

## Situation Report for COVID-19: Afghanistan, 2021-05-10

[Download the report for Afghanistan, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
62,063	221	2,698	12	1.1 (95% CI: 1.01-1.17)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

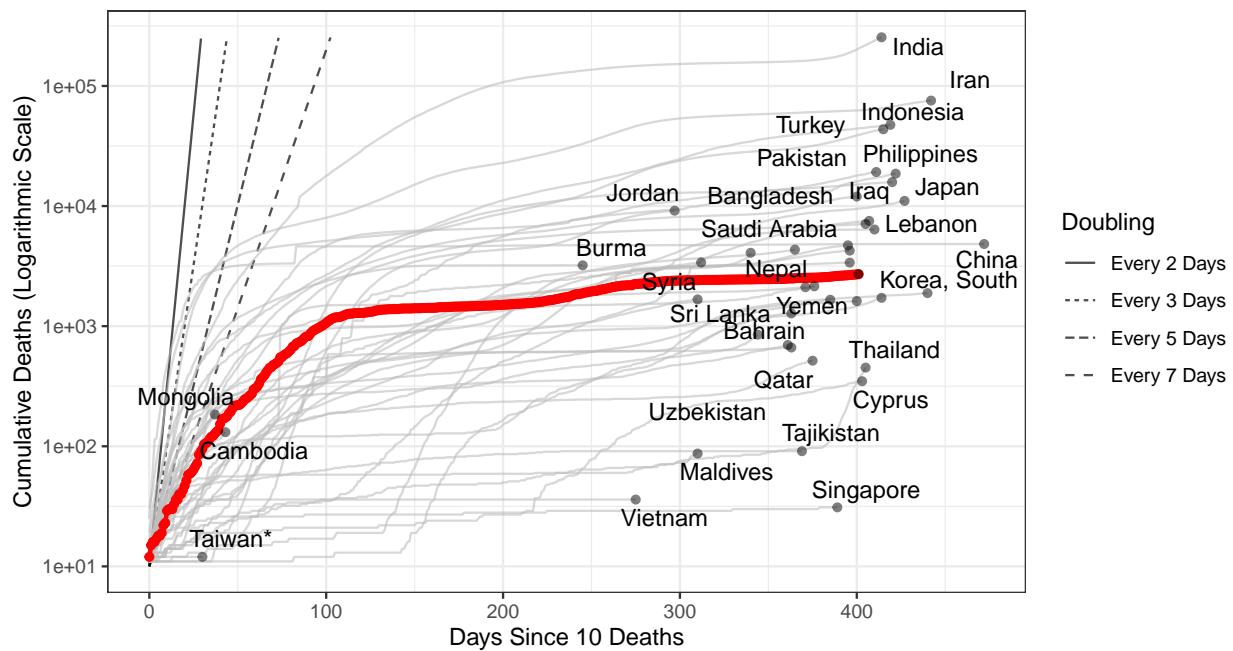


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 129,381 (95% CI: 124,751-134,011) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

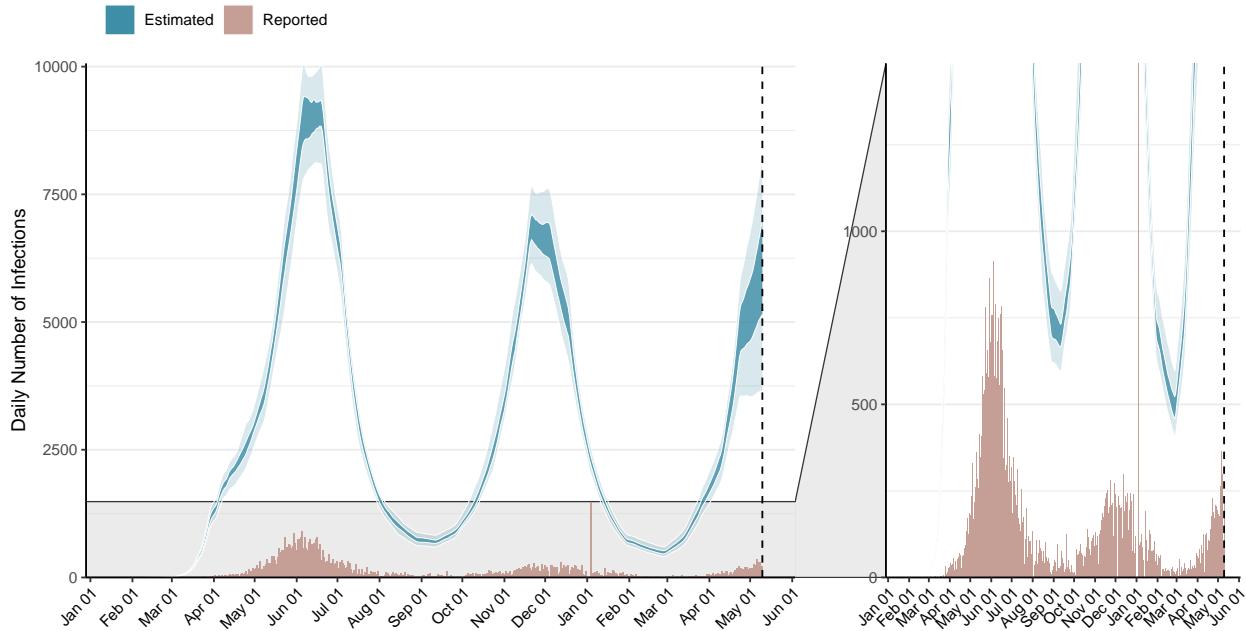
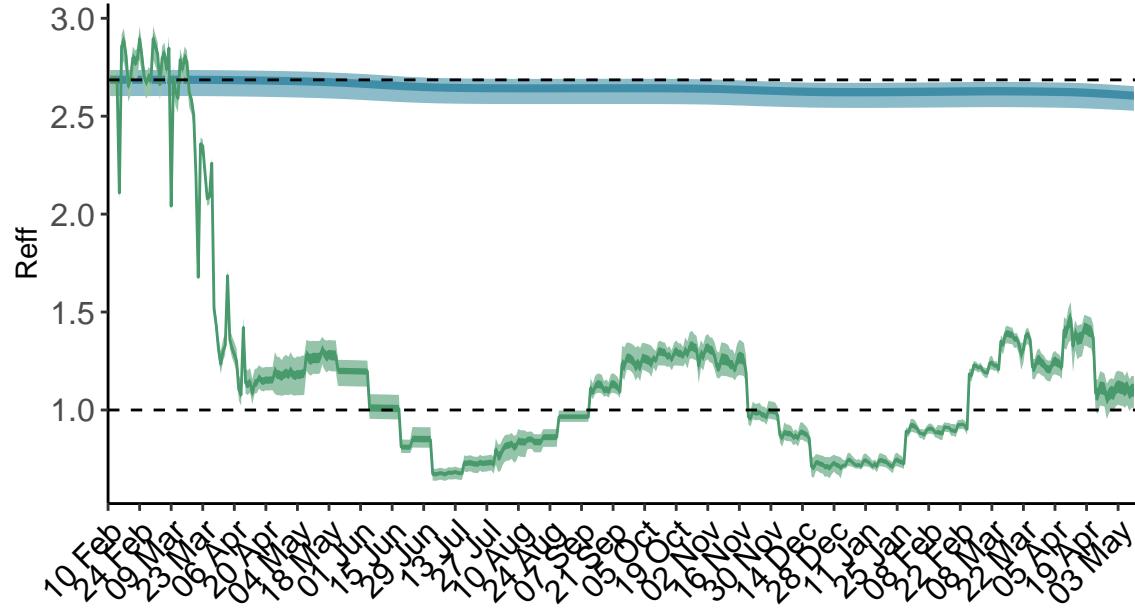


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Afghanistan is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

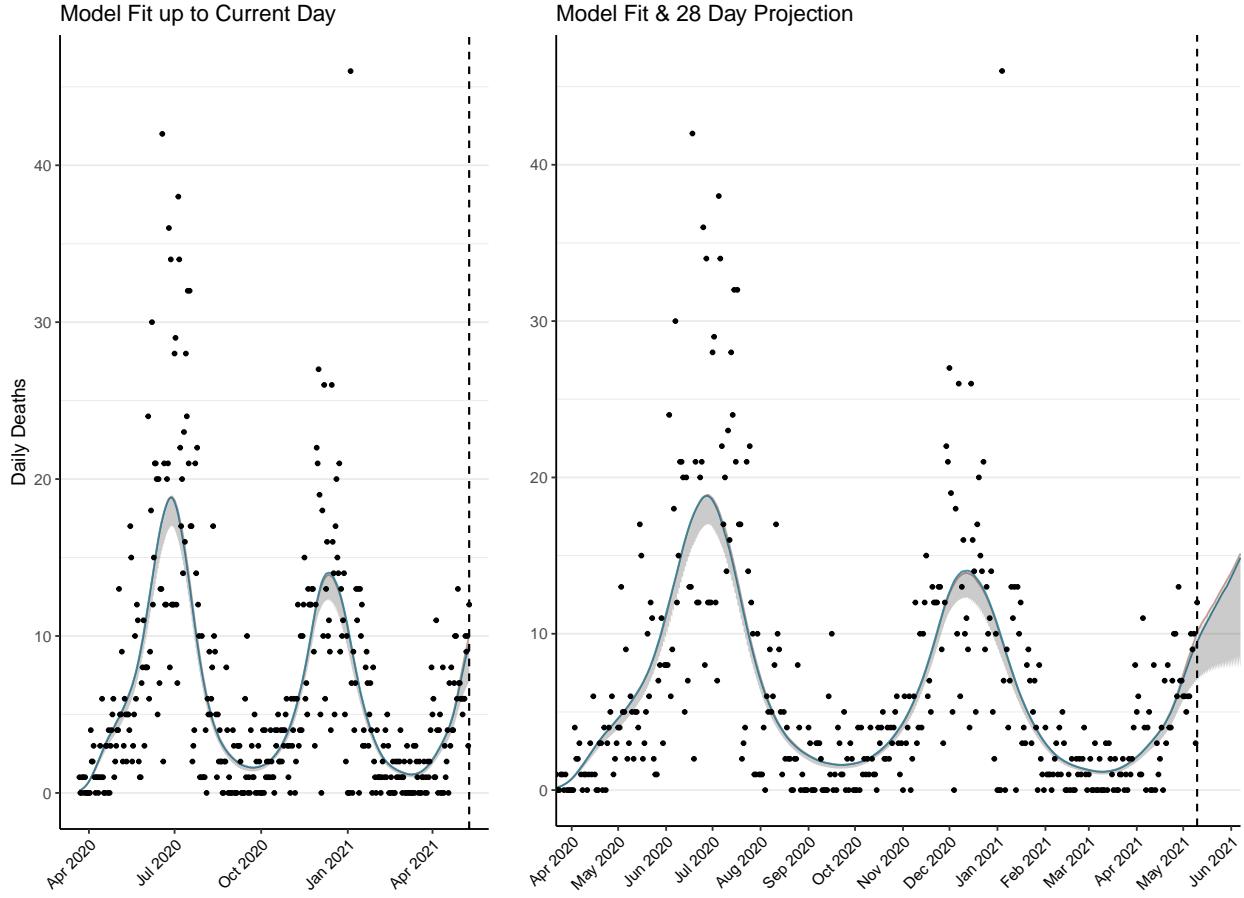


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 405 (95% CI: 390-420) patients requiring treatment with high-pressure oxygen at the current date to 627 (95% CI: 588-666) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 149 (95% CI: 144-154) patients requiring treatment with mechanical ventilation at the current date to 229 (95% CI: 217-241) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

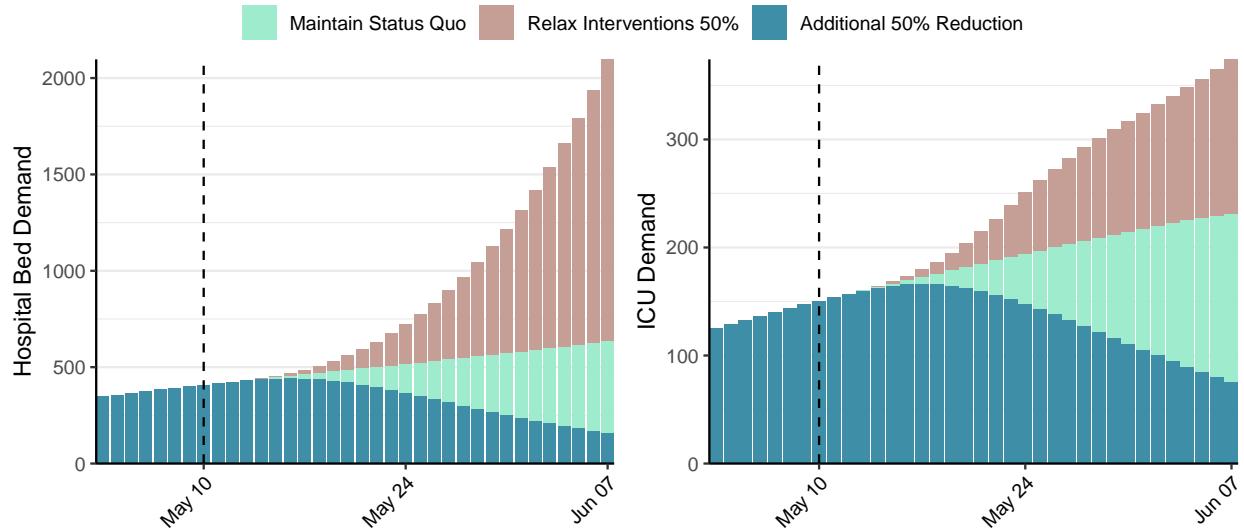
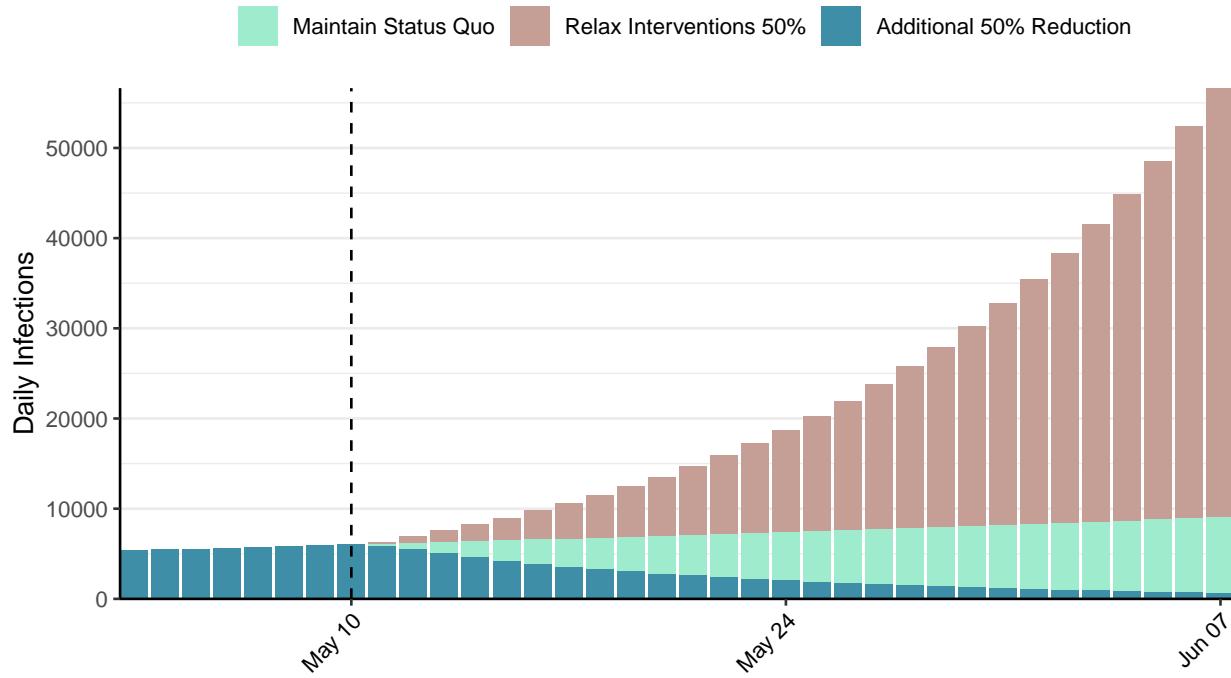


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 5,934 (95% CI: 5,661-6,207) at the current date to 651 (95% CI: 606-695) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 5,934 (95% CI: 5,661-6,207) at the current date to 56,075 (95% CI: 51,770-60,379) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Angola, 2021-05-10

[Download the report for Angola, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
28,875	135	639	3	1.13 (95% CI: 1.04-1.25)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

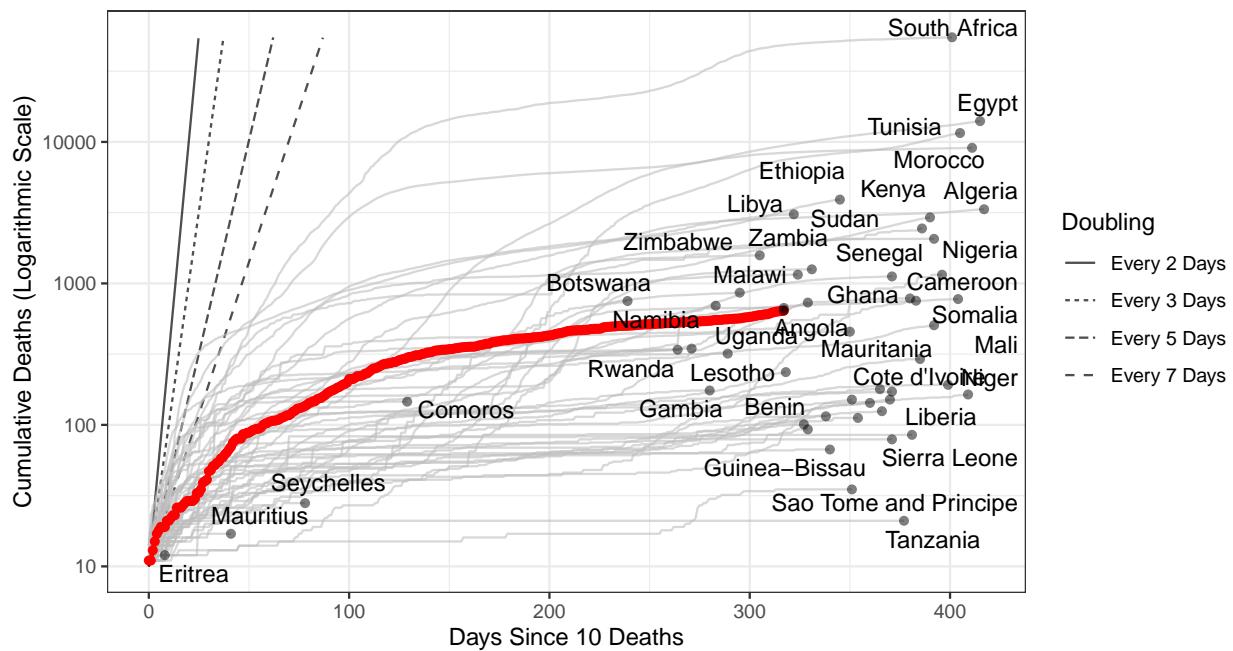


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 75,529 (95% CI: 72,773-78,284) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

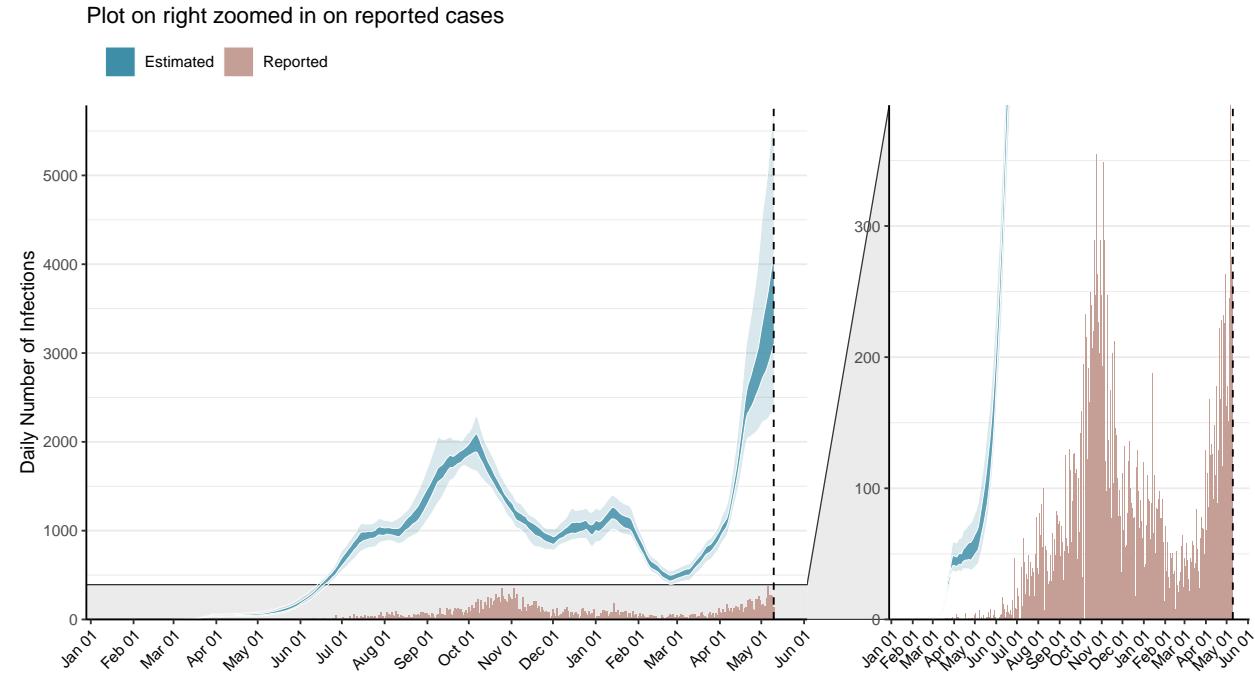
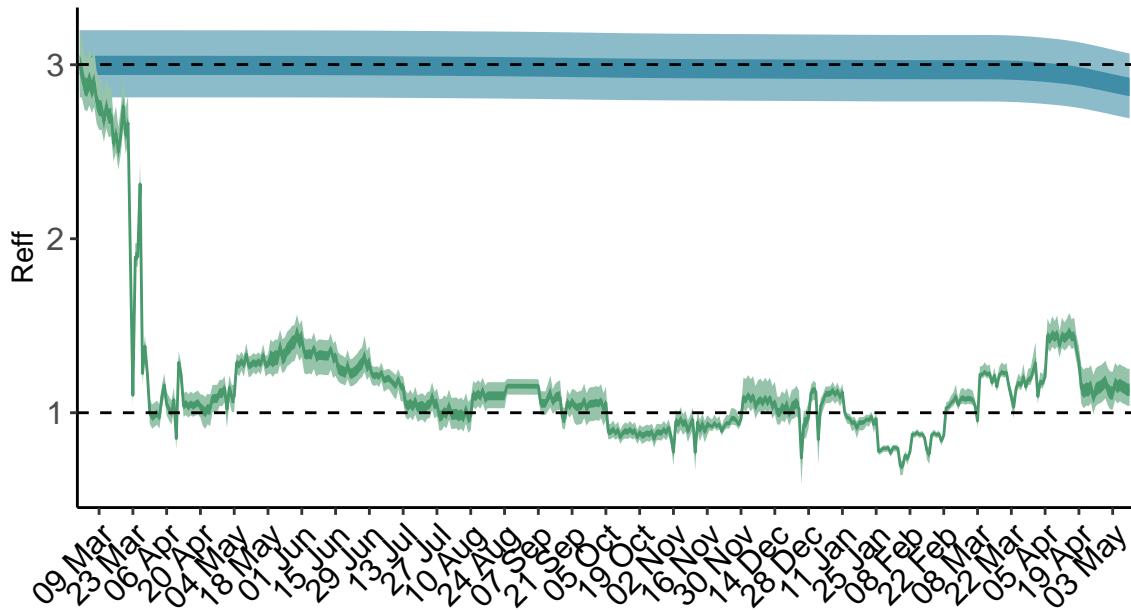


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

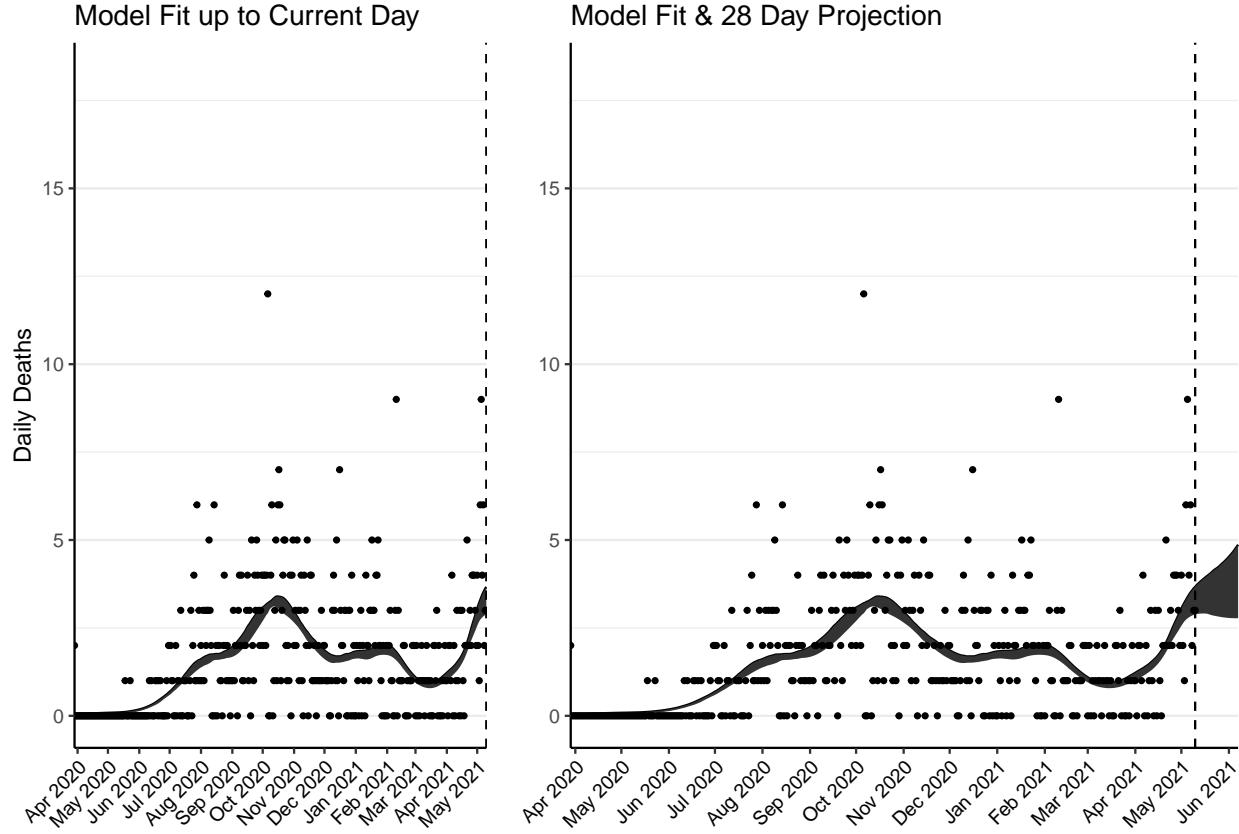


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 173 (95% CI: 166-179) patients requiring treatment with high-pressure oxygen at the current date to 266 (95% CI: 245-287) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 66 (95% CI: 63-68) patients requiring treatment with mechanical ventilation at the current date to 105 (95% CI: 97-113) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

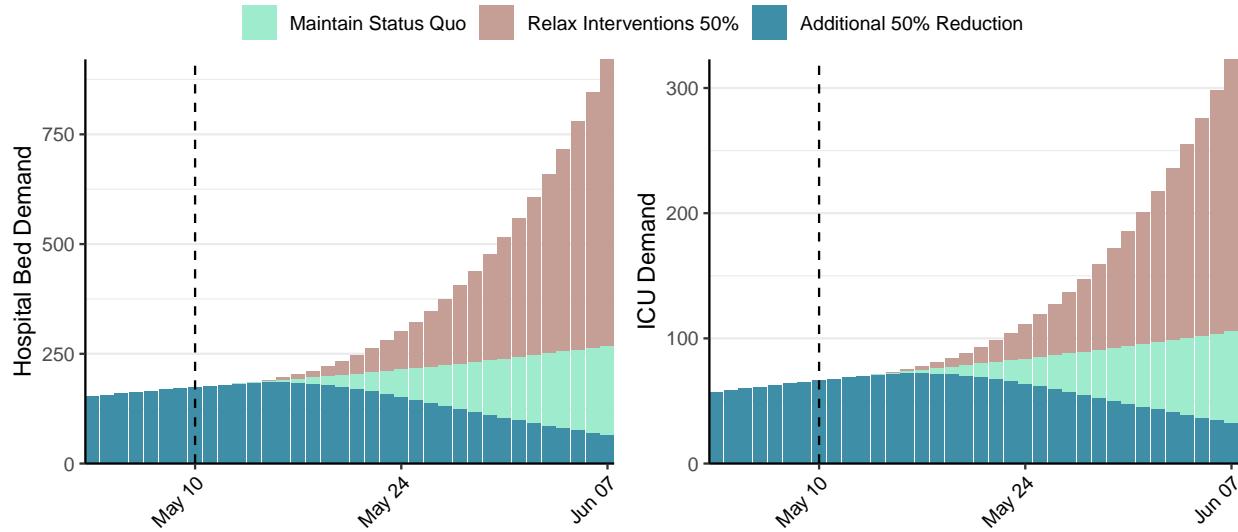


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 3,626 (95% CI: 3,438-3,814) at the current date to 439 (95% CI: 400-479) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 3,626 (95% CI: 3,438-3,814) at the current date to 40,451 (95% CI: 36,202-44,700) by 2021-06-07.

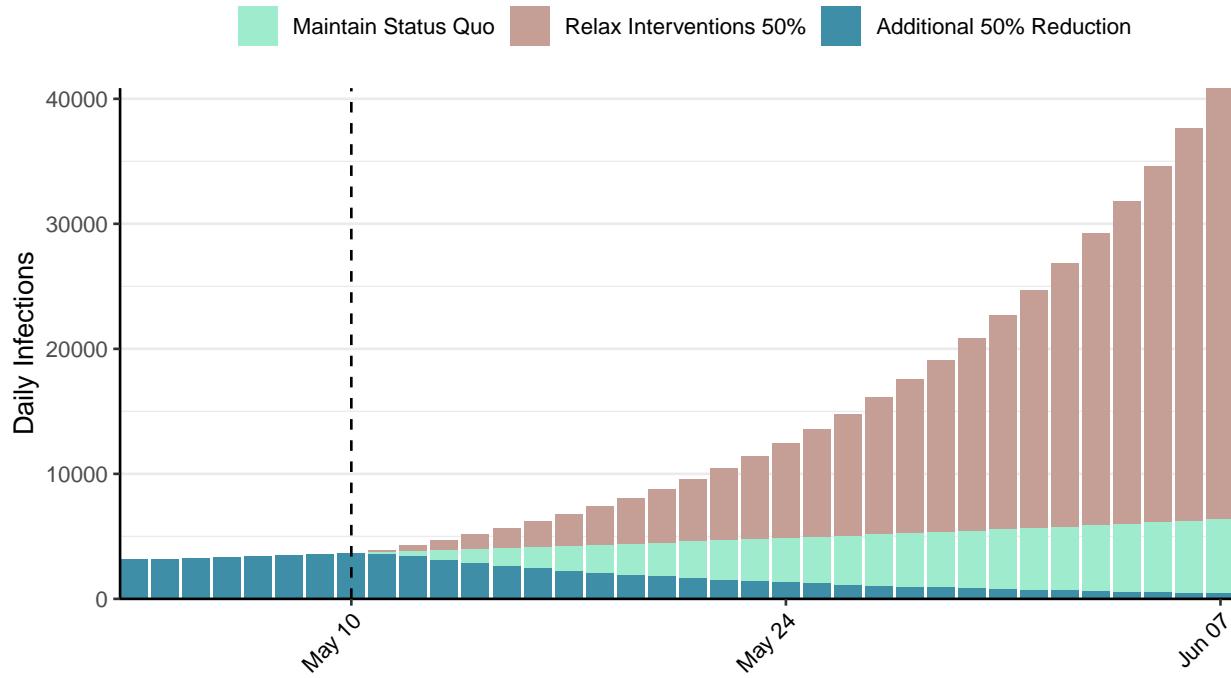


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Albania, 2021-05-10

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### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
131,753	30	2,416	4	0.58 (95% CI: 0.53-0.64)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

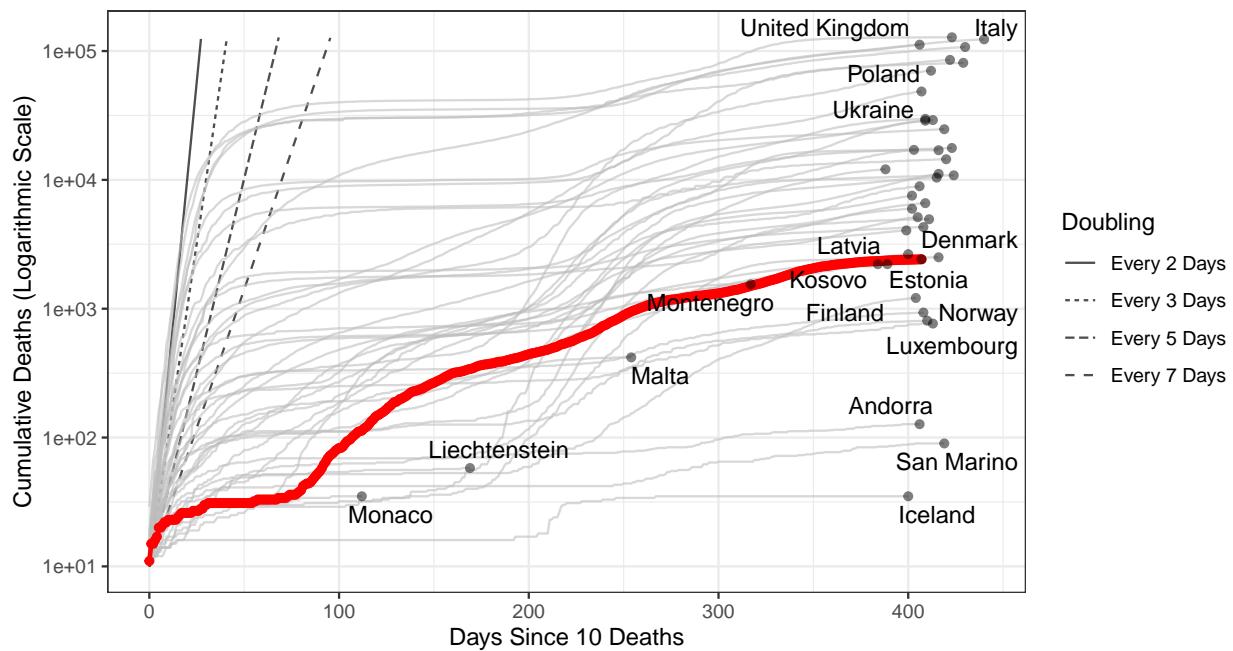


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 10,753 (95% CI: 10,389-11,118) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

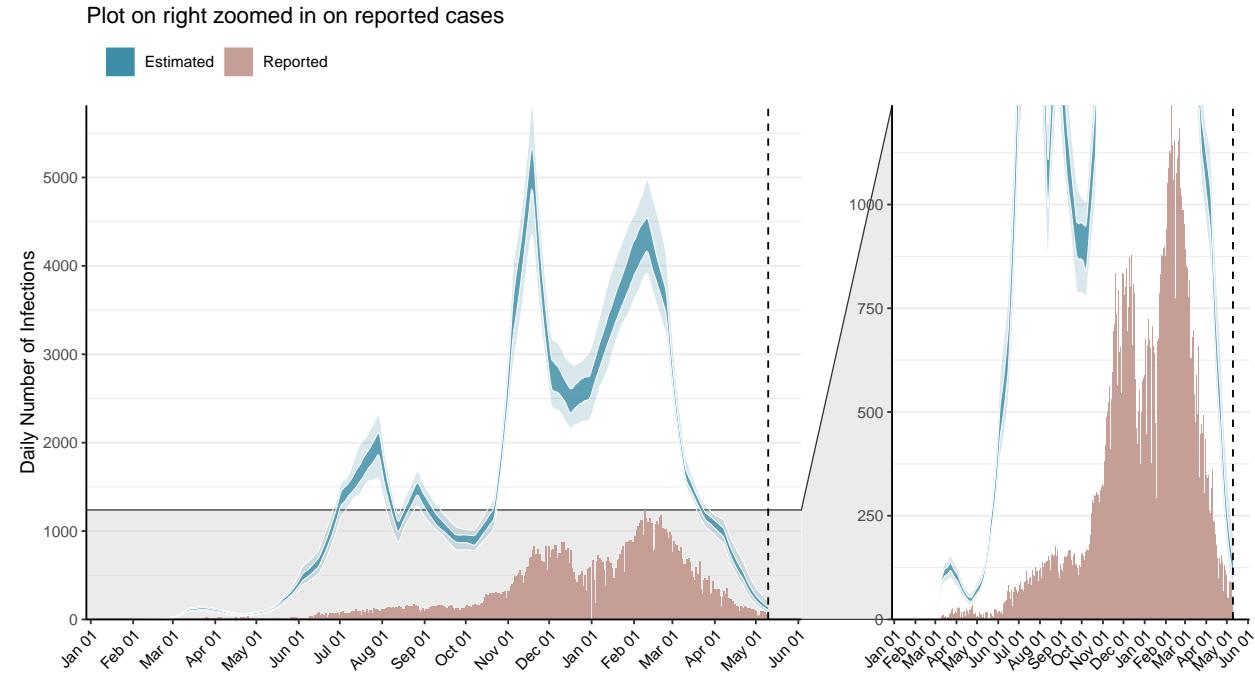
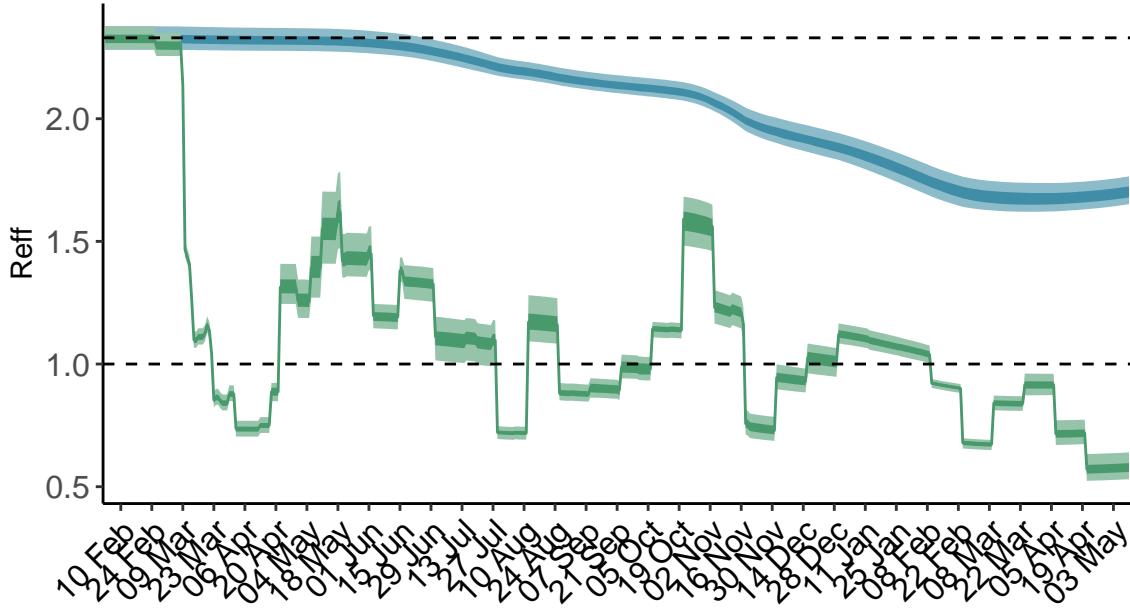


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

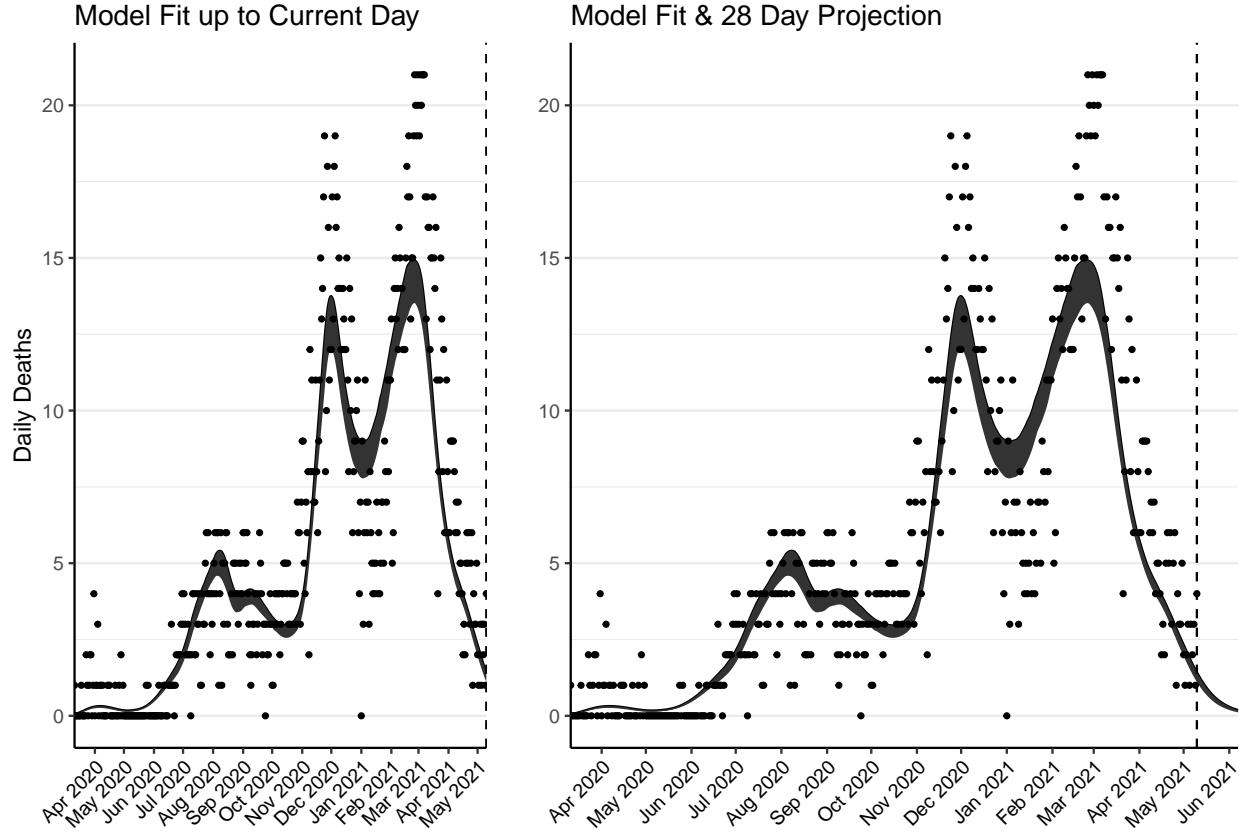


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 42 (95% CI: 40-43) patients requiring treatment with high-pressure oxygen at the current date to 6 (95% CI: 5-6) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 21 (95% CI: 20-21) patients requiring treatment with mechanical ventilation at the current date to 3 (95% CI: 3-3) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

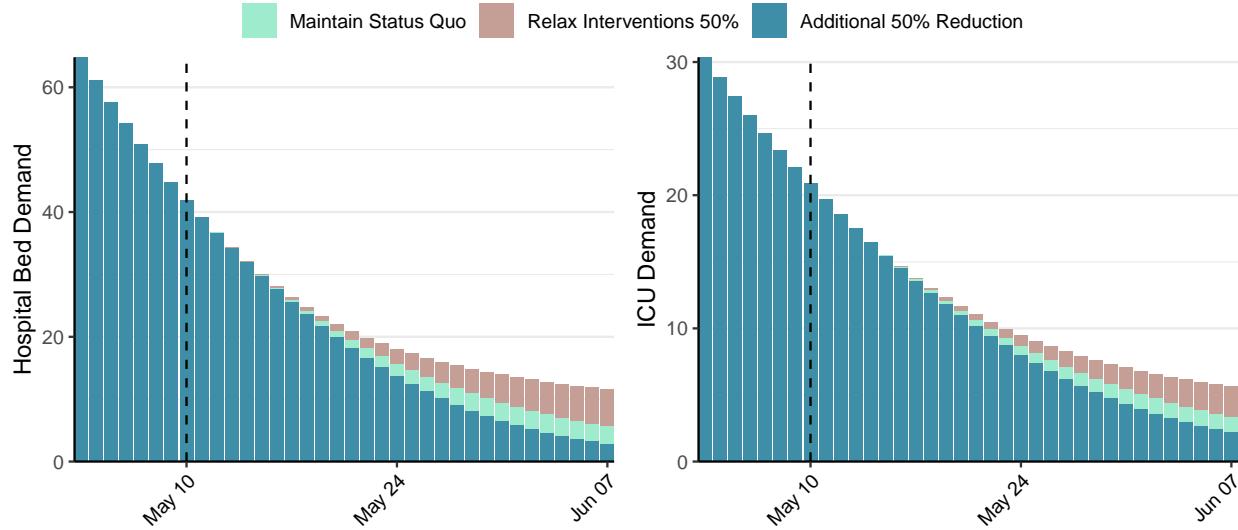


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 127 (95% CI: 121-134) at the current date to 2 (95% CI: 2-2) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 127 (95% CI: 121-134) at the current date to 79 (95% CI: 71-86) by 2021-06-07.

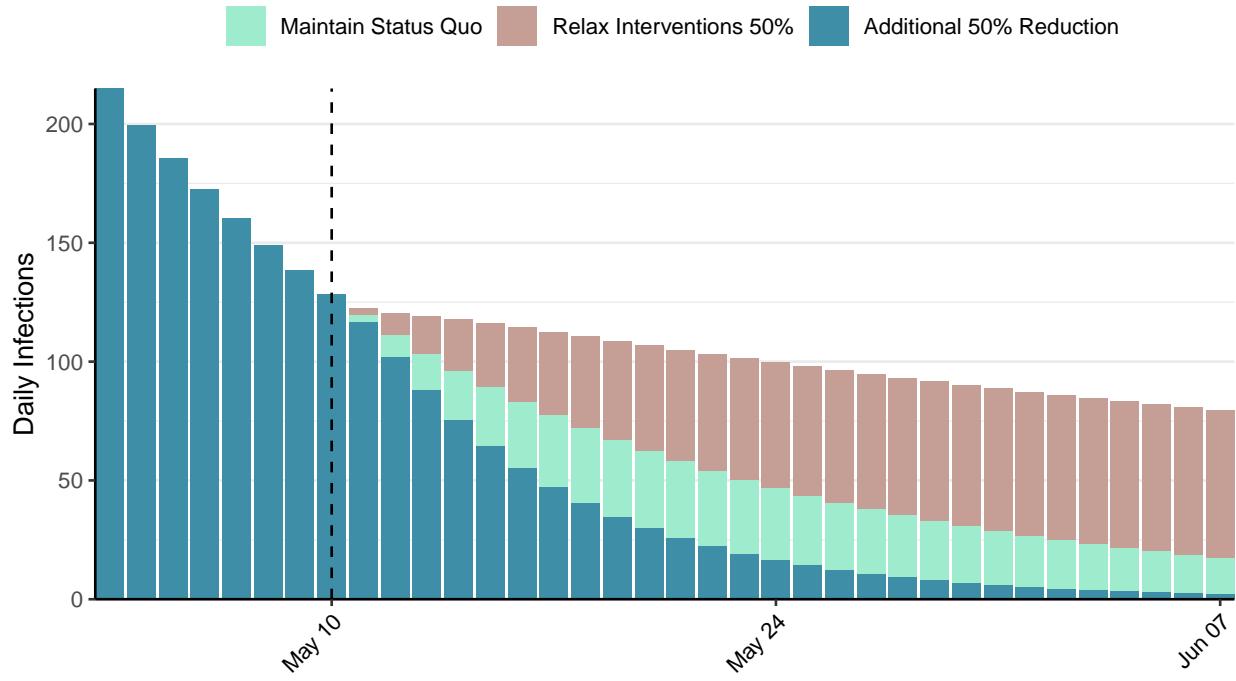


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Argentina, 2021-05-10

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### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
3,165,121	17,381	67,821	496	0.84 (95% CI: 0.8-0.89)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

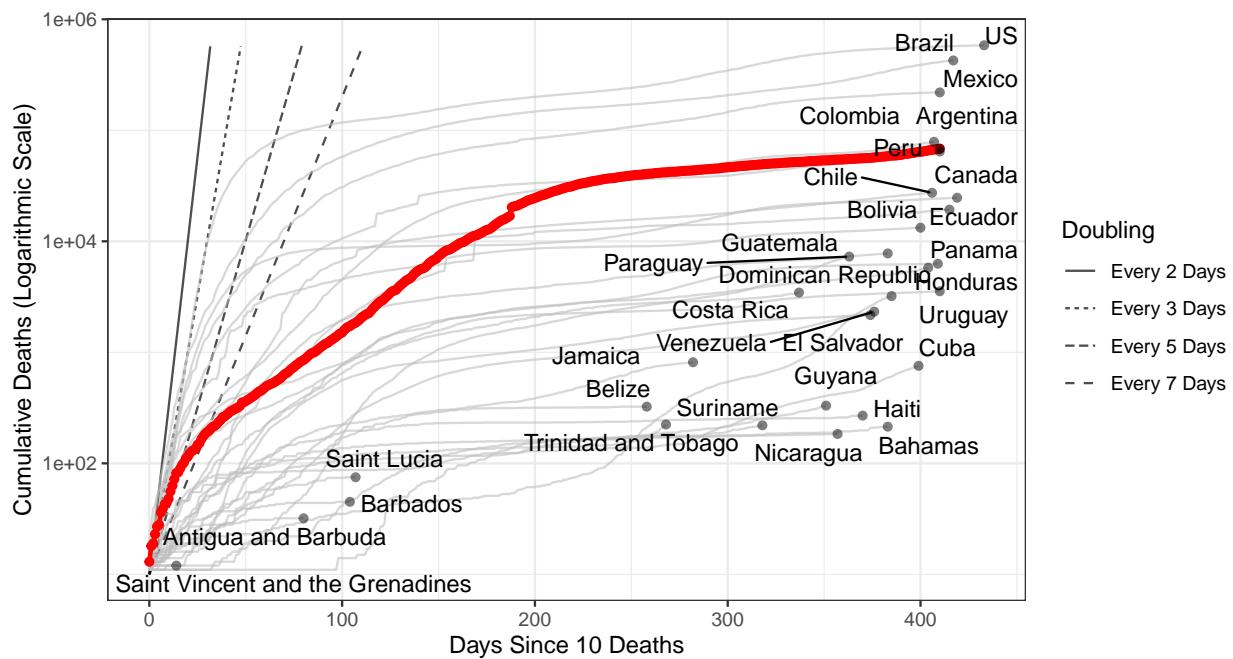


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 4,093,787 (95% CI: 3,980,902-4,206,672) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

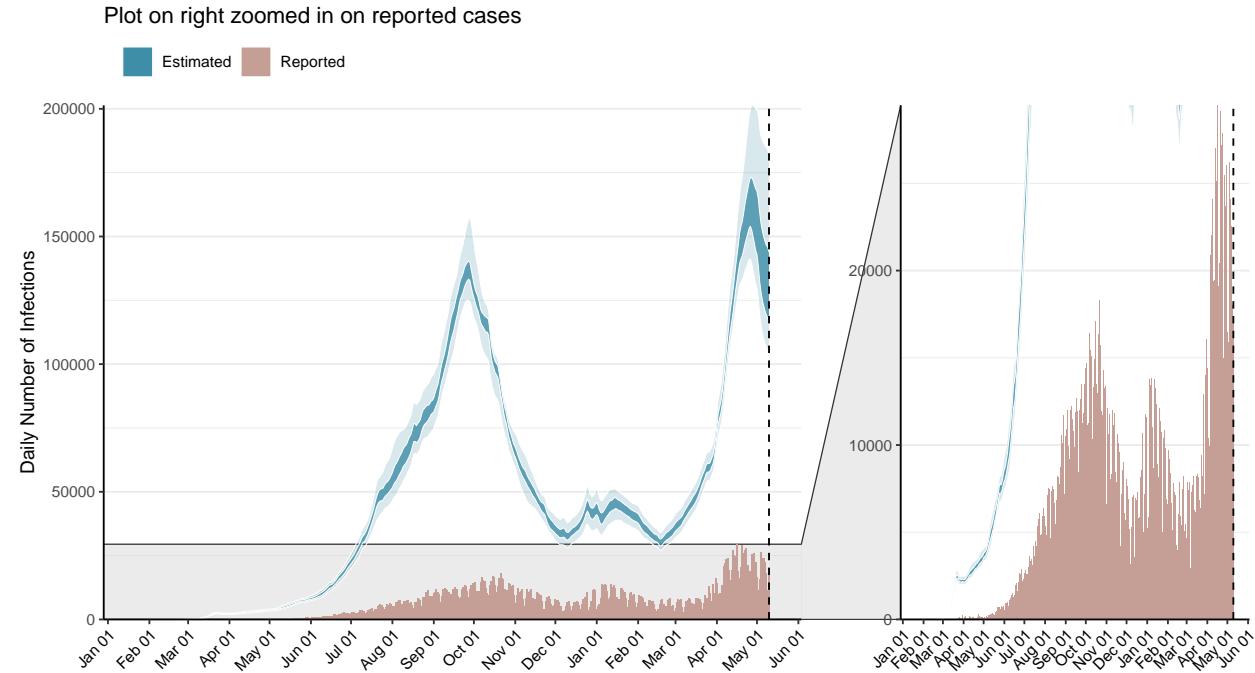
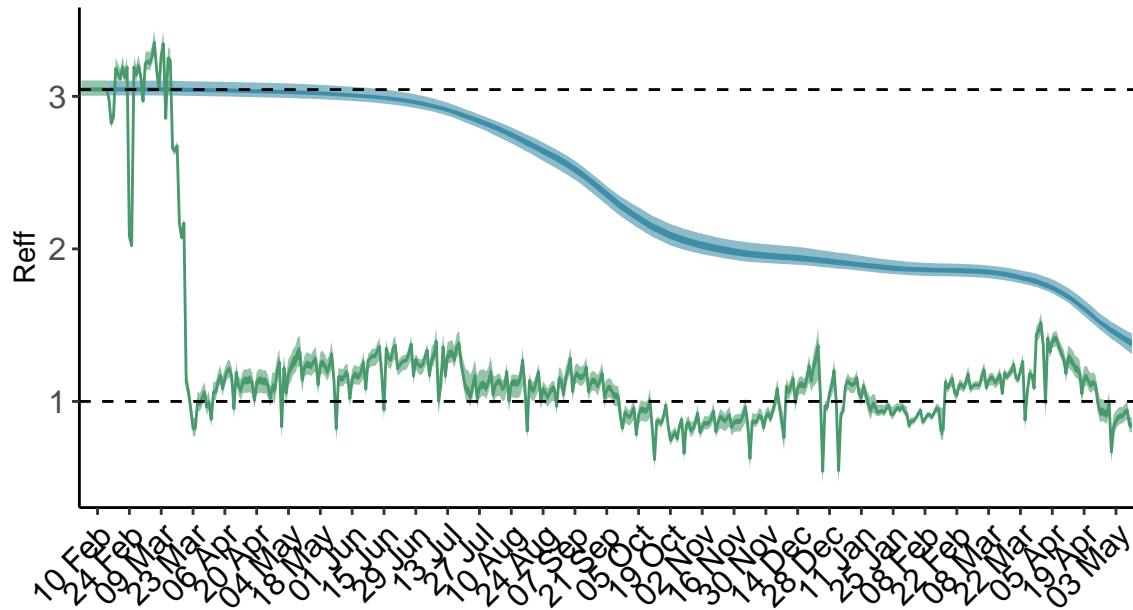


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Argentina is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

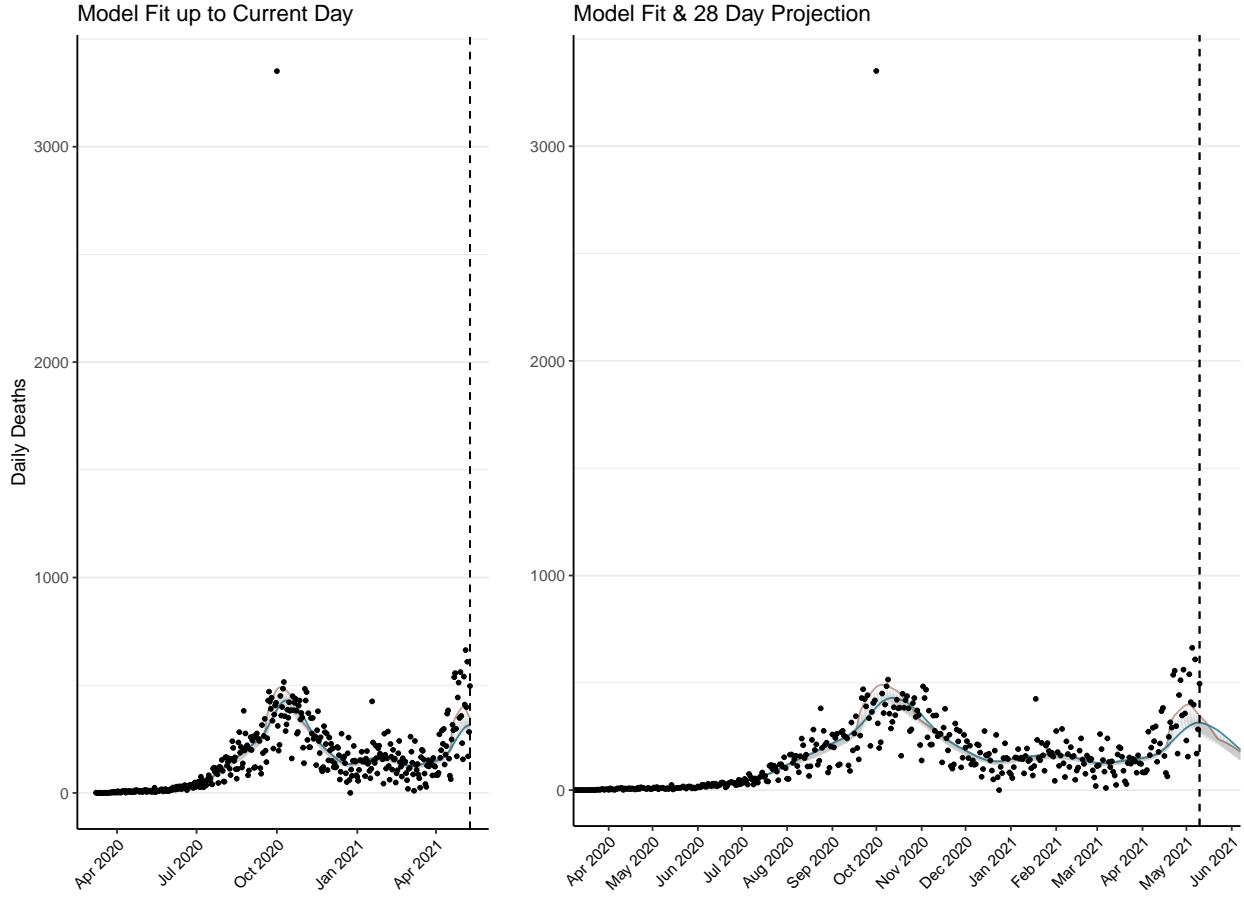


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 12,351 (95% CI: 11,996-12,707) patients requiring treatment with high-pressure oxygen at the current date to 6,471 (95% CI: 6,190-6,753) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 3,634 (95% CI: 3,561-3,707) patients requiring treatment with mechanical ventilation at the current date to 2,630 (95% CI: 2,539-2,720) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B.** These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.

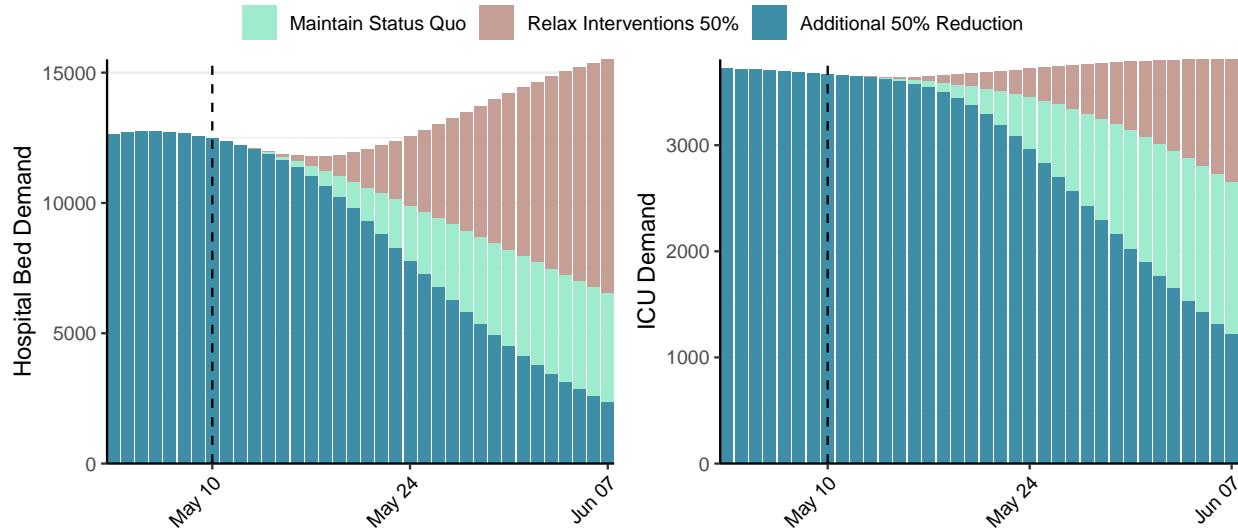
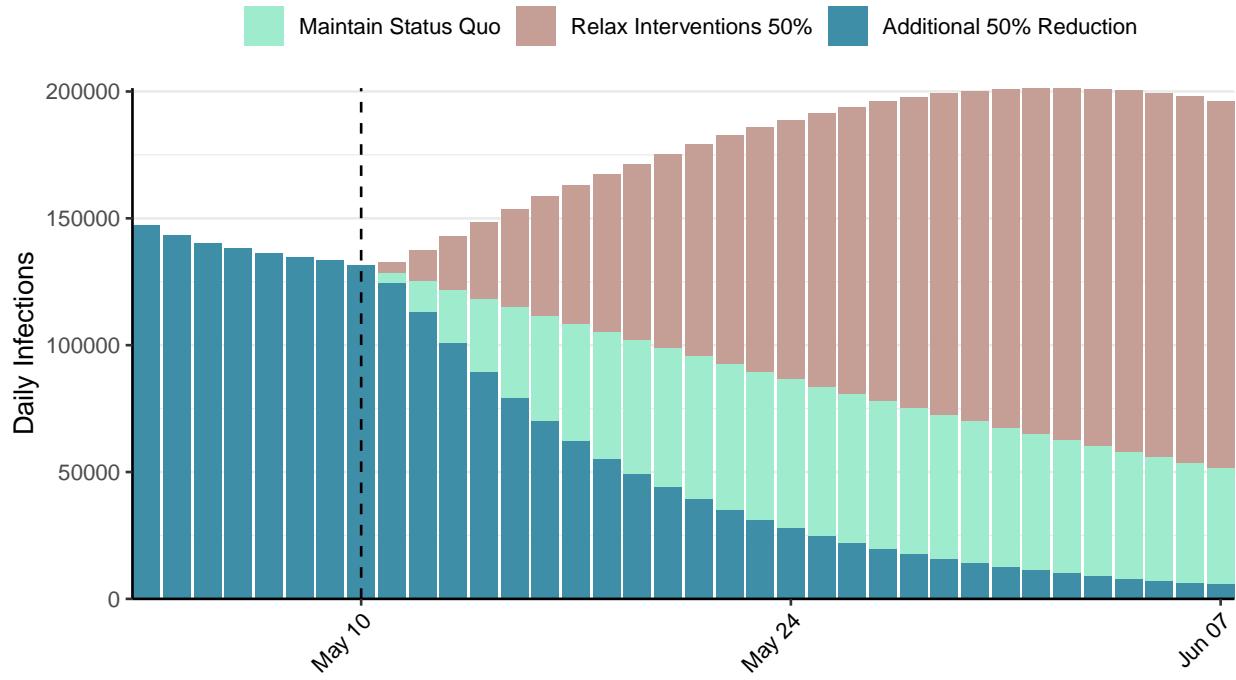


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 130,131 (95% CI: 125,379-134,883) at the current date to 5,530 (95% CI: 5,262-5,798) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 130,131 (95% CI: 125,379-134,883) at the current date to 194,315 (95% CI: 187,465-201,166) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Armenia, 2021-05-10

[Download the report for Armenia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
219,353	83	4,249	15	0.7 (95% CI: 0.66-0.74)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

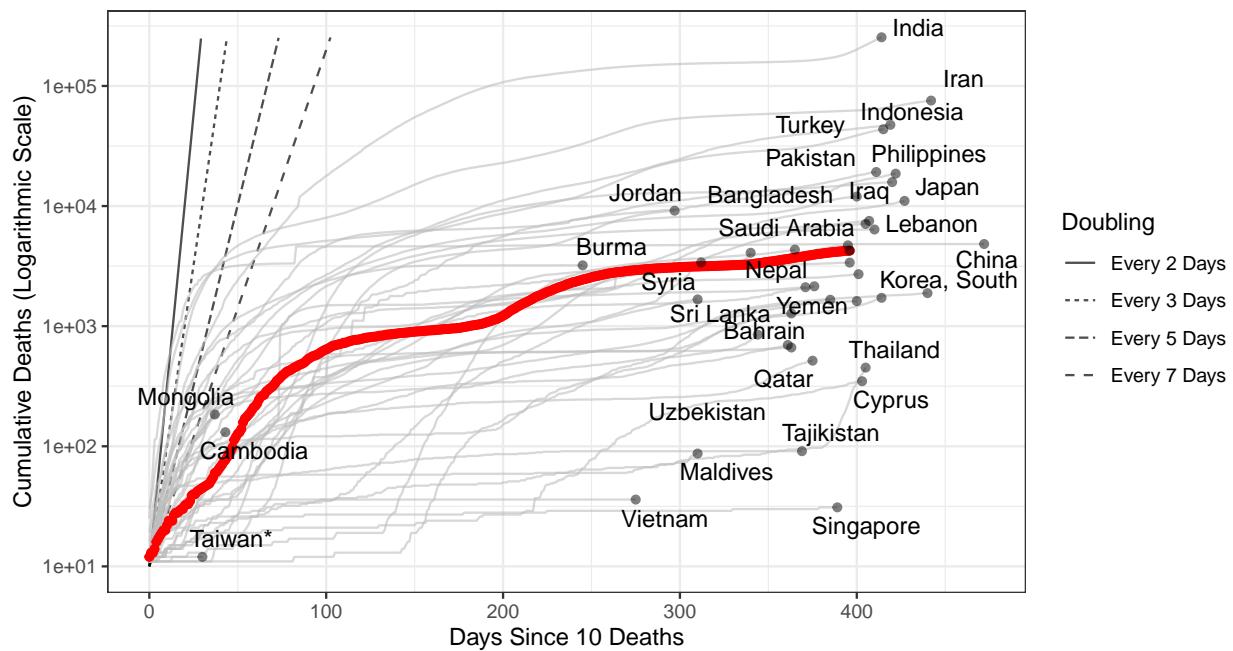


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 59,697 (95% CI: 58,522-60,873) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

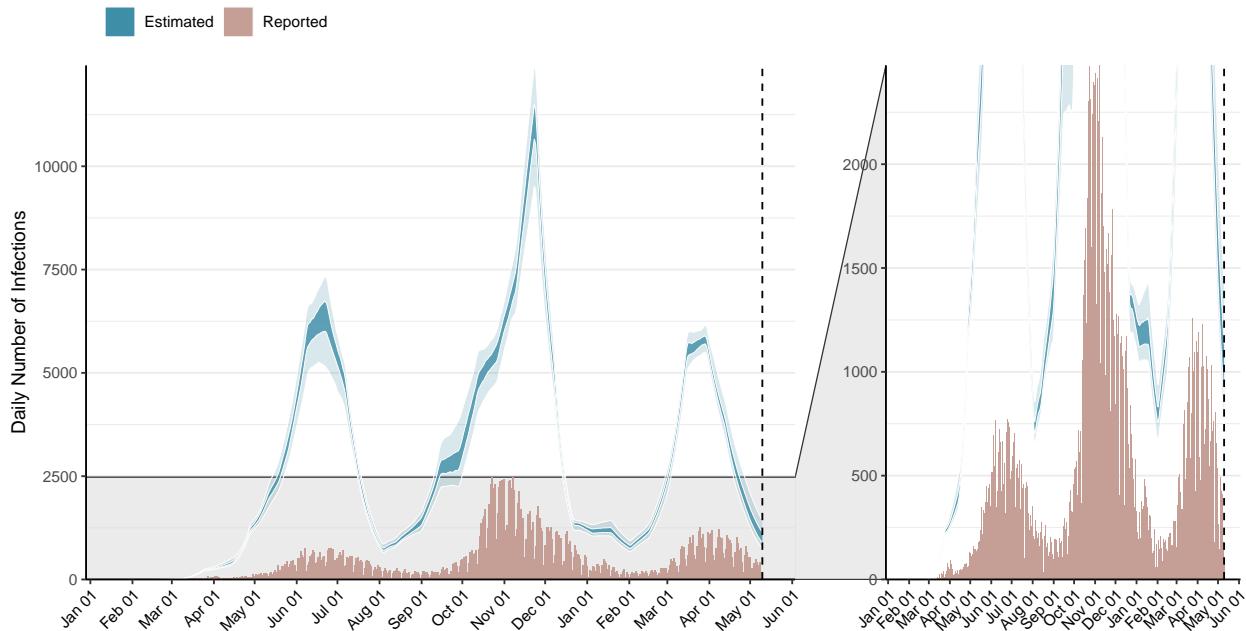
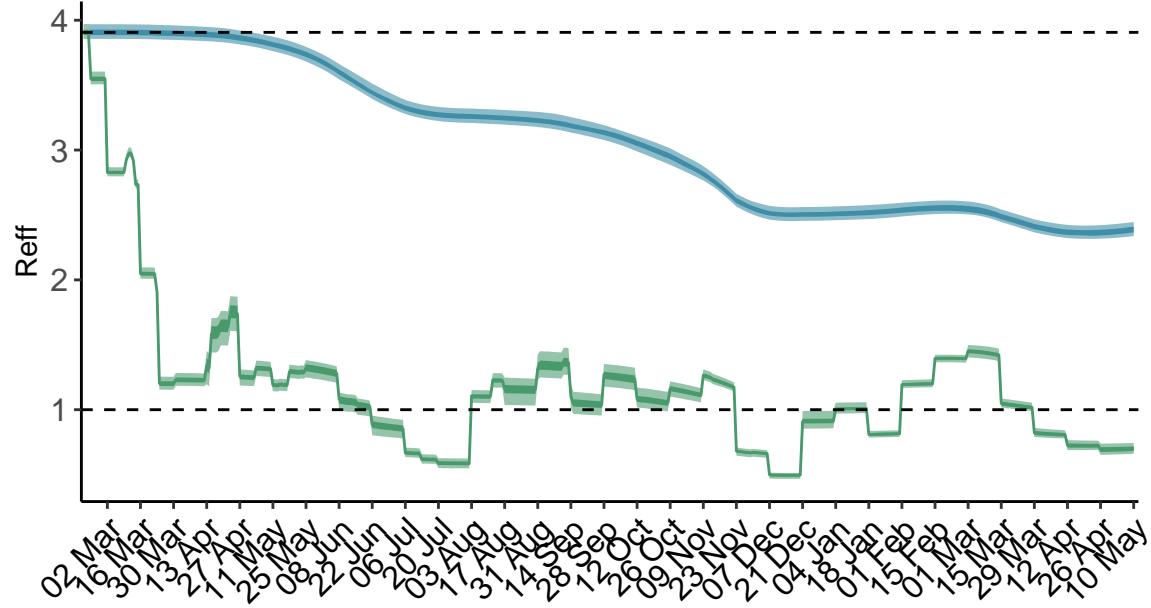


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Armenia is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

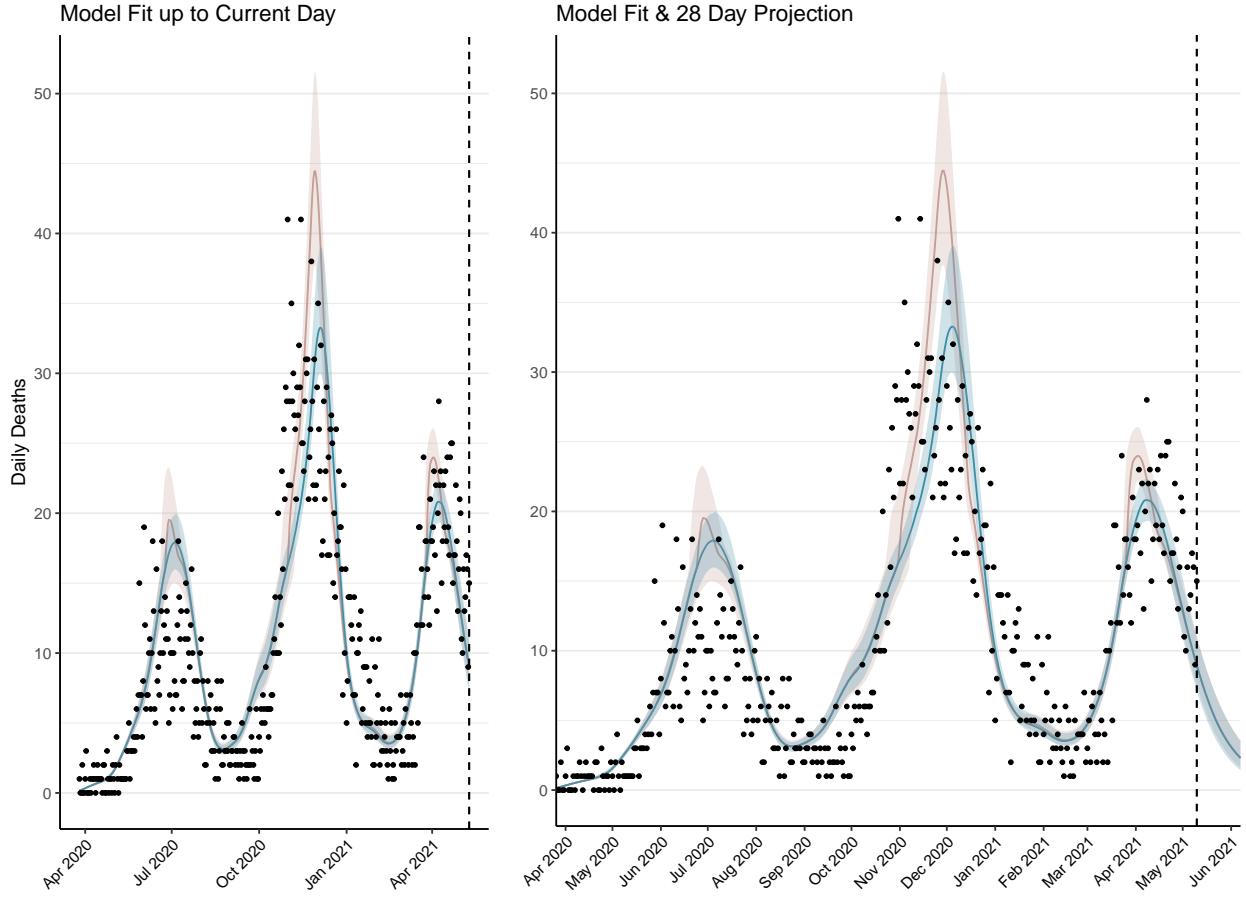


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 266 (95% CI: 260-272) patients requiring treatment with high-pressure oxygen at the current date to 69 (95% CI: 66-72) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 114 (95% CI: 112-116) patients requiring treatment with mechanical ventilation at the current date to 31 (95% CI: 30-33) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

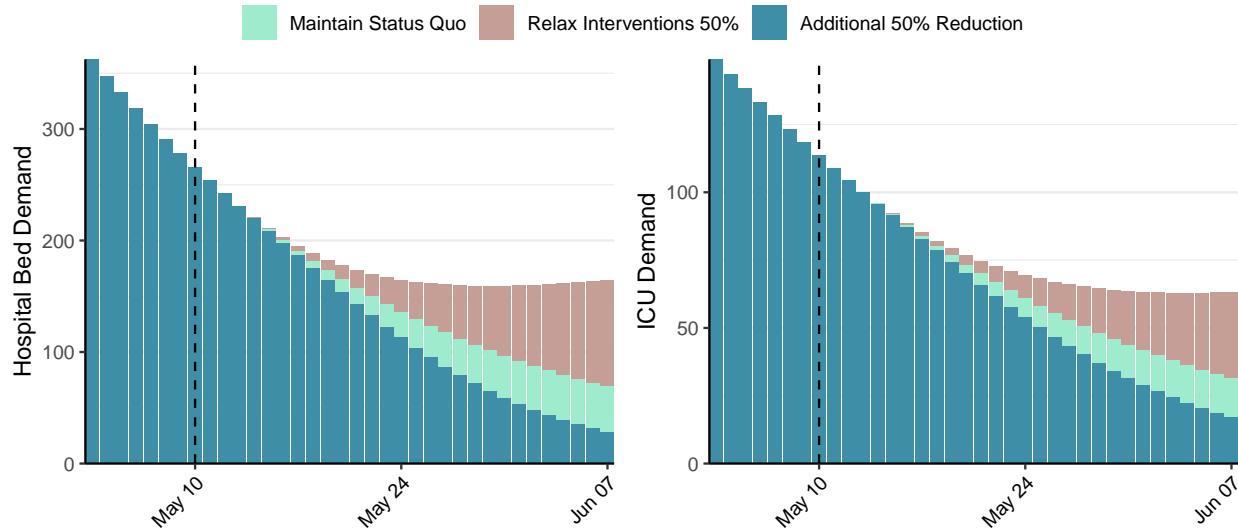


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,022 (95% CI: 988-1,057) at the current date to 28 (95% CI: 27-30) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,022 (95% CI: 988-1,057) at the current date to 1,335 (95% CI: 1,252-1,419) by 2021-06-07.

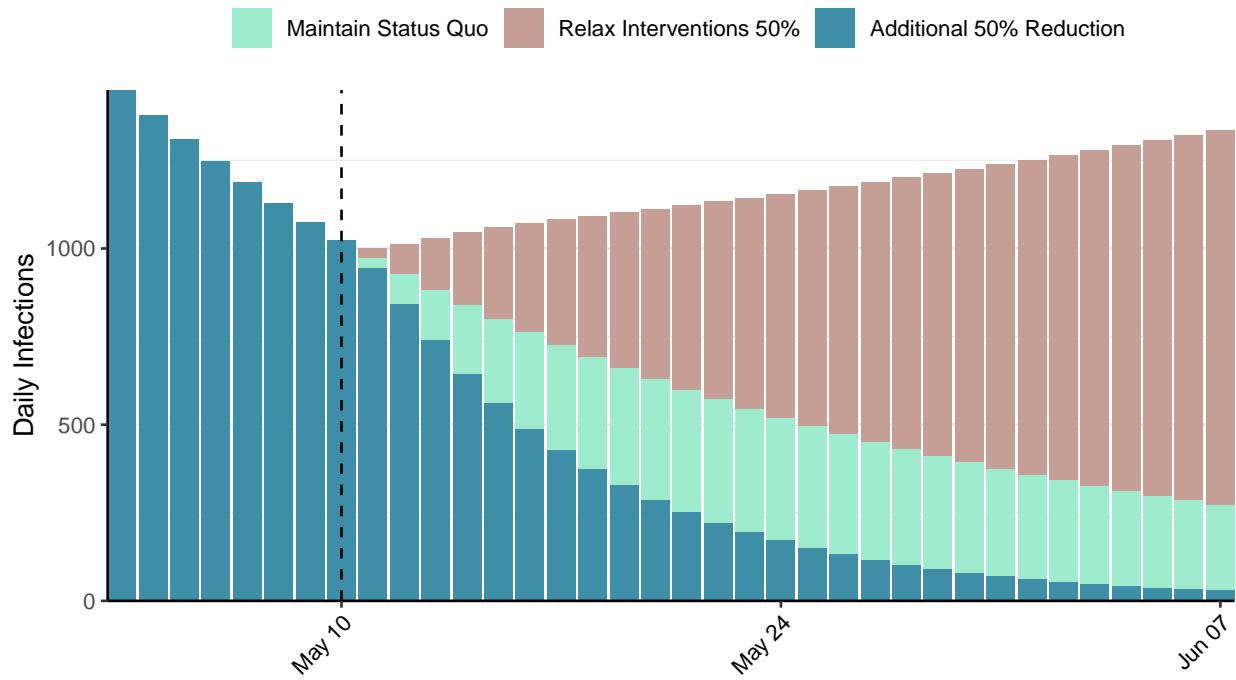


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Azerbaijan, 2021-05-10

[Download the report for Azerbaijan, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
327,087	371	4,698	18	0.51 (95% CI: 0.47-0.54)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

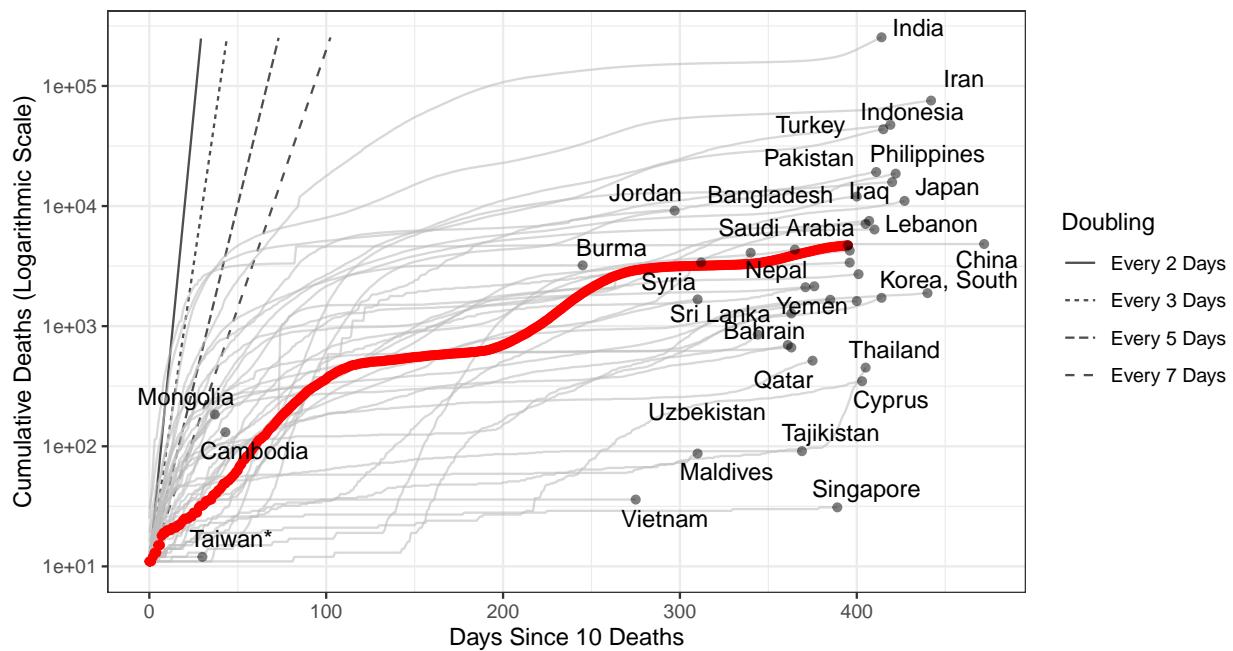


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 457,941 (95% CI: 449,113-466,768) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

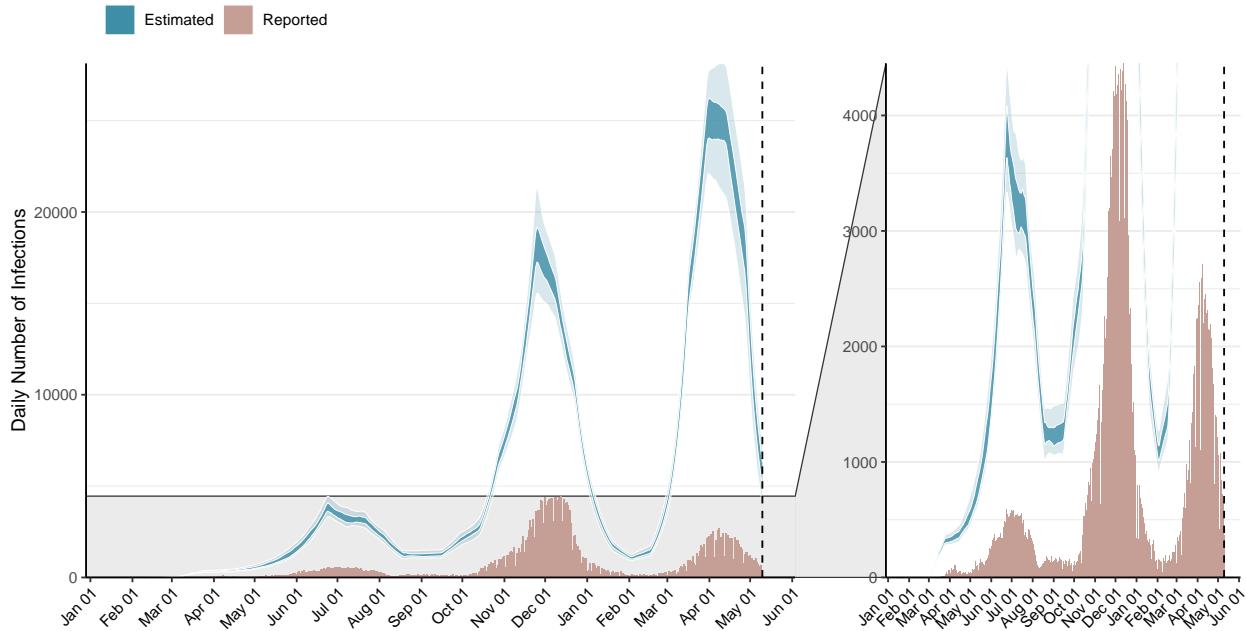
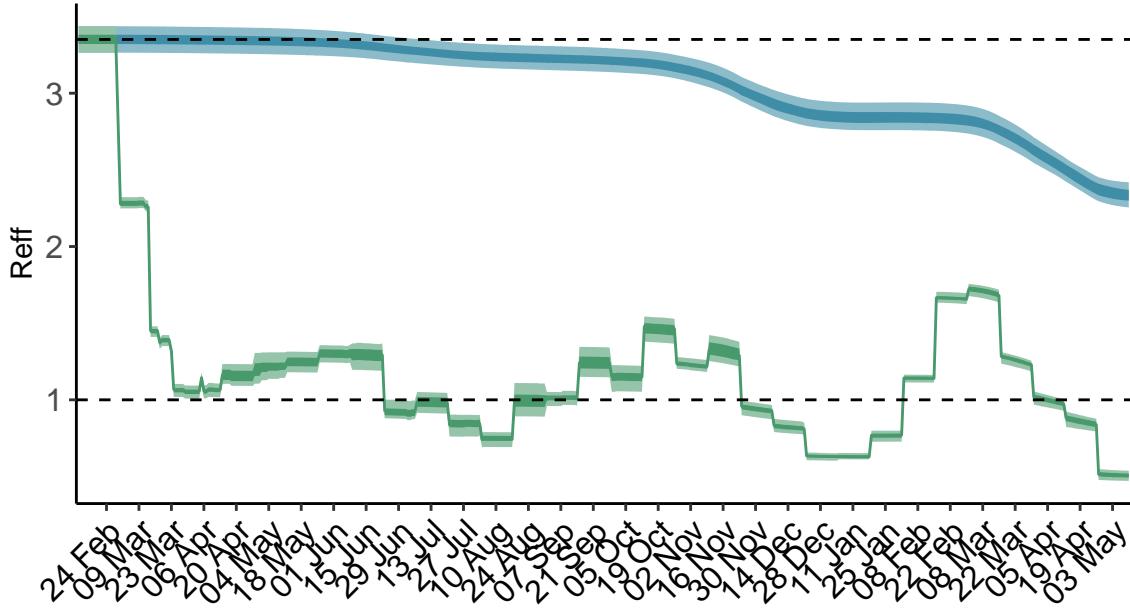


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

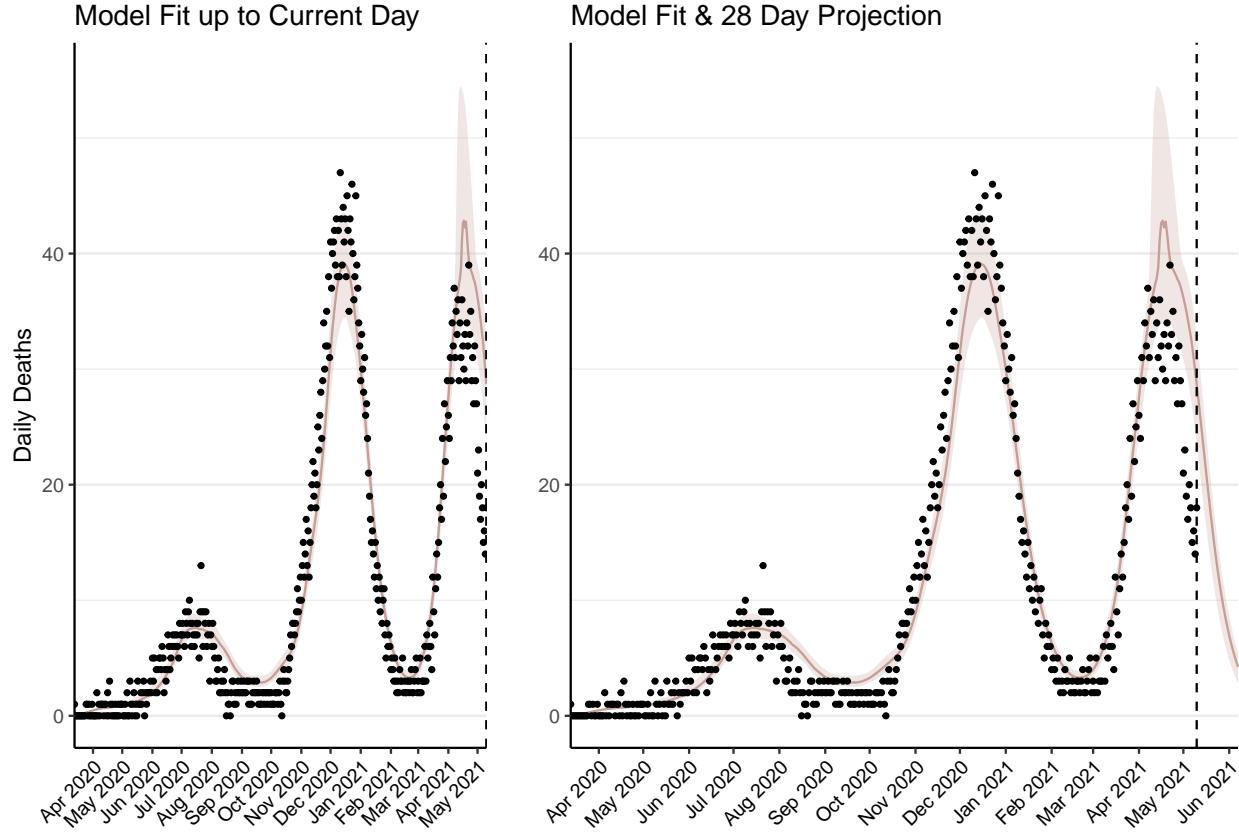


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 1,133 (95% CI: 1,109-1,157) patients requiring treatment with high-pressure oxygen at the current date to 134 (95% CI: 129-140) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 538 (95% CI: 528-547) patients requiring treatment with mechanical ventilation at the current date to 85 (95% CI: 82-88) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

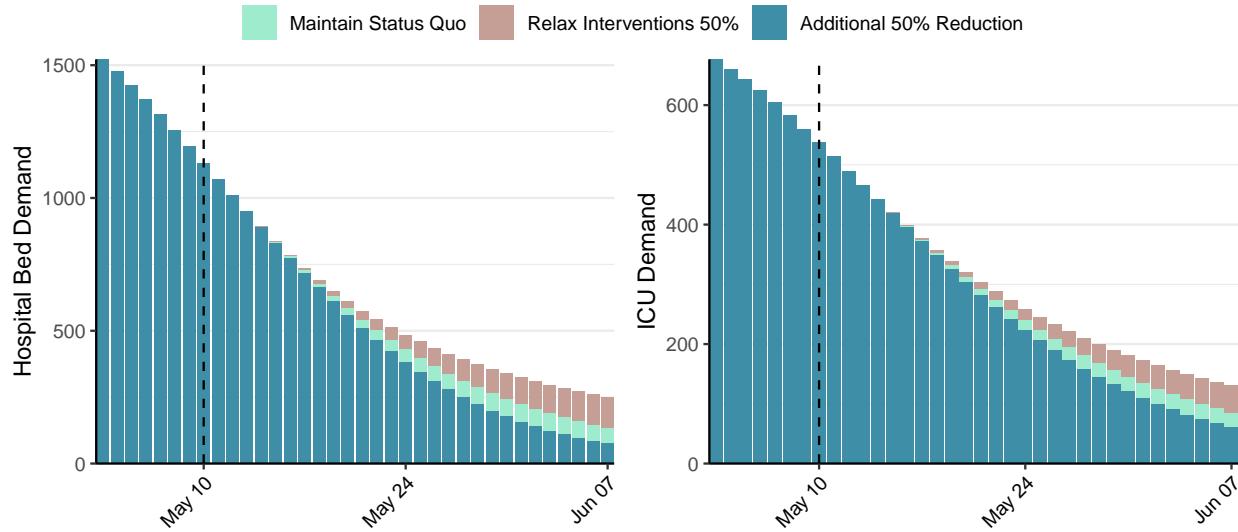


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 5,756 (95% CI: 5,575-5,938) at the current date to 62 (95% CI: 59-65) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 5,756 (95% CI: 5,575-5,938) at the current date to 1,932 (95% CI: 1,820-2,044) by 2021-06-07.

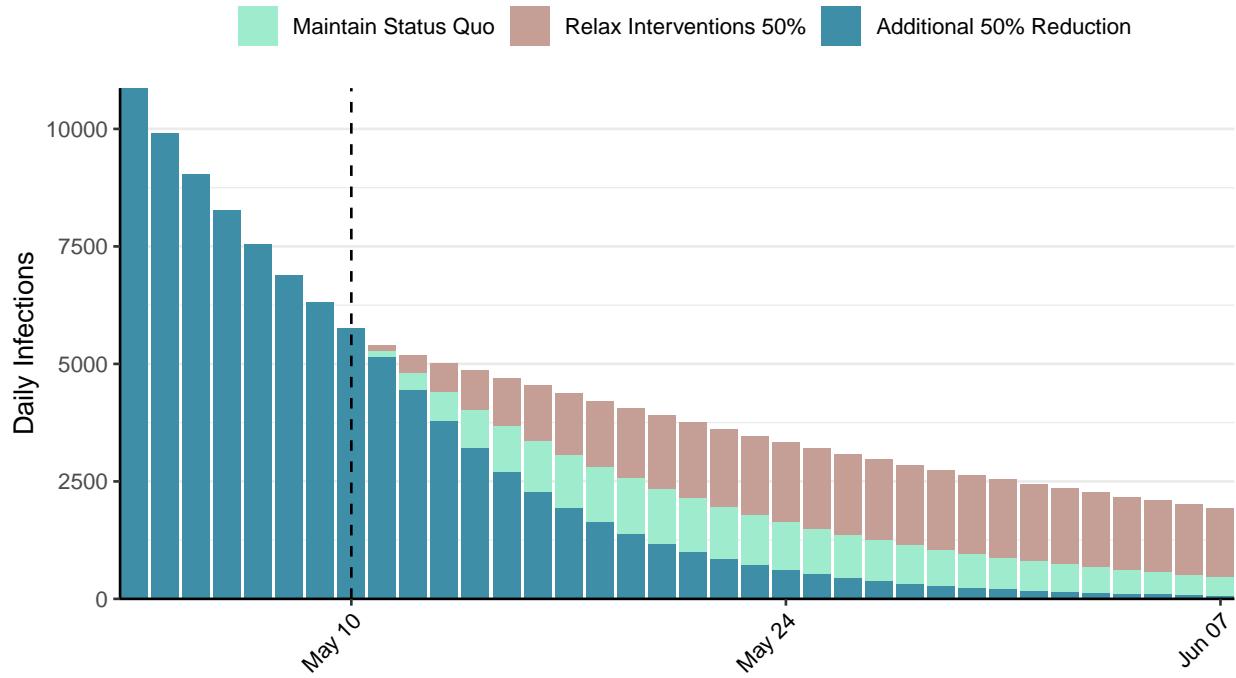


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Burundi, 2021-05-10

[Download the report for Burundi, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
4,200	23	6	0	0.64 (95% CI: 0.43-0.86)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease. **N.B.** Burundi is not shown in the following plot as only 6 deaths have been reported to date

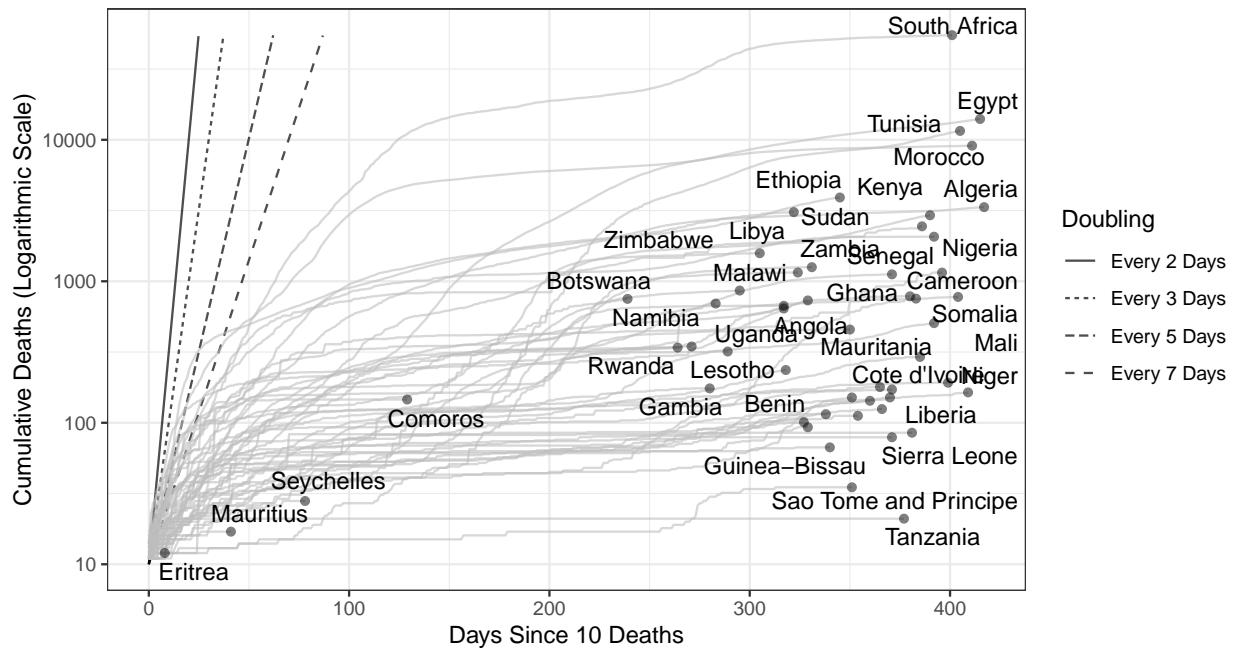


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 16 (95% CI: 13-20) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

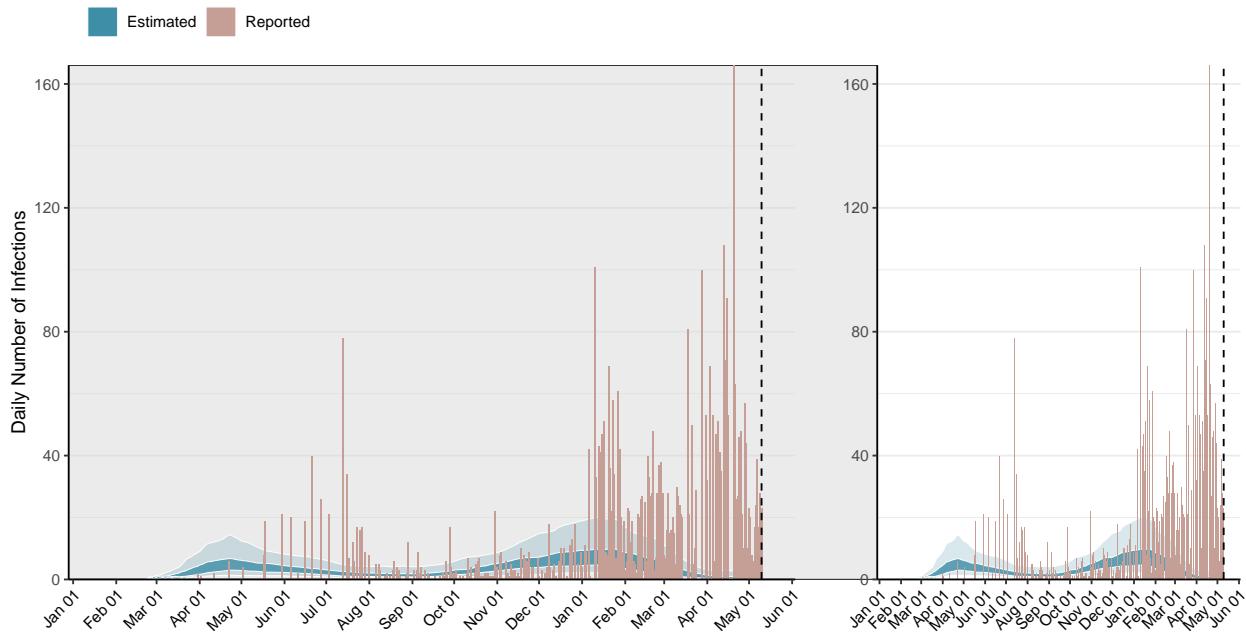
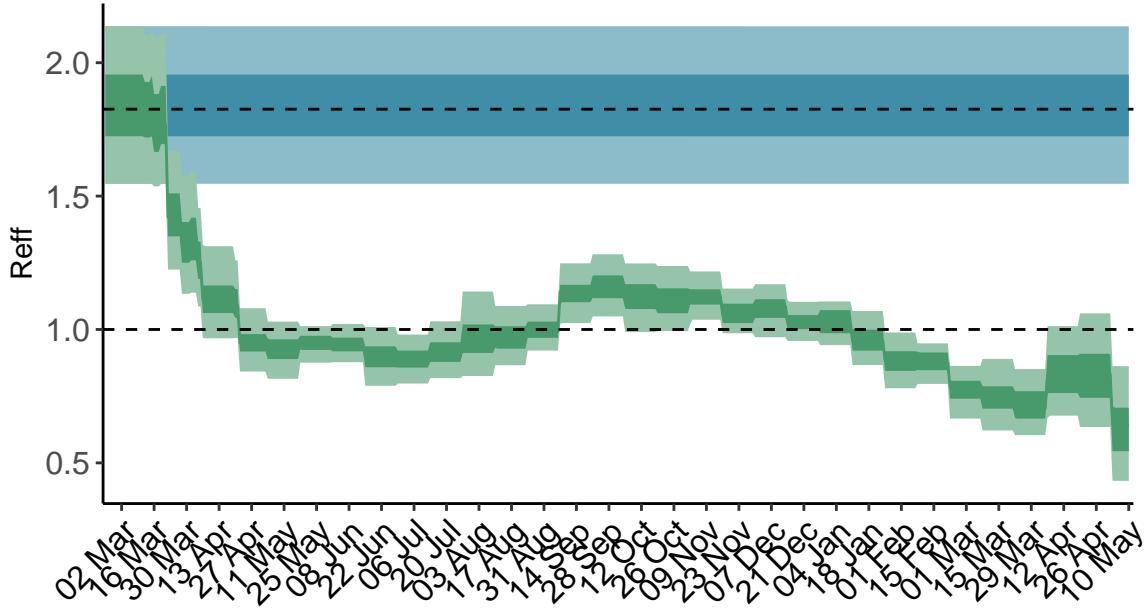


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

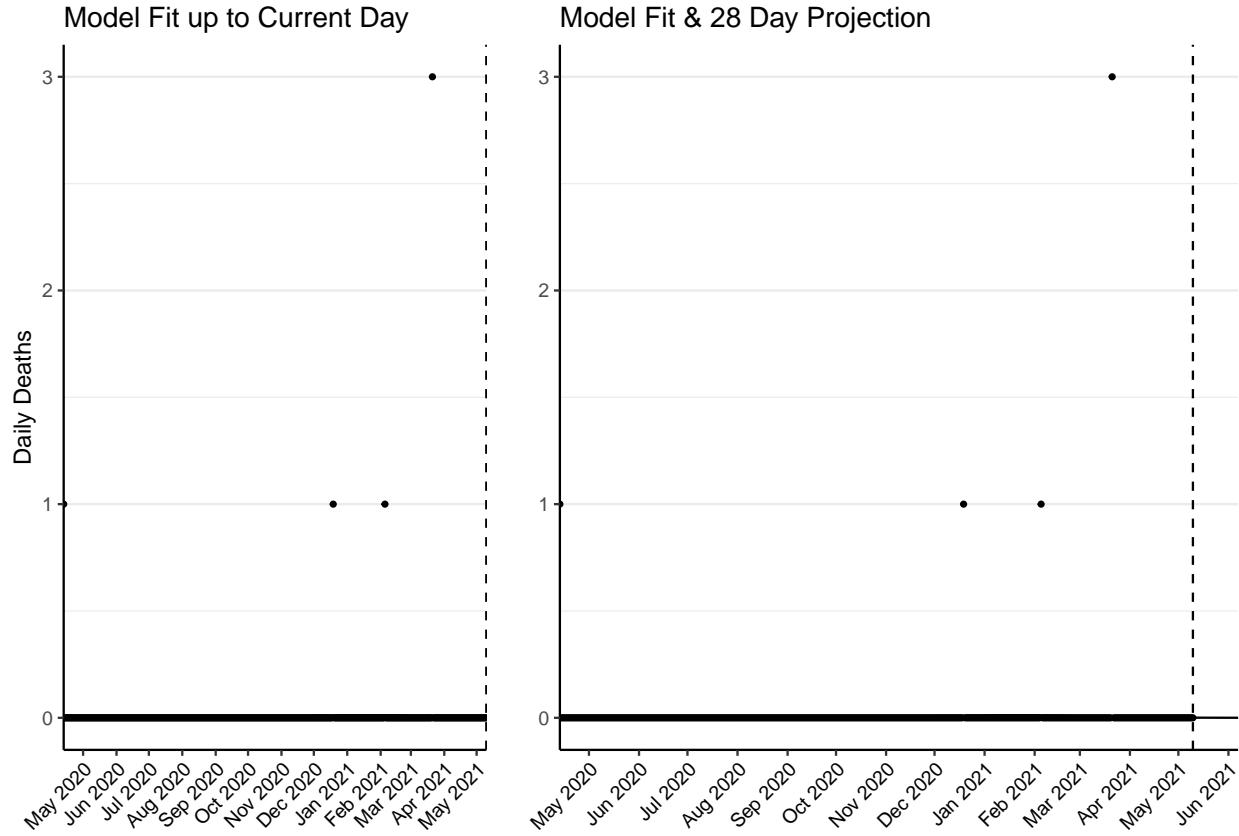


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 0 (95% CI: 0-0) patients requiring treatment with high-pressure oxygen at the current date to 0 (95% CI: 0-0) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 0 (95% CI: 0-0) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

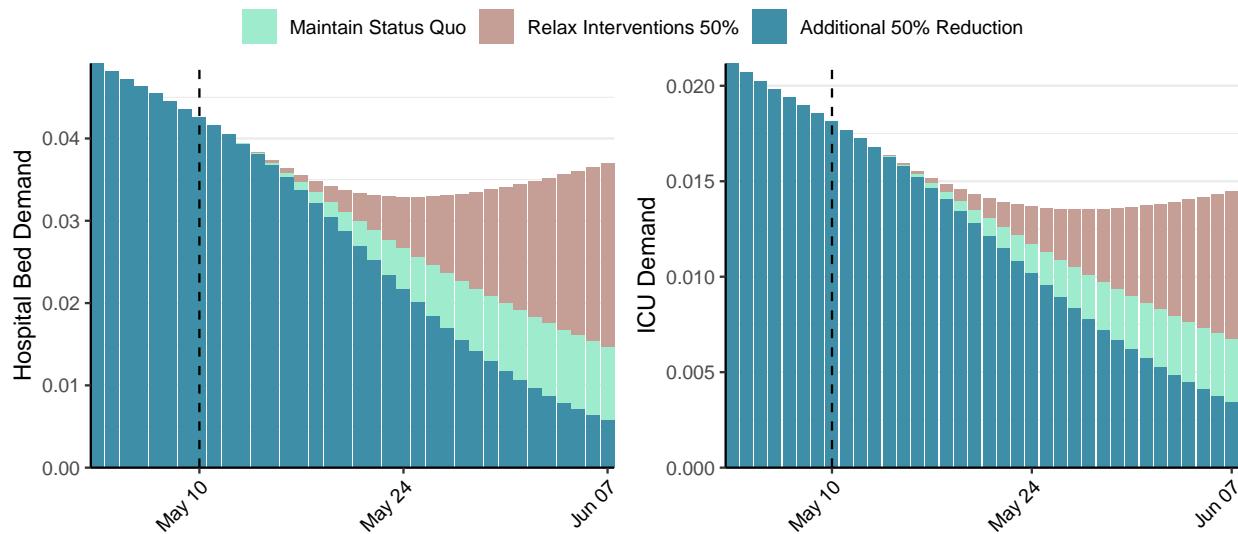


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 0 (95% CI: 0-0) at the current date to 0 (95% CI: 0-0) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 0 (95% CI: 0-0) at the current date to 1 (95% CI: 0-1) by 2021-06-07.

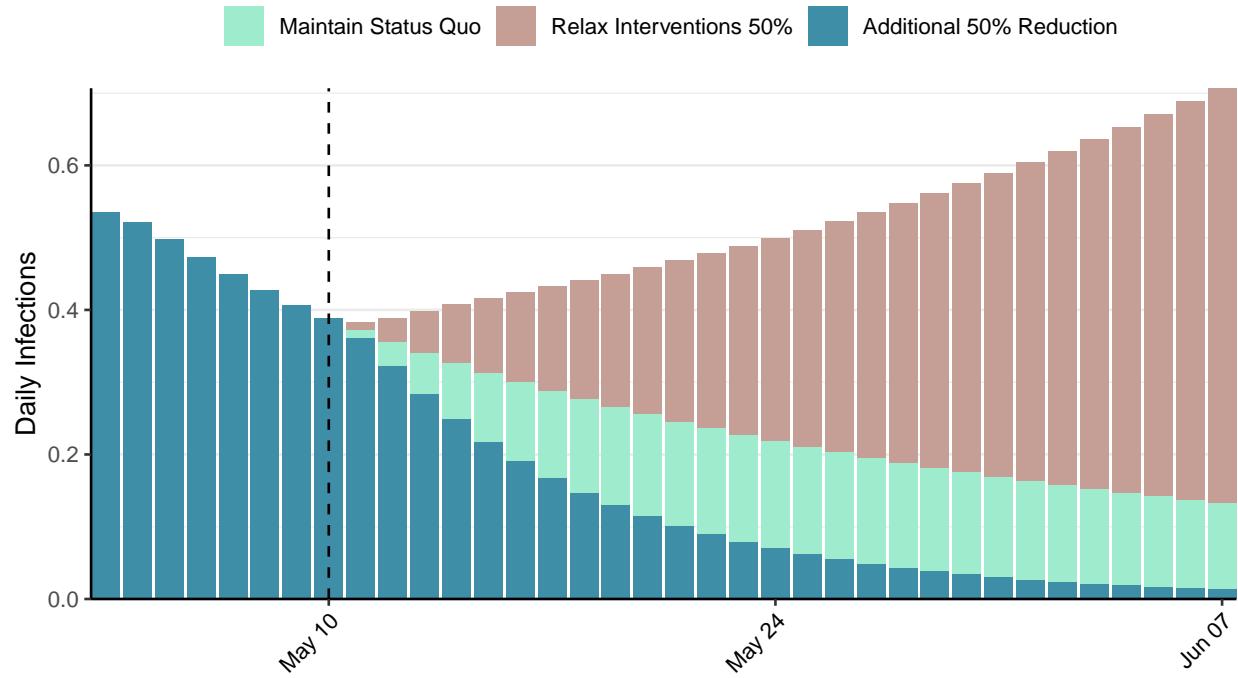


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Benin, 2021-05-10

[Download the report for Benin, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
7,884	0	100	0	0.69 (95% CI: 0.59-0.83)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

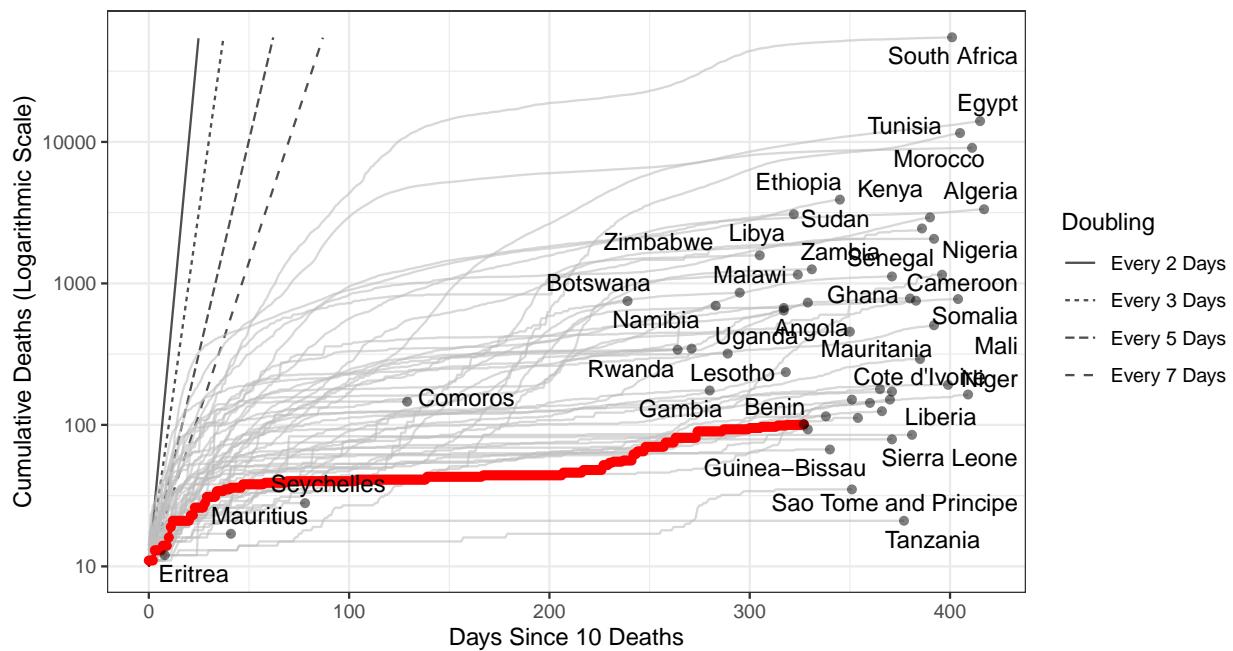


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 842 (95% CI: 776-908) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Benin has revised their historic reported cases and thus have reported negative cases.**

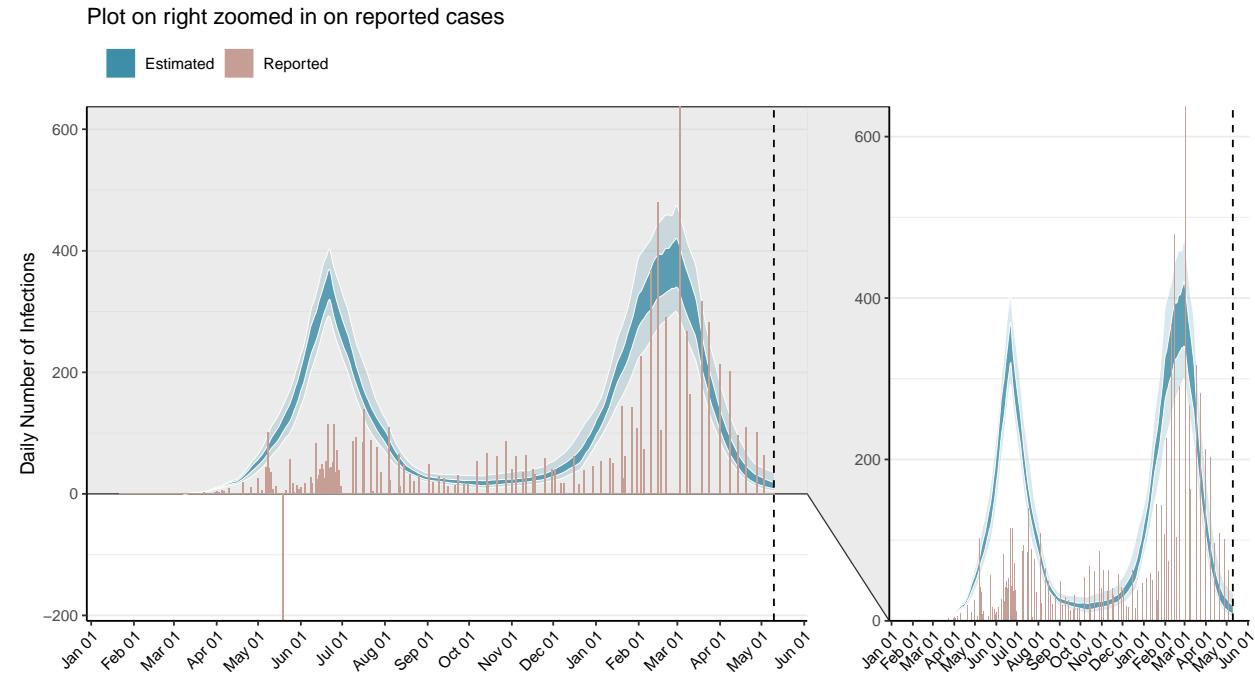
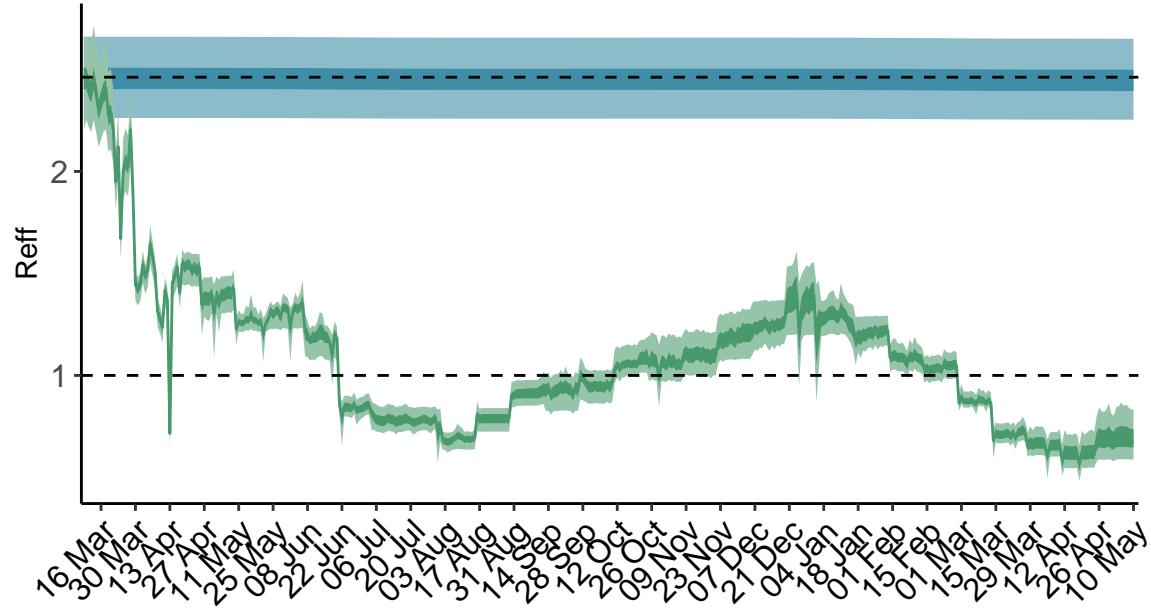


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

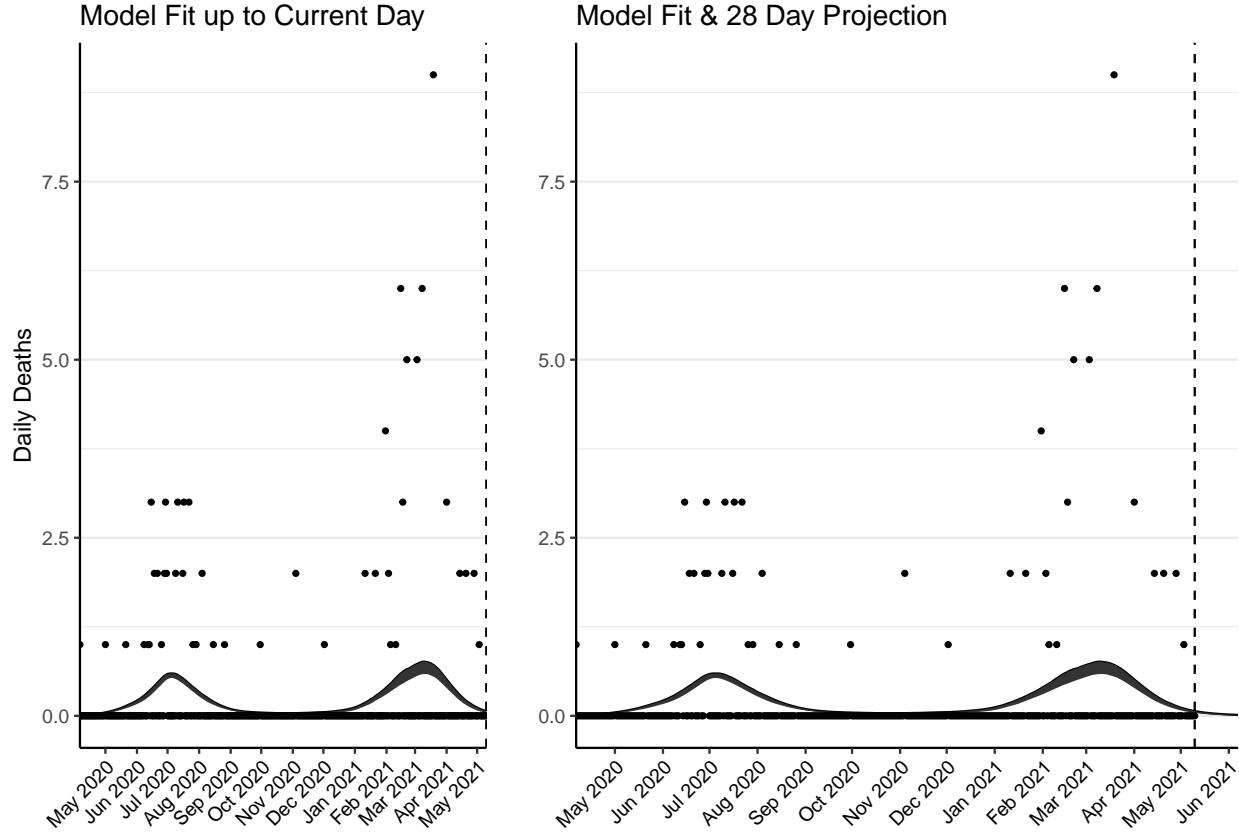


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 2 (95% CI: 2-2) patients requiring treatment with high-pressure oxygen at the current date to 1 (95% CI: 1-1) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1 (95% CI: 1-1) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

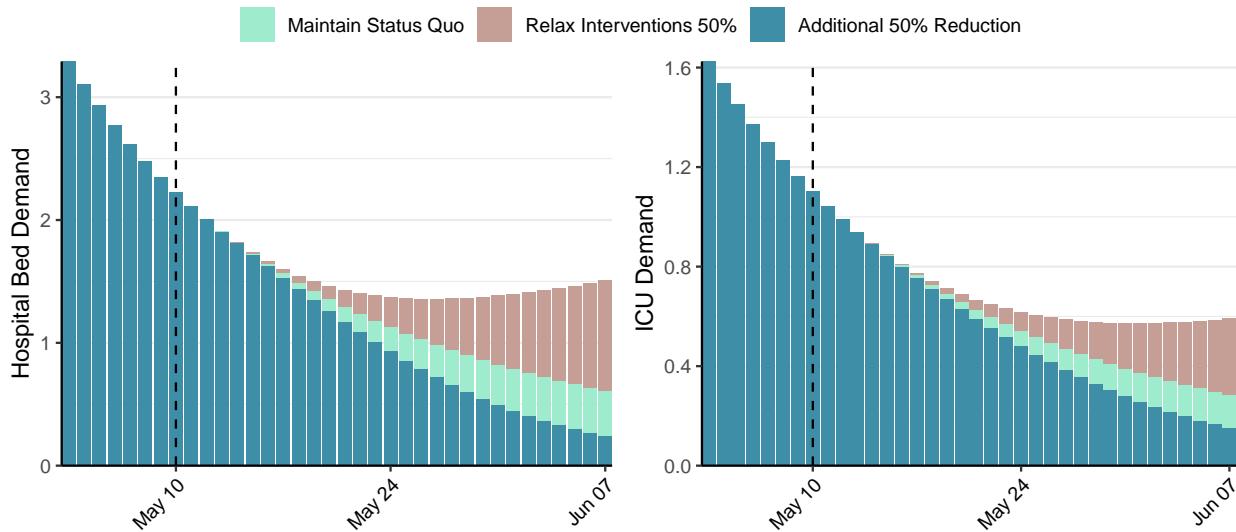


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 14 (95% CI: 12-16) at the current date to 0 (95% CI: 0-1) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 14 (95% CI: 12-16) at the current date to 22 (95% CI: 17-28) by 2021-06-07.

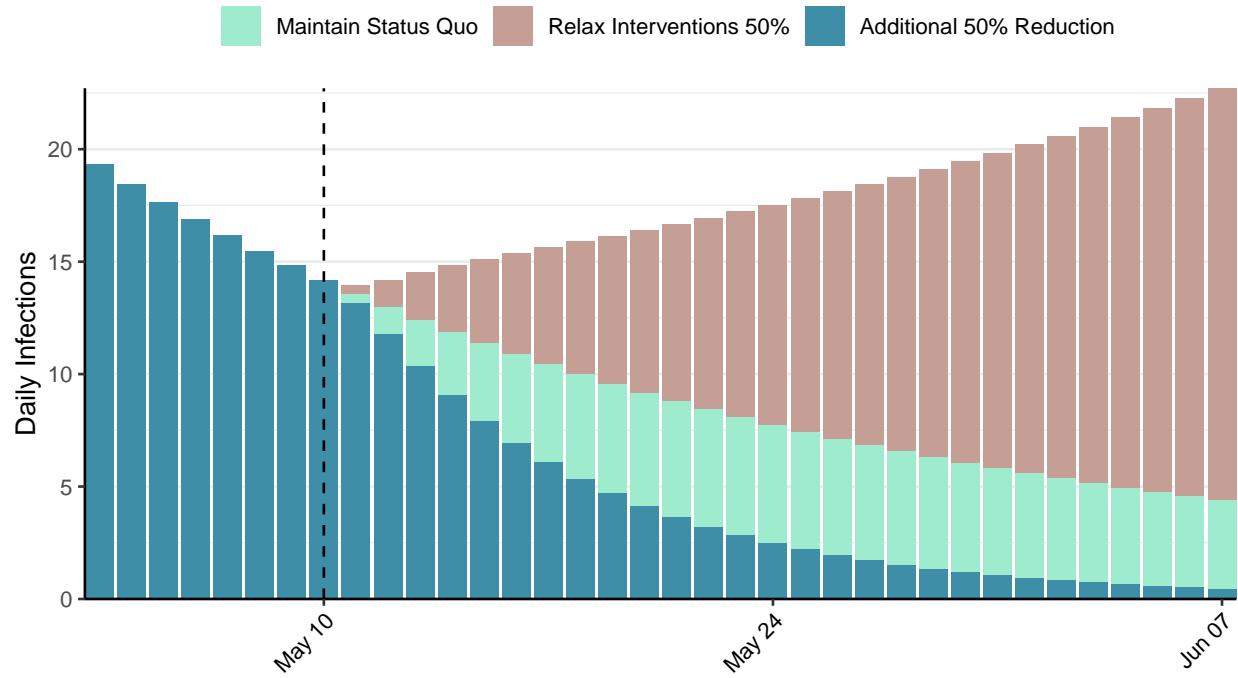


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Burkina Faso, 2021-05-10

[Download the report for Burkina Faso, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
13,382	3	162	0	0.75 (95% CI: 0.68-0.86)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

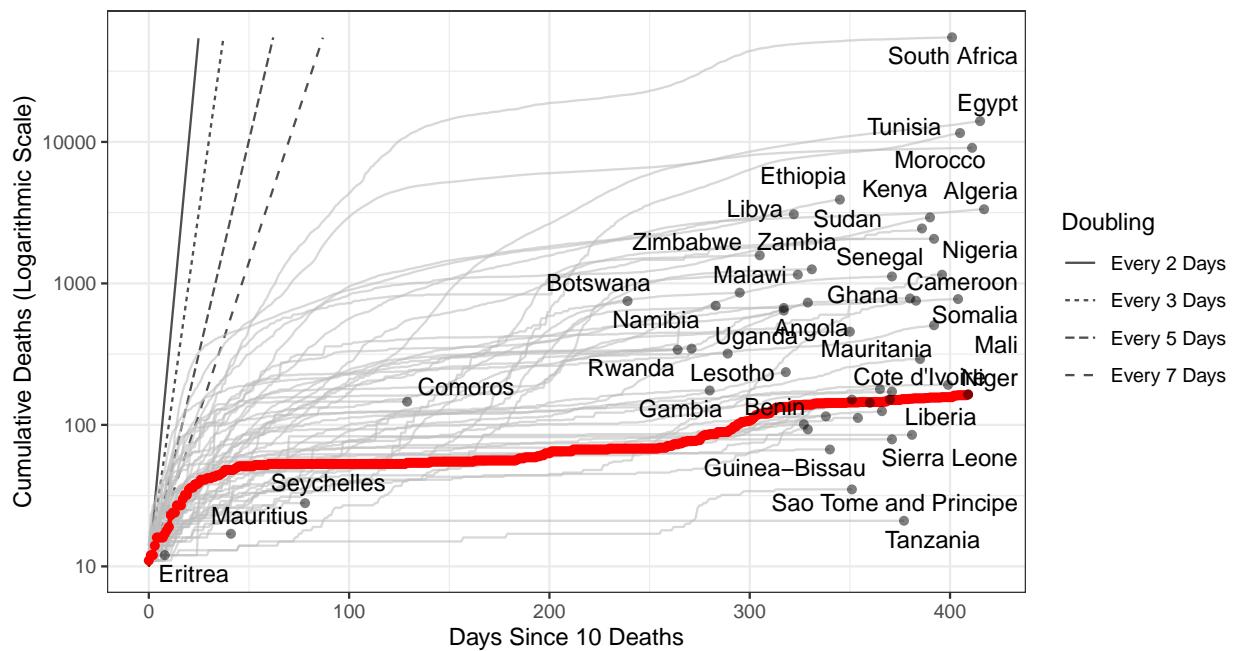


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 4,508 (95% CI: 4,304-4,712) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

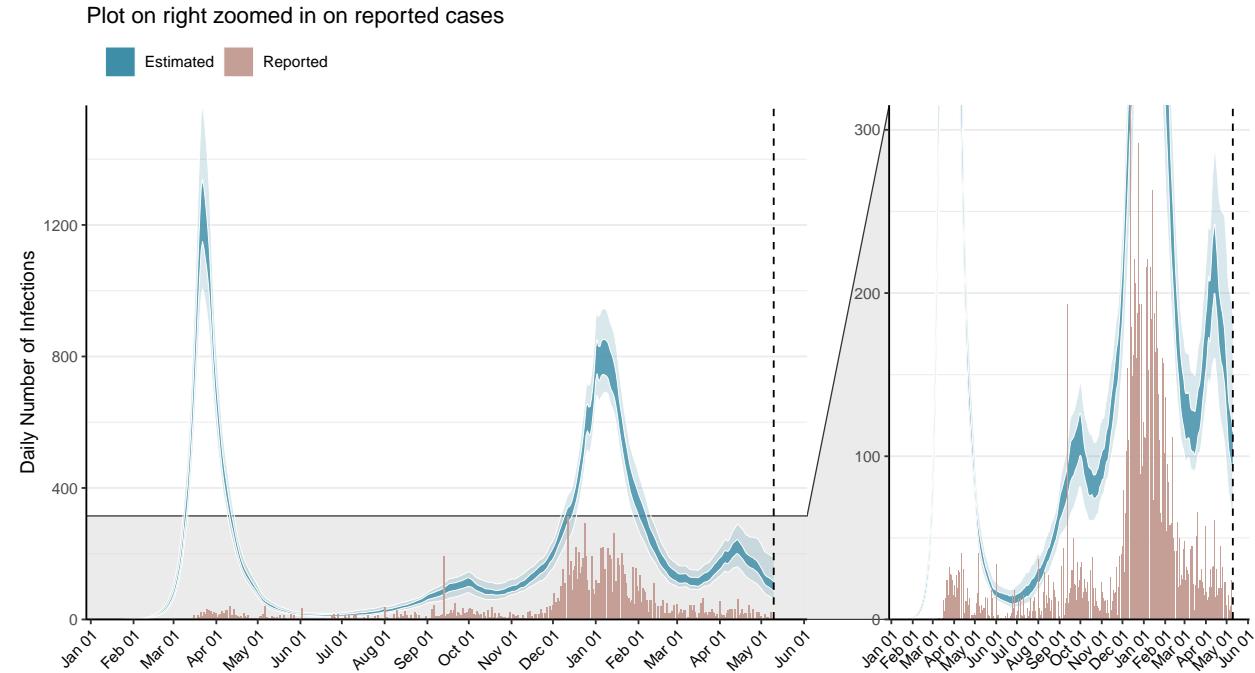
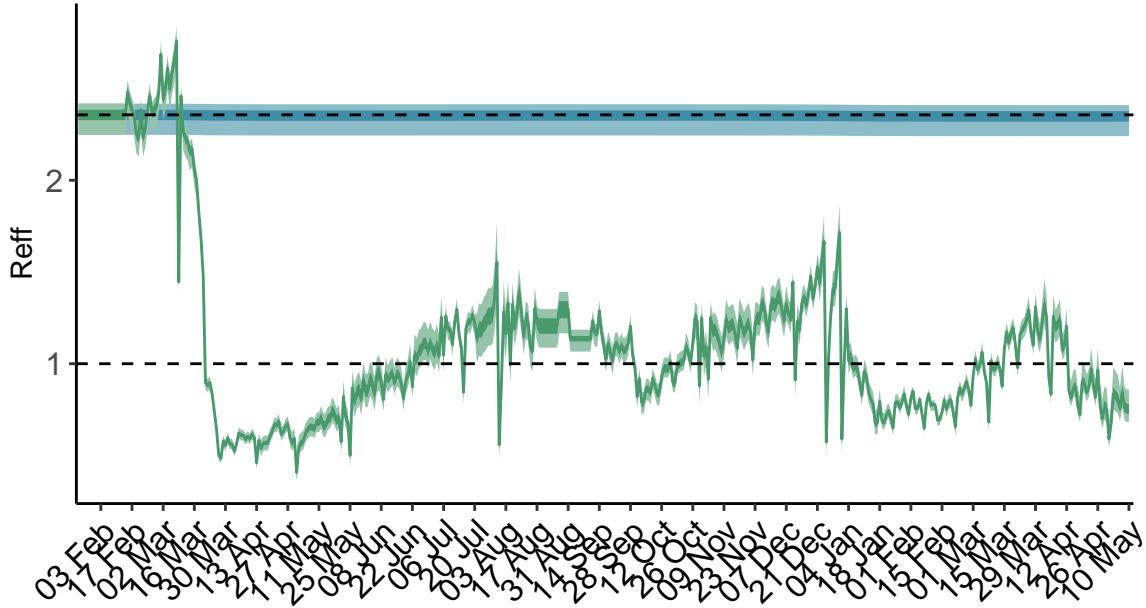


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

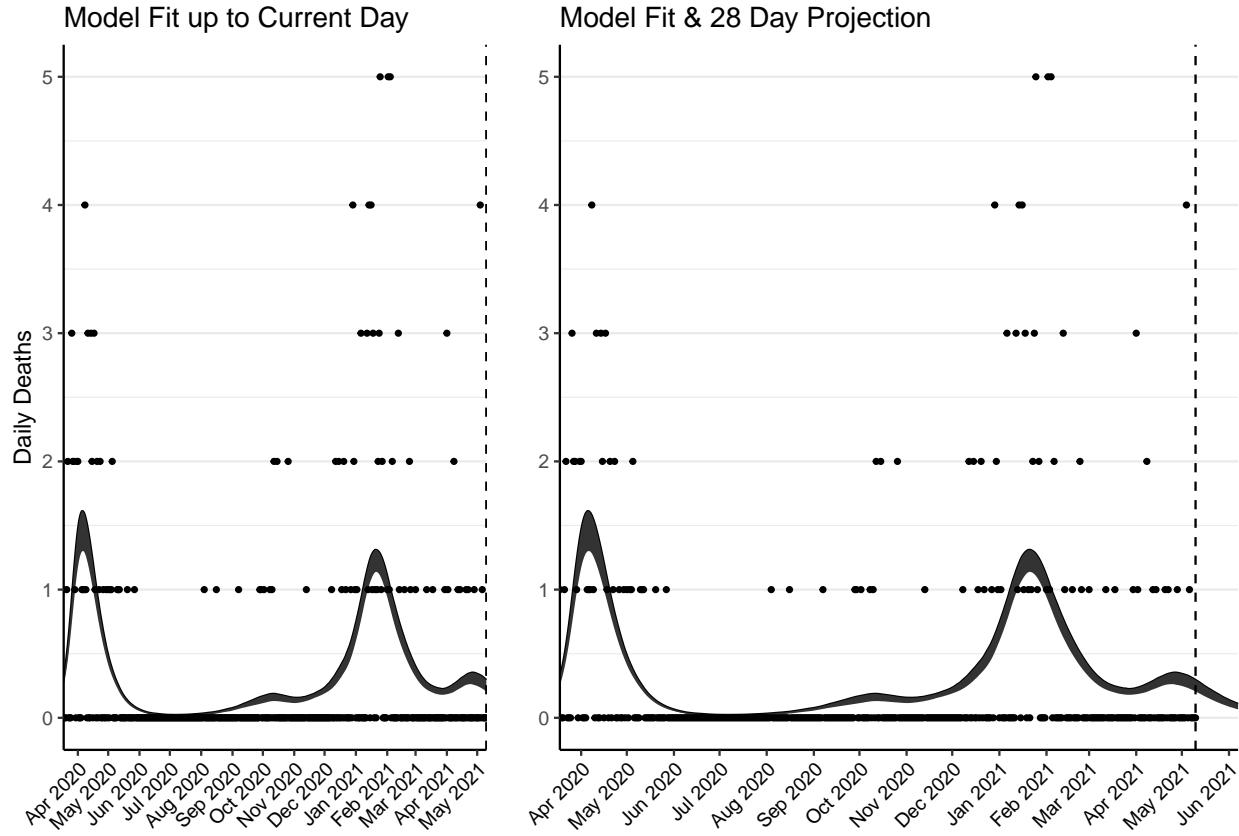


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 11 (95% CI: 11-12) patients requiring treatment with high-pressure oxygen at the current date to 4 (95% CI: 4-5) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 5 (95% CI: 4-5) patients requiring treatment with mechanical ventilation at the current date to 2 (95% CI: 2-2) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

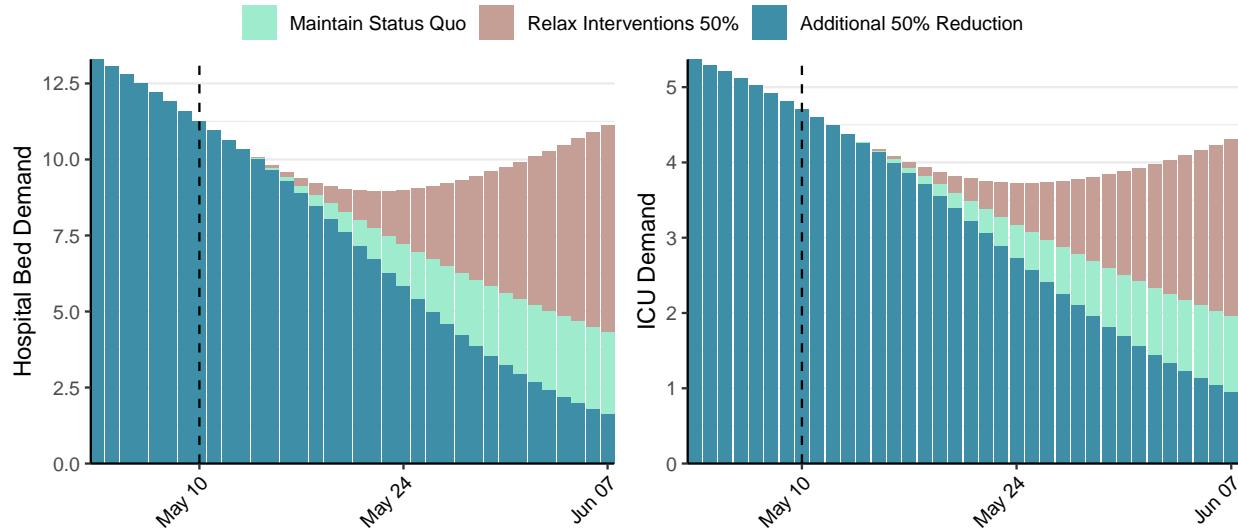


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 103 (95% CI: 97-110) at the current date to 4 (95% CI: 3-4) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 103 (95% CI: 97-110) at the current date to 191 (95% CI: 164-219) by 2021-06-07.

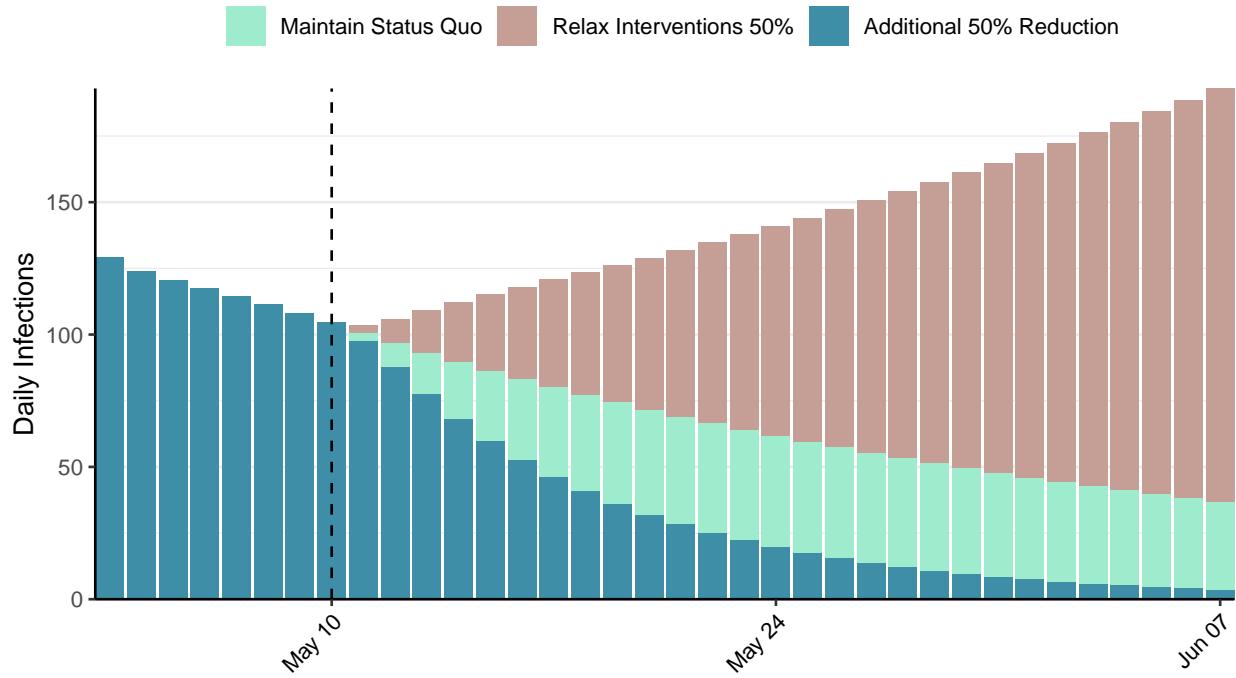


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Bangladesh, 2021-05-10

[Download the report for Bangladesh, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
775,027	1,514	11,972	38	0.68 (95% CI: 0.64-0.74)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

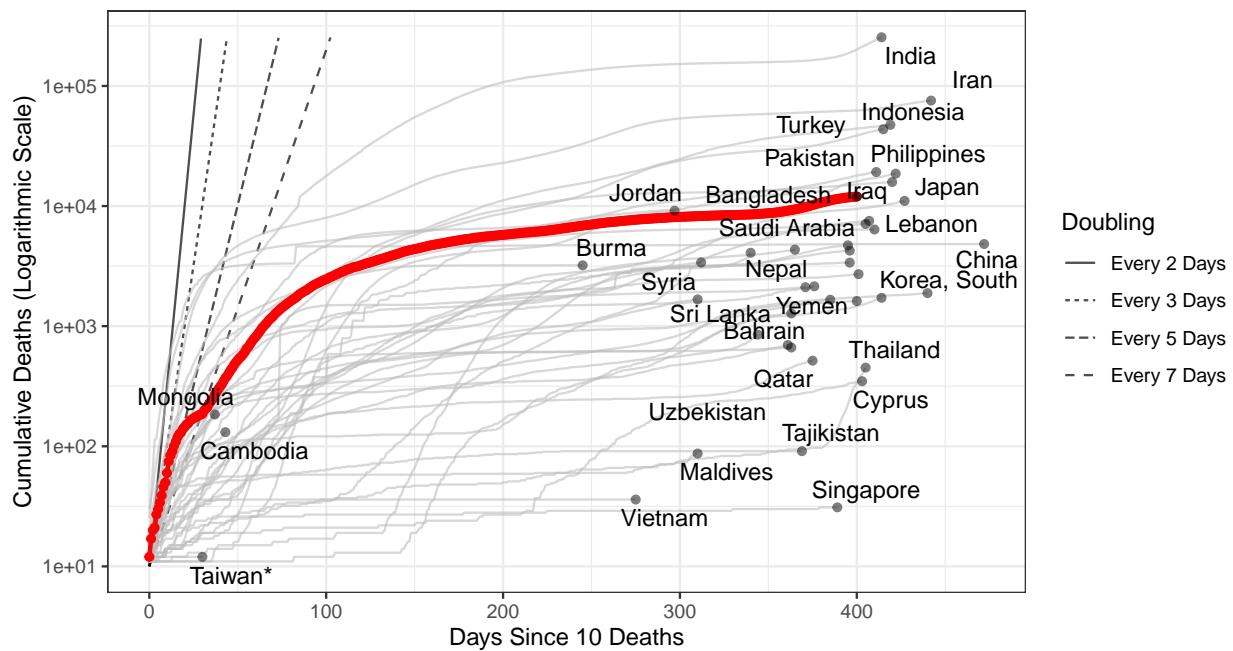


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 575,861 (95% CI: 559,726-591,996) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

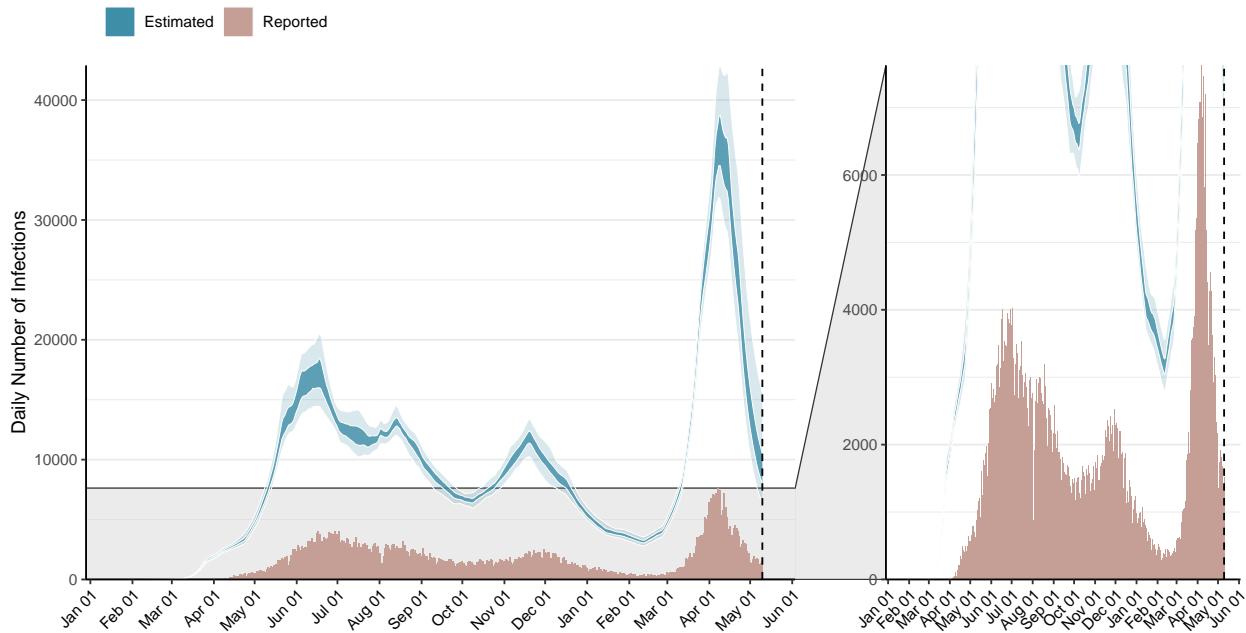
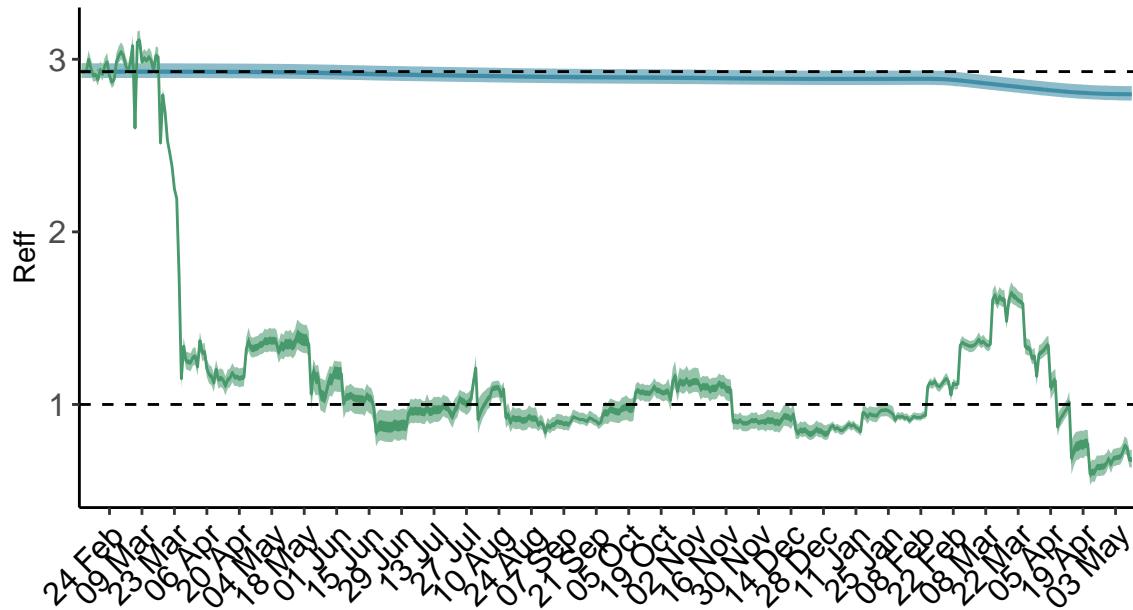


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

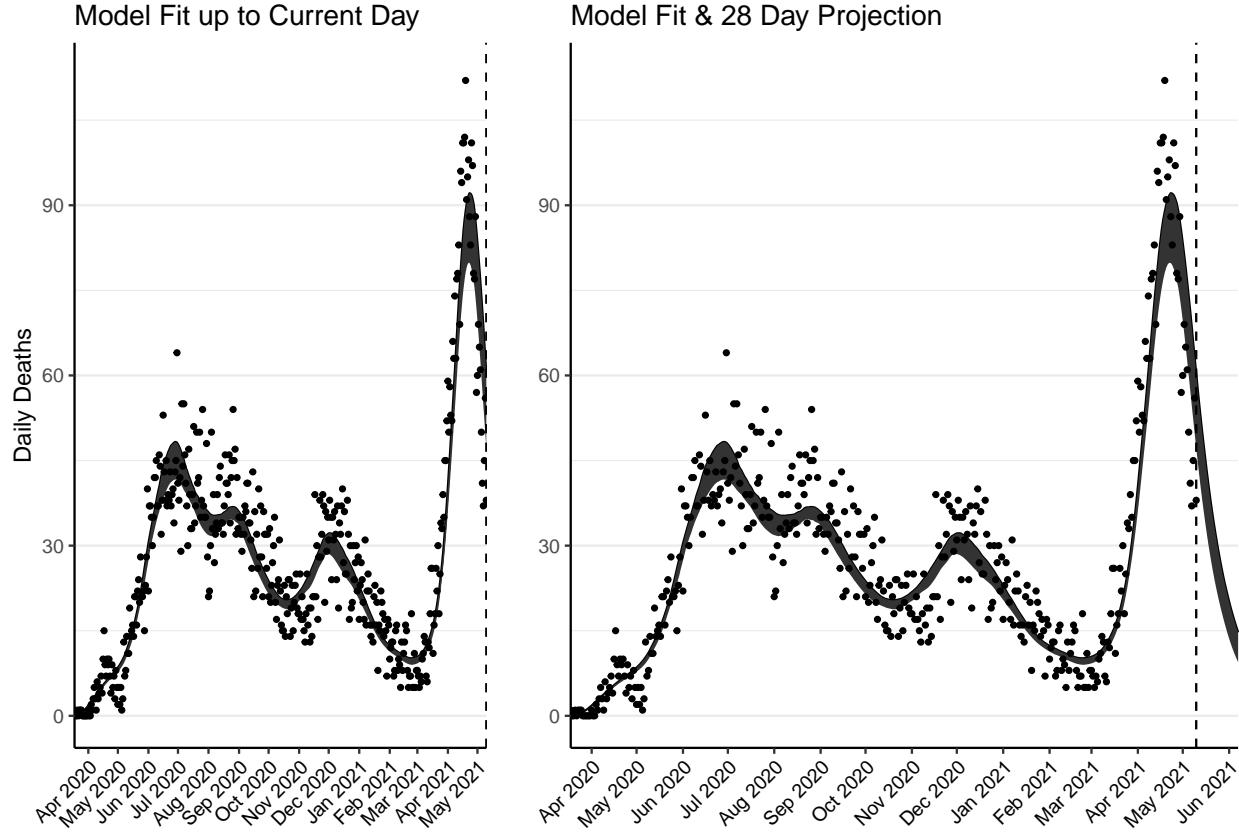


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 1,877 (95% CI: 1,819-1,936) patients requiring treatment with high-pressure oxygen at the current date to 462 (95% CI: 434-489) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 799 (95% CI: 777-822) patients requiring treatment with mechanical ventilation at the current date to 214 (95% CI: 203-226) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

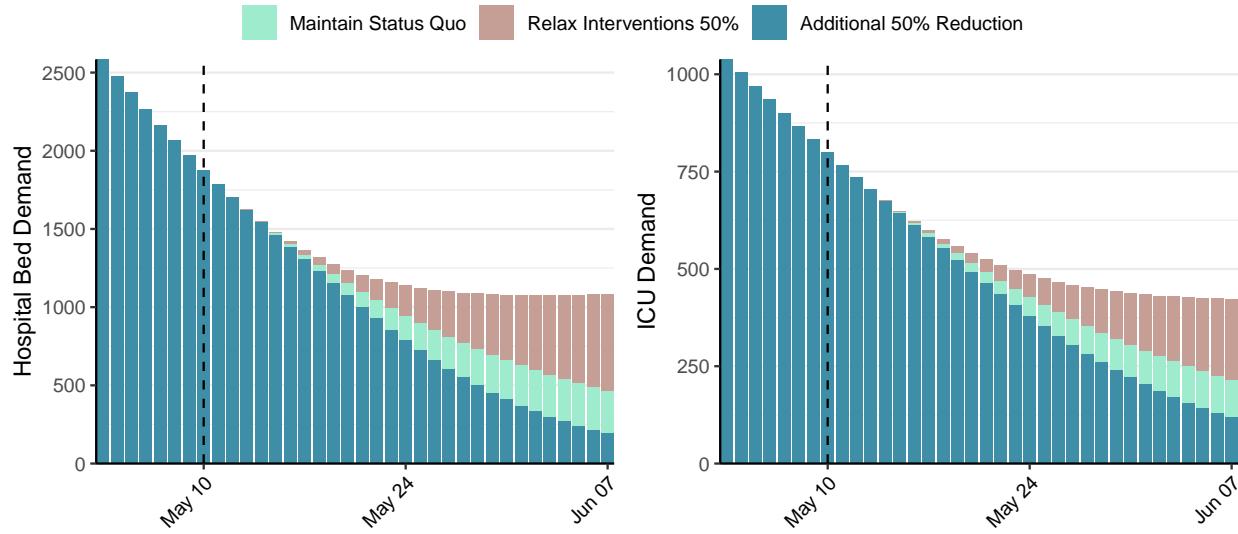
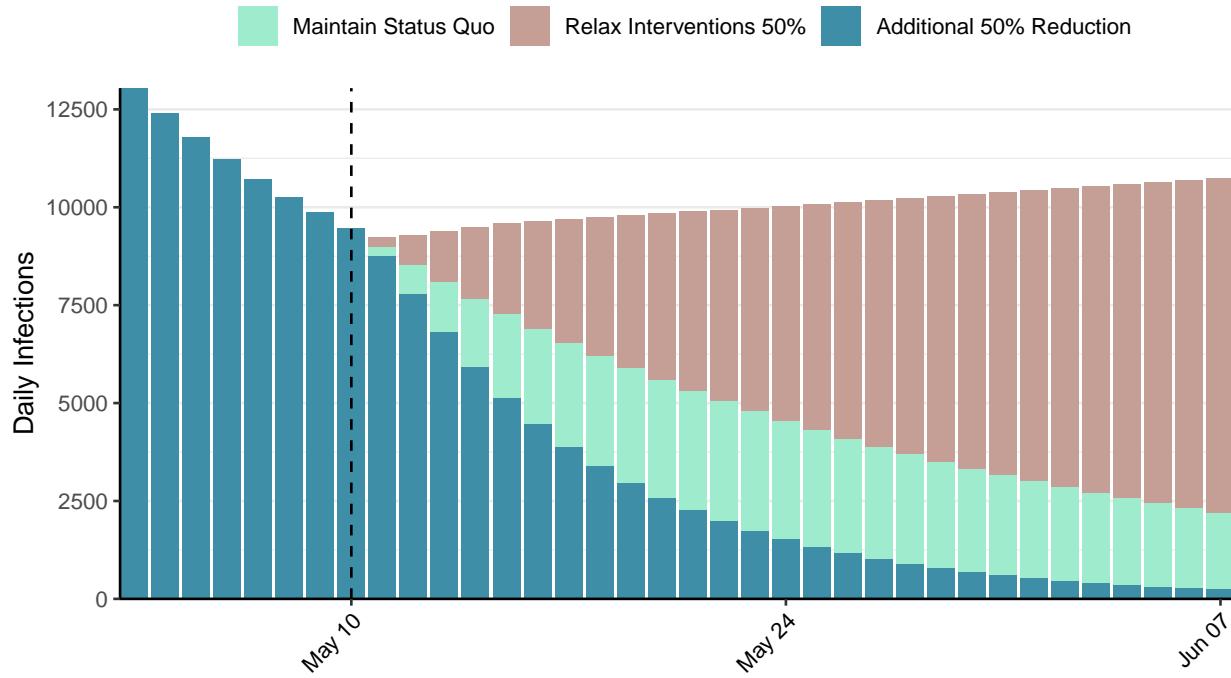


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 9,451 (95% CI: 9,019-9,882) at the current date to 234 (95% CI: 217-251) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 9,451 (95% CI: 9,019-9,882) at the current date to 10,745 (95% CI: 9,852-11,638) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Bulgaria, 2021-05-10

[Download the report for Bulgaria, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
411,280	1,078	17,045	116	0.7 (95% CI: 0.65-0.75)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

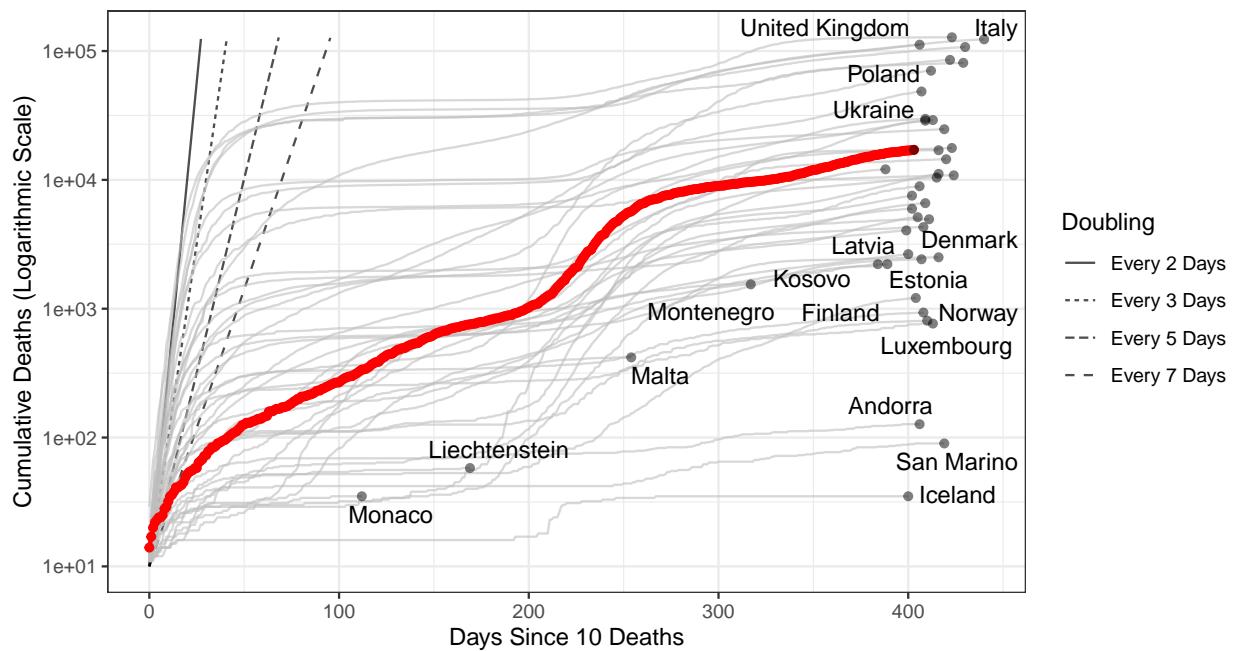


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 402,695 (95% CI: 390,133-415,257) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

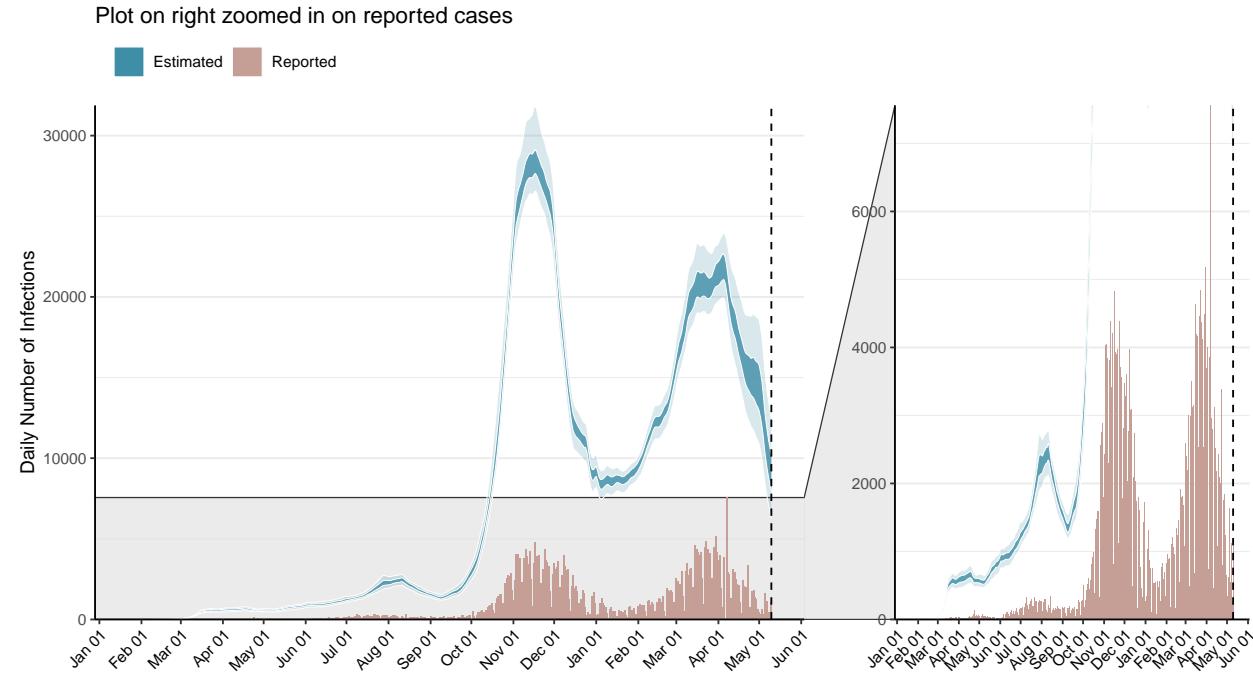
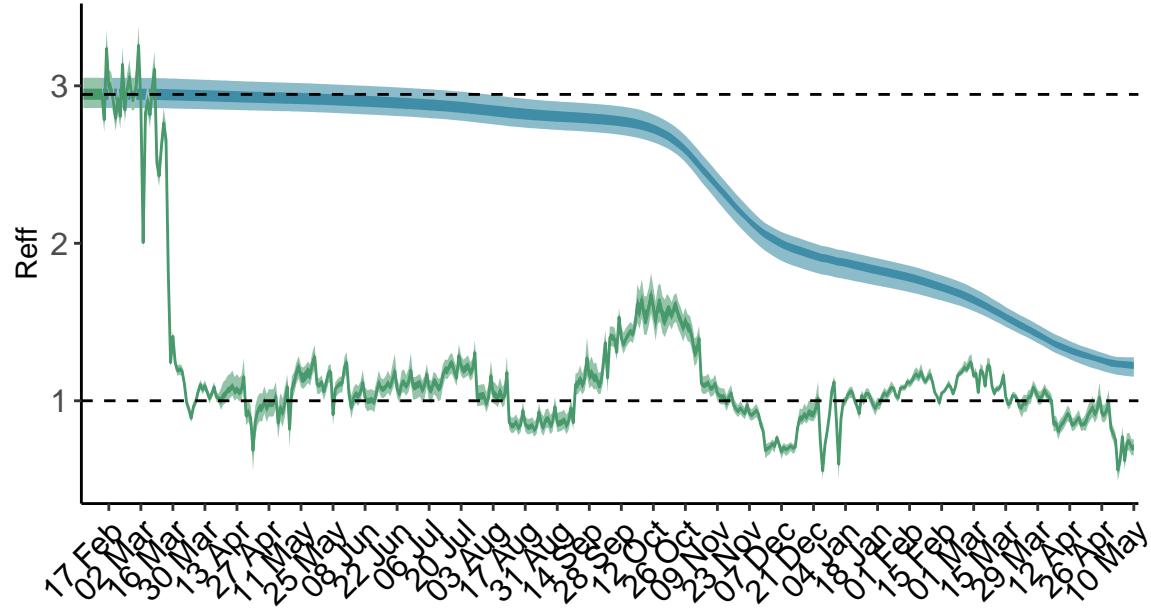


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Bulgaria is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

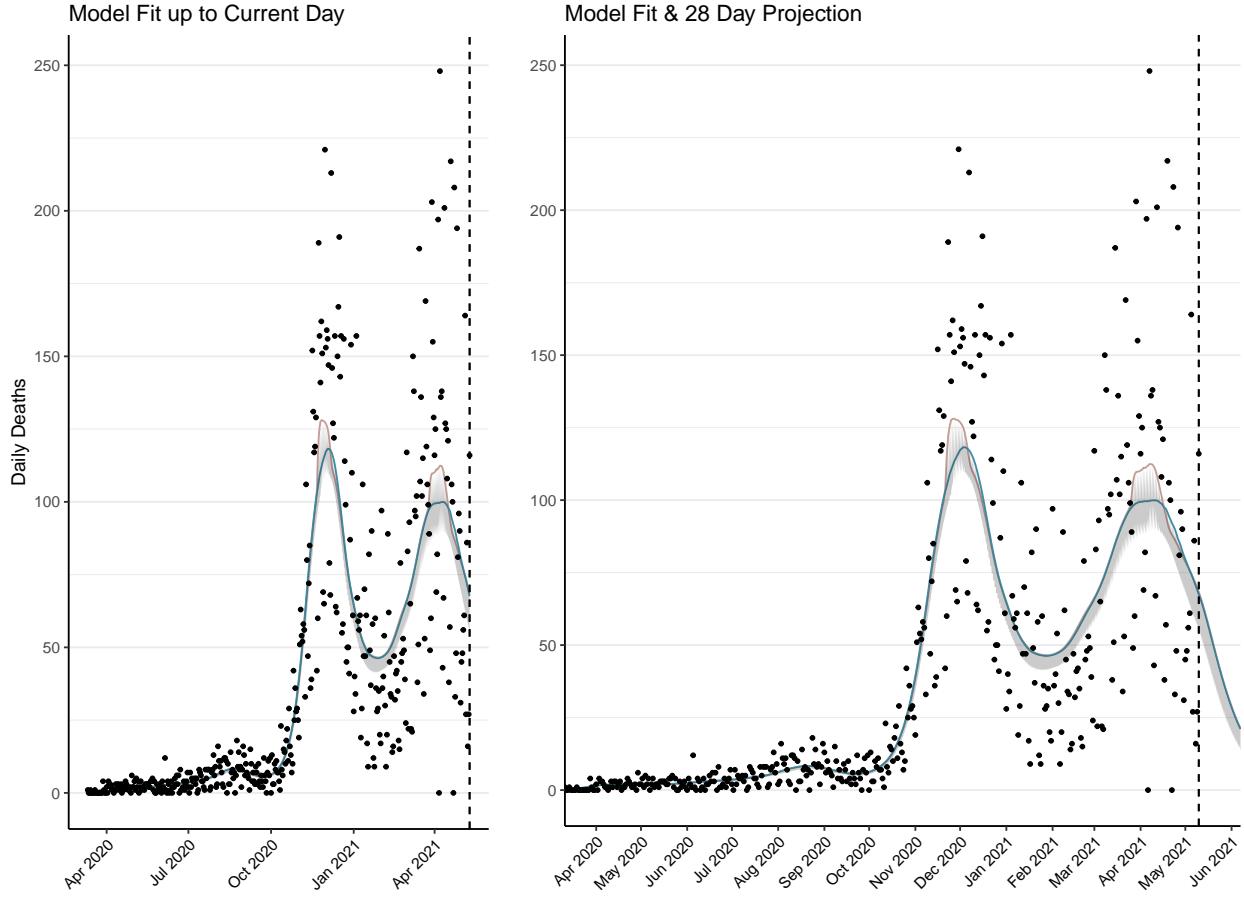


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 2,293 (95% CI: 2,218-2,368) patients requiring treatment with high-pressure oxygen at the current date to 673 (95% CI: 637-710) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1,061 (95% CI: 1,030-1,092) patients requiring treatment with mechanical ventilation at the current date to 362 (95% CI: 344-380) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

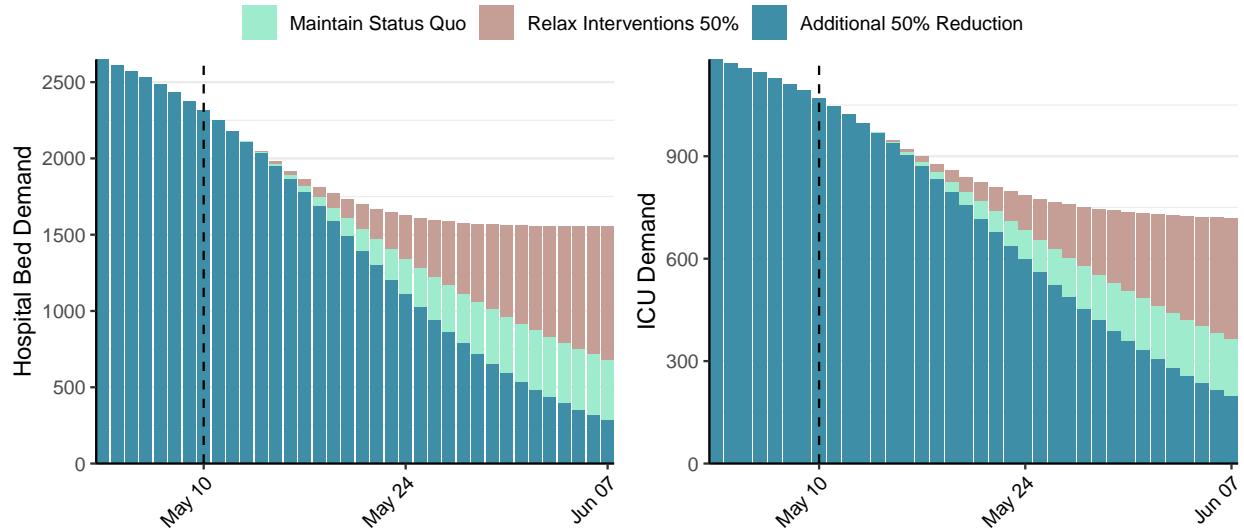
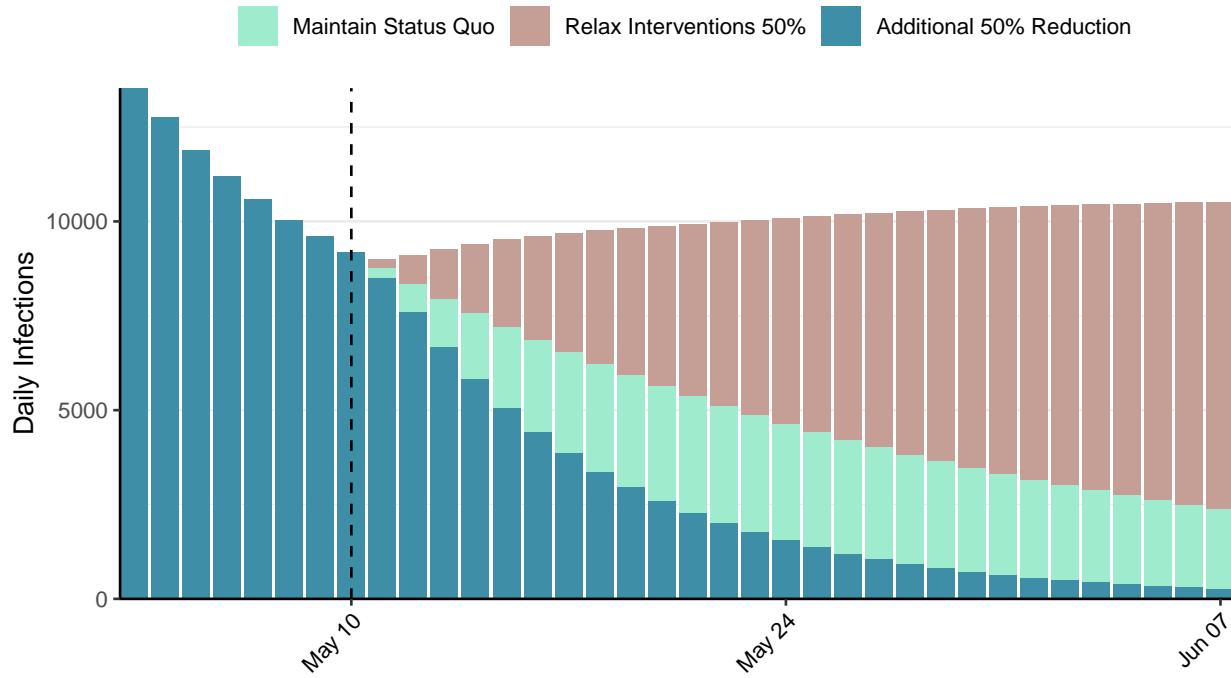


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 9,086 (95% CI: 8,700-9,472) at the current date to 257 (95% CI: 241-273) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 9,086 (95% CI: 8,700-9,472) at the current date to 10,401 (95% CI: 9,774-11,028) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Bosnia and Herzegovina, 2021-05-10

[Download the report for Bosnia and Herzegovina, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
201,217	524	8,873	72	0.5 (95% CI: 0.47-0.52)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

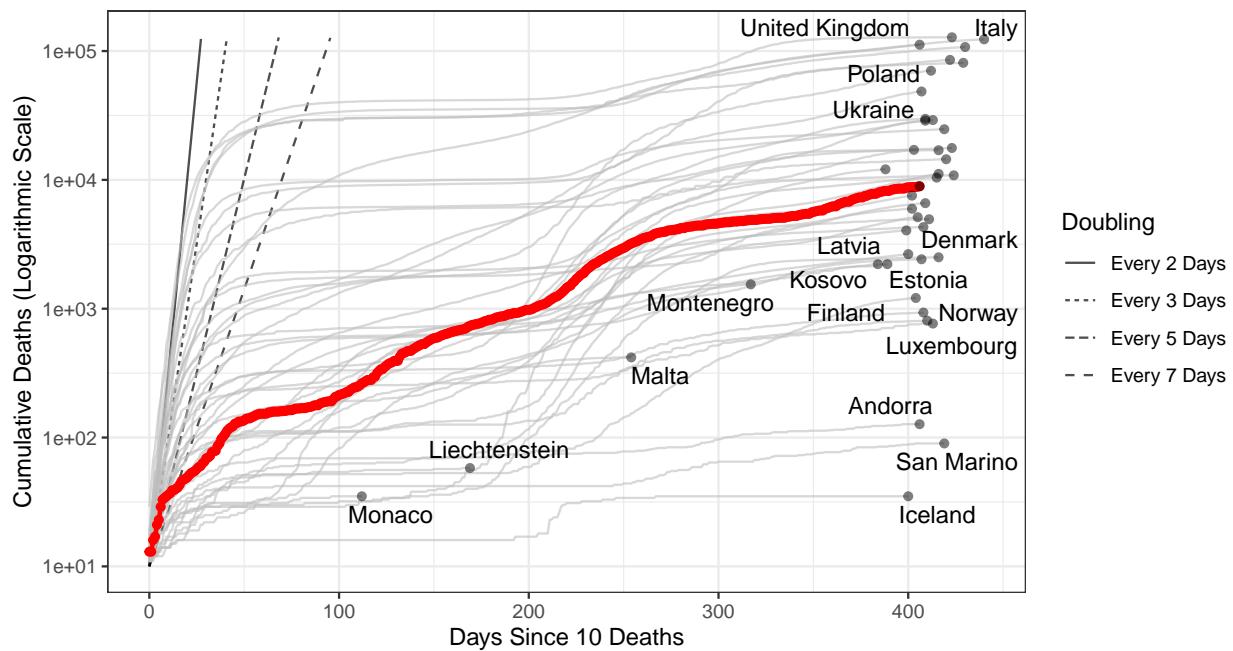


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 133,050 (95% CI: 129,301-136,799) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

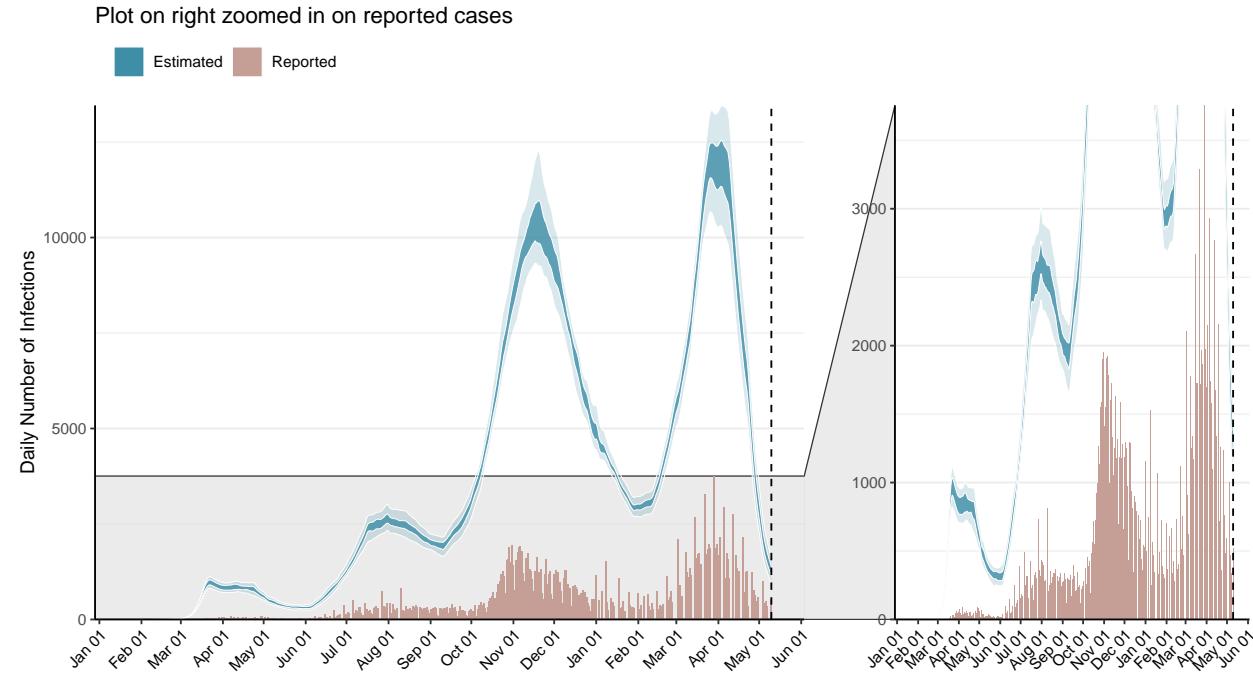
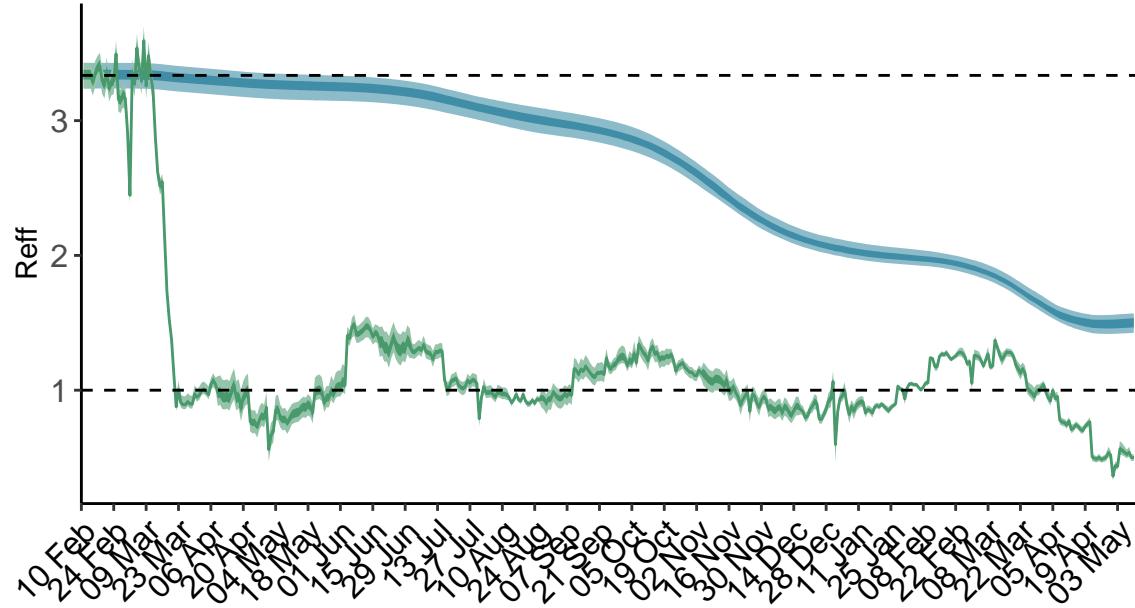


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Bosnia and Herzegovina is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

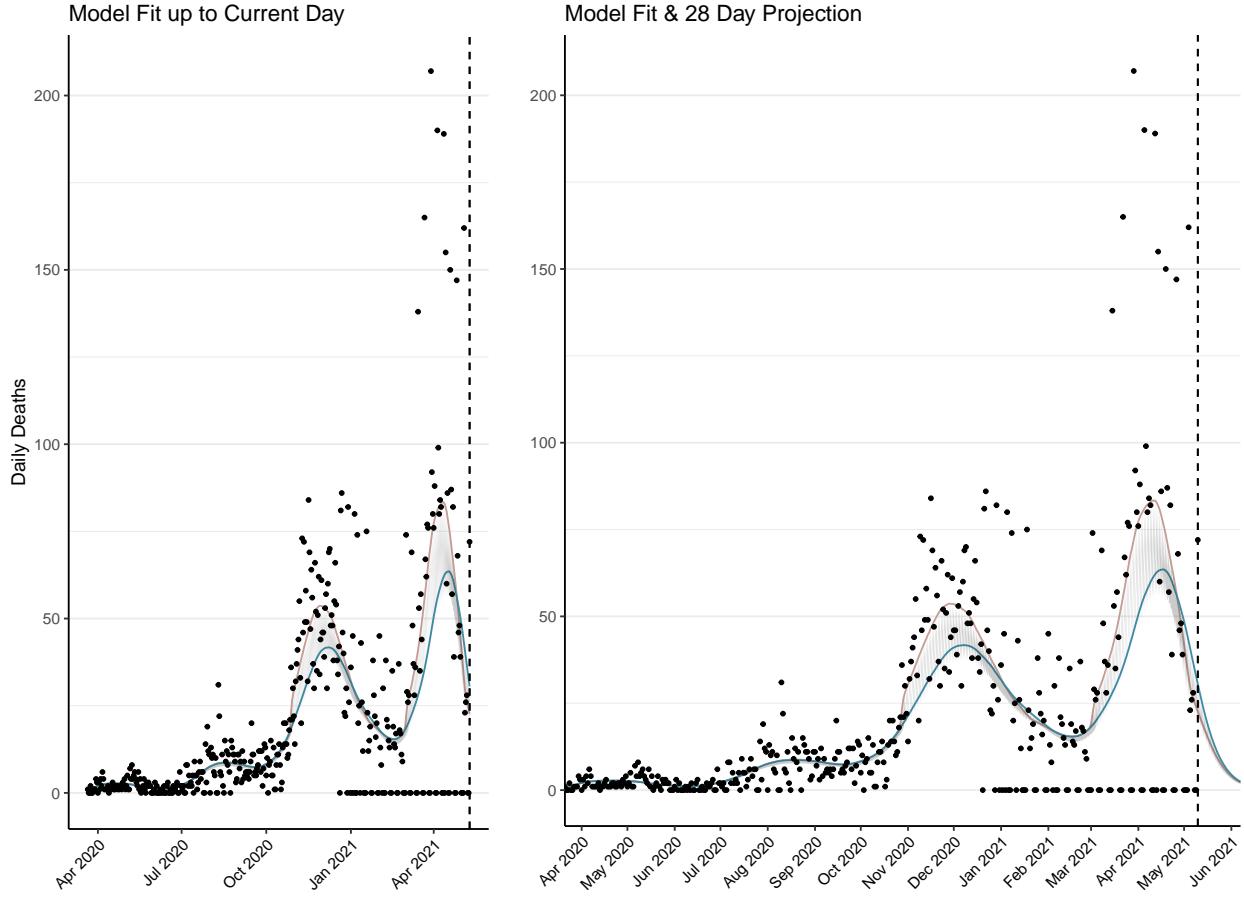


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 725 (95% CI: 704-746) patients requiring treatment with high-pressure oxygen at the current date to 55 (95% CI: 52-57) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 222 (95% CI: 217-227) patients requiring treatment with mechanical ventilation at the current date to 36 (95% CI: 34-37) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

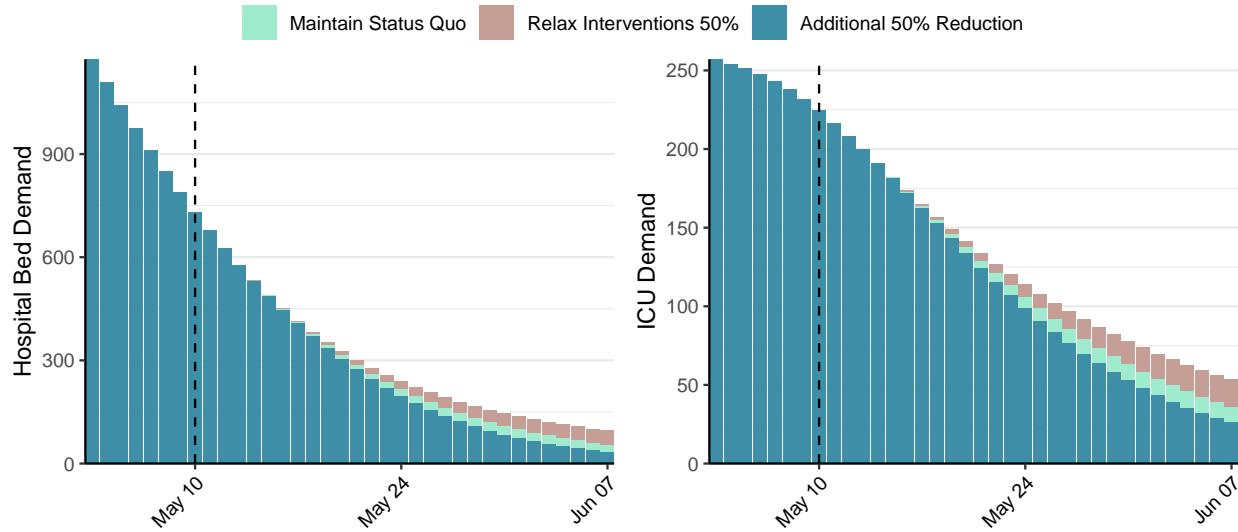
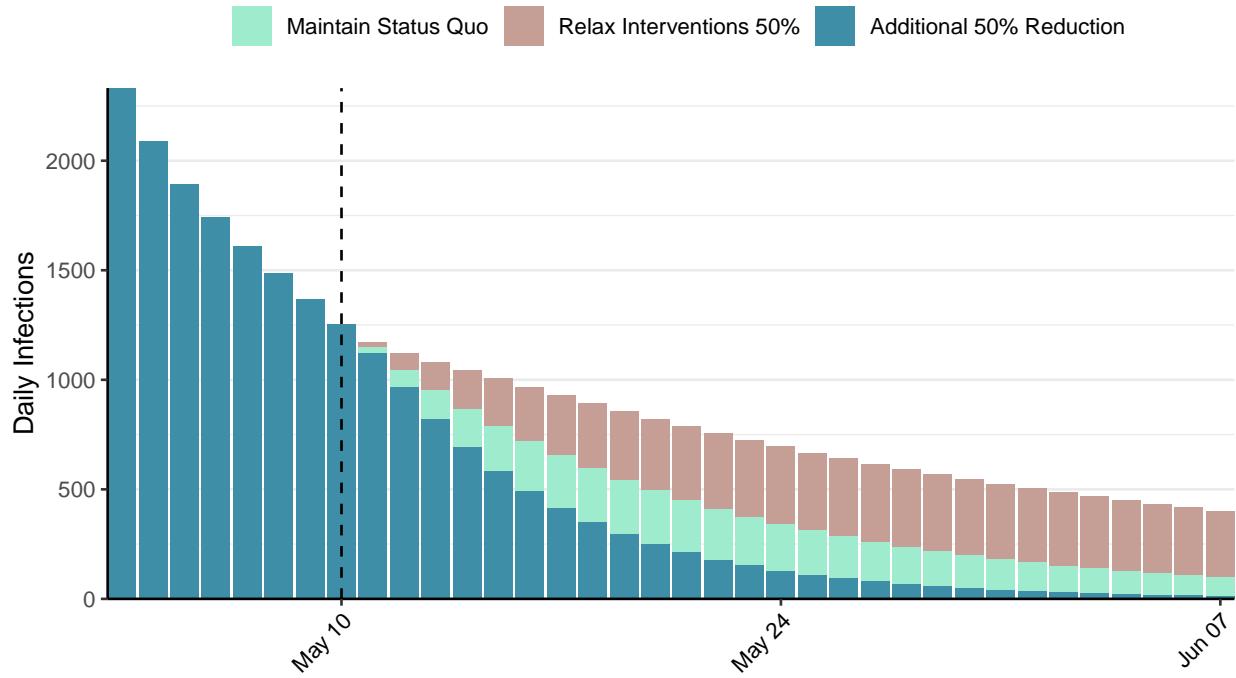


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,242 (95% CI: 1,200-1,285) at the current date to 13 (95% CI: 12-13) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,242 (95% CI: 1,200-1,285) at the current date to 397 (95% CI: 378-416) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Belarus, 2021-05-10

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### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
369,767	879	2,642	10	0.84 (95% CI: 0.72-0.97)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

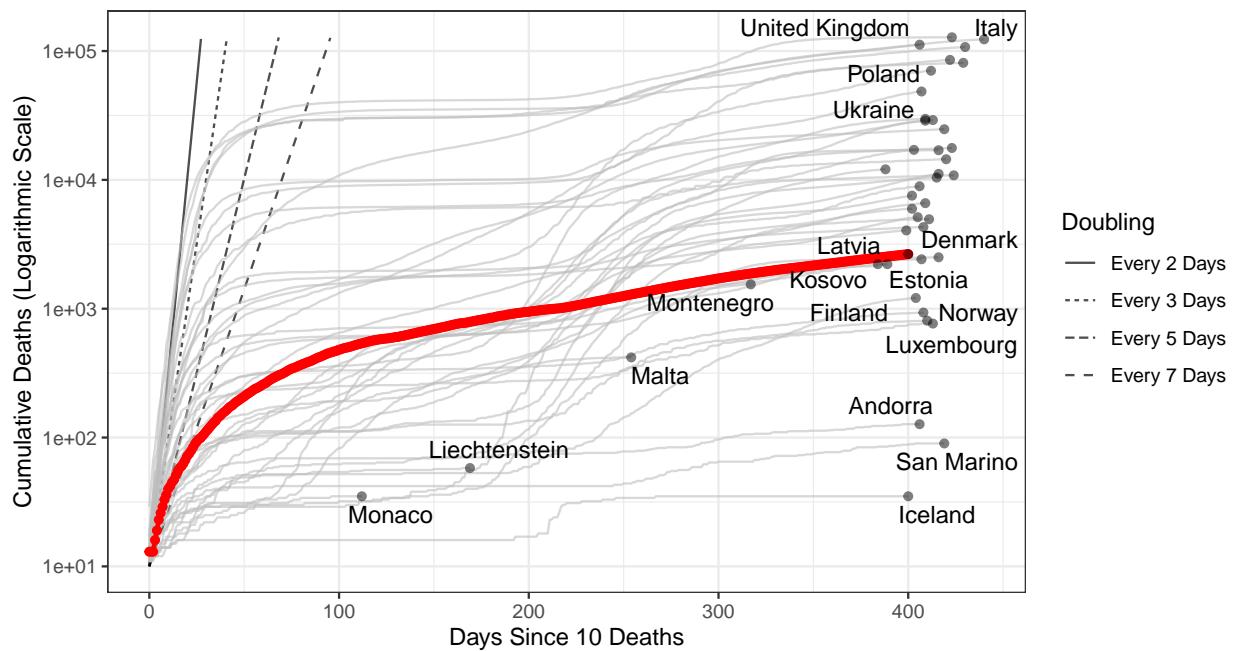


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 82,172 (95% CI: 78,732-85,612) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

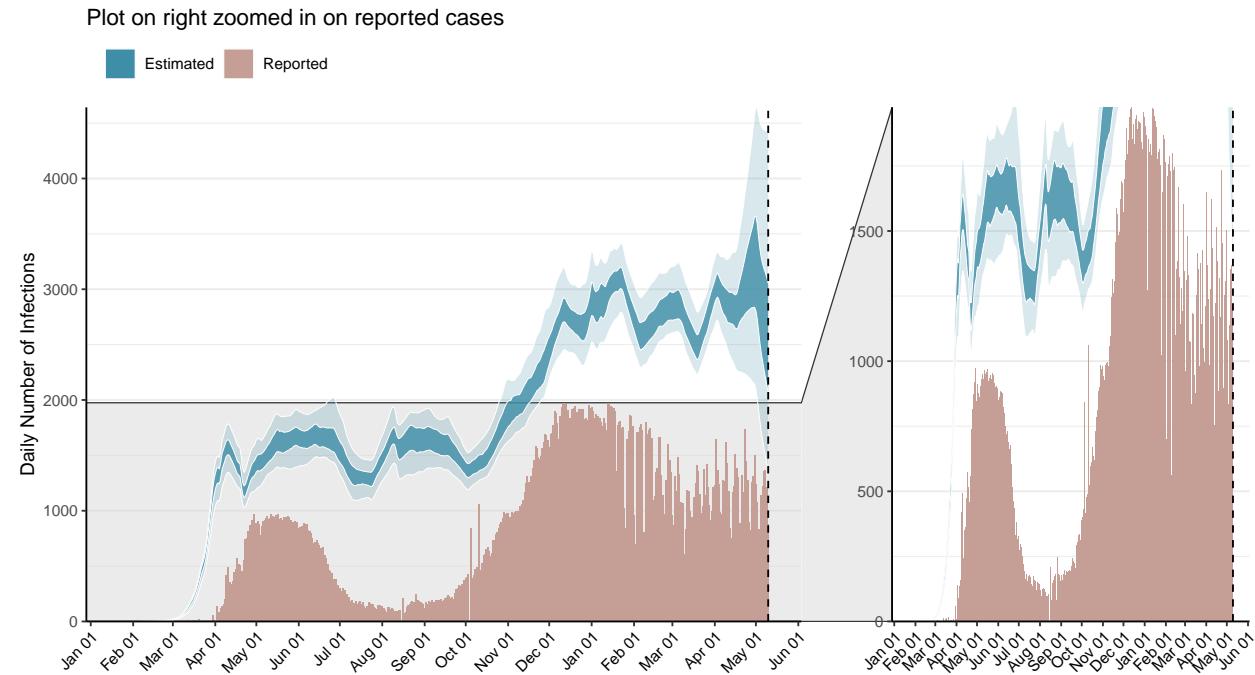
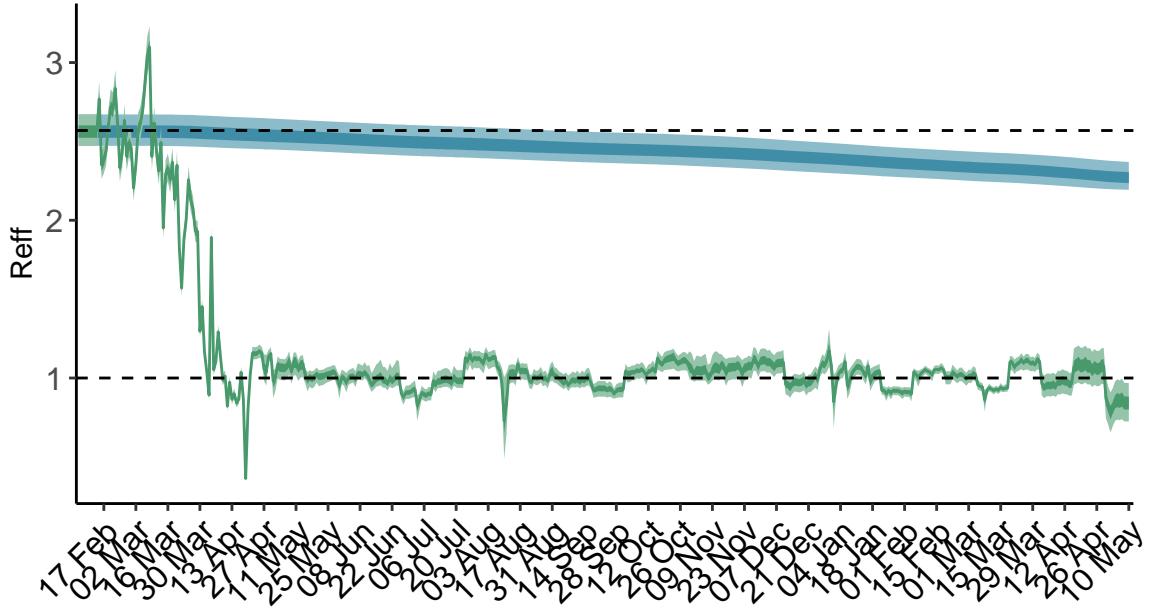


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

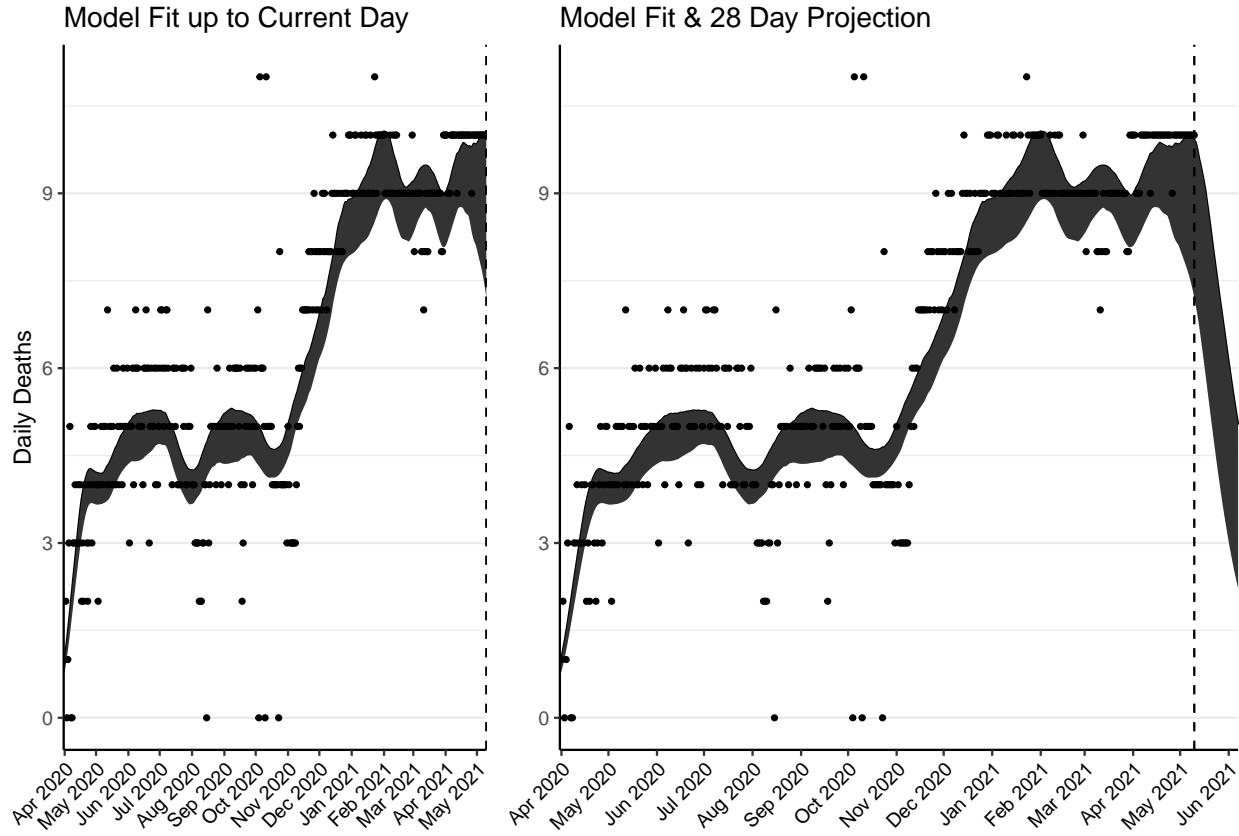


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 361 (95% CI: 345-377) patients requiring treatment with high-pressure oxygen at the current date to 191 (95% CI: 172-210) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 139 (95% CI: 133-144) patients requiring treatment with mechanical ventilation at the current date to 87 (95% CI: 79-95) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

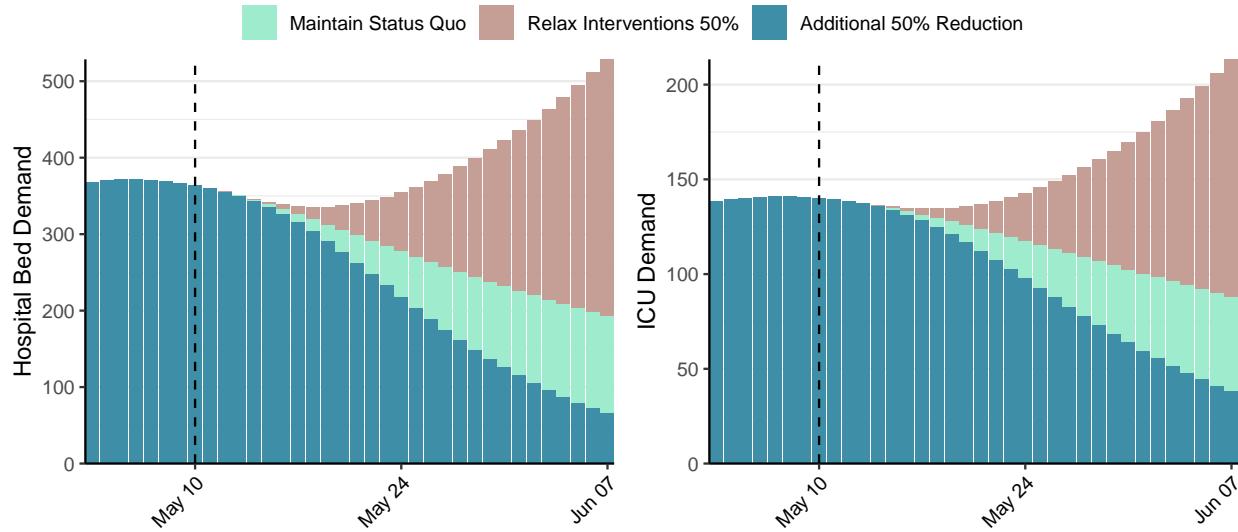
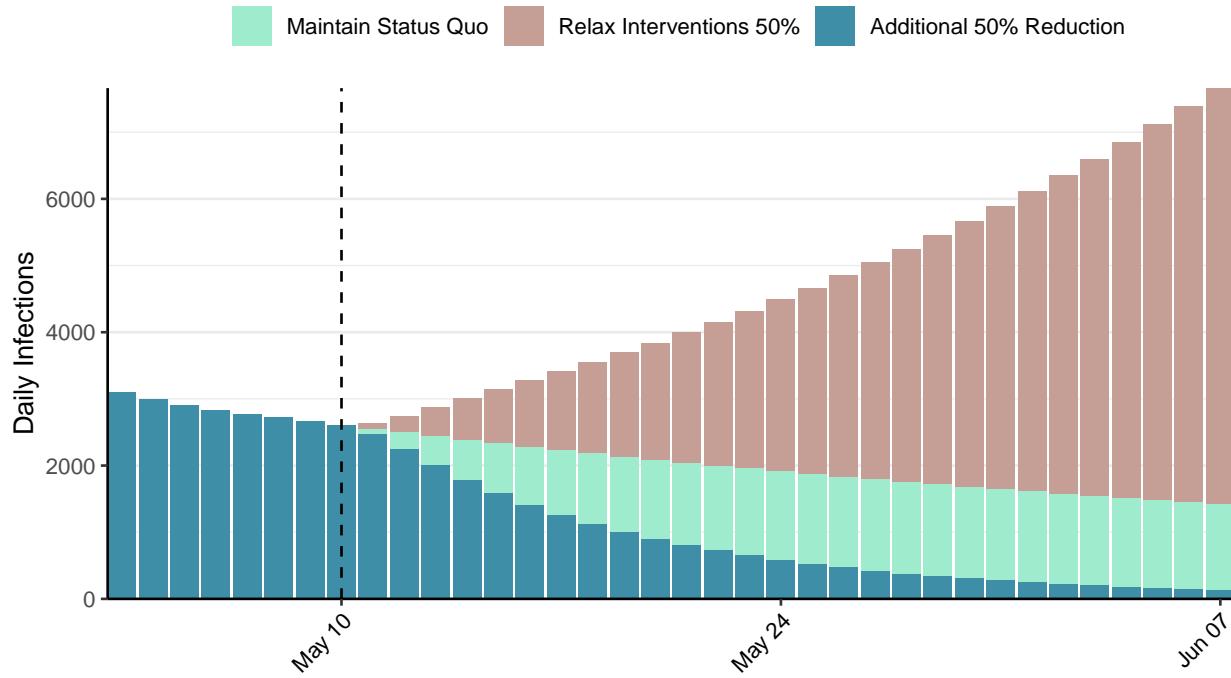


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 2,580 (95% CI: 2,410-2,750) at the current date to 125 (95% CI: 111-140) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 2,580 (95% CI: 2,410-2,750) at the current date to 7,585 (95% CI: 6,569-8,602) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Belize, 2021-05-10

[Download the report for Belize, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
12,700	14	324	0	1.38 (95% CI: 1.11-1.68)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

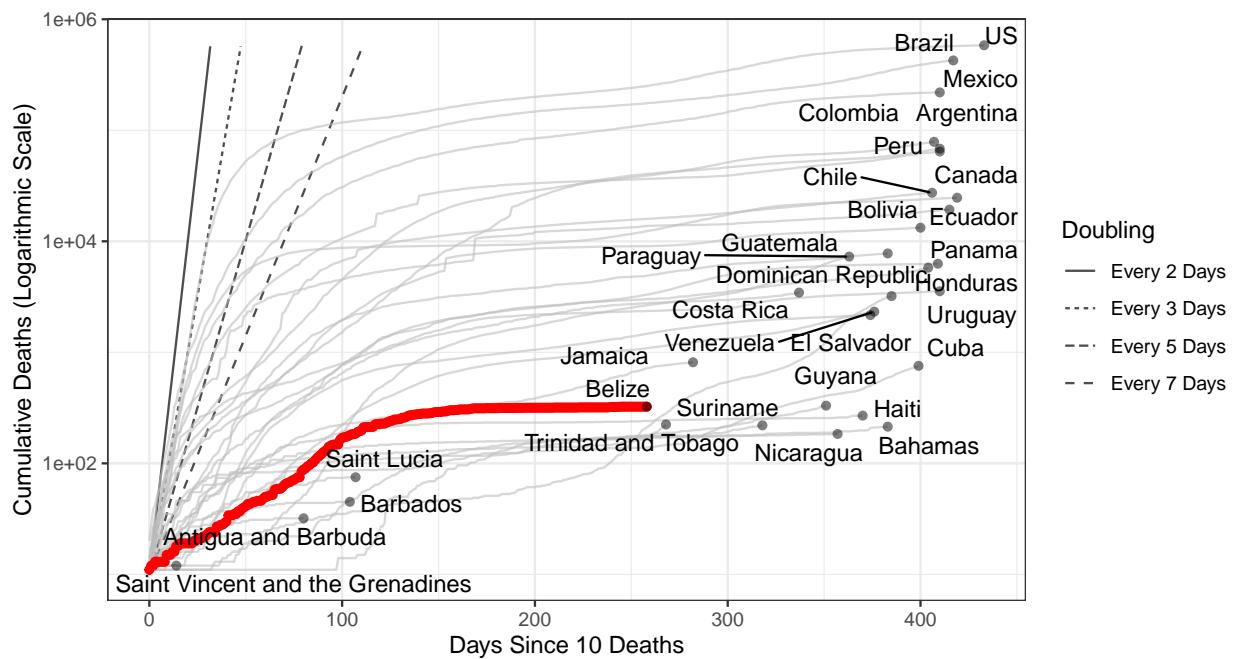


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 3,404 (95% CI: 3,126-3,681) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

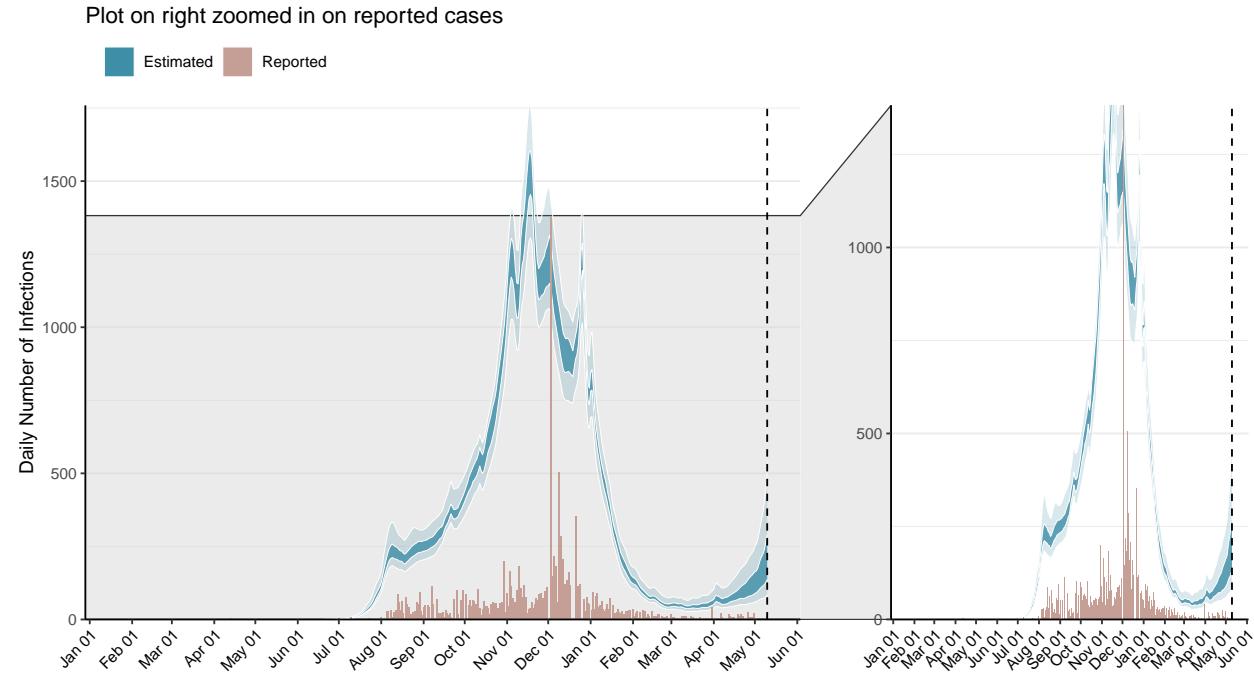
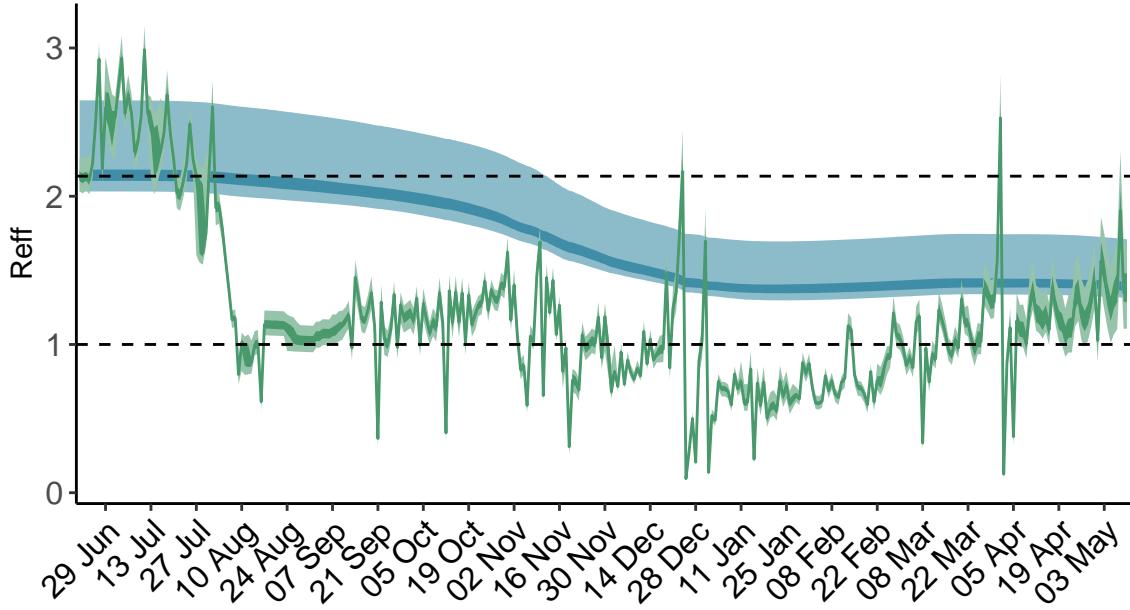


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Belize is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

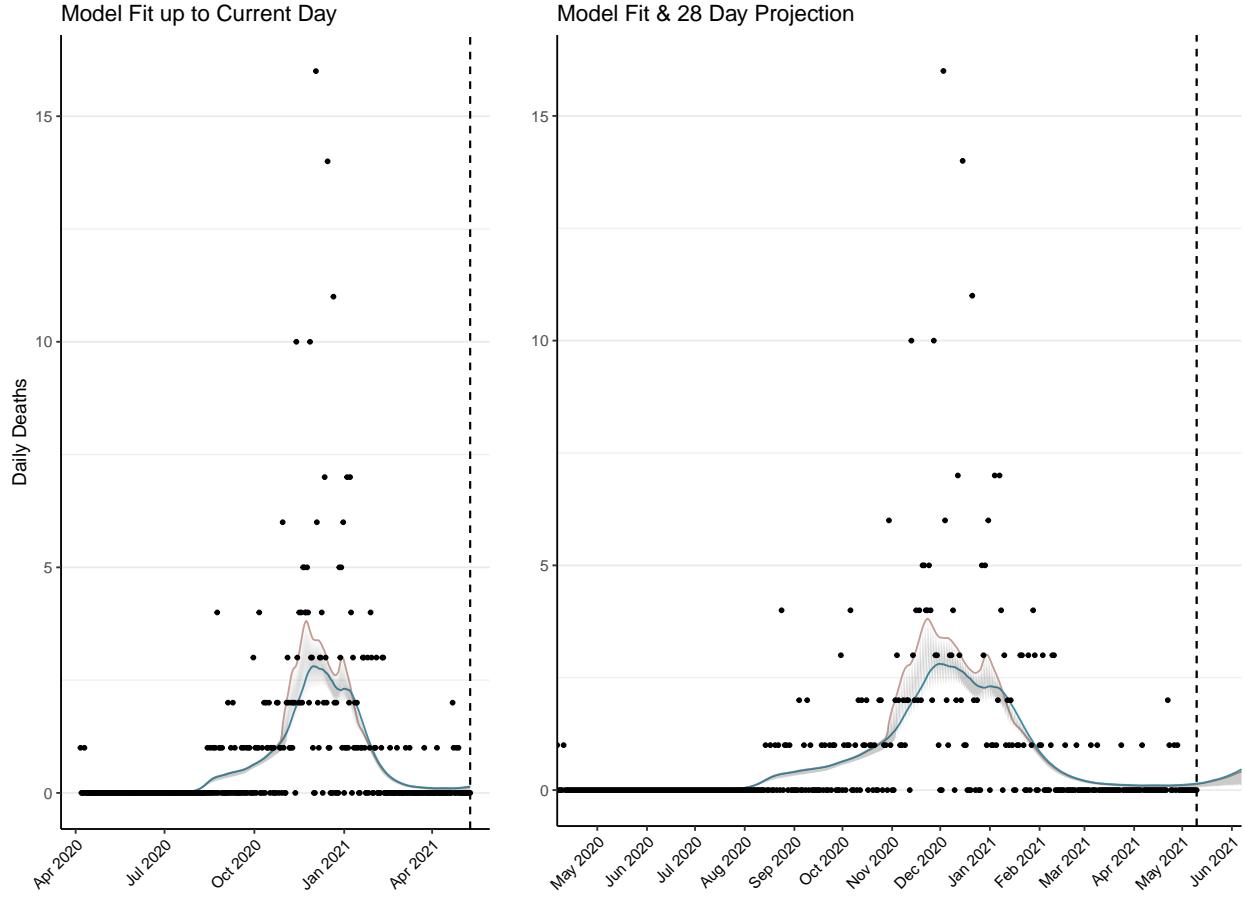


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 7 (95% CI: 7-8) patients requiring treatment with high-pressure oxygen at the current date to 32 (95% CI: 27-37) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 3 (95% CI: 3-3) patients requiring treatment with mechanical ventilation at the current date to 10 (95% CI: 9-11) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

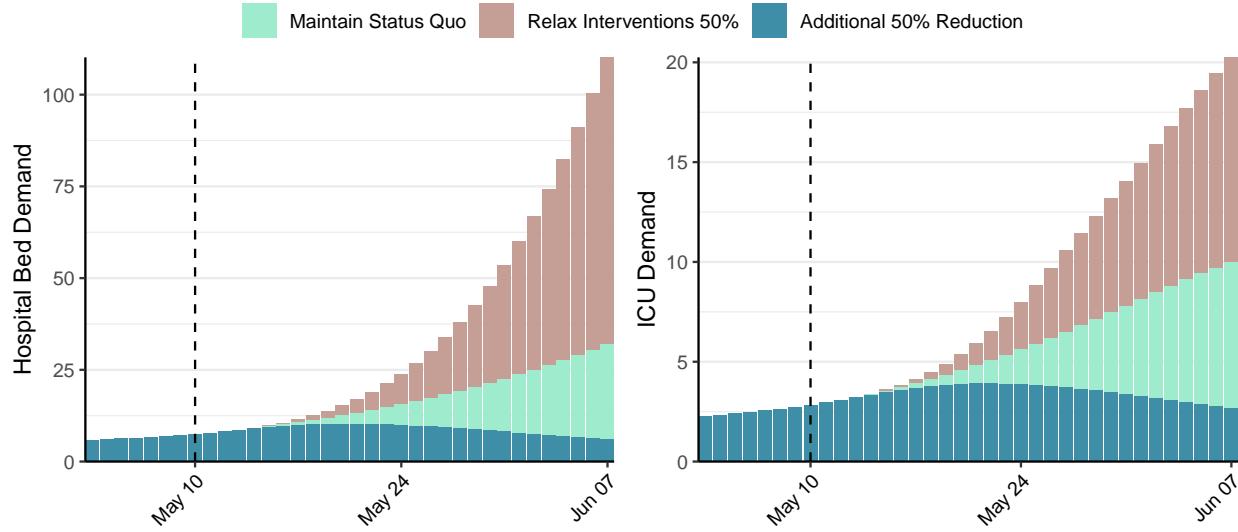


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 221 (95% CI: 198-245) at the current date to 61 (95% CI: 50-73) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 221 (95% CI: 198-245) at the current date to 4,126 (95% CI: 3,639-4,613) by 2021-06-07.

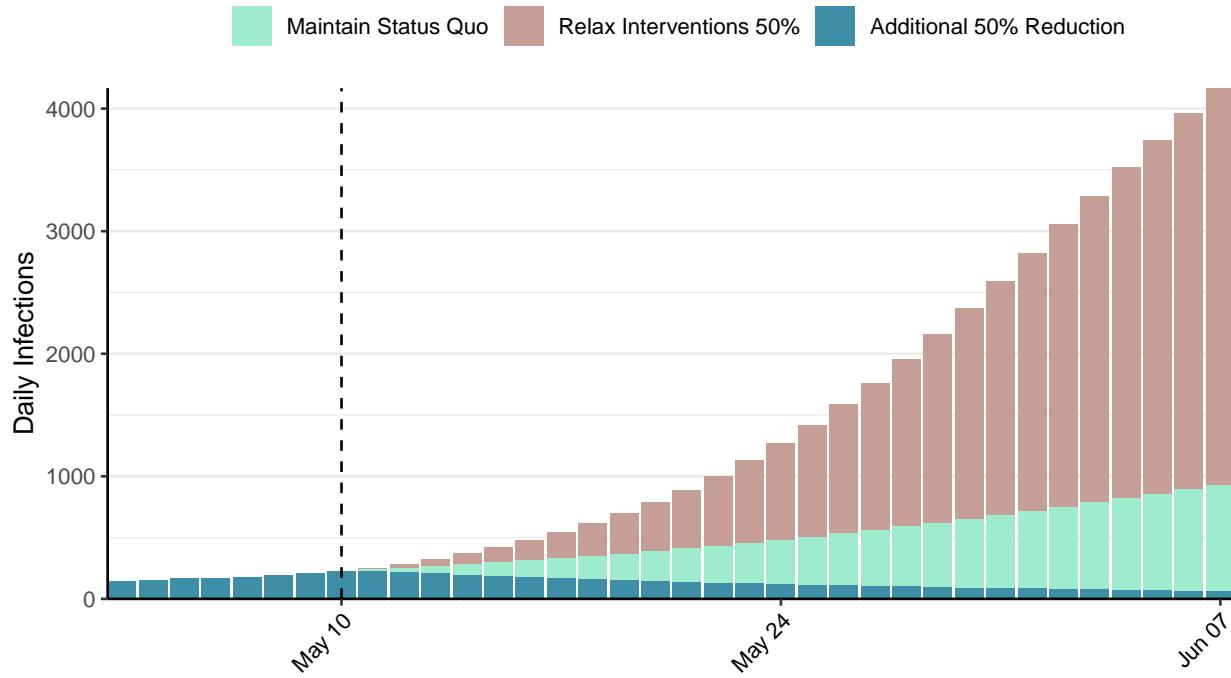


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Bolivia, 2021-05-10

[Download the report for Bolivia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
320,207	1,599	13,258	30	1.17 (95% CI: 1.13-1.23)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

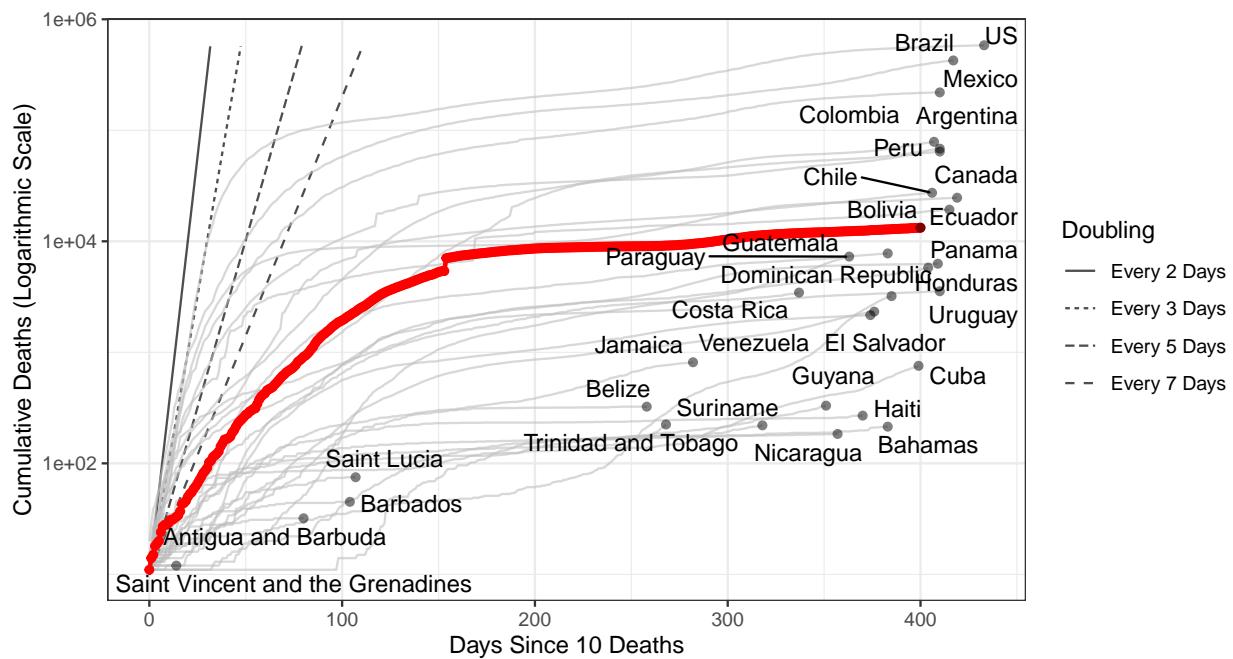


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 335,394 (95% CI: 328,242-342,546) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

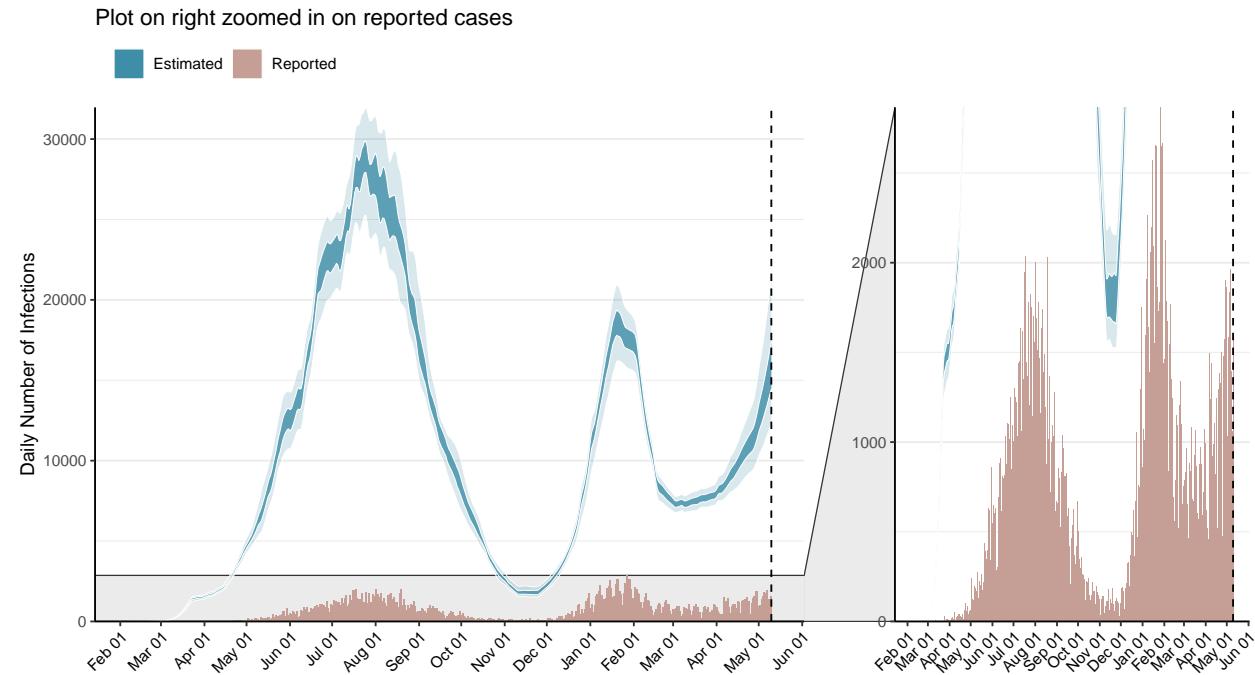
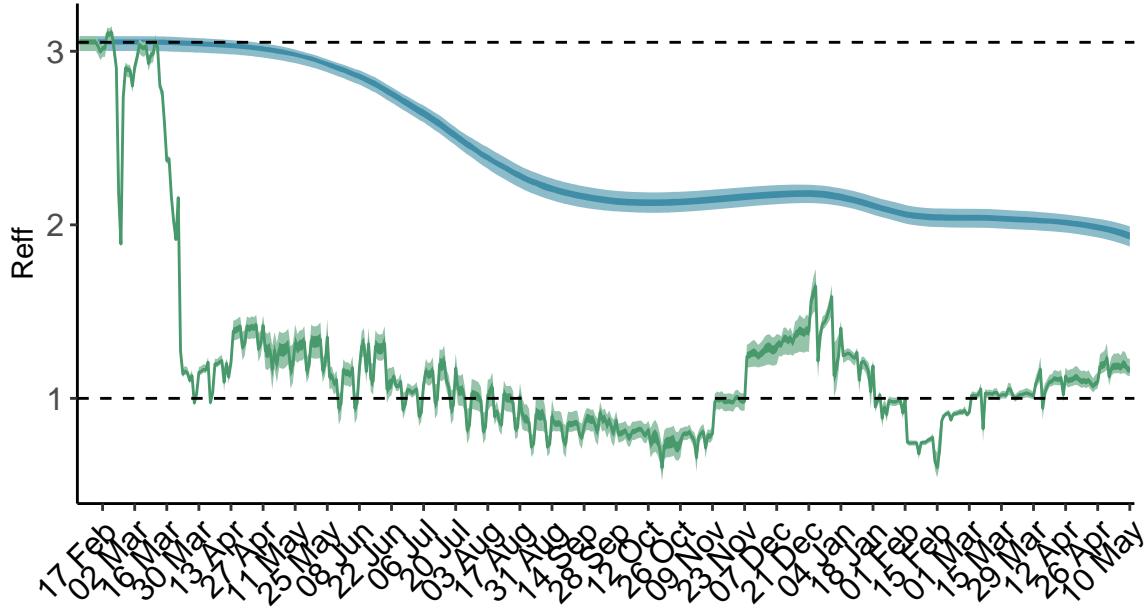


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Bolivia is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

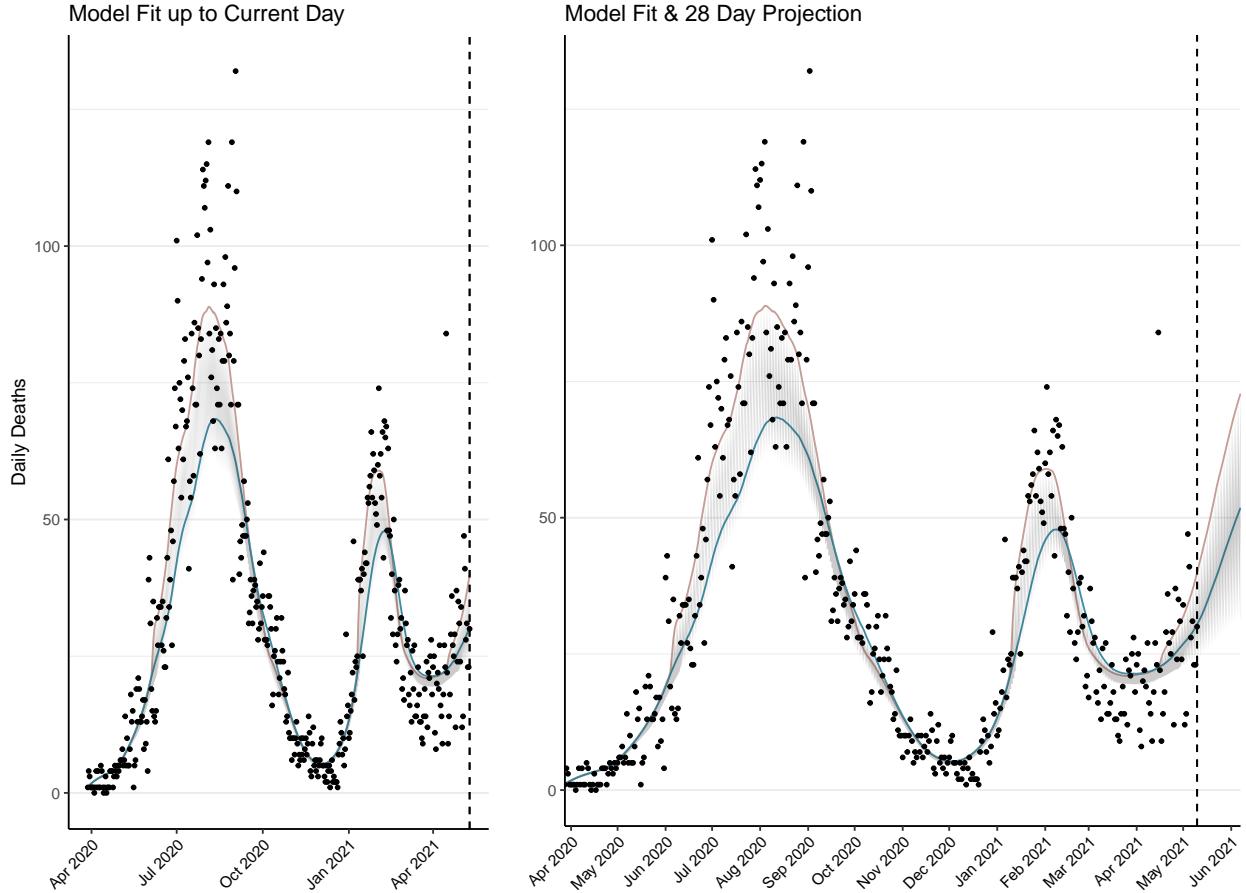


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 1,179 (95% CI: 1,153-1,205) patients requiring treatment with high-pressure oxygen at the current date to 2,017 (95% CI: 1,935-2,098) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 304 (95% CI: 303-305) patients requiring treatment with mechanical ventilation at the current date to 335 (95% CI: 332-339) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

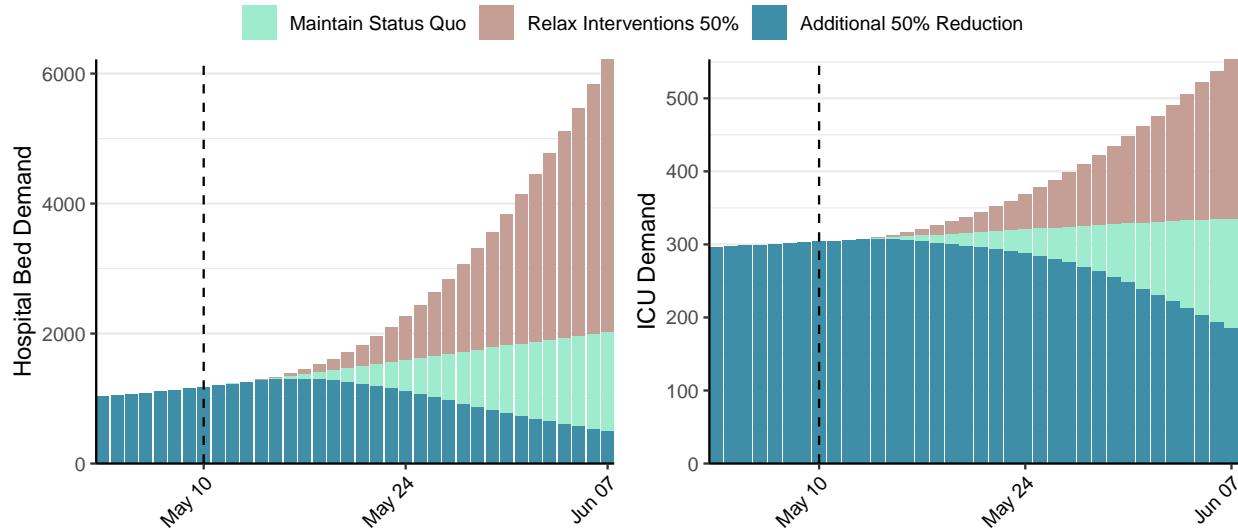


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 16,095 (95% CI: 15,610-16,581) at the current date to 2,067 (95% CI: 1,974-2,159) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 16,095 (95% CI: 15,610-16,581) at the current date to 115,479 (95% CI: 112,214-118,744) by 2021-06-07.

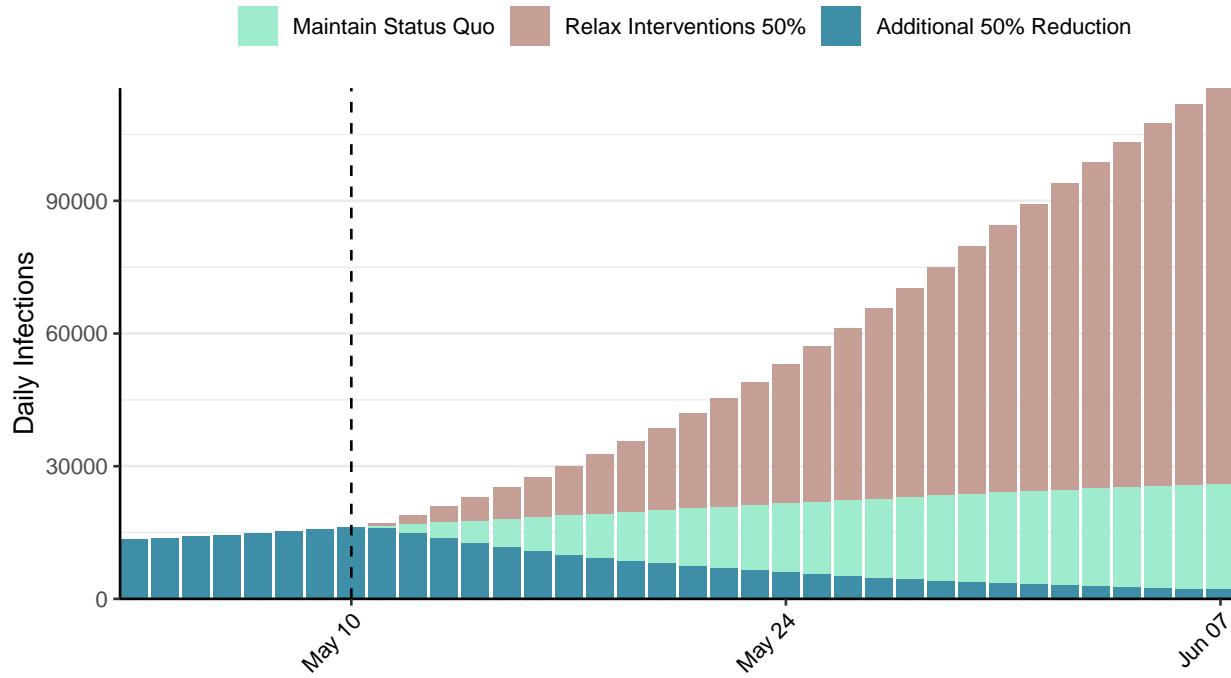


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Brazil, 2021-05-10

[Download the report for Brazil, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
15,209,990	25,200	423,229	889	0.89 (95% CI: 0.85-0.93)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

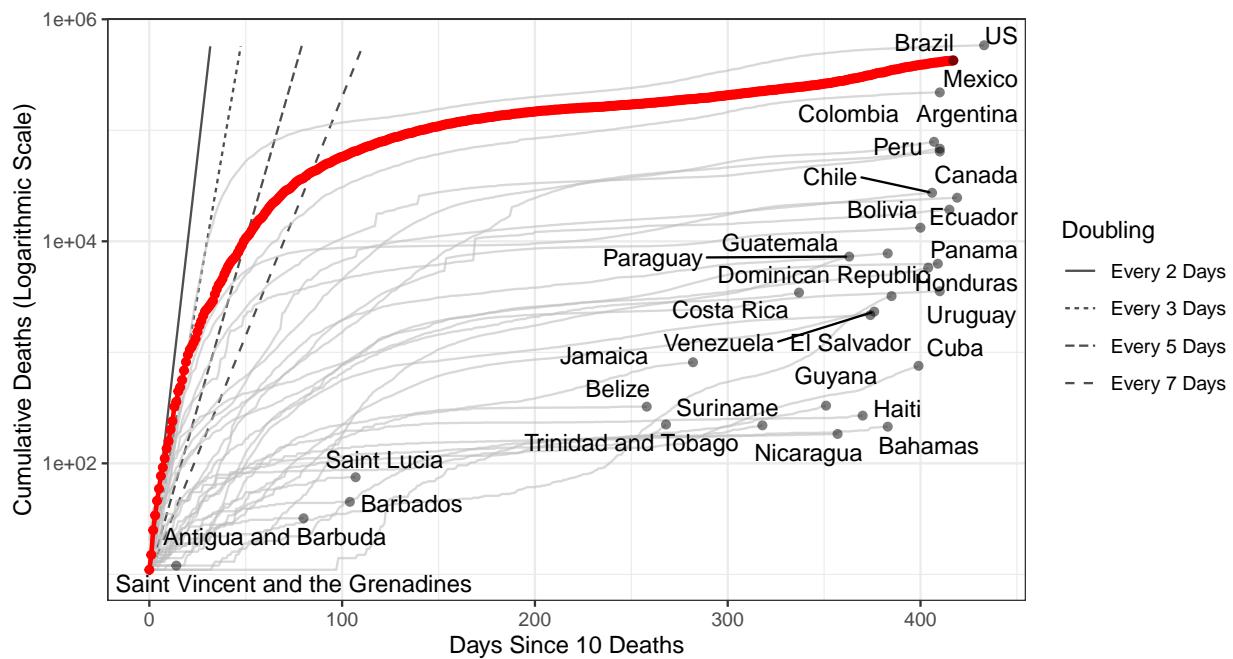


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 20,879,758 (95% CI: 20,618,526-21,140,990) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

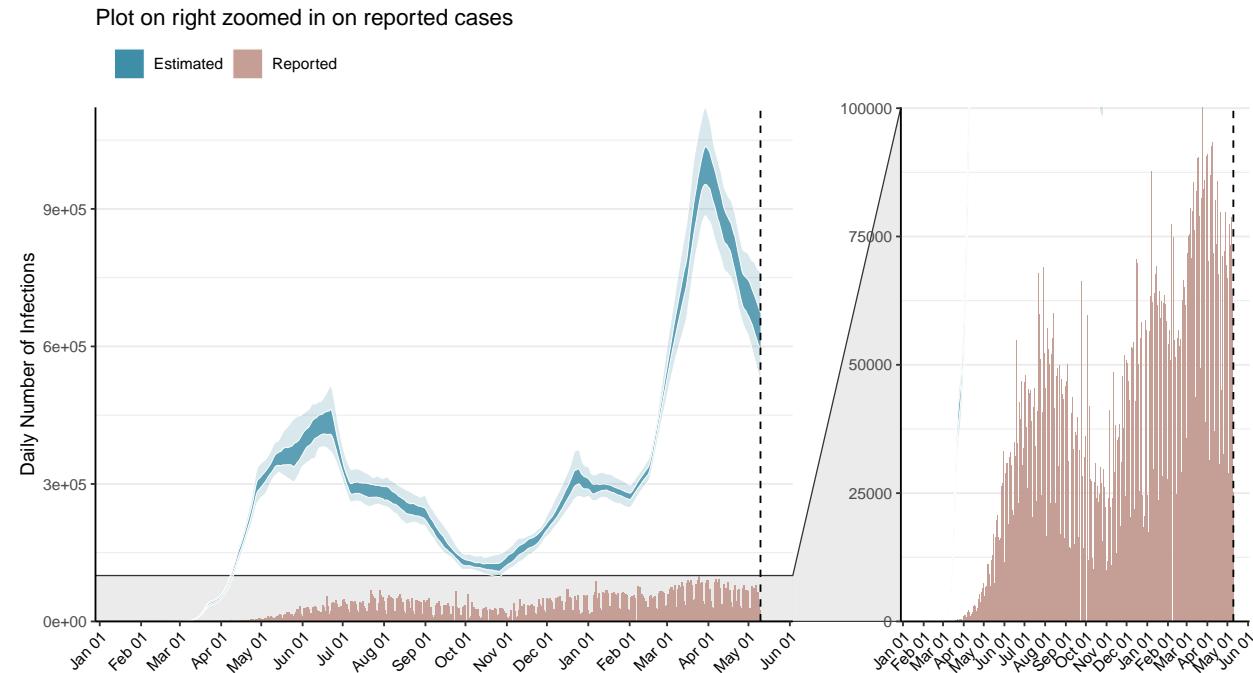


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.

For sub-national estimates of  $R_t$ , and further analysis of Brazil, please see [Report 21](#)

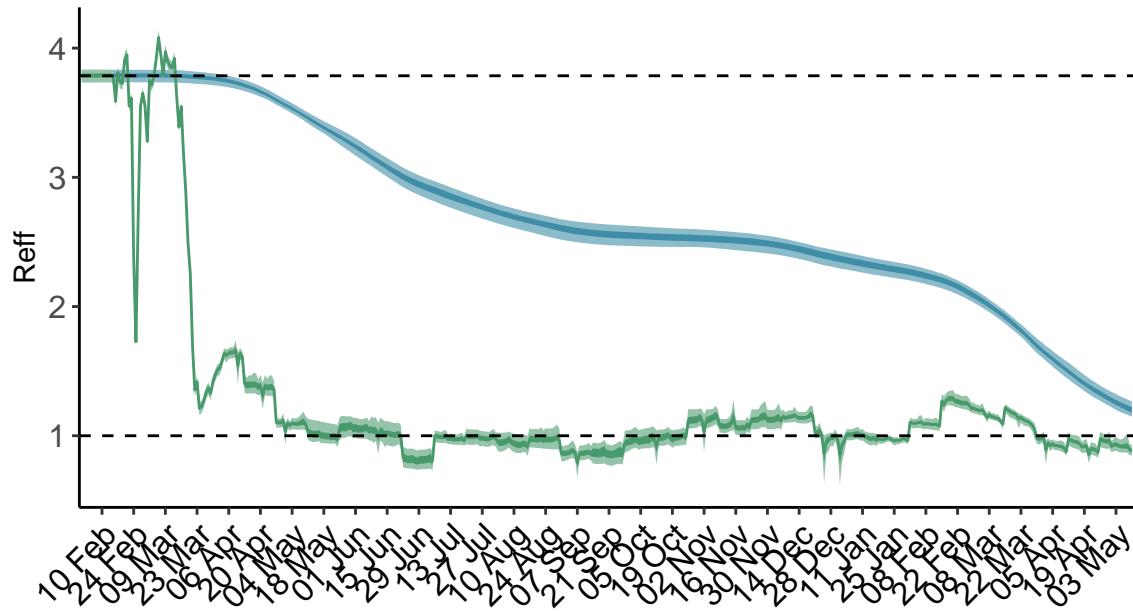


Figure 3: **Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (**green**) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Brazil is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

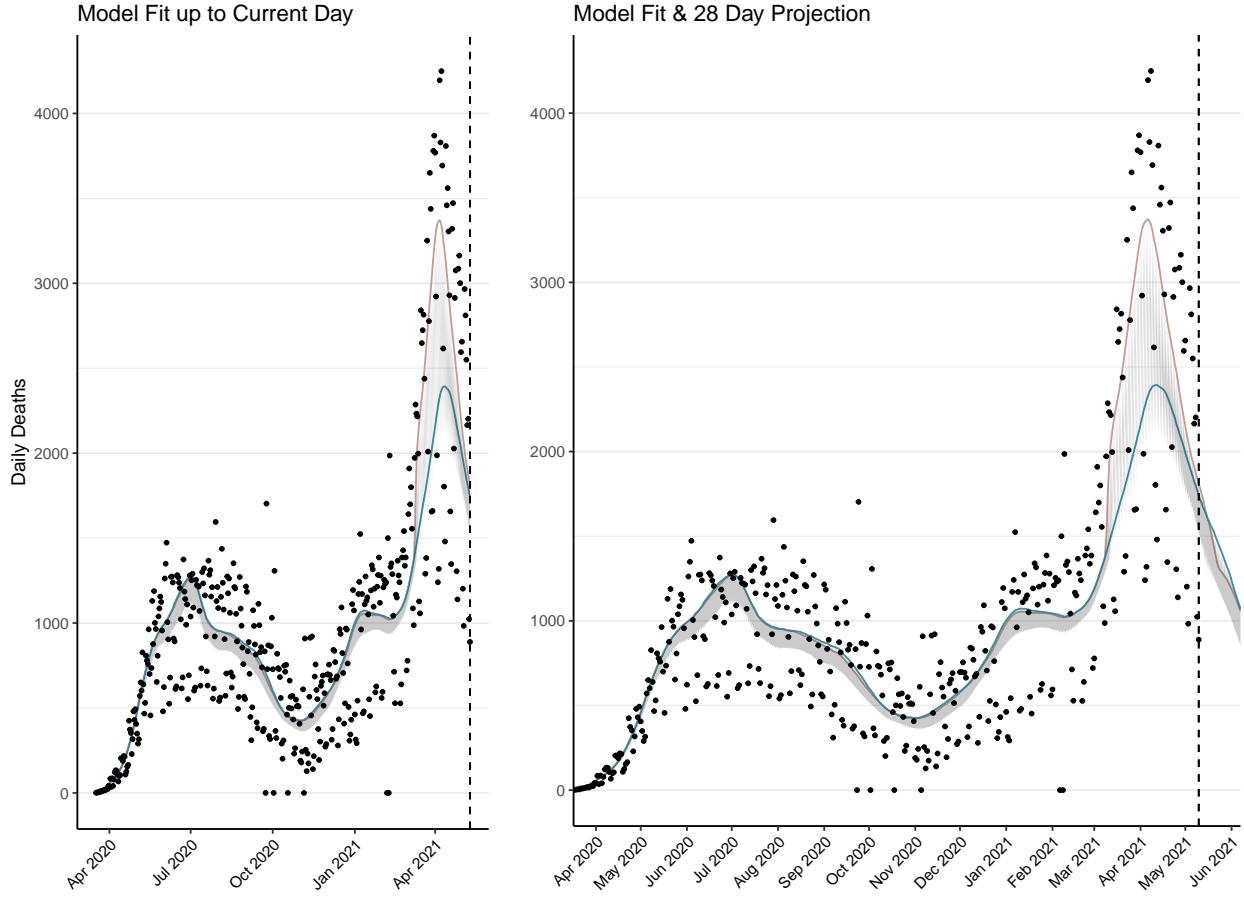


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 67,546 (95% CI: 66,652-68,440) patients requiring treatment with high-pressure oxygen at the current date to 39,901 (95% CI: 38,939-40,864) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 21,856 (95% CI: 21,812-21,901) patients requiring treatment with mechanical ventilation at the current date to 17,104 (95% CI: 16,790-17,418) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B.** These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.

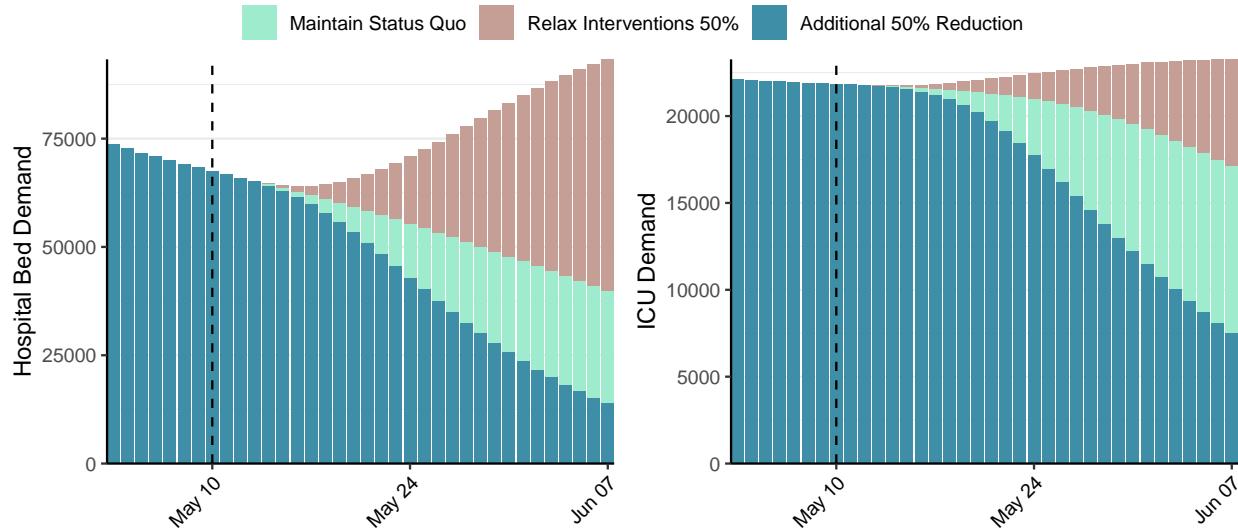
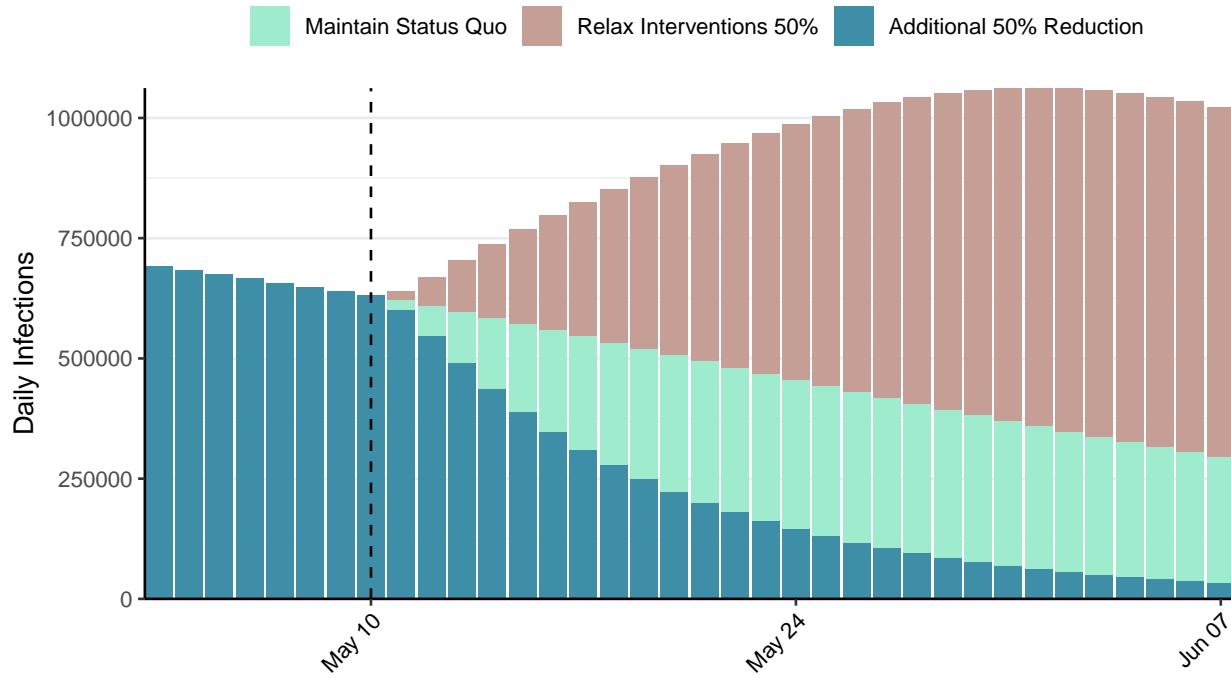


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 630,812 (95% CI: 618,477-643,147) at the current date to 32,367 (95% CI: 31,412-33,322) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 630,812 (95% CI: 618,477-643,147) at the current date to 1,021,405 (95% CI: 1,003,456-1,039,354) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Bhutan, 2021-05-10

[Download the report for Bhutan, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
1,241	20	1	0	0.79 (95% CI: 0.49-1.1)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease. **N.B.** Bhutan is not shown in the following plot as only 1 deaths have been reported to date

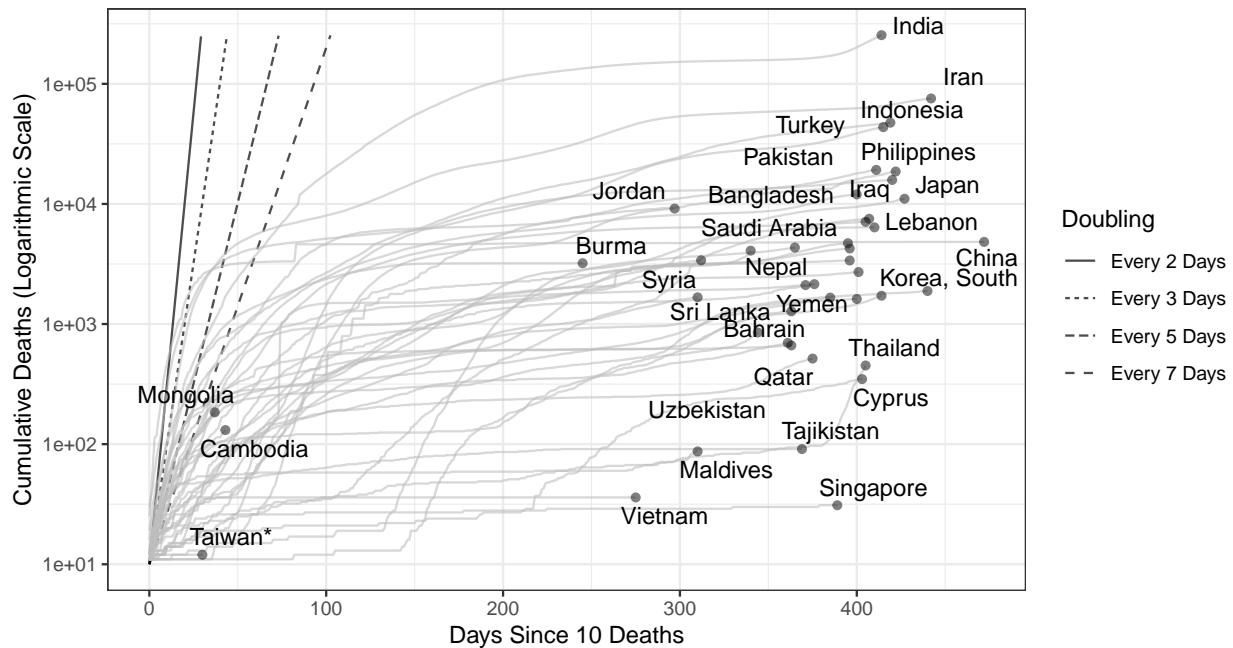


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 24 (95% CI: 14-34) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

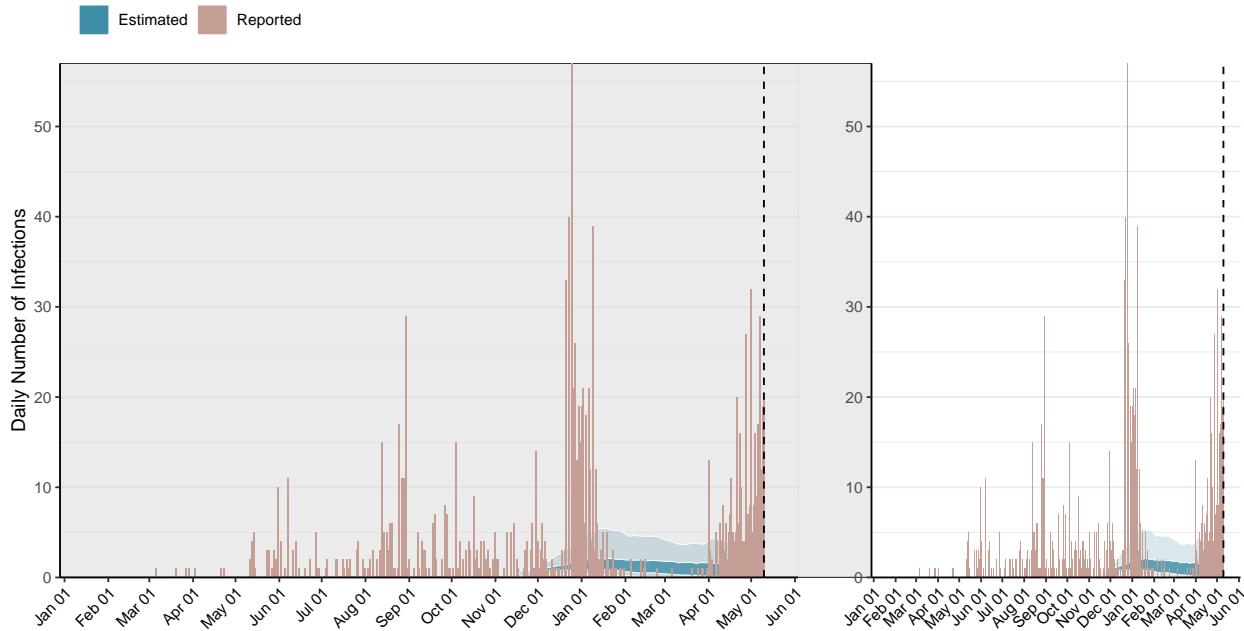
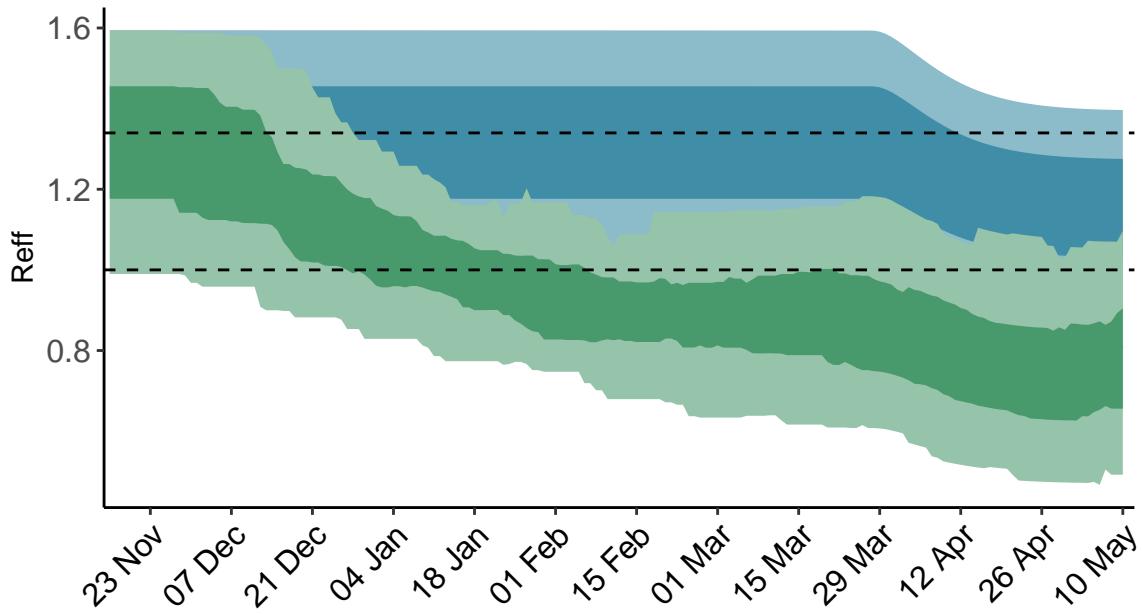


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

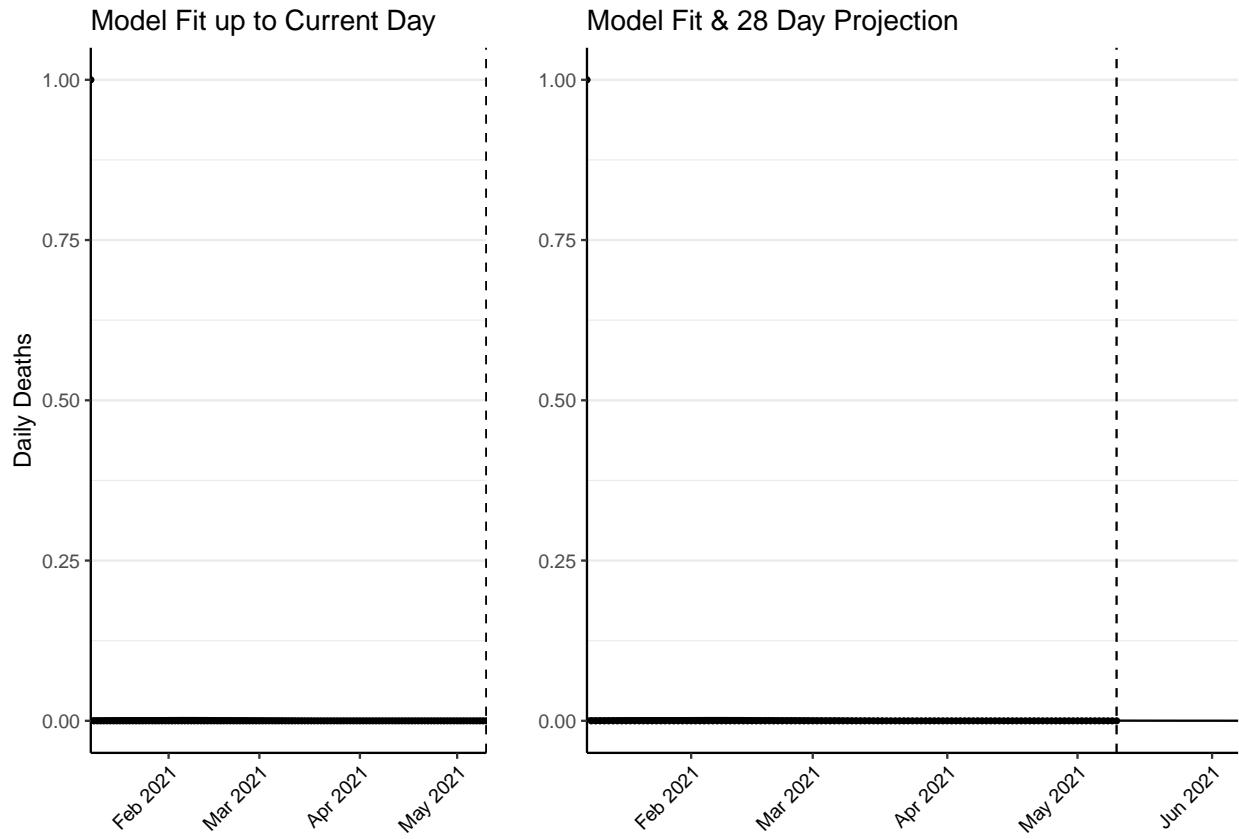


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 0 (95% CI: 0-0) patients requiring treatment with high-pressure oxygen at the current date to 0 (95% CI: 0-0) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 0 (95% CI: 0-0) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

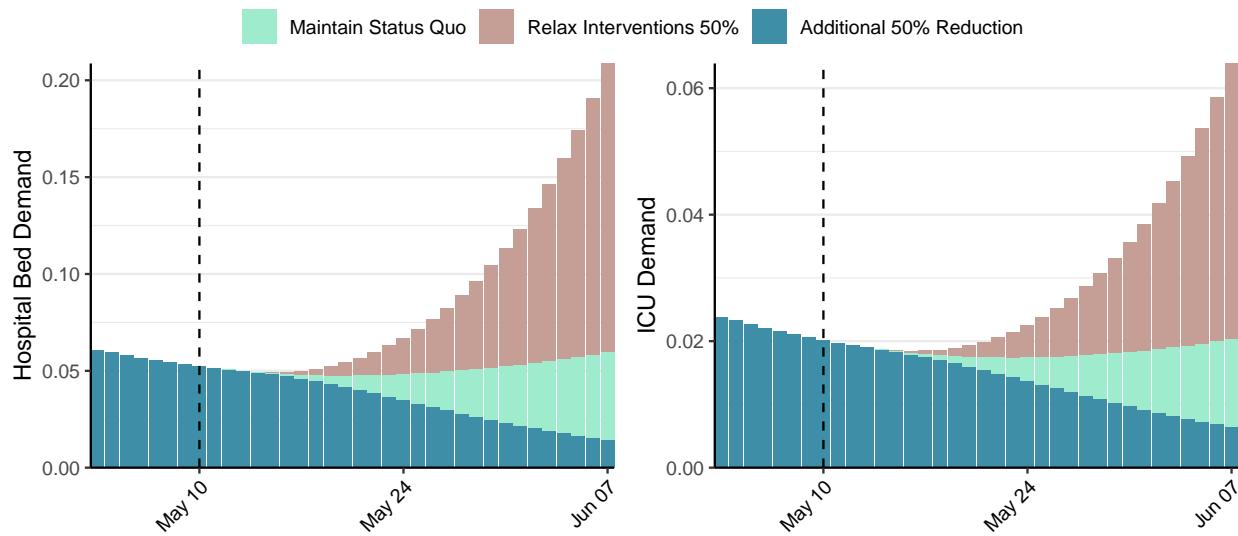


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1 (95% CI: 0-1) at the current date to 0 (95% CI: 0-0) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1 (95% CI: 0-1) at the current date to 9 (95% CI: 0-17) by 2021-06-07.

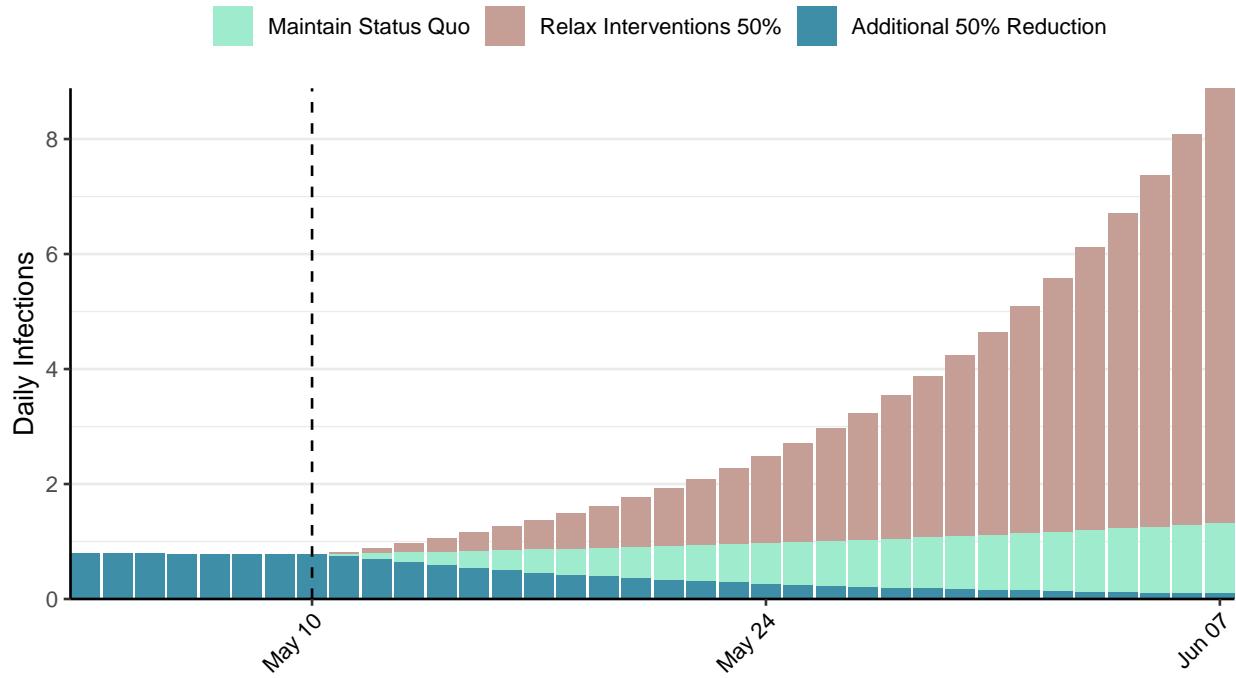


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Botswana, 2021-05-10

[Download the report for Botswana, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
49,041	624	751	17	0.81 (95% CI: 0.71-0.92)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

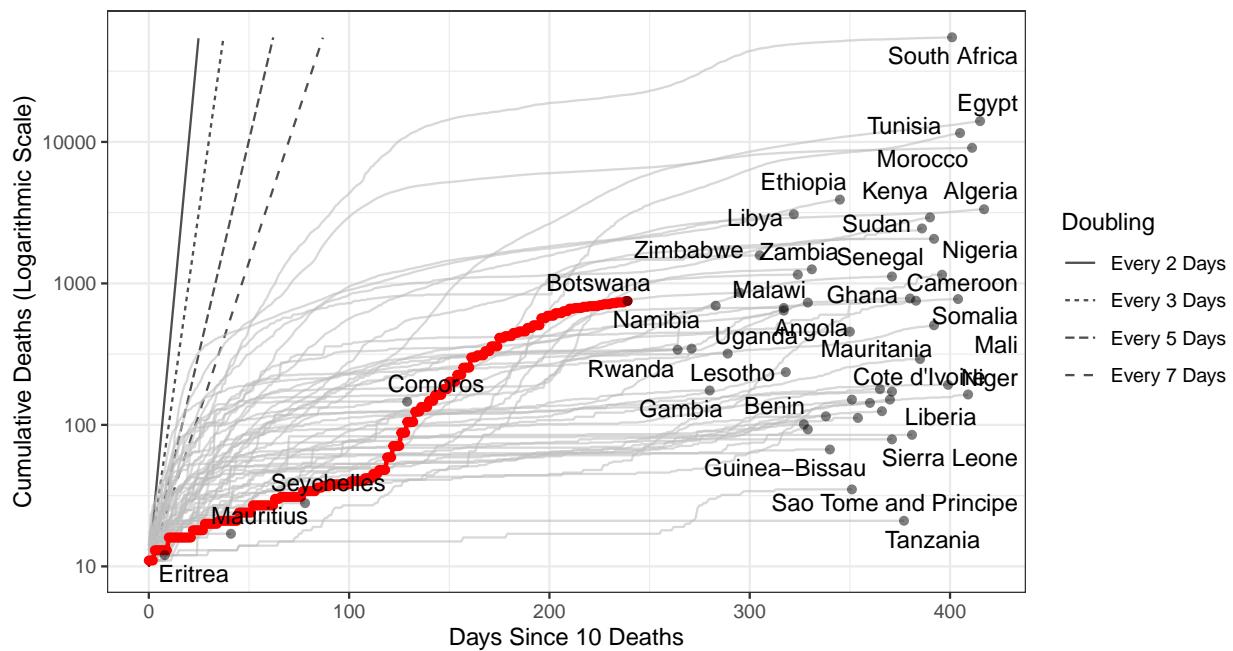


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 36,316 (95% CI: 34,858-37,775) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

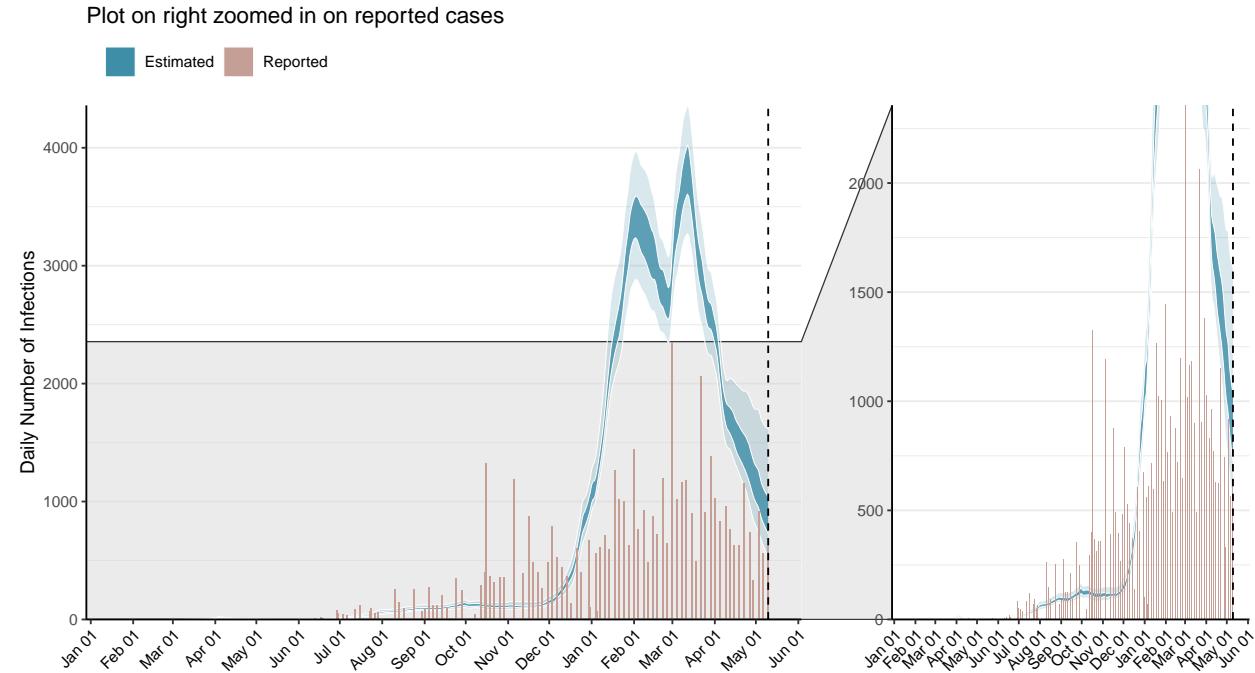
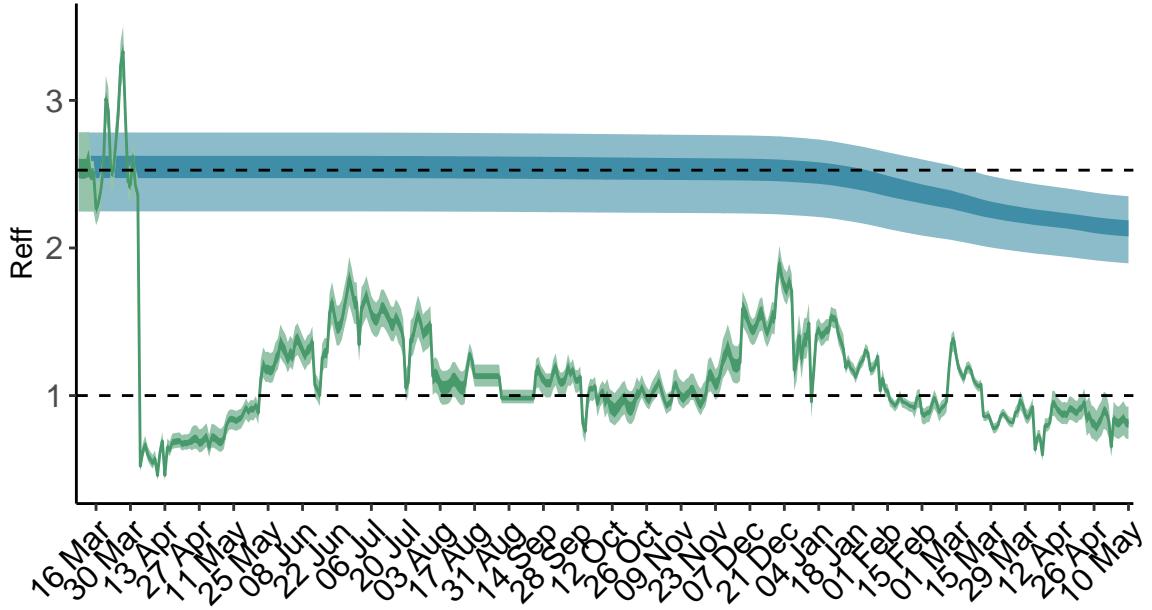


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

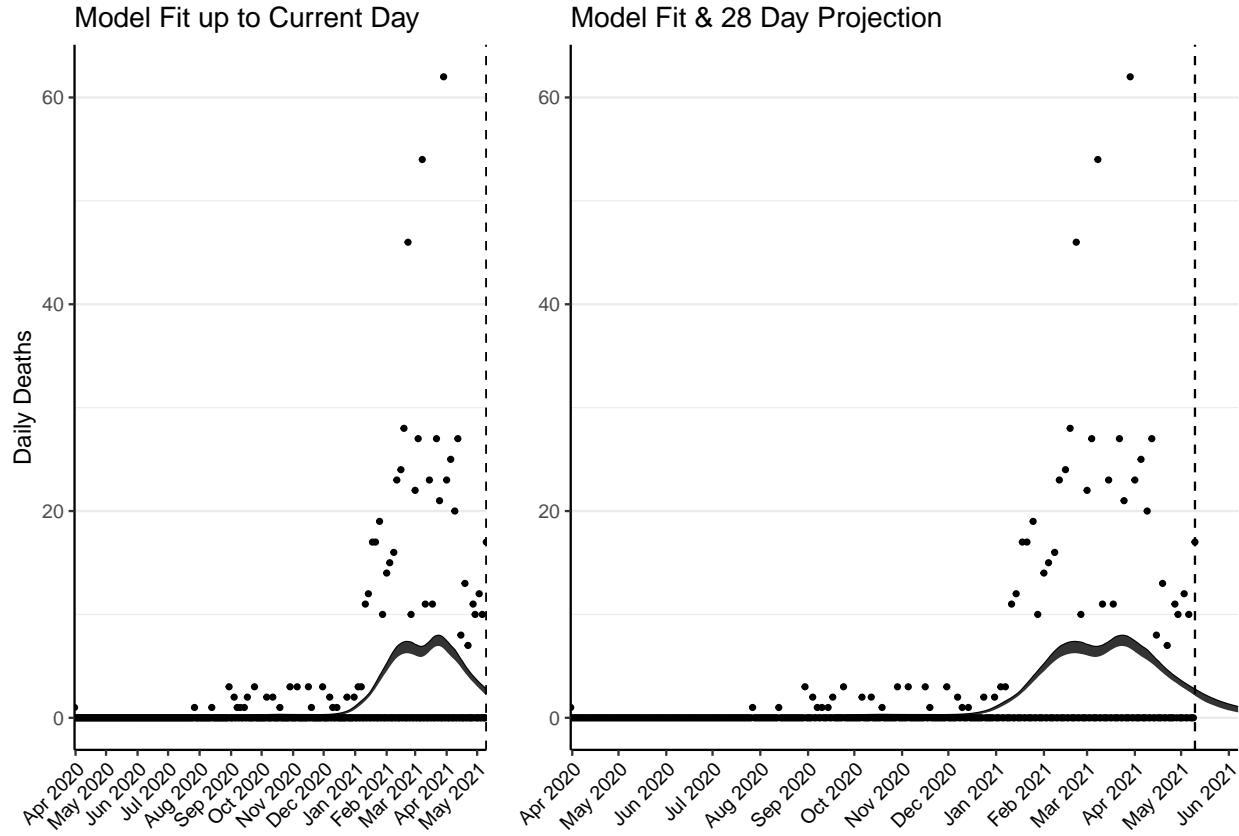


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 102 (95% CI: 97-106) patients requiring treatment with high-pressure oxygen at the current date to 43 (95% CI: 39-47) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 46 (95% CI: 44-48) patients requiring treatment with mechanical ventilation at the current date to 21 (95% CI: 19-22) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

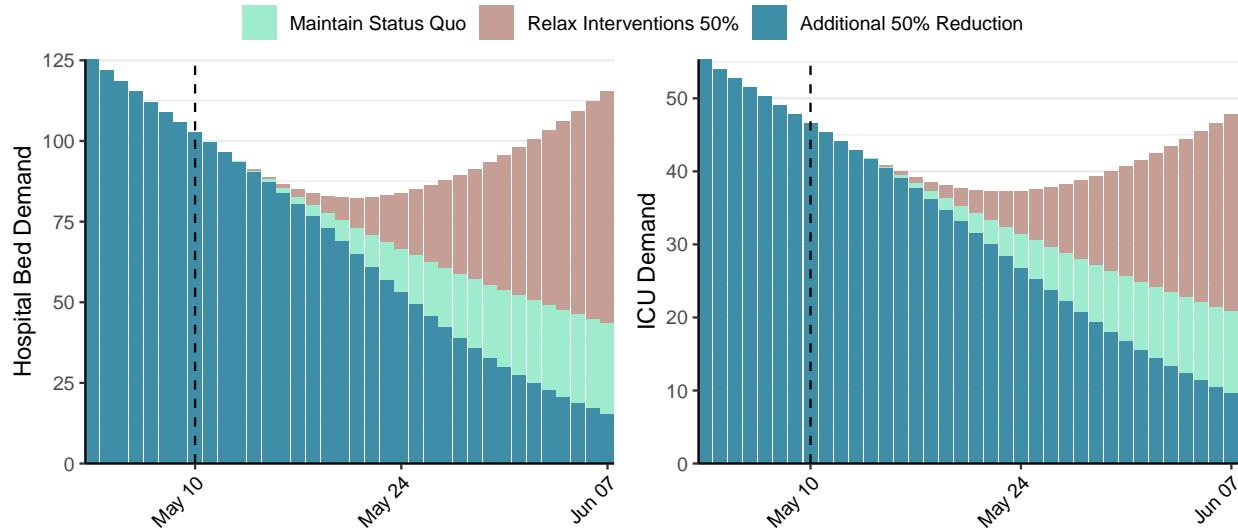


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 915 (95% CI: 858-973) at the current date to 40 (95% CI: 35-44) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 915 (95% CI: 858-973) at the current date to 2,258 (95% CI: 1,992-2,525) by 2021-06-07.

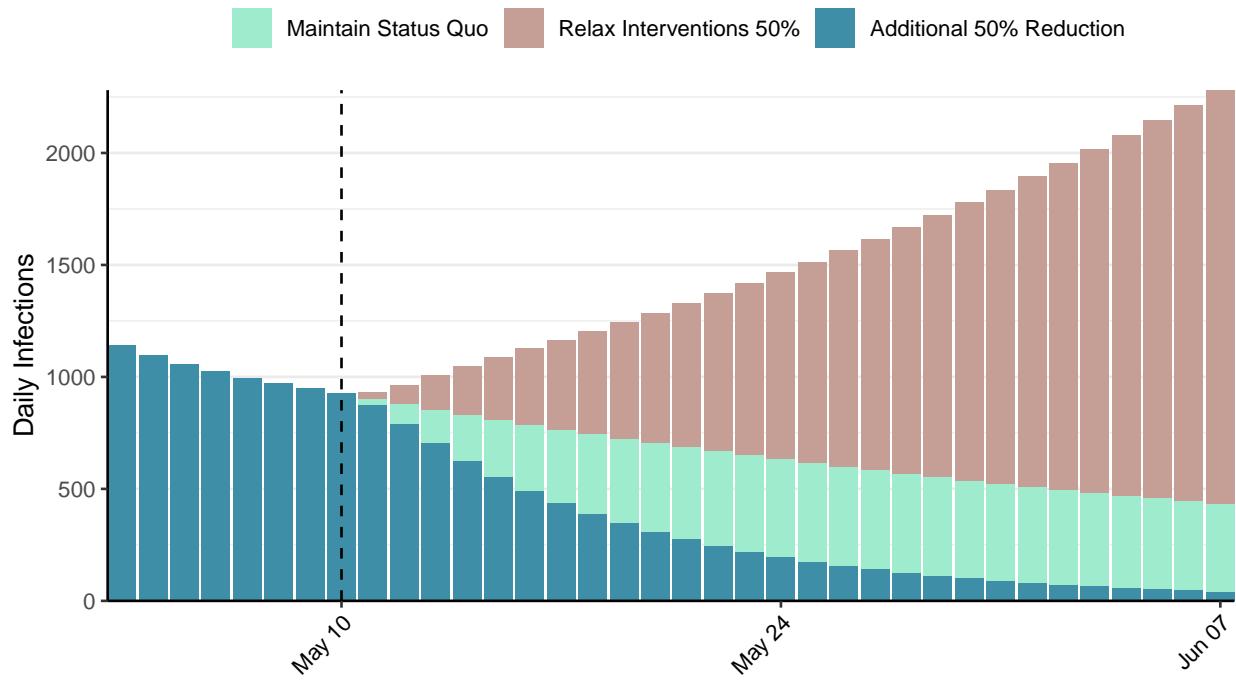


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Central African Republic, 2021-05-10

[Download the report for Central African Republic, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
6,674	0	93	0	0.84 (95% CI: 0.69-1.04)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

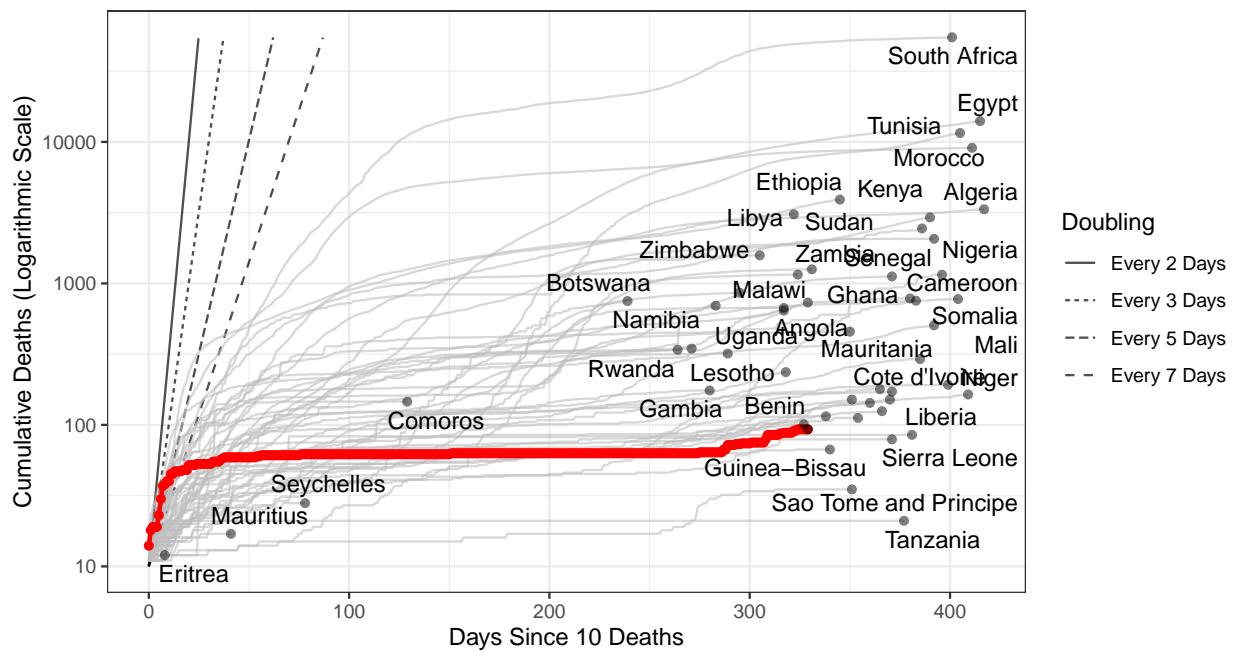


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 10,077 (95% CI: 9,616-10,538) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

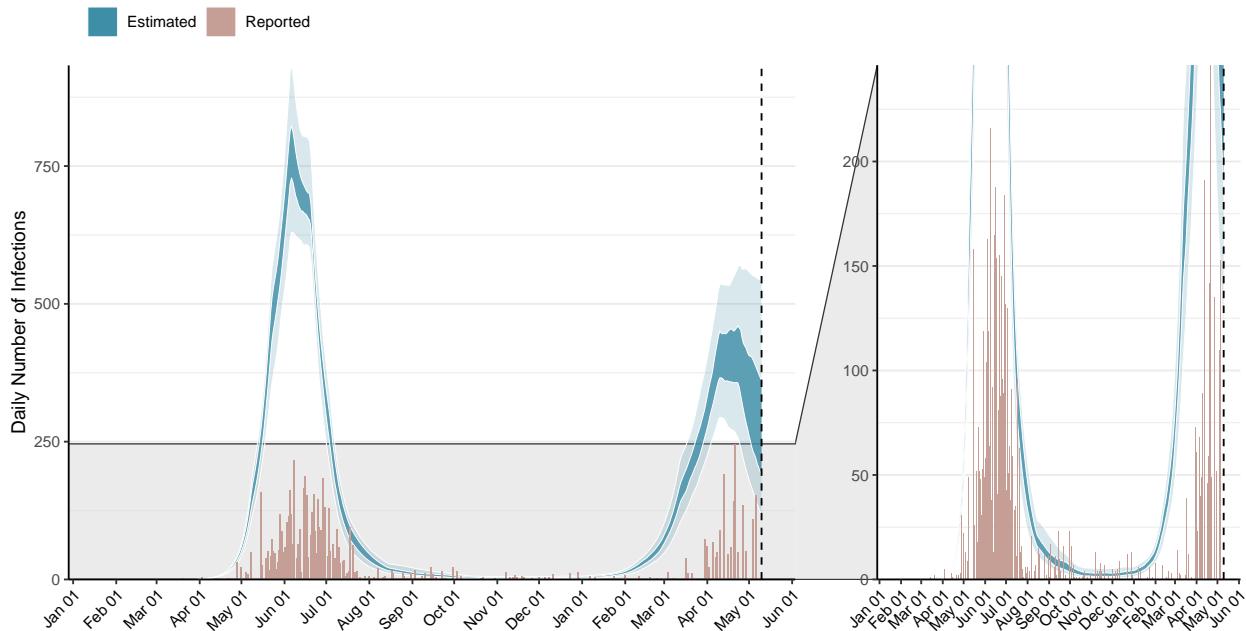
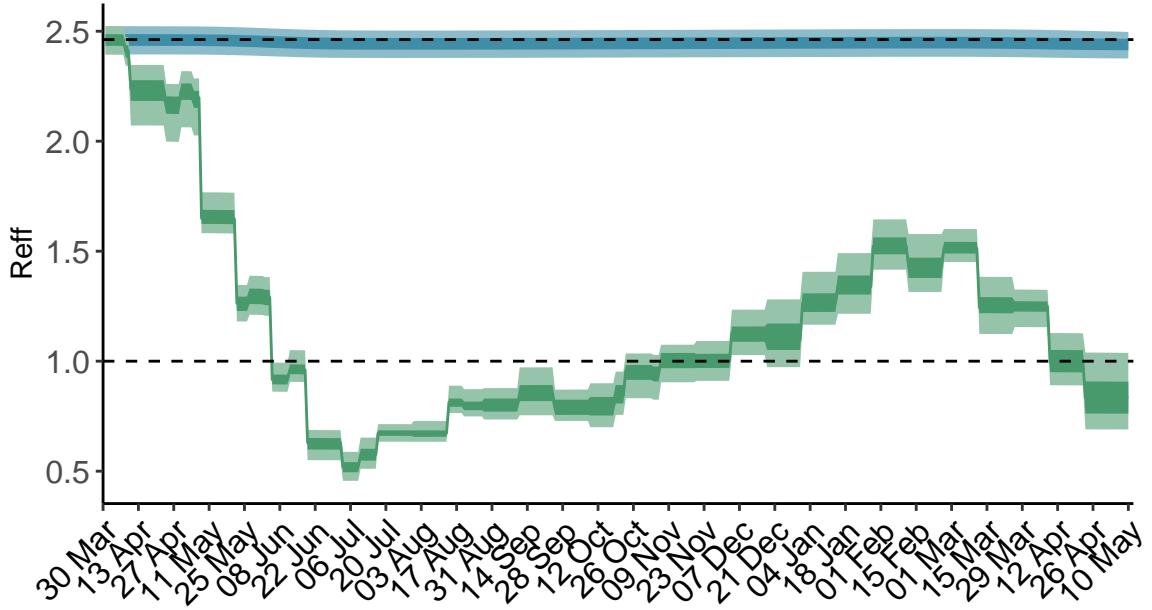


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

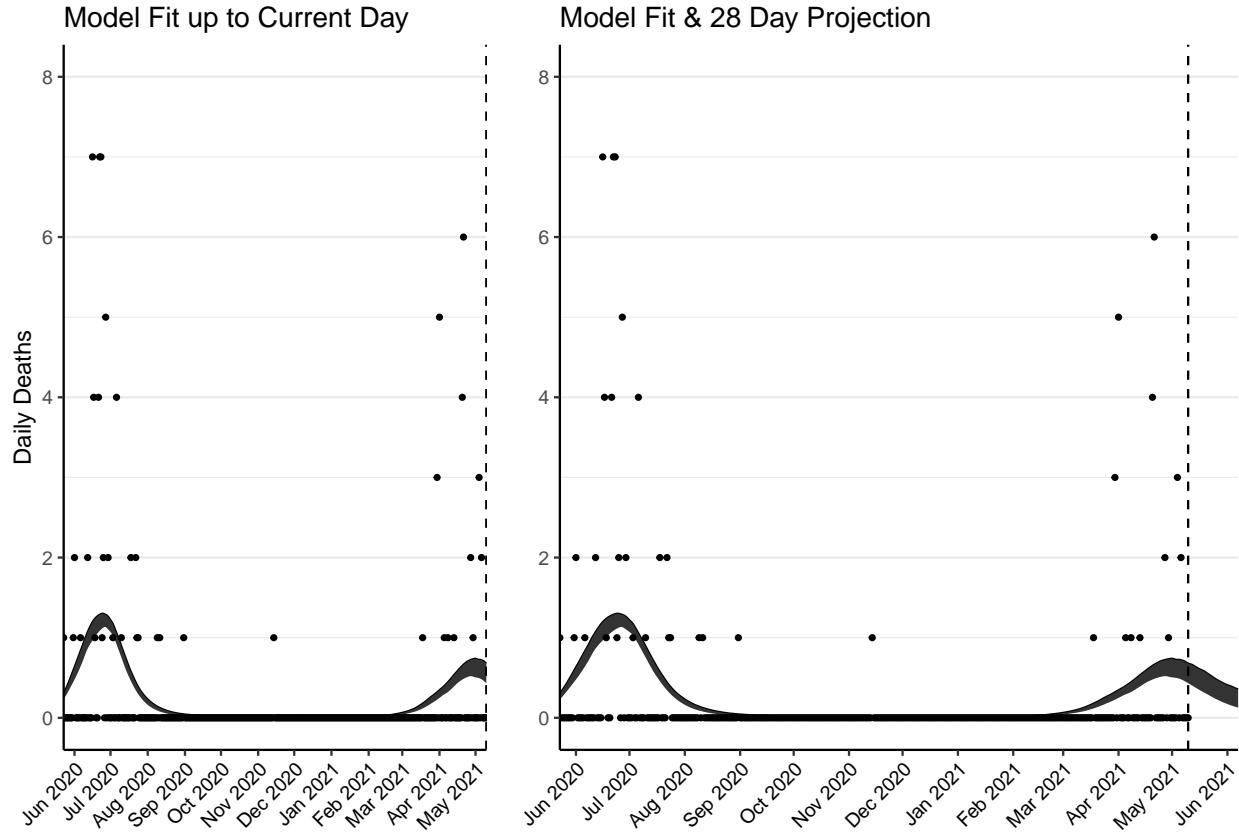


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 27 (95% CI: 25-28) patients requiring treatment with high-pressure oxygen at the current date to 16 (95% CI: 14-18) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 11 (95% CI: 10-11) patients requiring treatment with mechanical ventilation at the current date to 7 (95% CI: 6-7) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

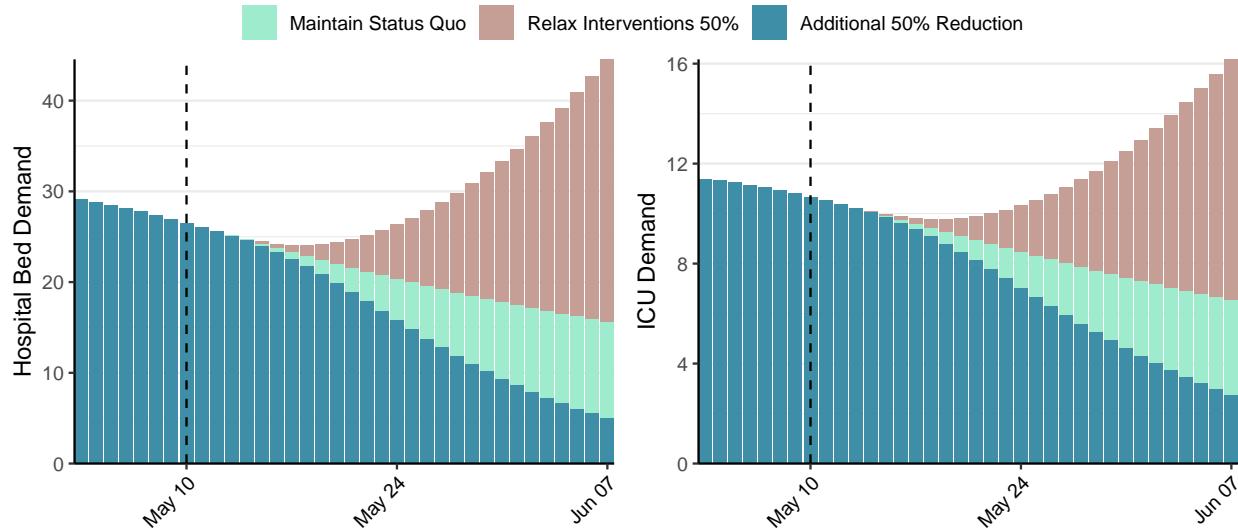


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 277 (95% CI: 254-300) at the current date to 14 (95% CI: 12-17) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 277 (95% CI: 254-300) at the current date to 953 (95% CI: 775-1,131) by 2021-06-07.

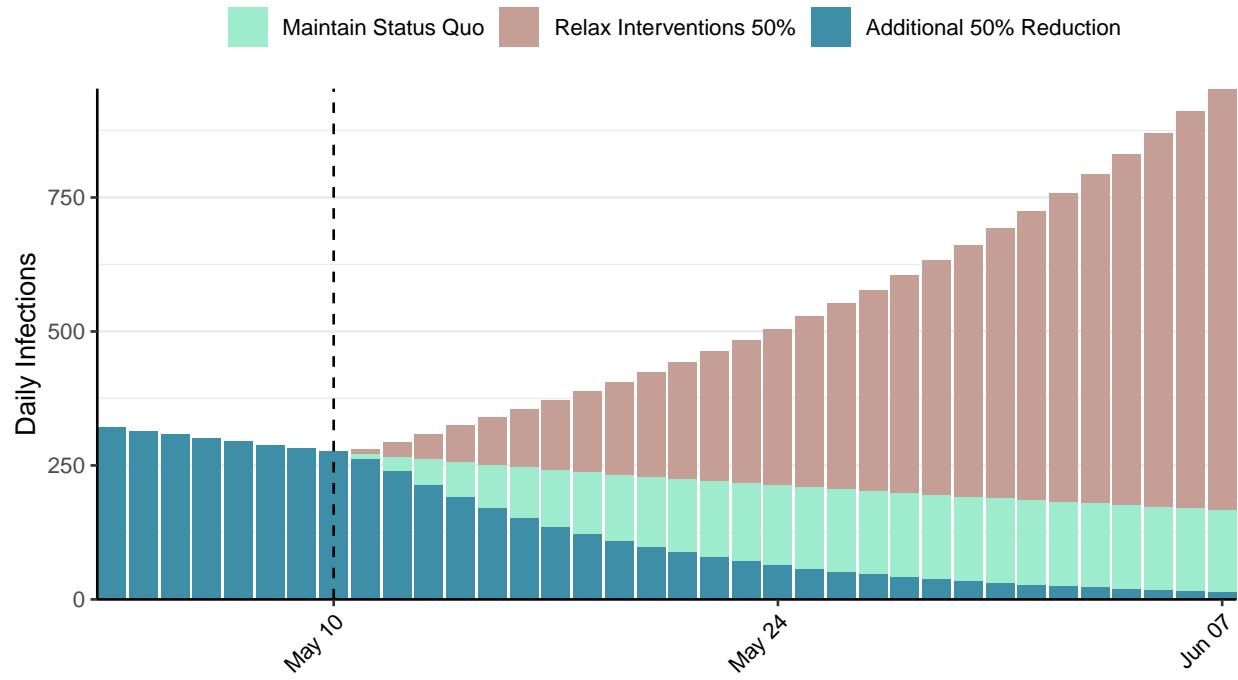


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Chile, 2021-05-10

[Download the report for Chile, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
1,256,545	3,738	27,356	38	0.88 (95% CI: 0.83-0.92)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

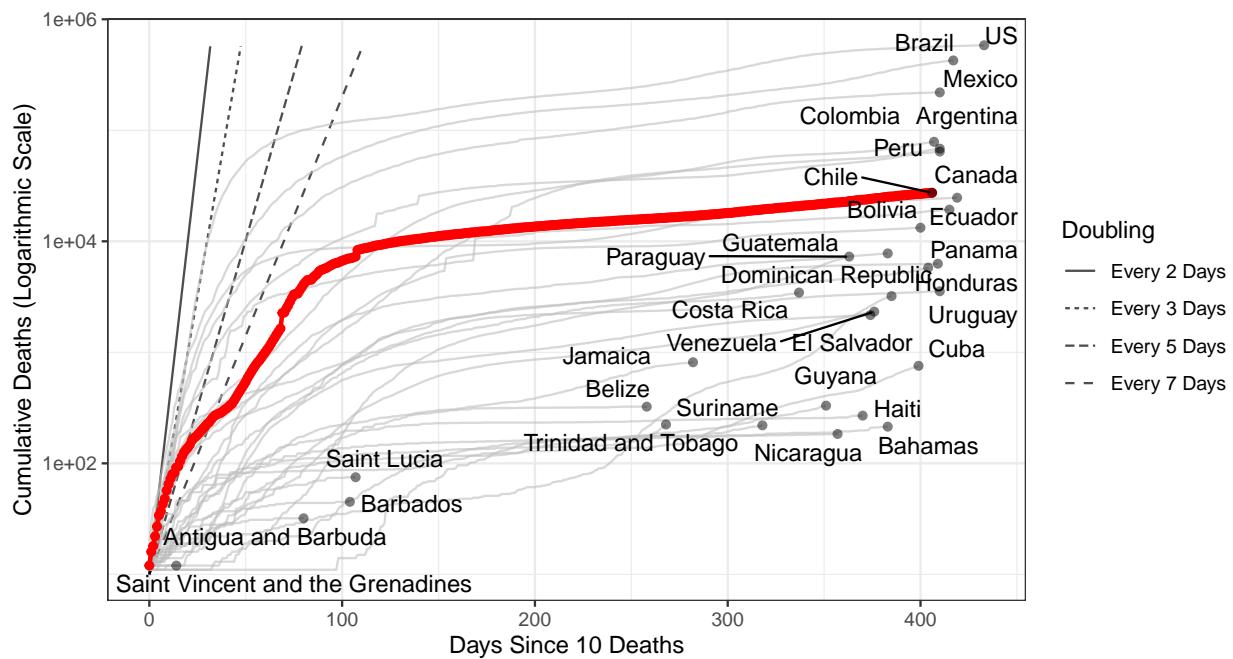


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 1,500,009 (95% CI: 1,463,782-1,536,235) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

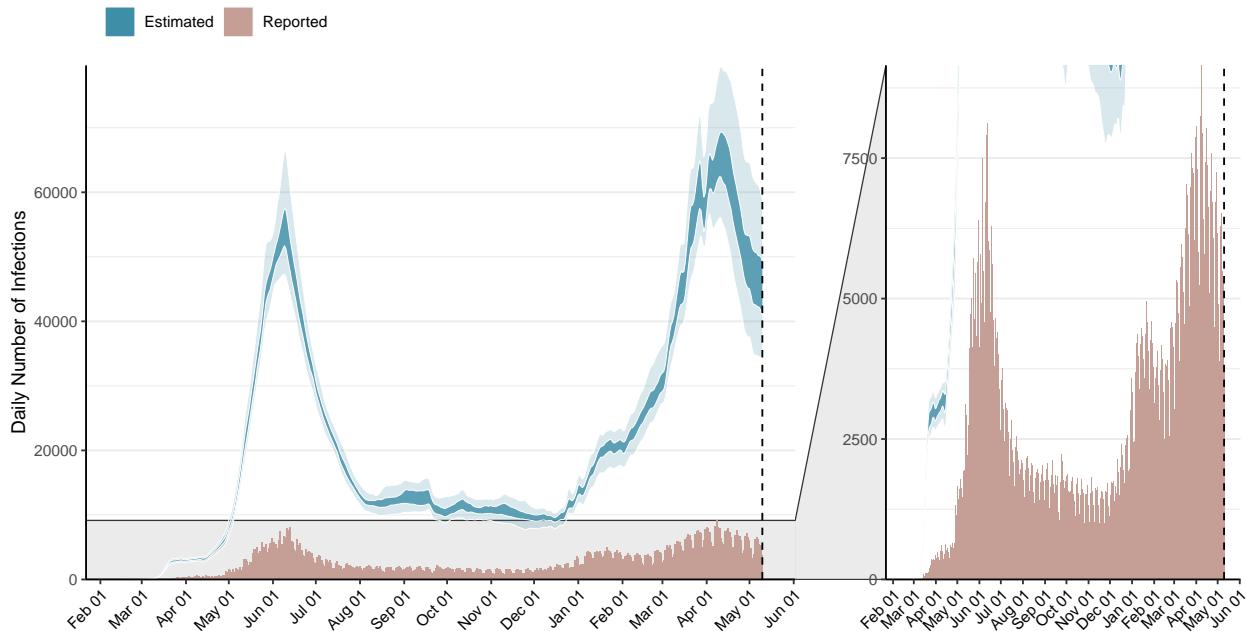
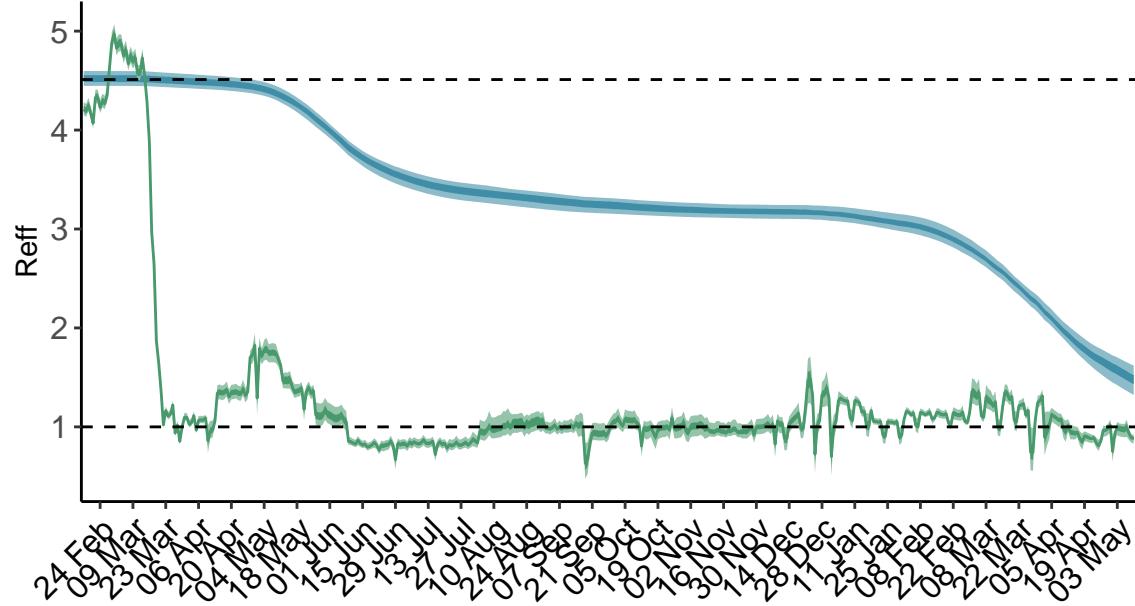


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Chile is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

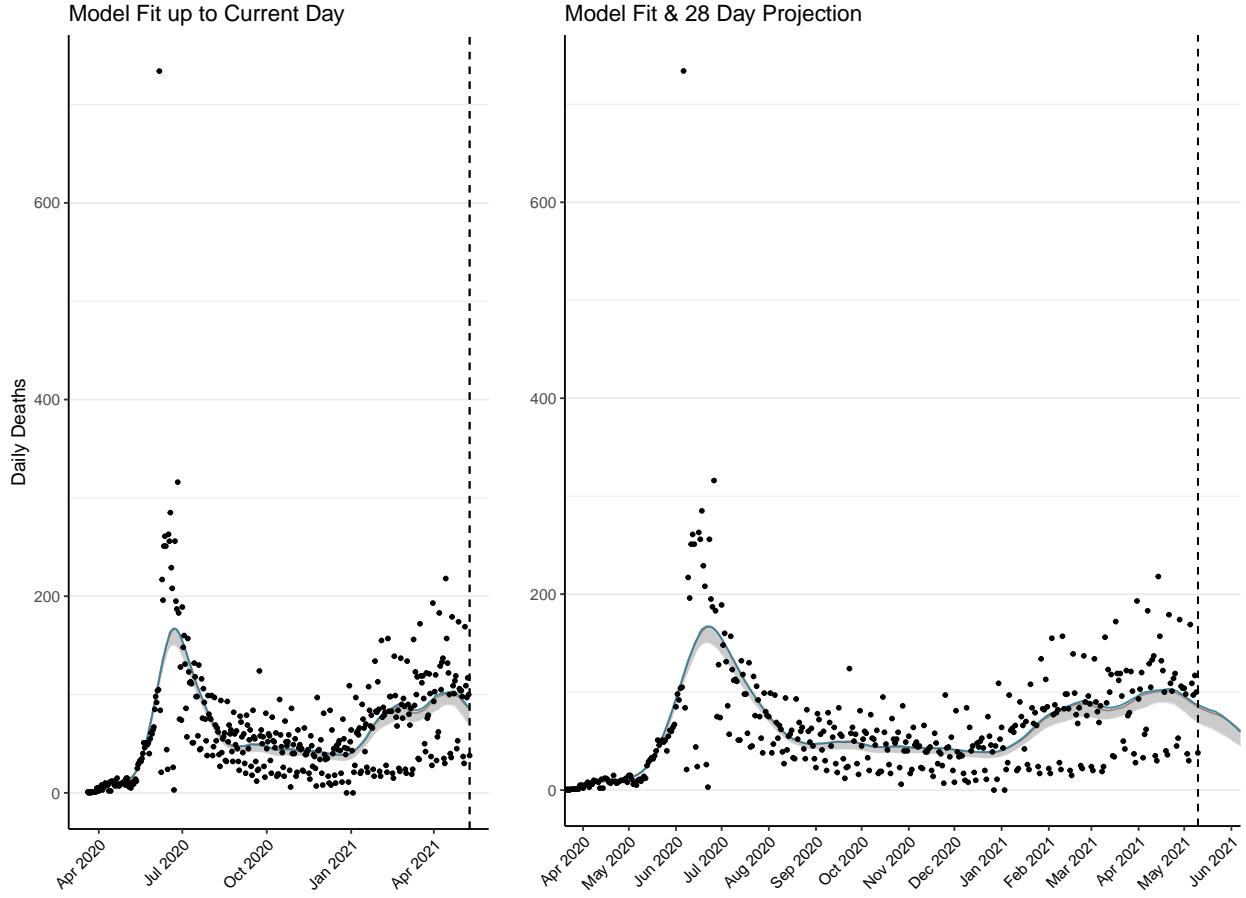


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 3,254 (95% CI: 3,166-3,342) patients requiring treatment with high-pressure oxygen at the current date to 2,004 (95% CI: 1,948-2,060) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1,110 (95% CI: 1,082-1,137) patients requiring treatment with mechanical ventilation at the current date to 708 (95% CI: 689-728) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

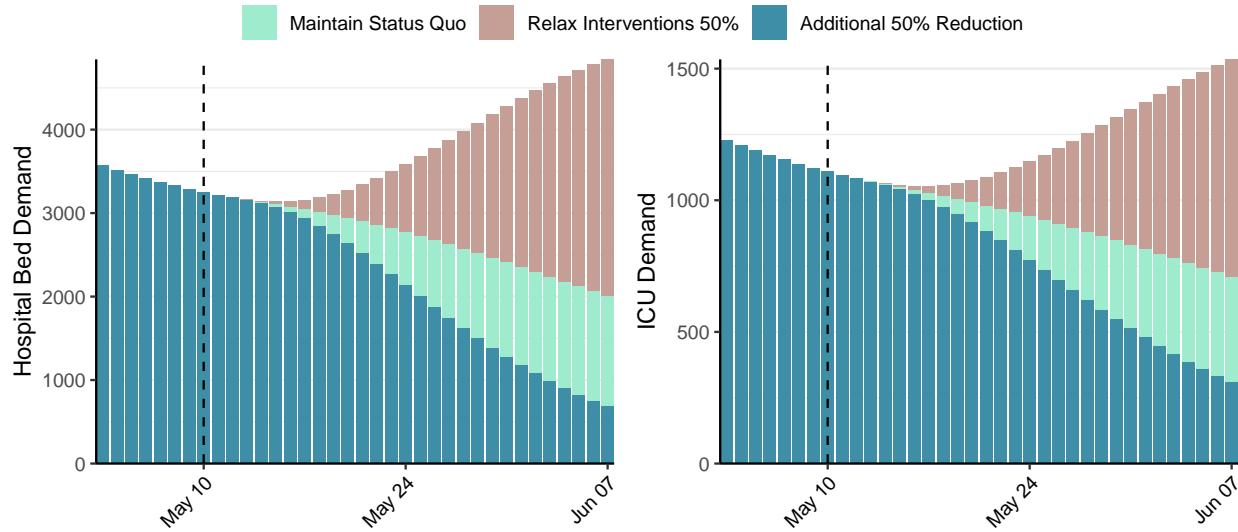


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 45,305 (95% CI: 44,094-46,515) at the current date to 2,078 (95% CI: 2,020-2,136) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 45,305 (95% CI: 44,094-46,515) at the current date to 65,210 (95% CI: 64,111-66,309) by 2021-06-07.

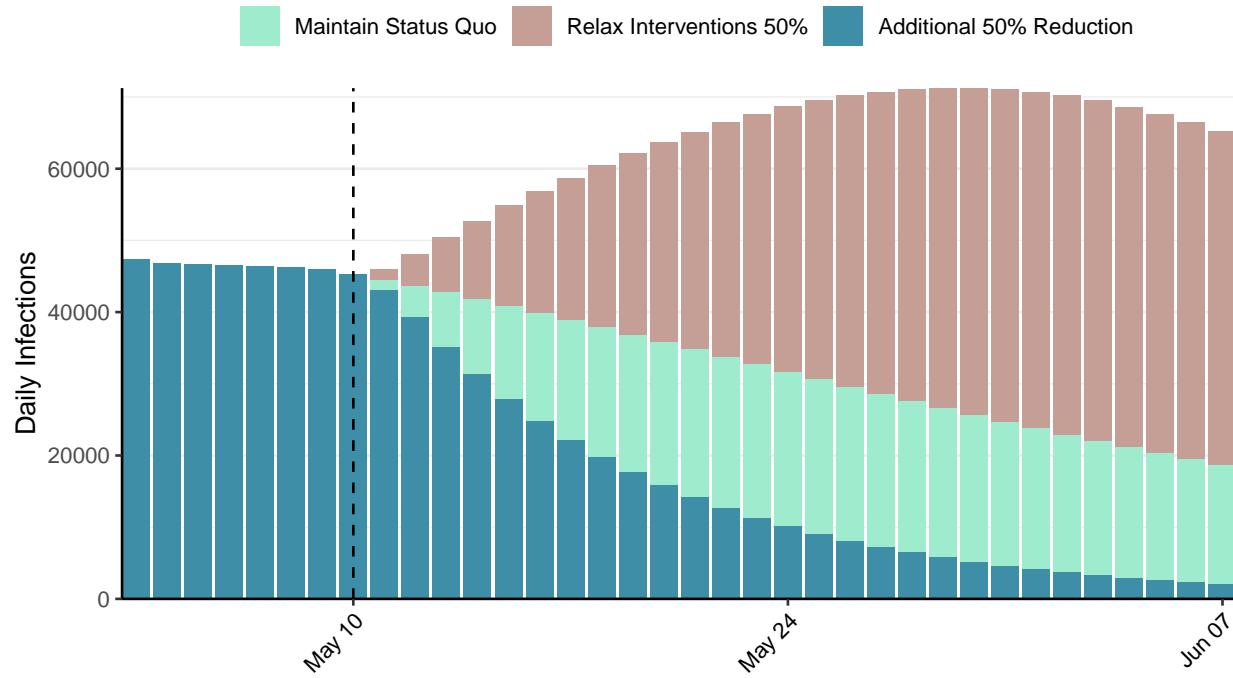


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: China, 2021-05-10

[Download the report for China, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
102,095	18	4,829	0	0.65 (95% CI: 0.54-0.77)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

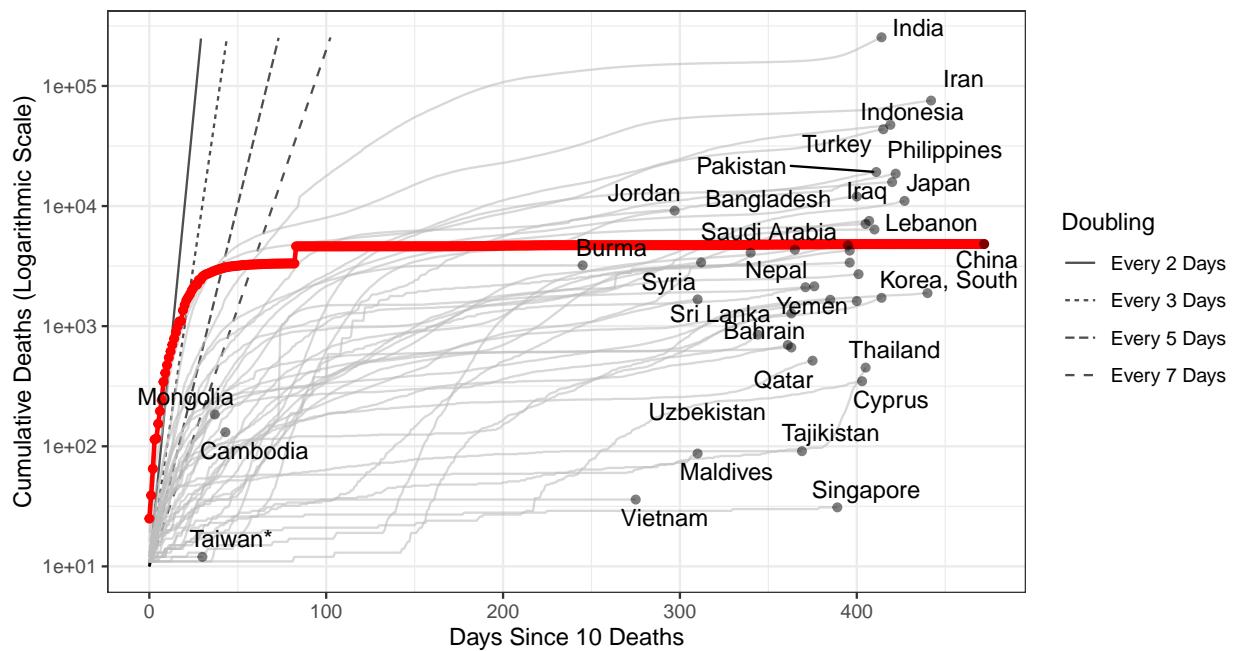


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 673 (95% CI: 620-727) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. China has revised their historic reported cases and thus have reported negative cases.**

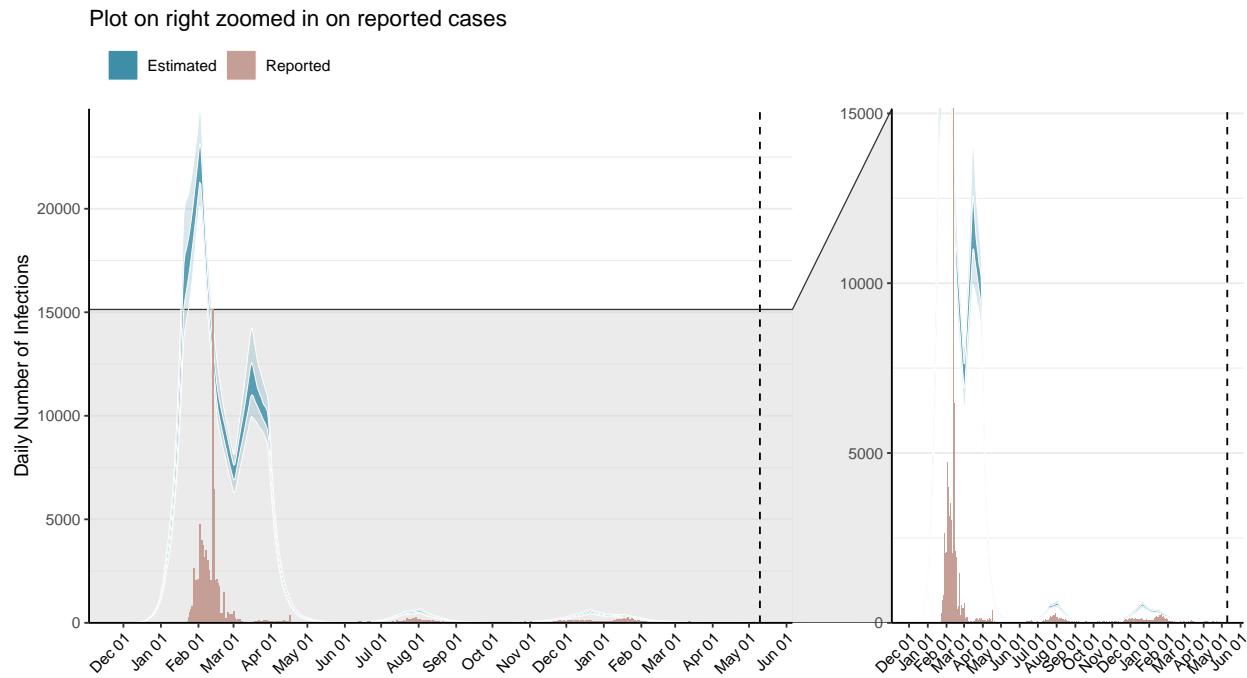
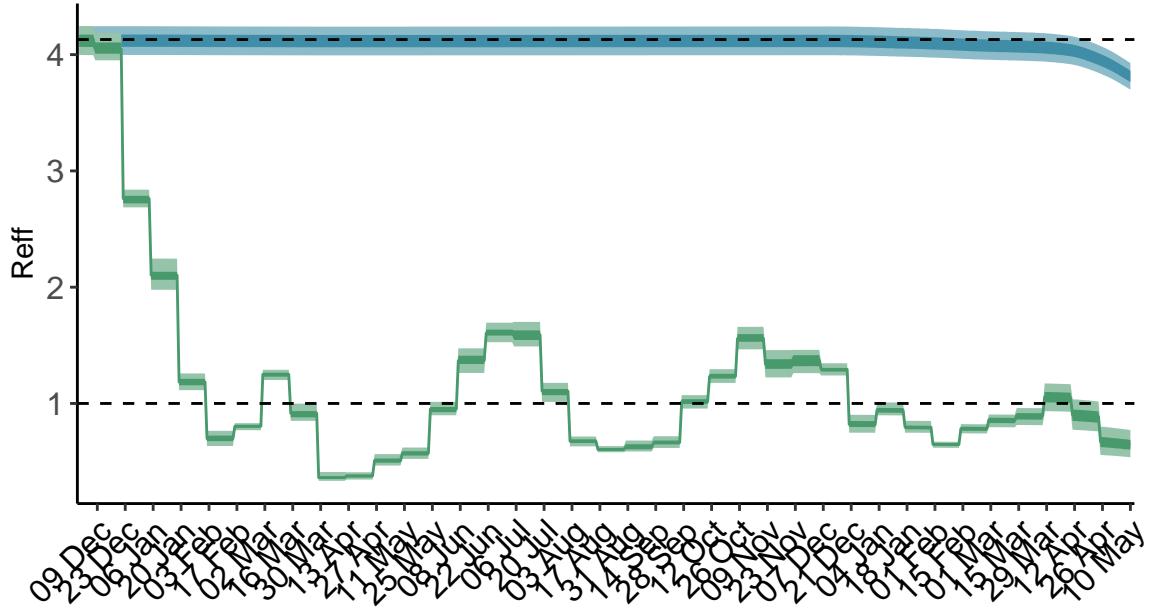


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

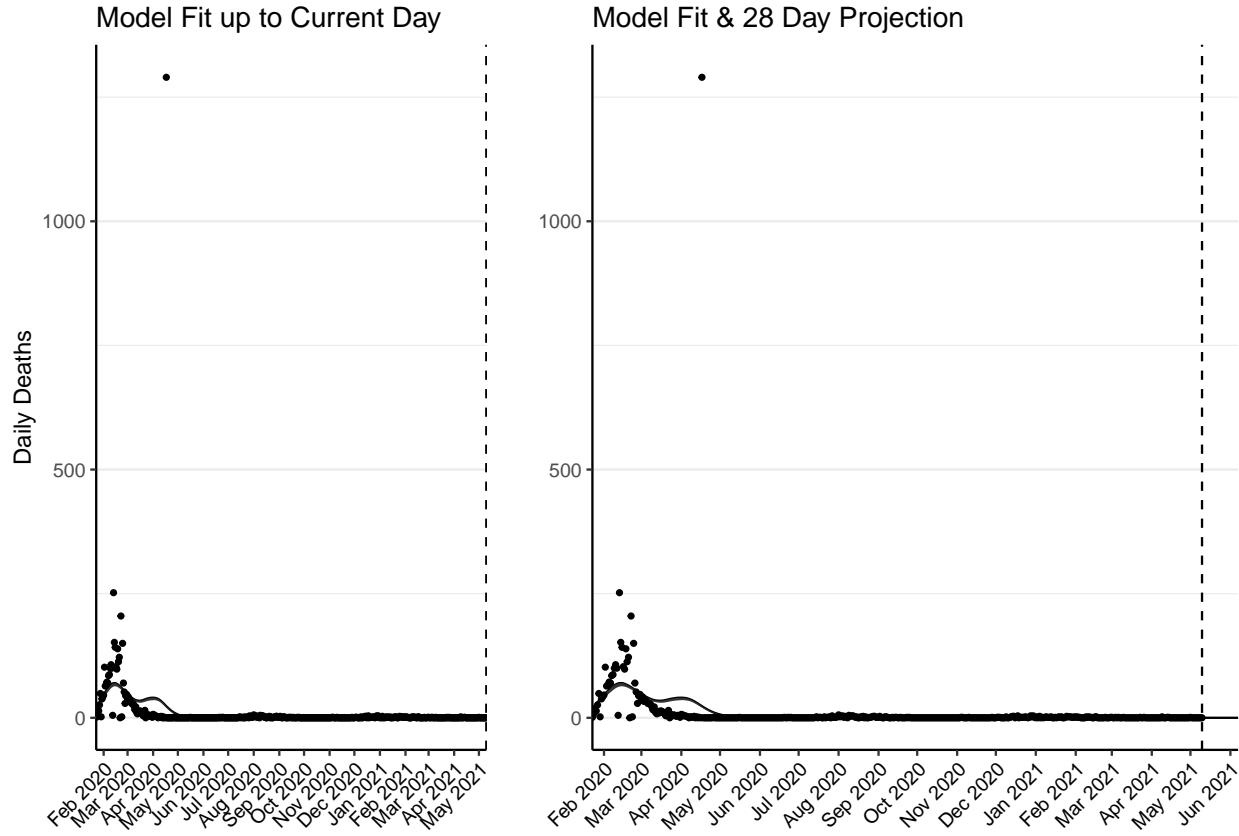


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 2 (95% CI: 2-2) patients requiring treatment with high-pressure oxygen at the current date to 0 (95% CI: 0-1) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1 (95% CI: 1-1) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

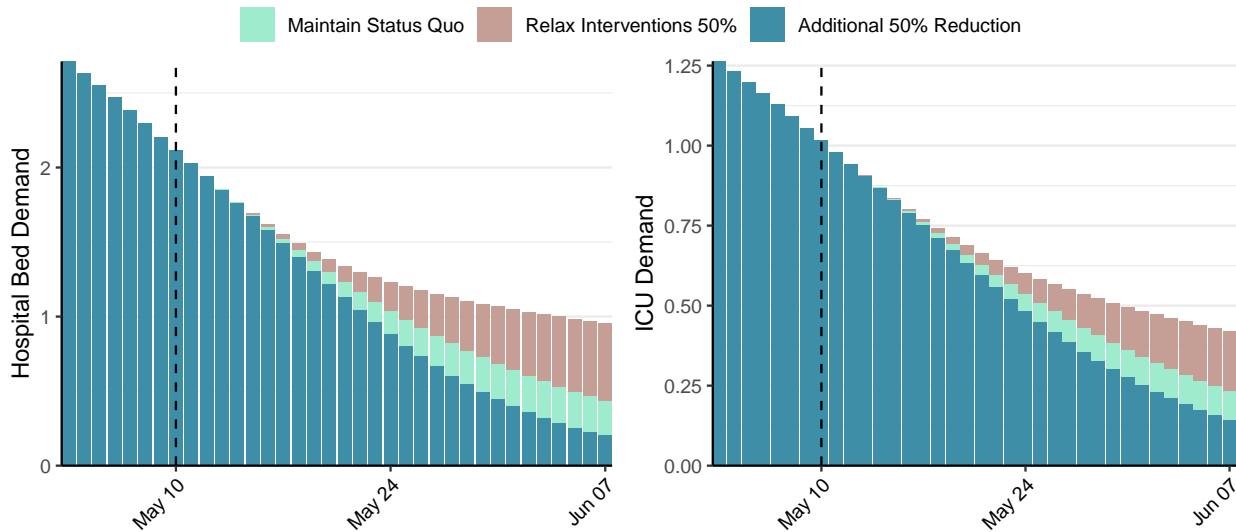


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 12 (95% CI: 11-14) at the current date to 0 (95% CI: 0-0) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 12 (95% CI: 11-14) at the current date to 11 (95% CI: 9-14) by 2021-06-07.

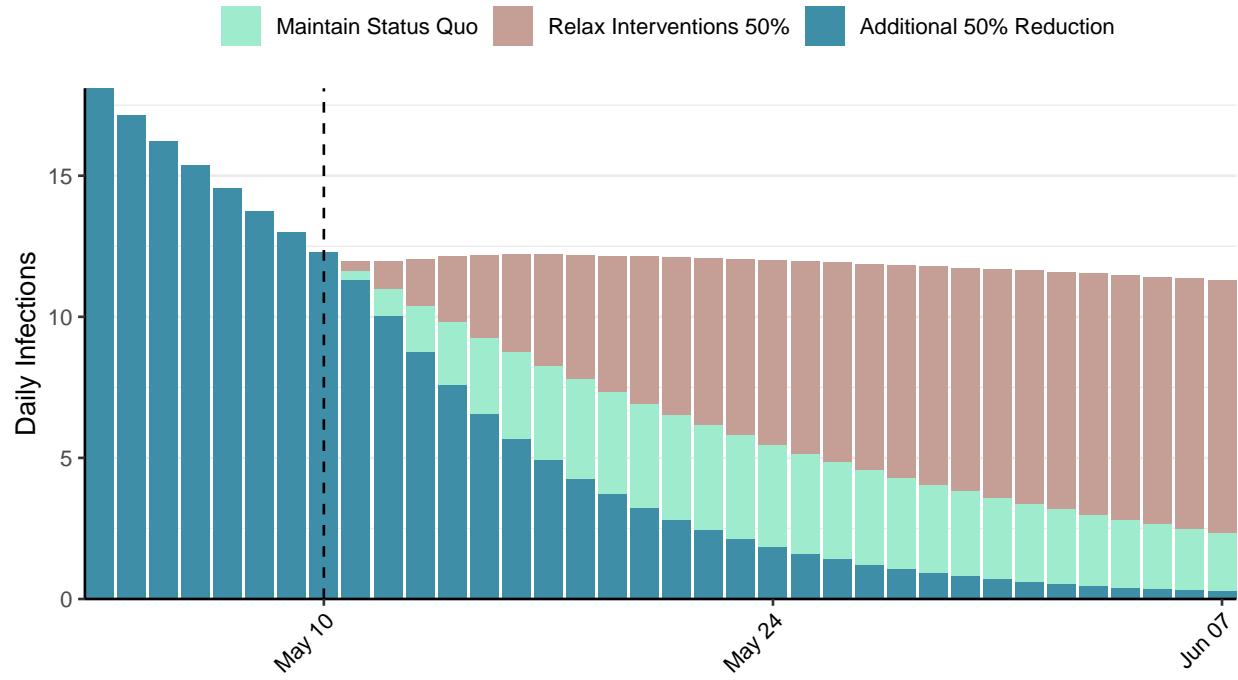


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Cote d'Ivoire, 2021-05-10

[Download the report for Cote d'Ivoire, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
46,443	1	291	0	0.71 (95% CI: 0.62-0.84)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

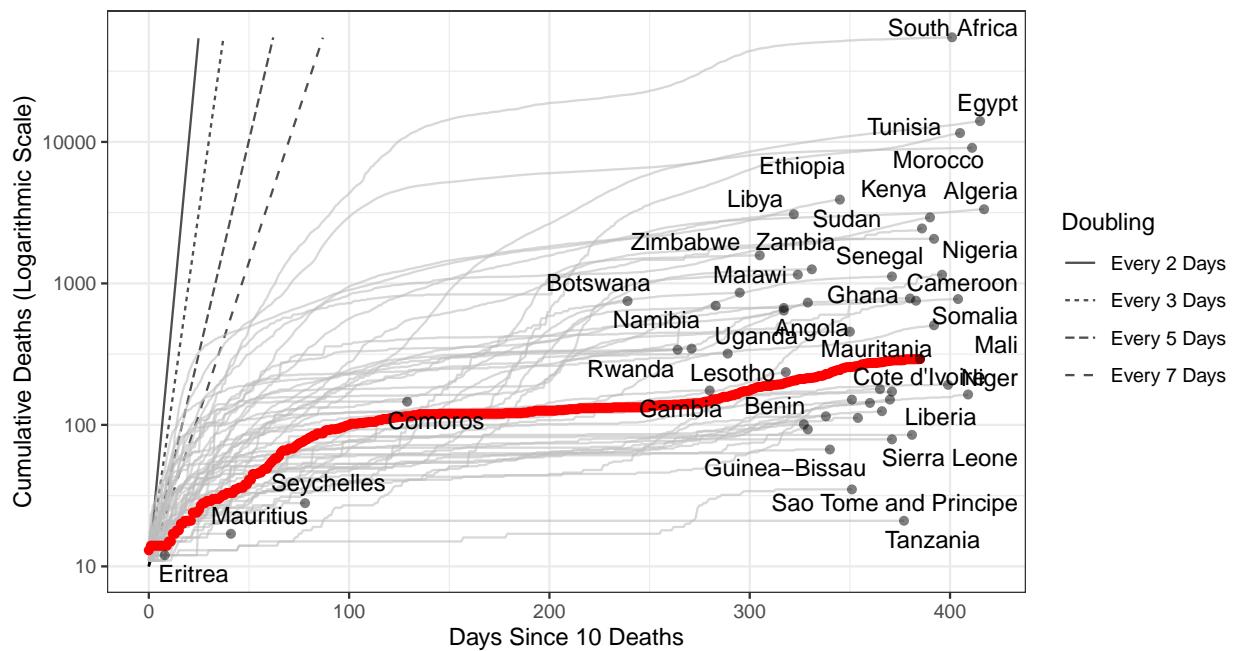


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 7,331 (95% CI: 6,939-7,724) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Cote d'Ivoire has revised their historic reported cases and thus have reported negative cases.**

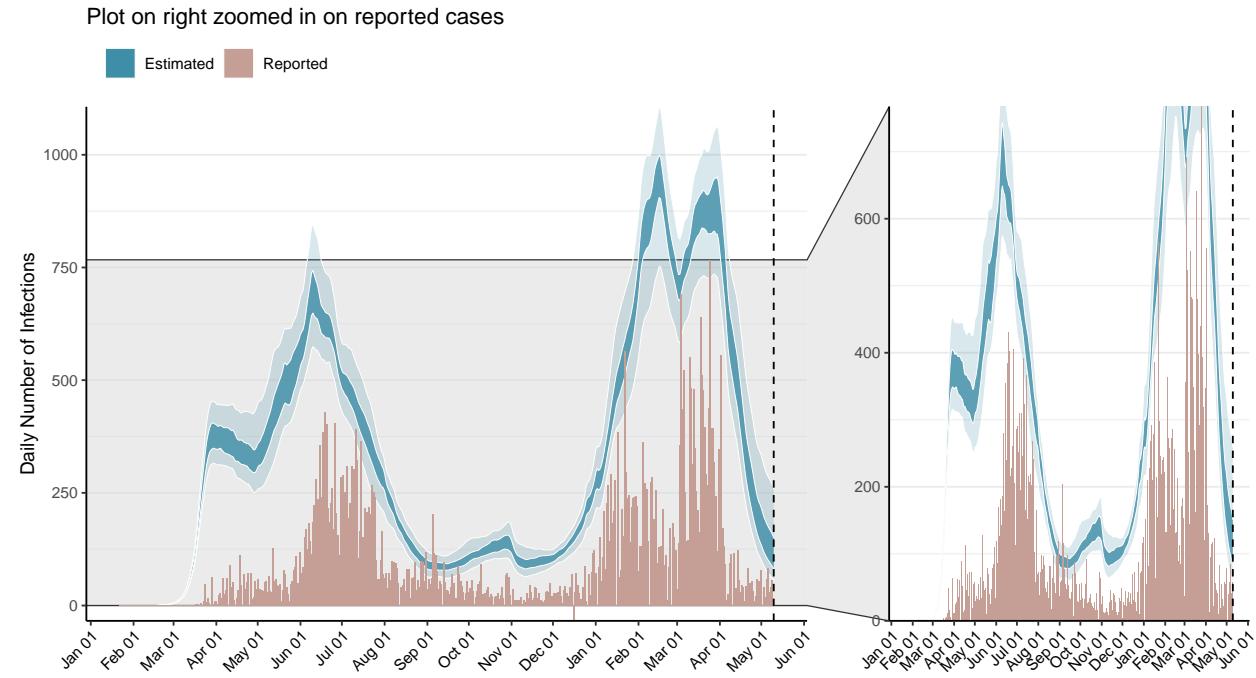
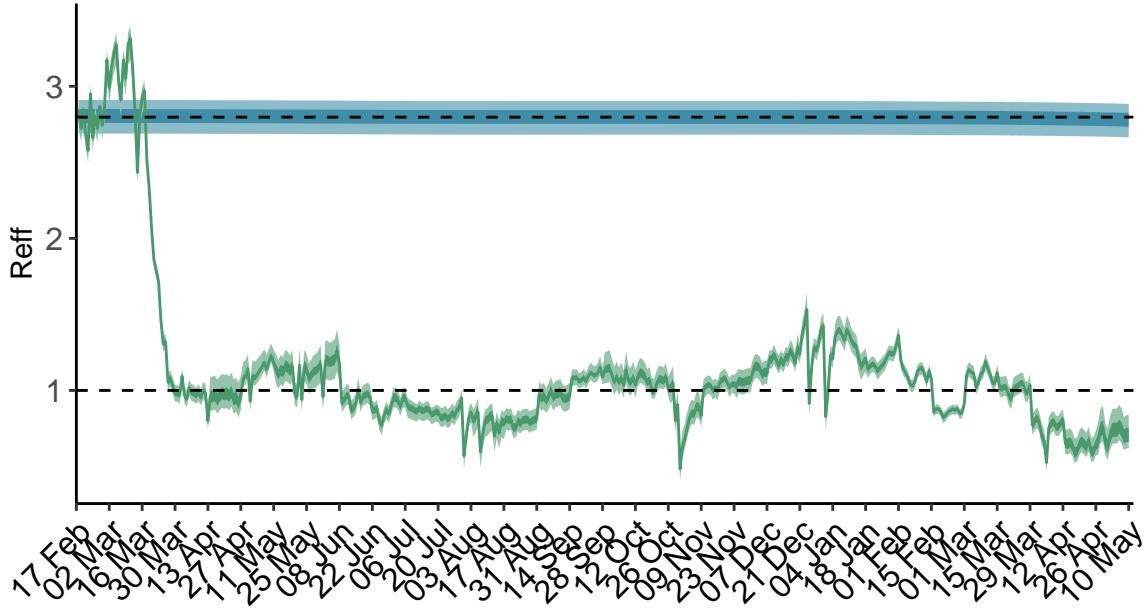


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

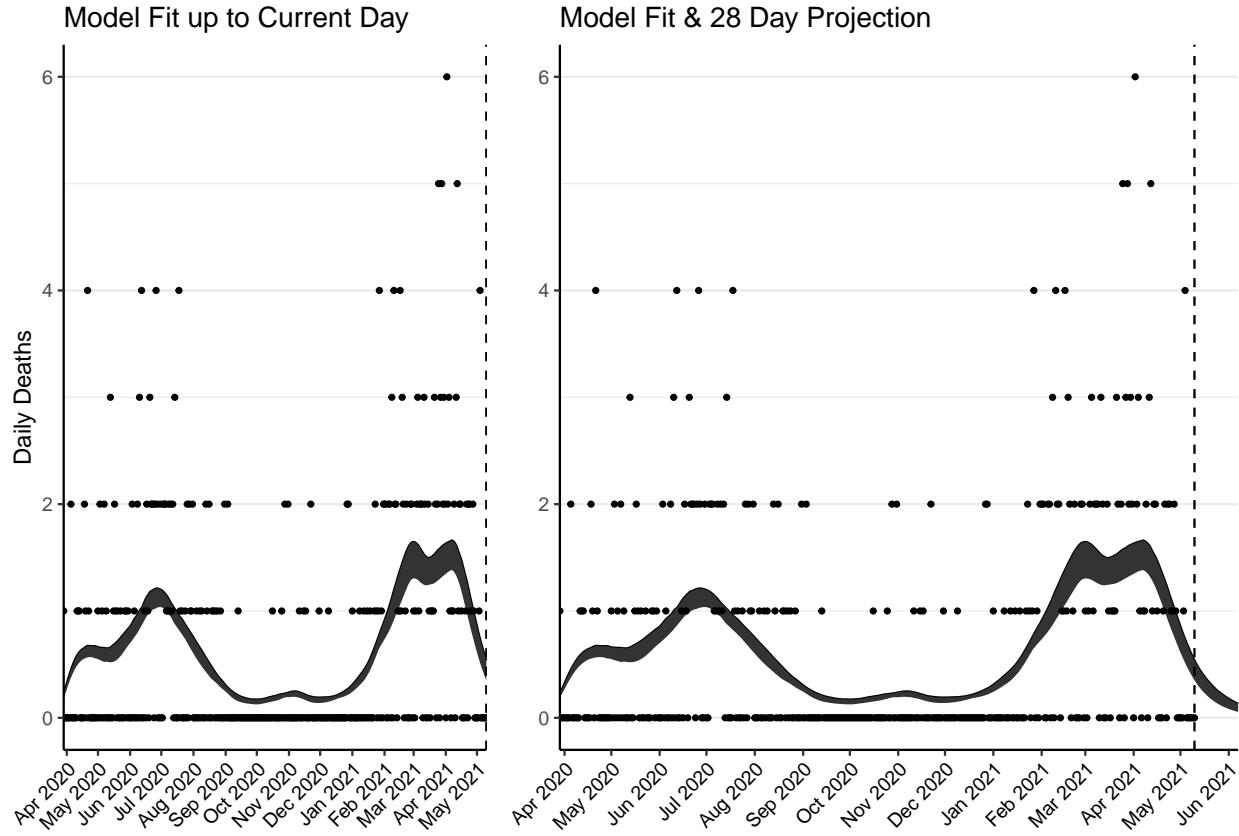


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 18 (95% CI: 17-19) patients requiring treatment with high-pressure oxygen at the current date to 5 (95% CI: 4-6) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 8 (95% CI: 8-9) patients requiring treatment with mechanical ventilation at the current date to 2 (95% CI: 2-3) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

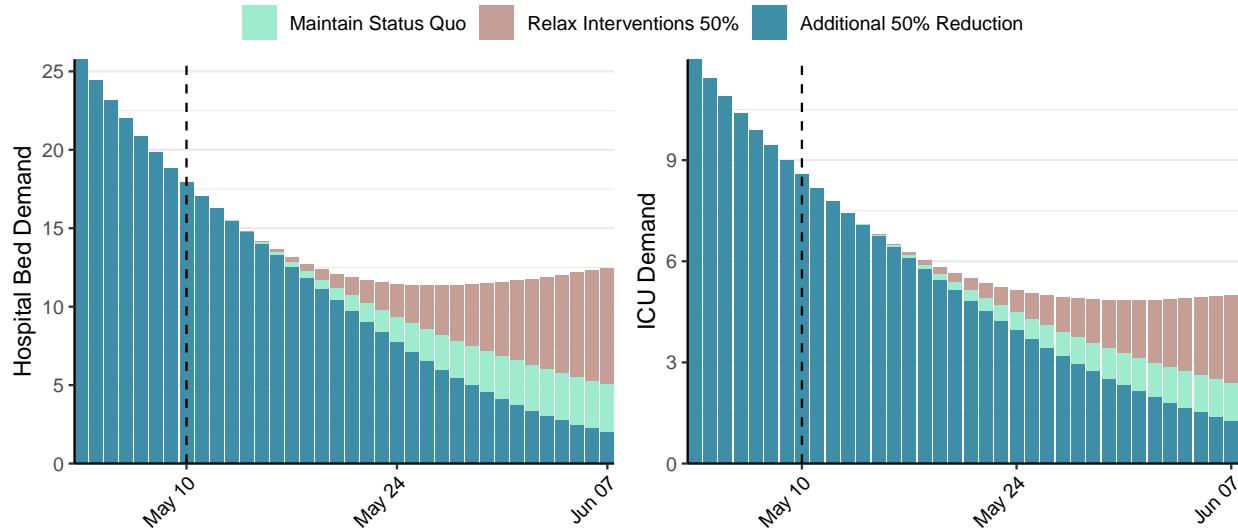


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 125 (95% CI: 114-136) at the current date to 4 (95% CI: 3-4) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 125 (95% CI: 114-136) at the current date to 193 (95% CI: 161-225) by 2021-06-07.

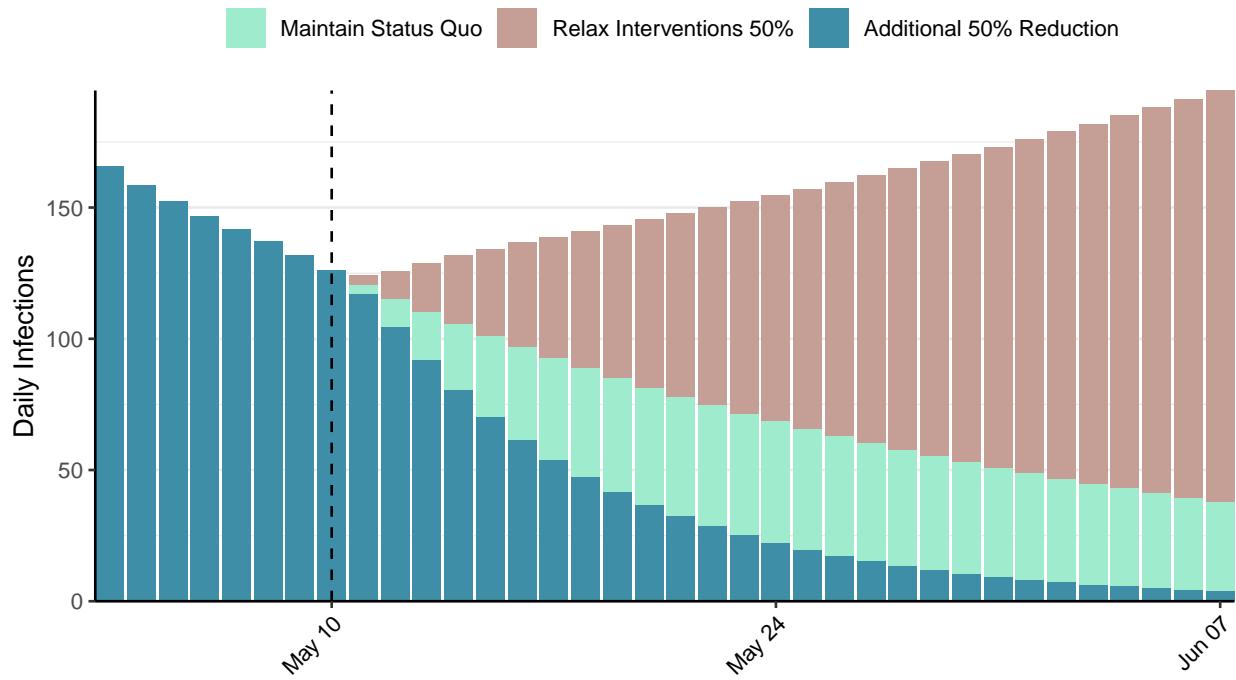


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Cameroon, 2021-05-10

[Download the report for Cameroon, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
74,946	0	1,152	0	0.94 (95% CI: 0.85-1.02)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

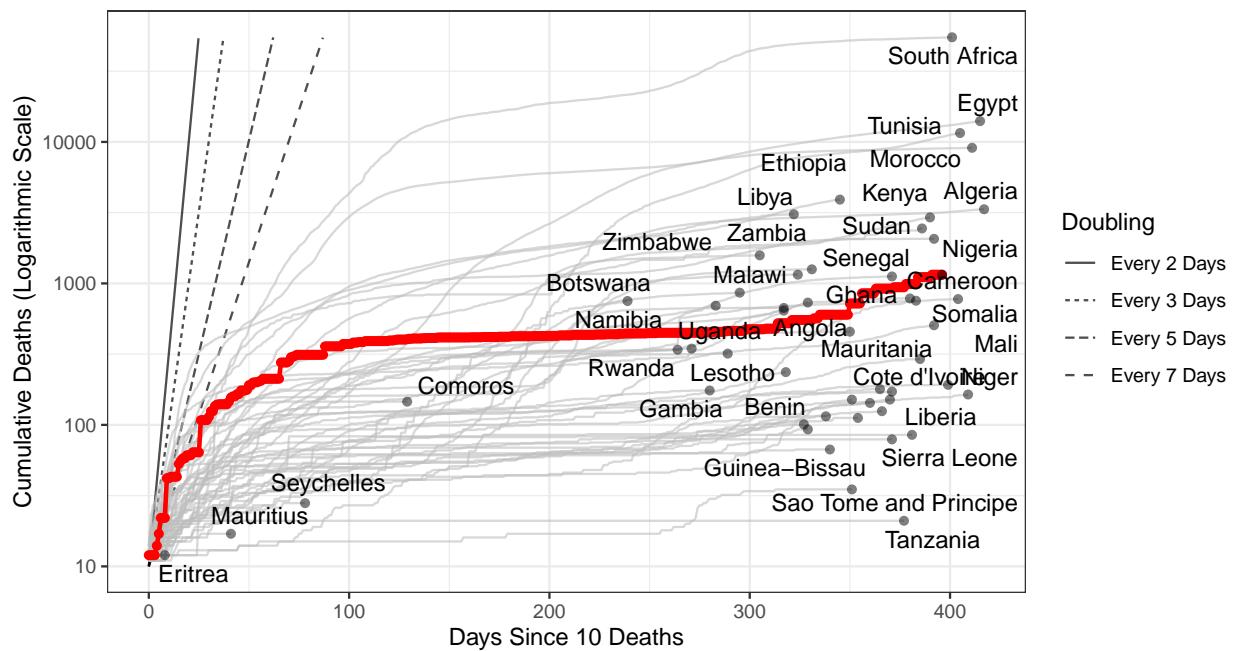


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 132,372 (95% CI: 127,735-137,009) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

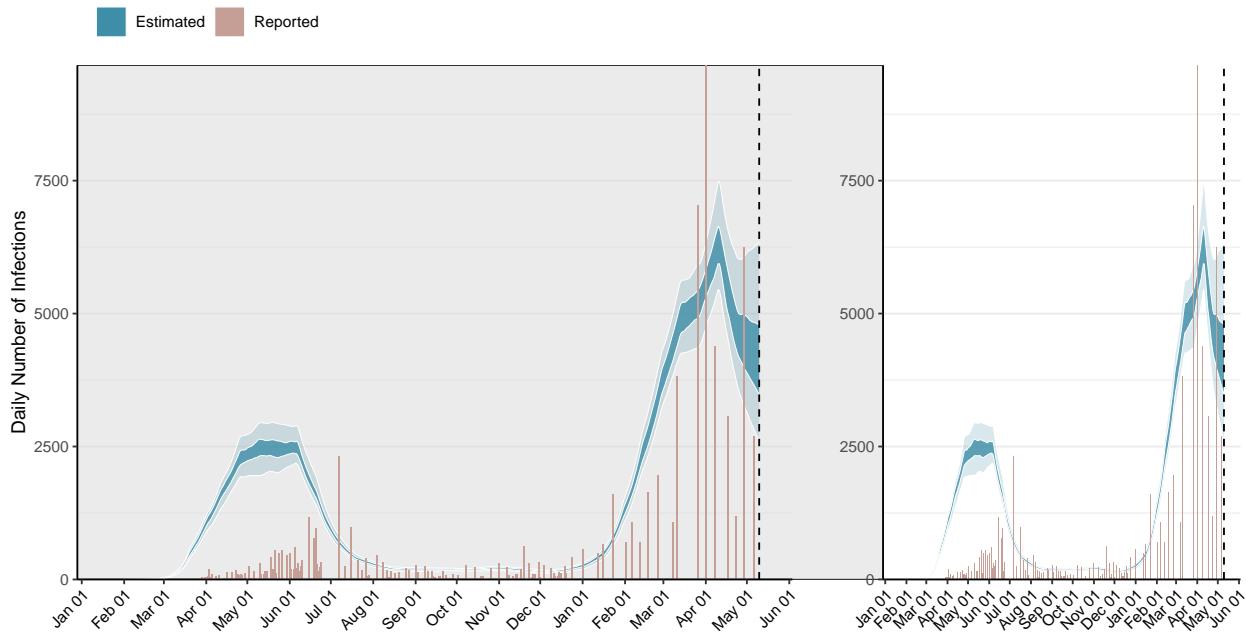
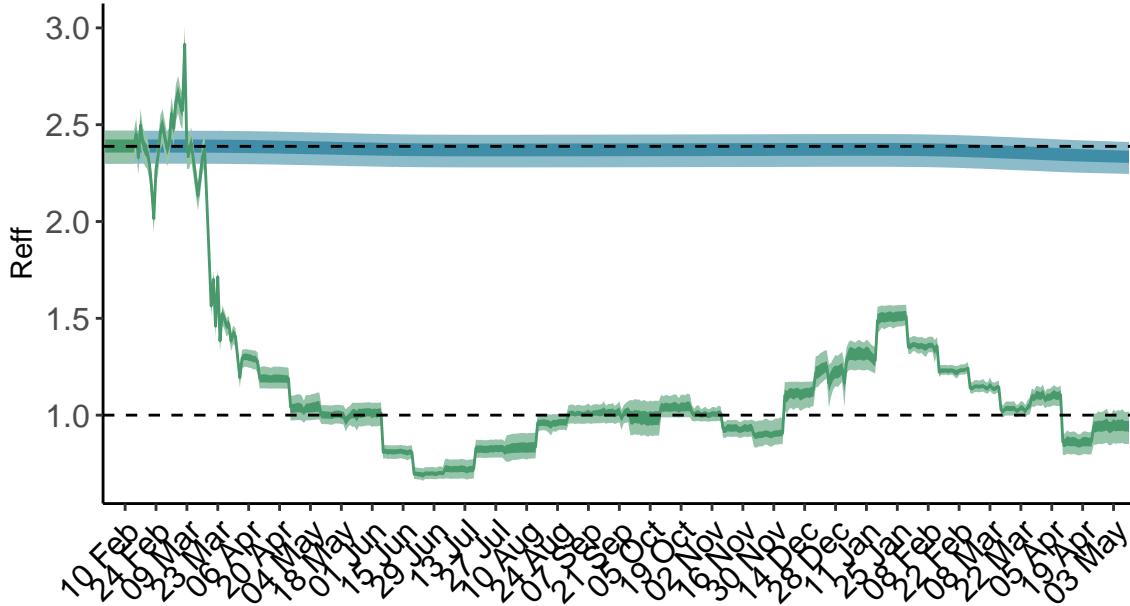


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

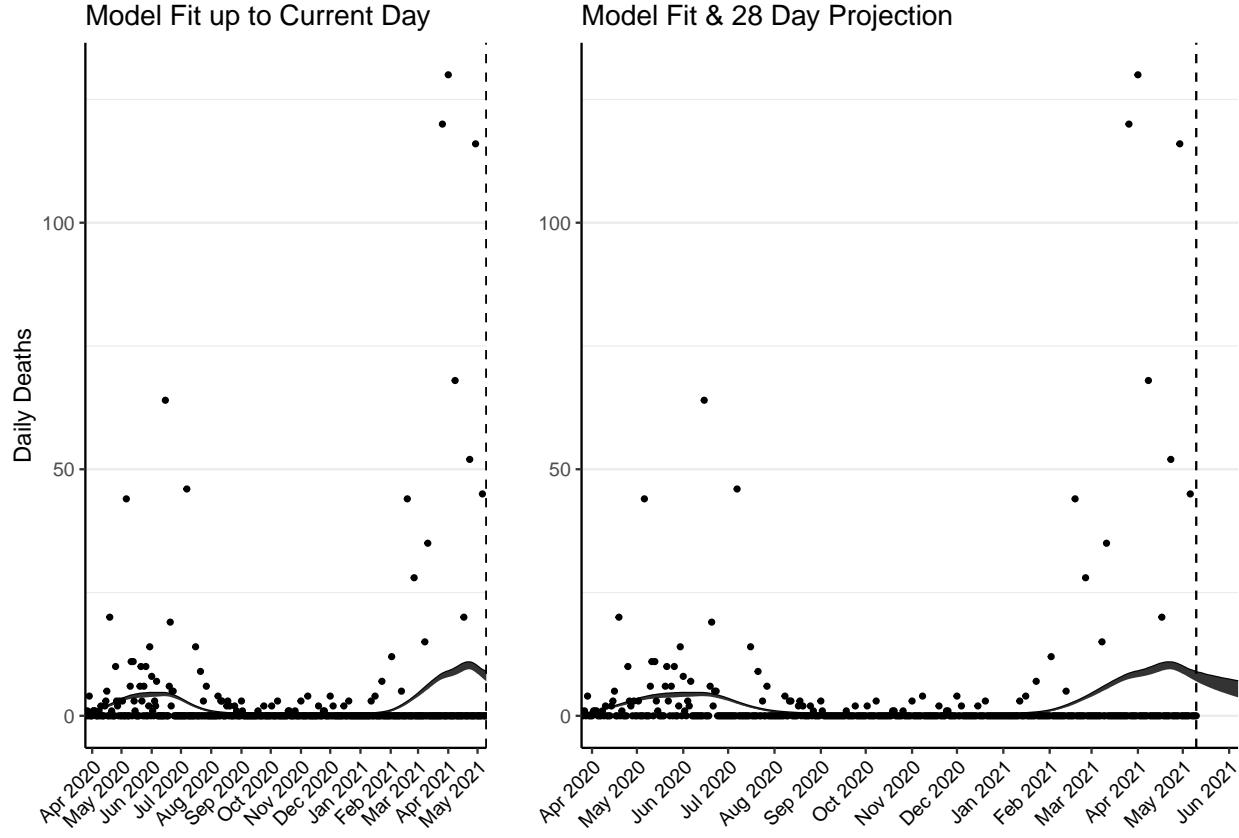


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 348 (95% CI: 335-361) patients requiring treatment with high-pressure oxygen at the current date to 281 (95% CI: 262-299) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 142 (95% CI: 137-147) patients requiring treatment with mechanical ventilation at the current date to 113 (95% CI: 106-121) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

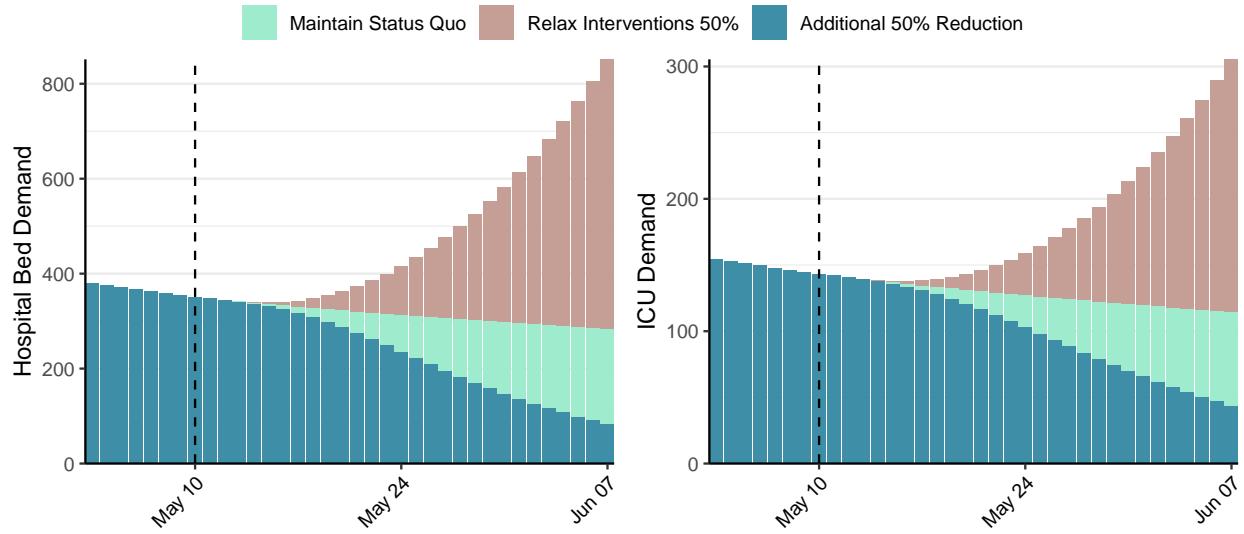


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 4,119 (95% CI: 3,917-4,322) at the current date to 279 (95% CI: 258-300) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 4,119 (95% CI: 3,917-4,322) at the current date to 19,778 (95% CI: 18,081-21,475) by 2021-06-07.

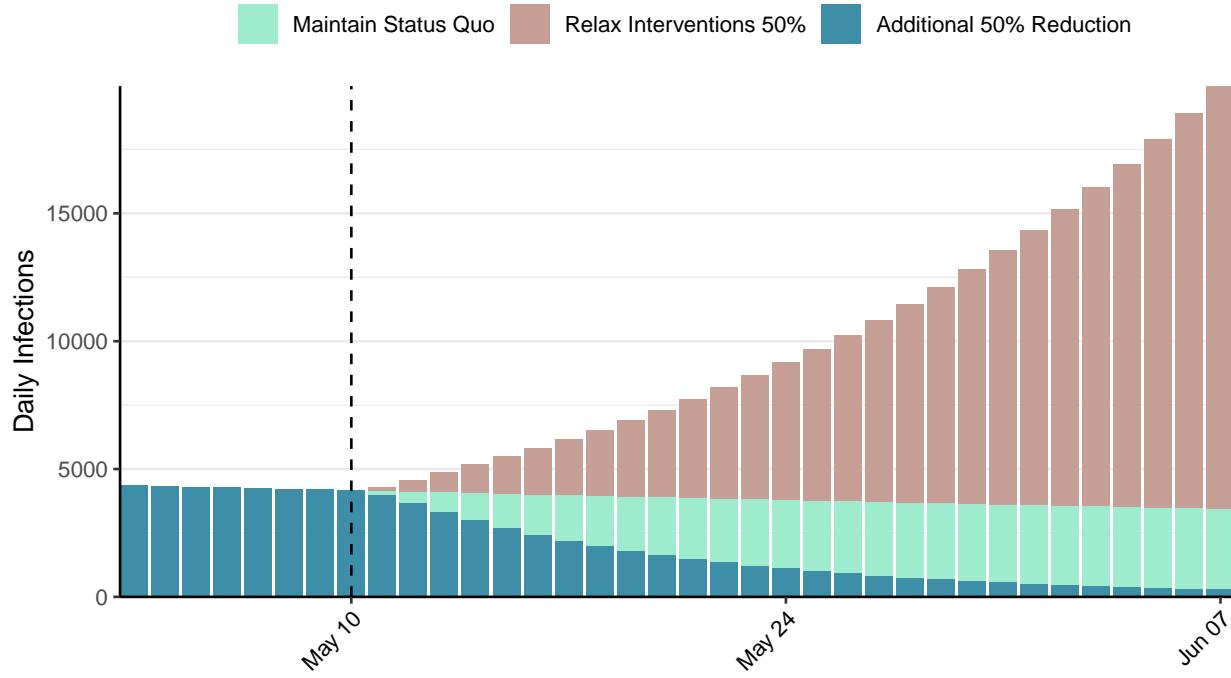


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Democratic Republic of Congo, 2021-05-10

[Download the report for Democratic Republic of Congo, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
30,391	42	775	3	0.89 (95% CI: 0.8-0.99)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

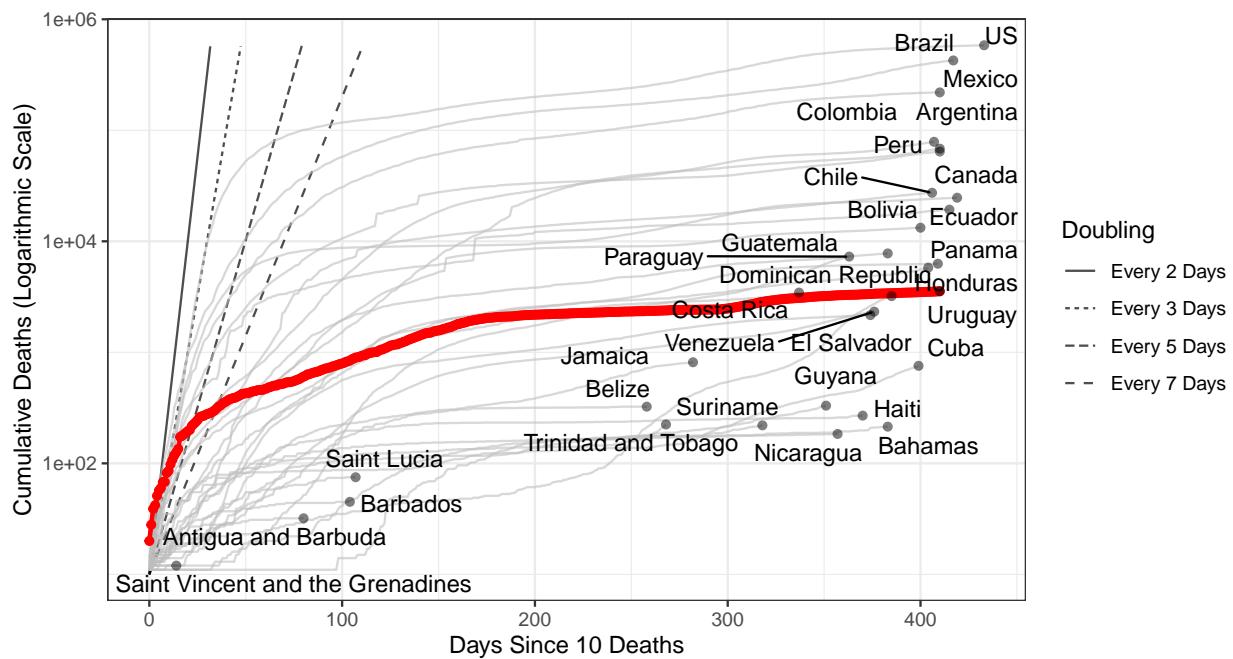


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 13,094 (95% CI: 12,511-13,677) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

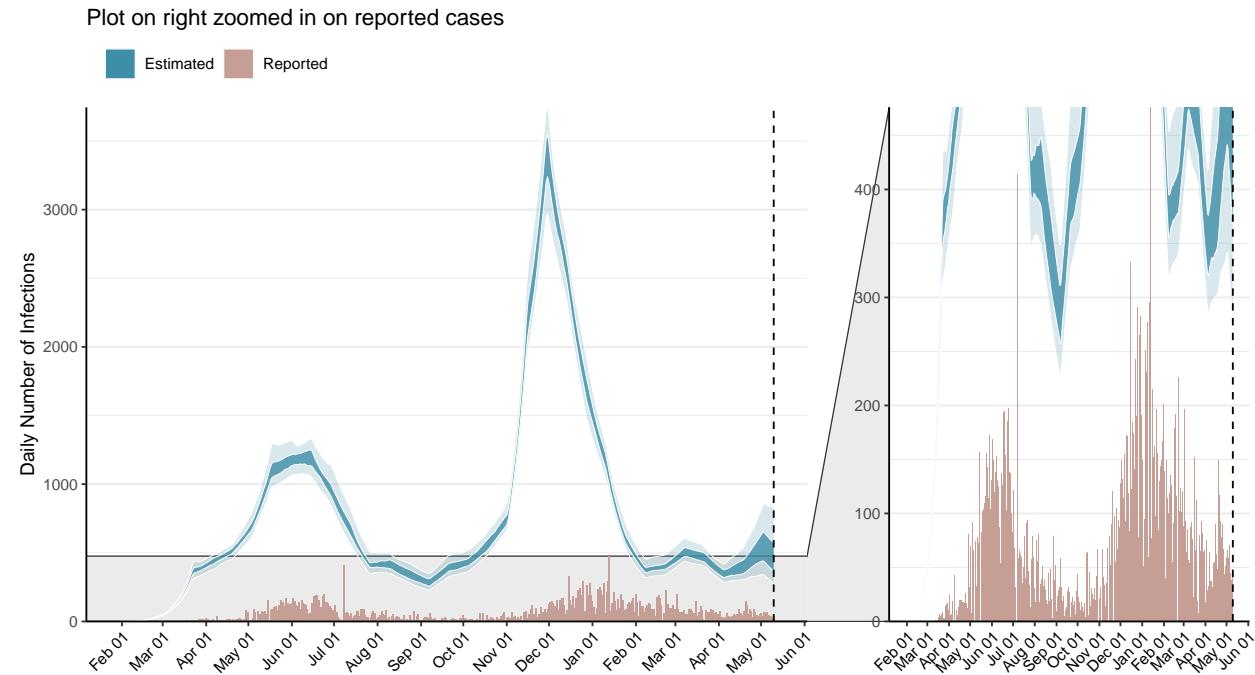
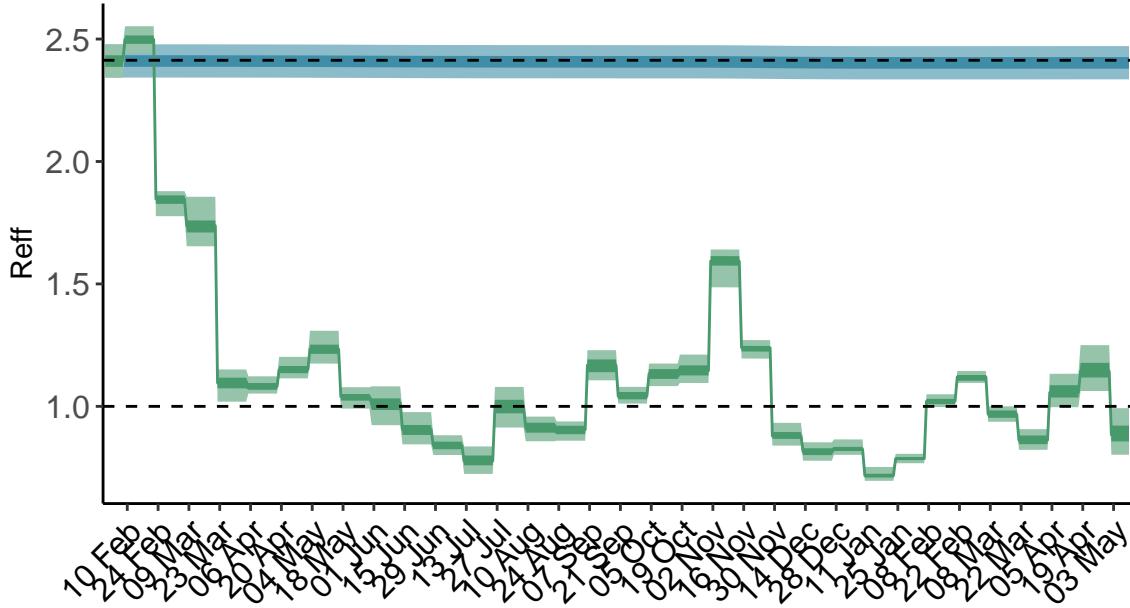


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

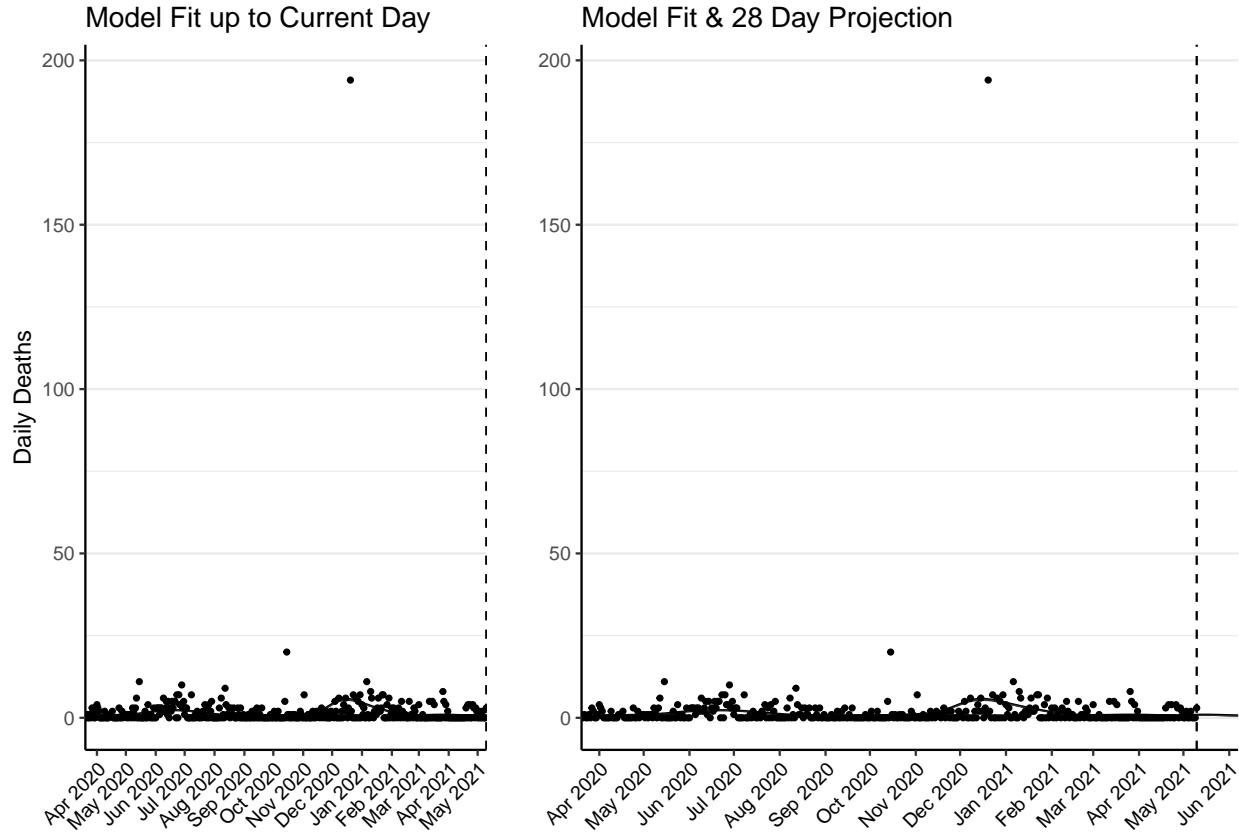


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 38 (95% CI: 37-40) patients requiring treatment with high-pressure oxygen at the current date to 30 (95% CI: 27-33) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 15 (95% CI: 14-15) patients requiring treatment with mechanical ventilation at the current date to 12 (95% CI: 11-13) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

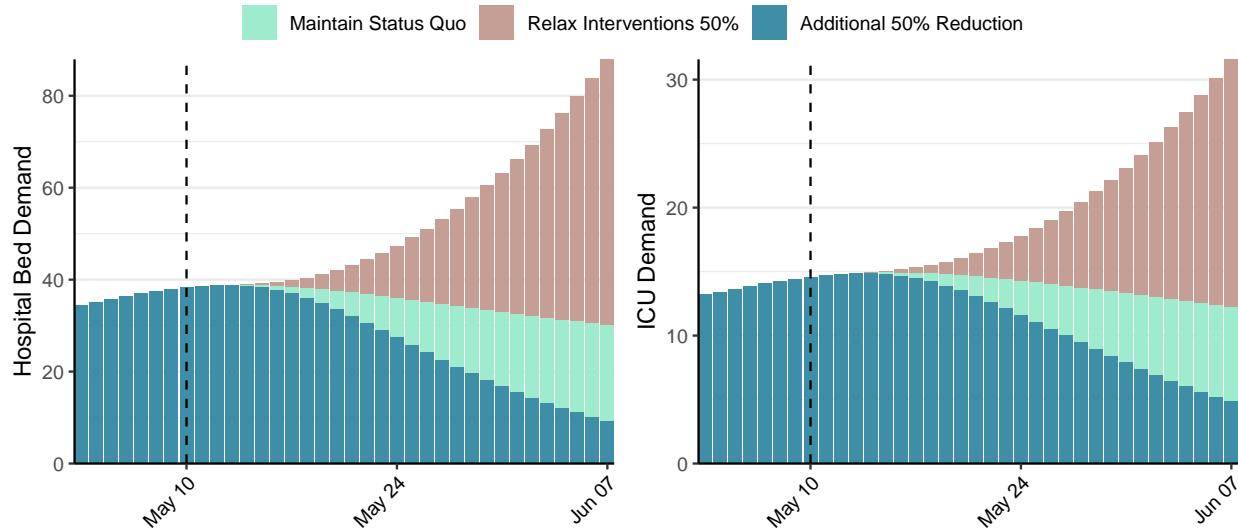


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 486 (95% CI: 456-517) at the current date to 28 (95% CI: 25-31) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 486 (95% CI: 456-517) at the current date to 1,899 (95% CI: 1,668-2,130) by 2021-06-07.

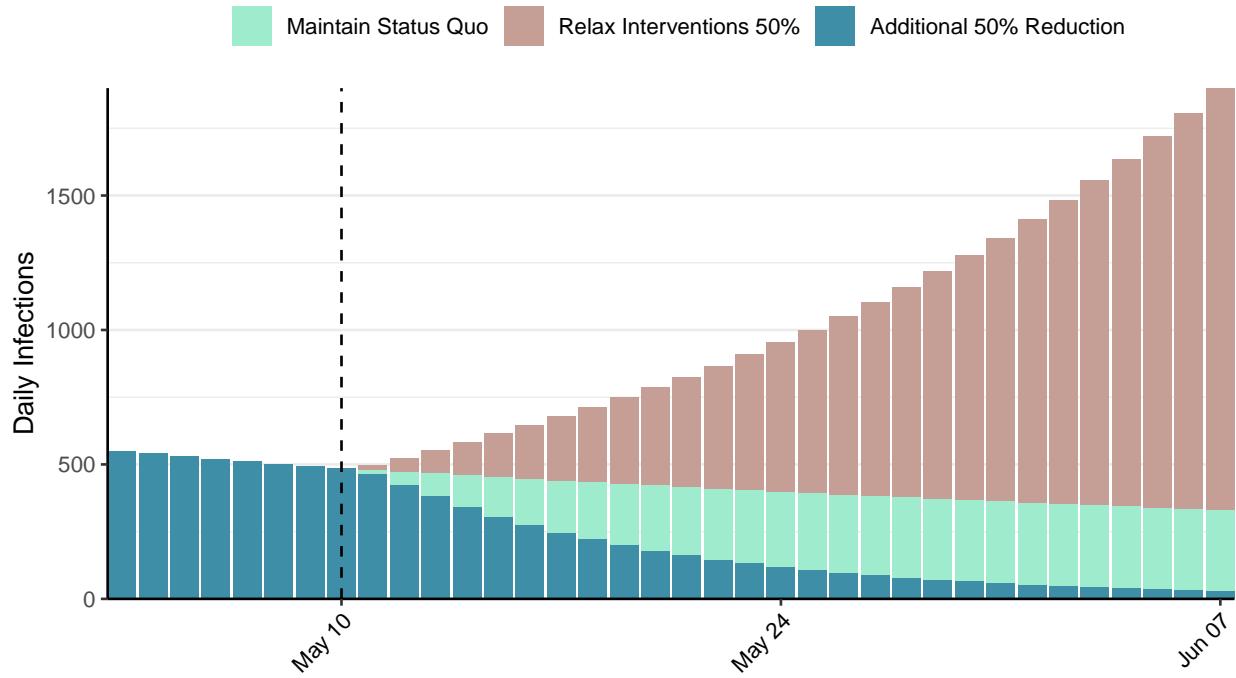


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Republic of the Congo, 2021-05-10

[Download the report for Republic of the Congo, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
11,343	196	179	0	1.07 (95% CI: 0.94-1.2)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

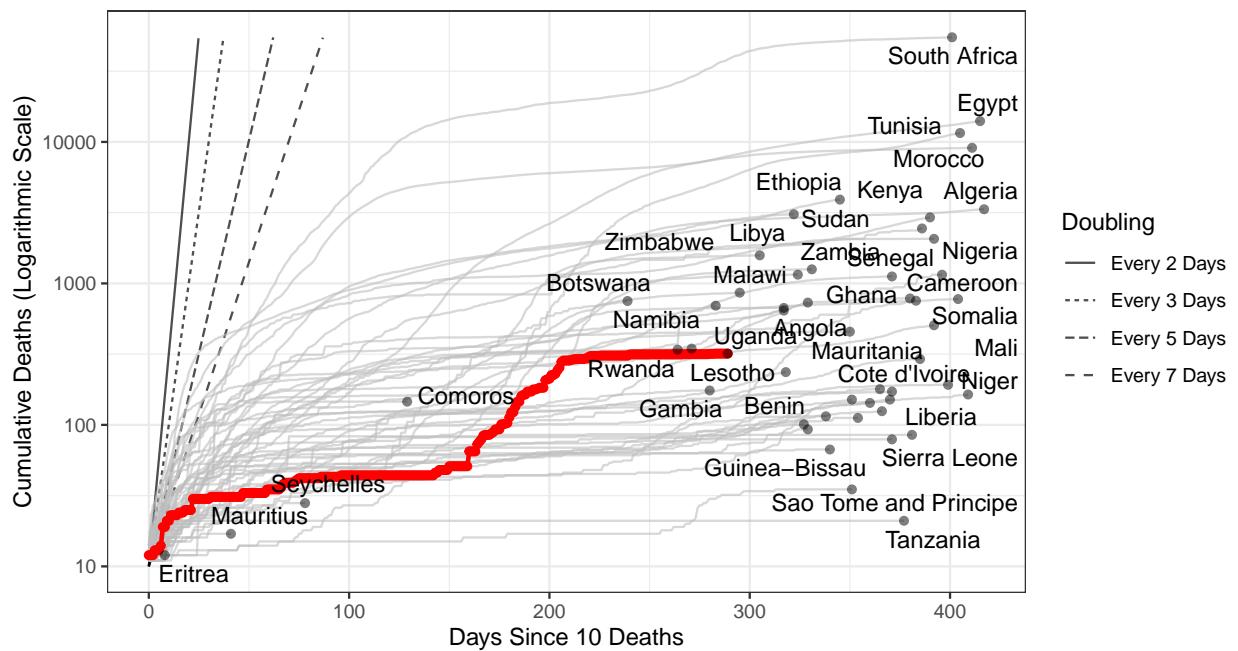


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 4,457 (95% CI: 4,196-4,718) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

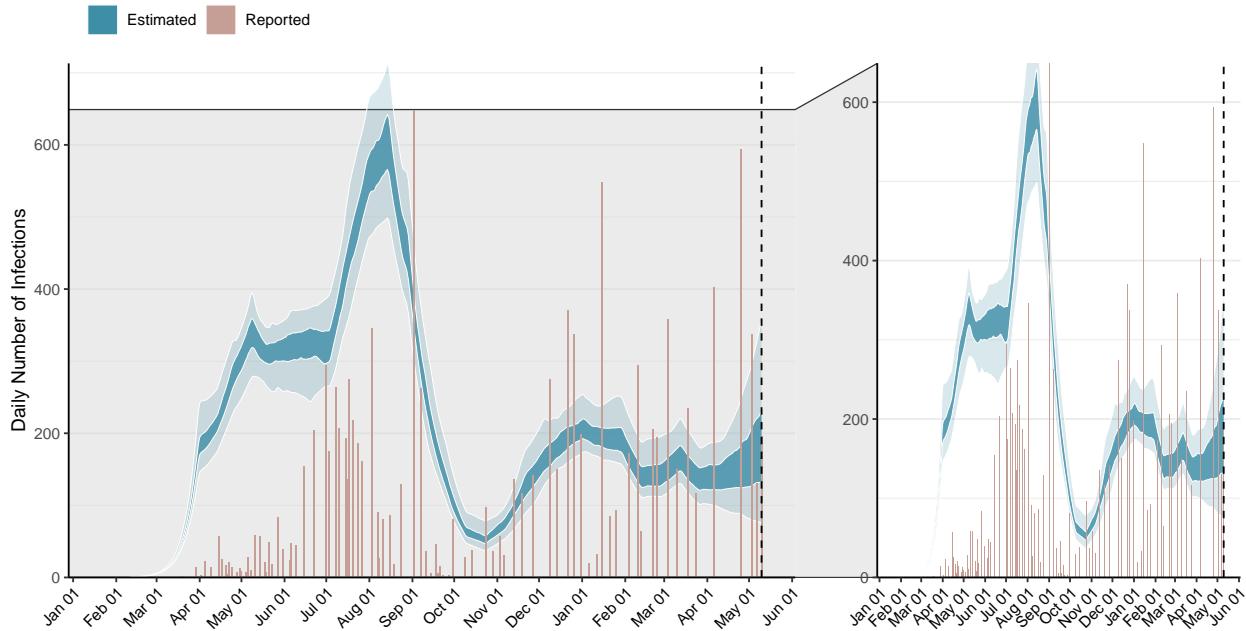
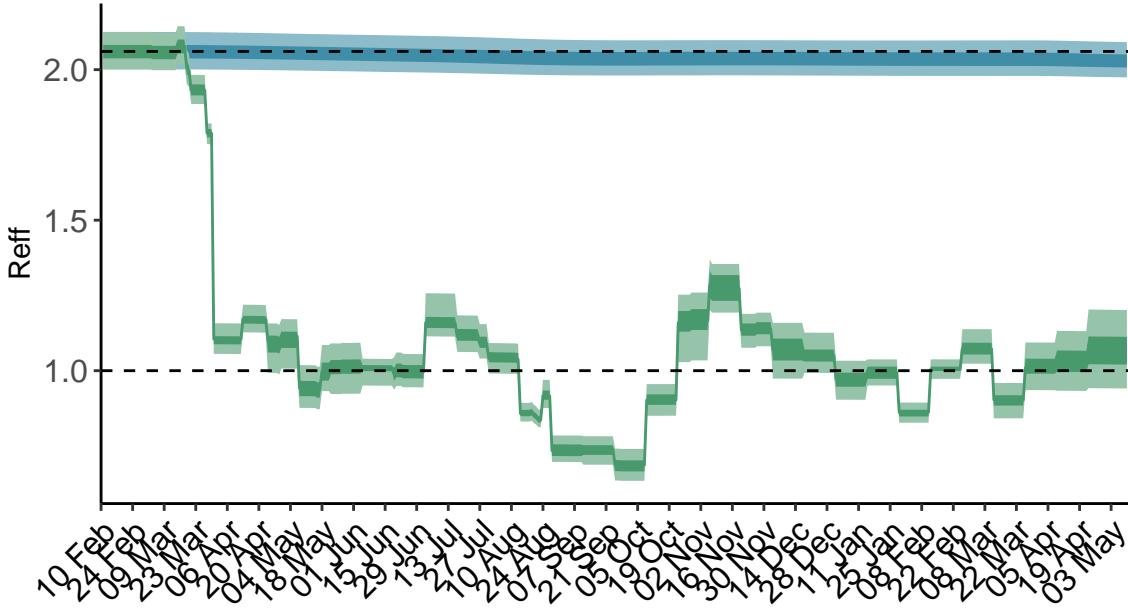


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

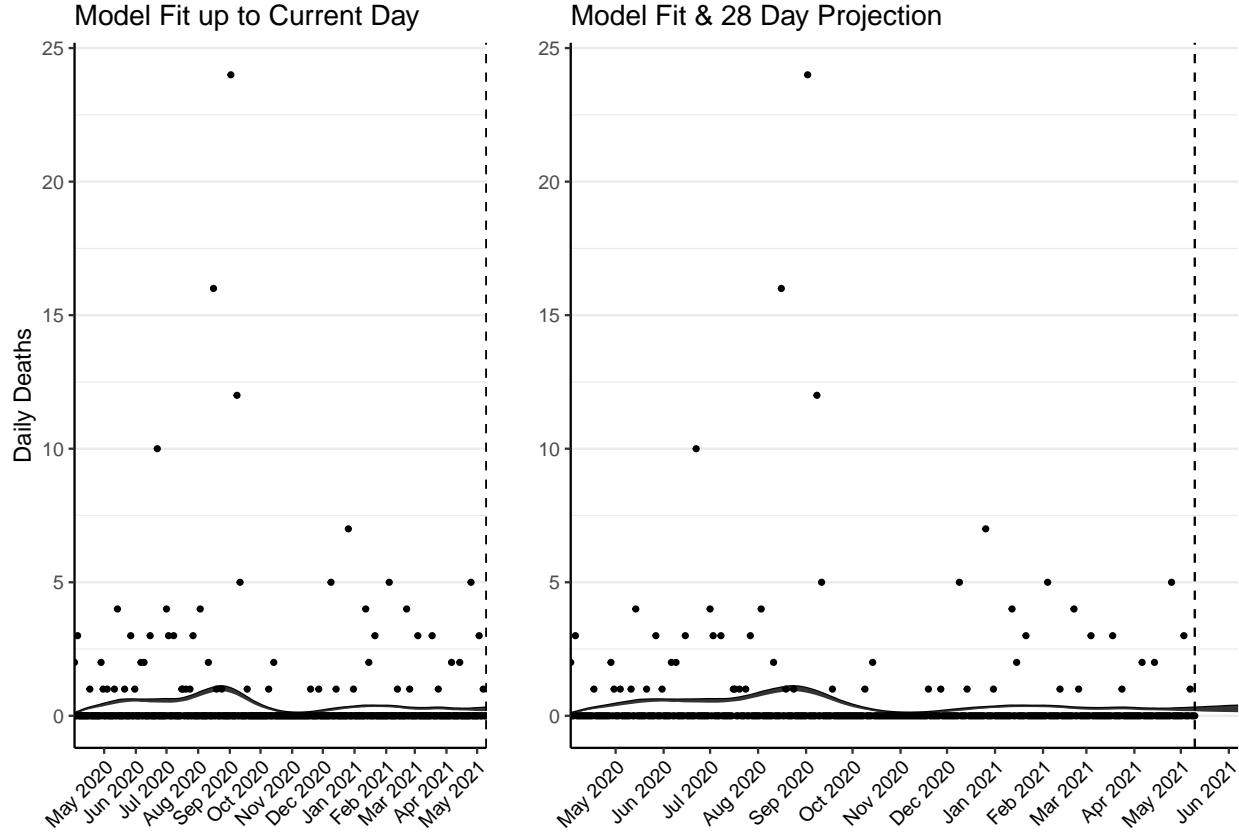


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 13 (95% CI: 12-13) patients requiring treatment with high-pressure oxygen at the current date to 18 (95% CI: 16-20) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 5 (95% CI: 5-5) patients requiring treatment with mechanical ventilation at the current date to 7 (95% CI: 6-8) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

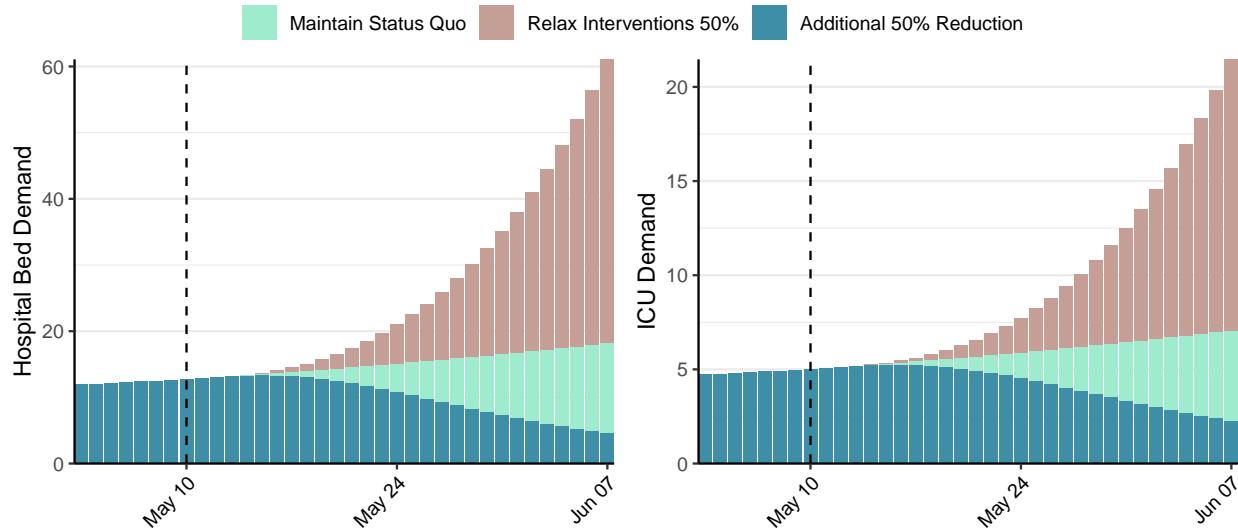


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 184 (95% CI: 170-199) at the current date to 20 (95% CI: 17-22) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 184 (95% CI: 170-199) at the current date to 1,735 (95% CI: 1,499-1,970) by 2021-06-07.

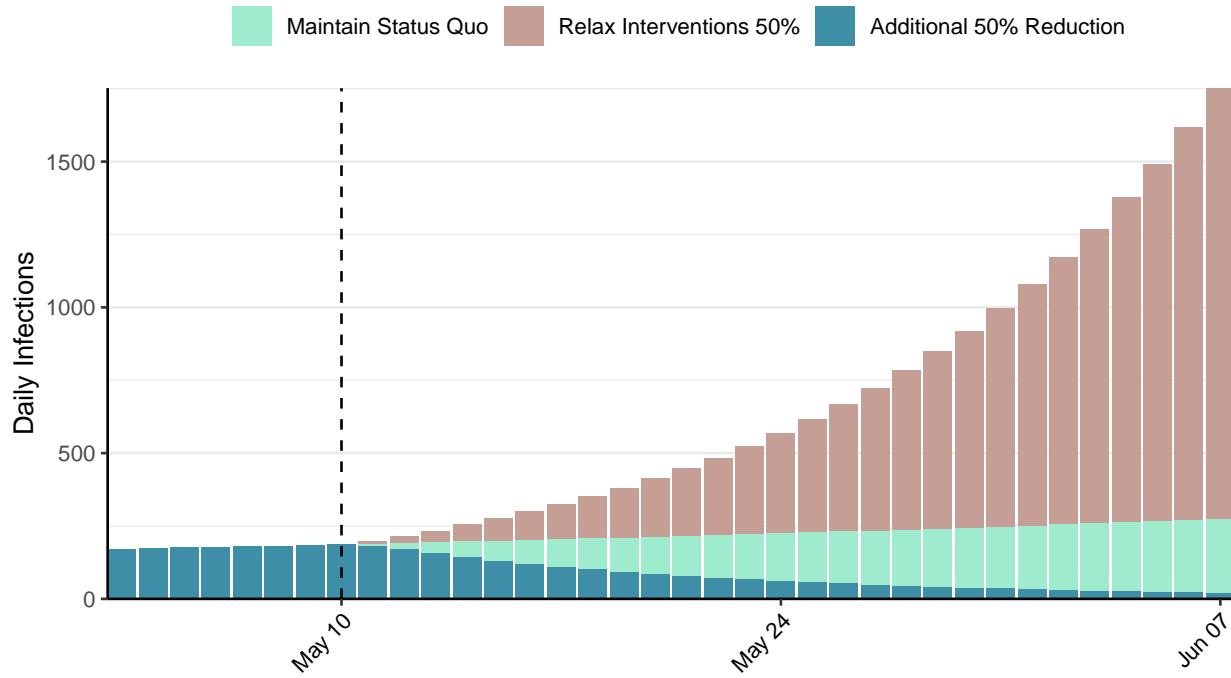


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Colombia, 2021-05-10

[Download the report for Colombia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
3,015,301	12,543	78,342	488	0.77 (95% CI: 0.73-0.82)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

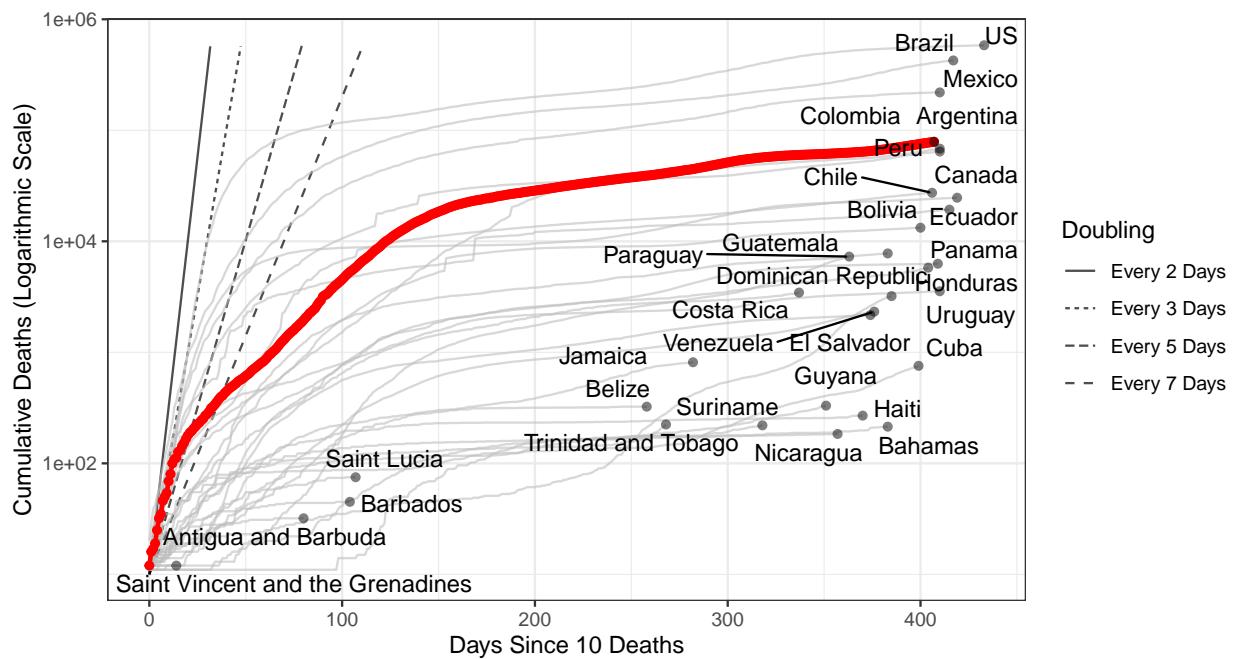


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 4,178,886 (95% CI: 4,081,135-4,276,638) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

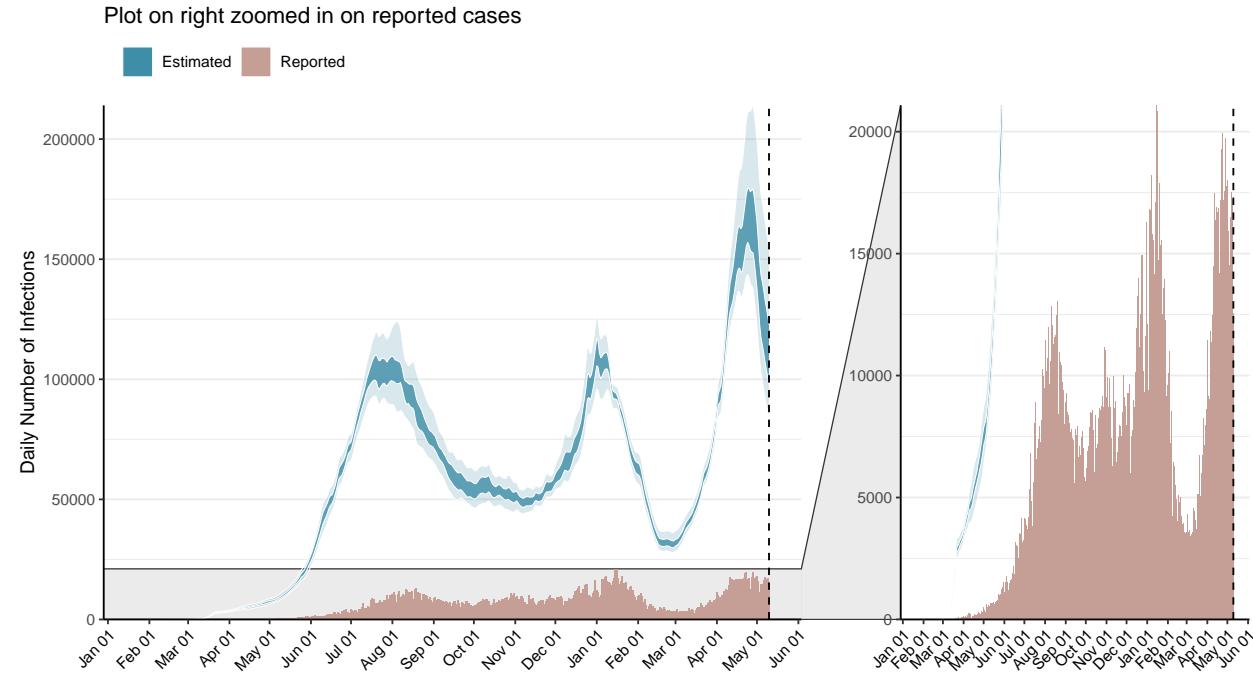
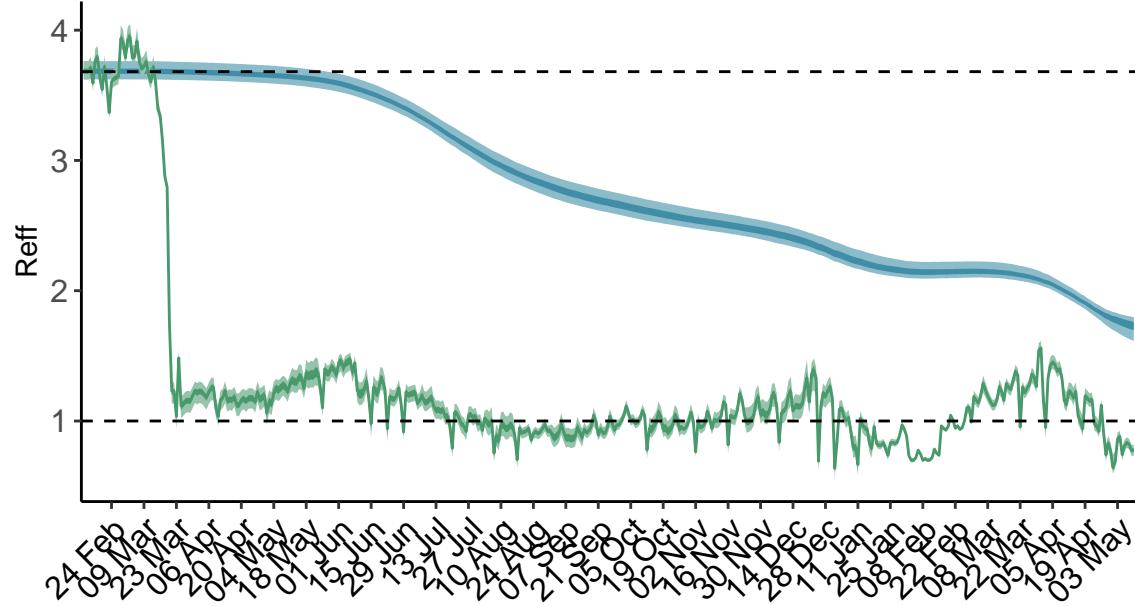


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Colombia is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

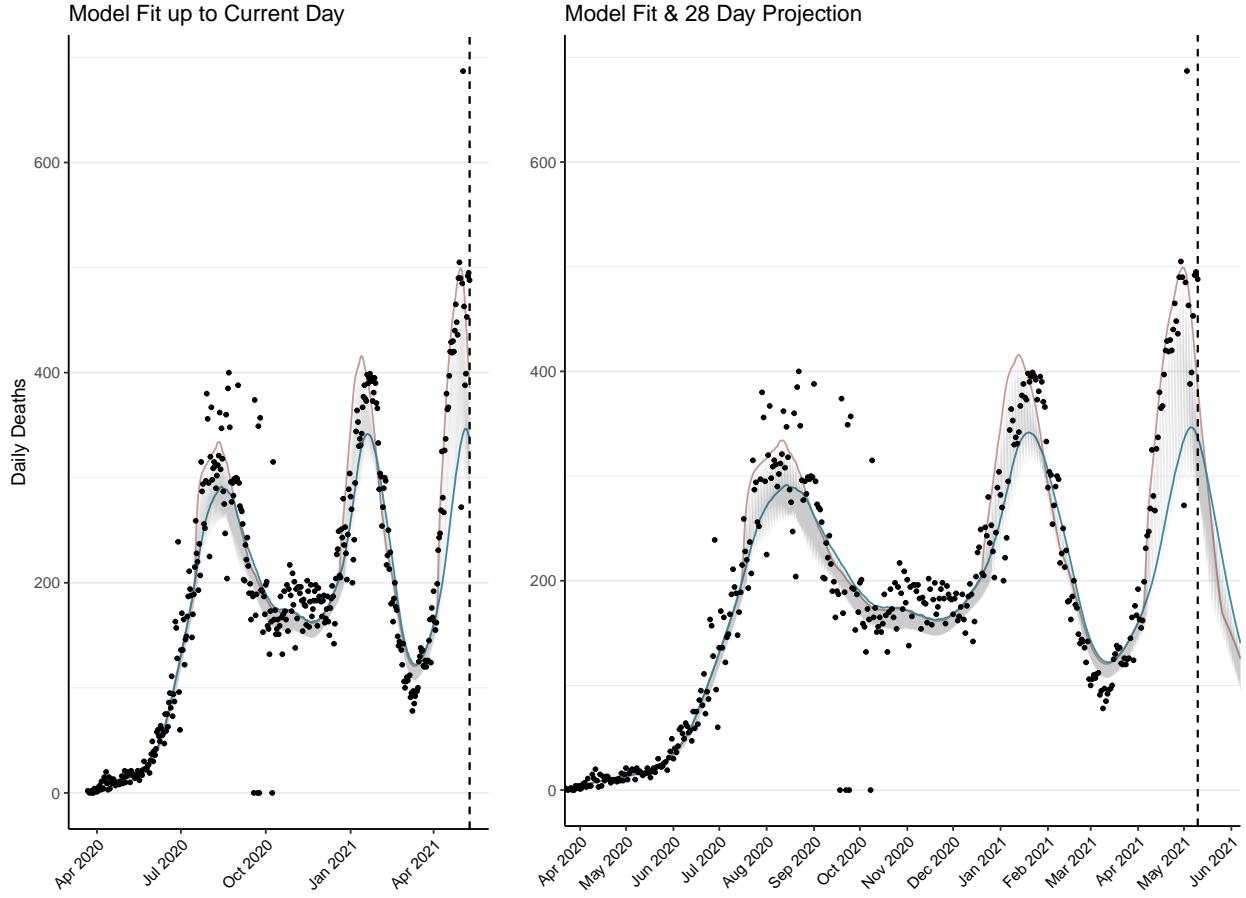


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 13,091 (95% CI: 12,756-13,426) patients requiring treatment with high-pressure oxygen at the current date to 5,104 (95% CI: 4,875-5,333) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 2,941 (95% CI: 2,924-2,957) patients requiring treatment with mechanical ventilation at the current date to 2,139 (95% CI: 2,080-2,199) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B.** These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.

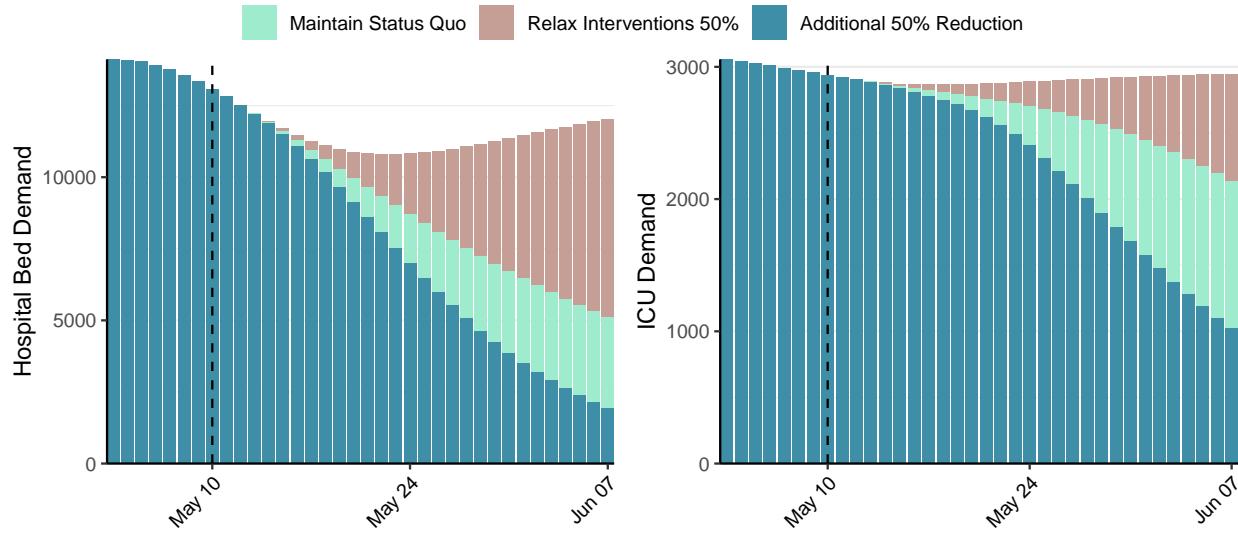
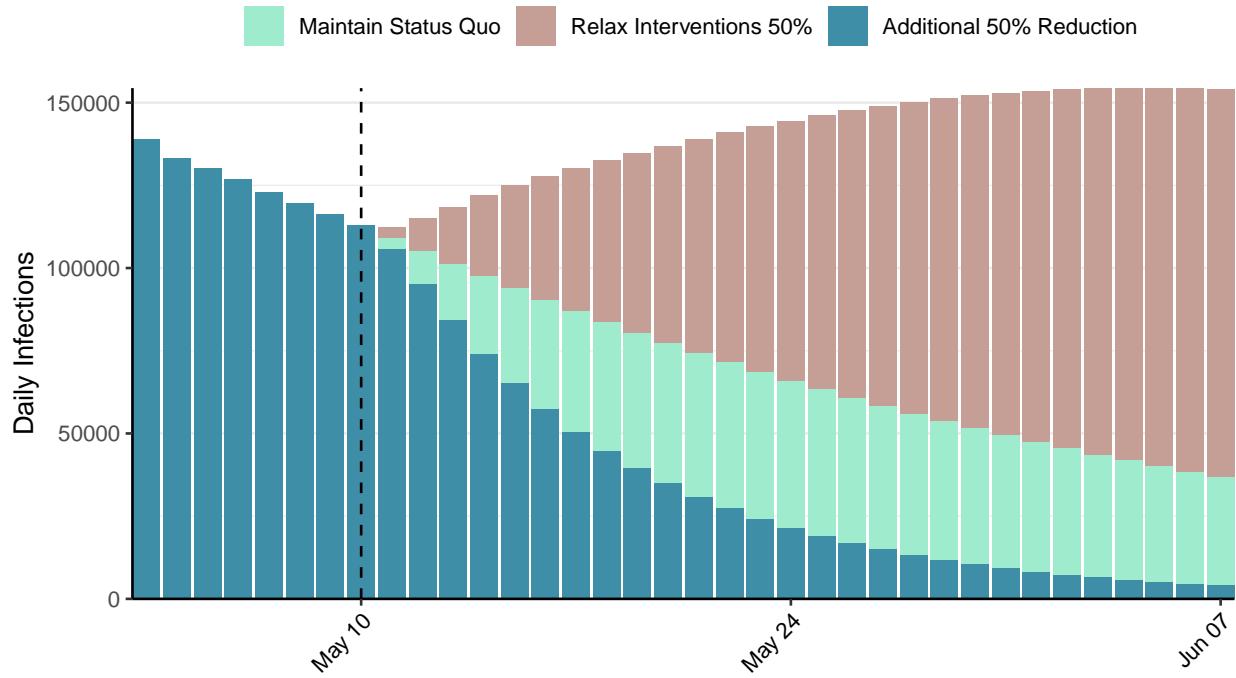


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 112,818 (95% CI: 108,781-116,854) at the current date to 3,944 (95% CI: 3,739-4,148) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 112,818 (95% CI: 108,781-116,854) at the current date to 153,867 (95% CI: 147,429-160,304) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Comoros, 2021-05-10

[Download the report for Comoros, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
3,860	6	146	0	0.47 (95% CI: 0.36-0.75)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

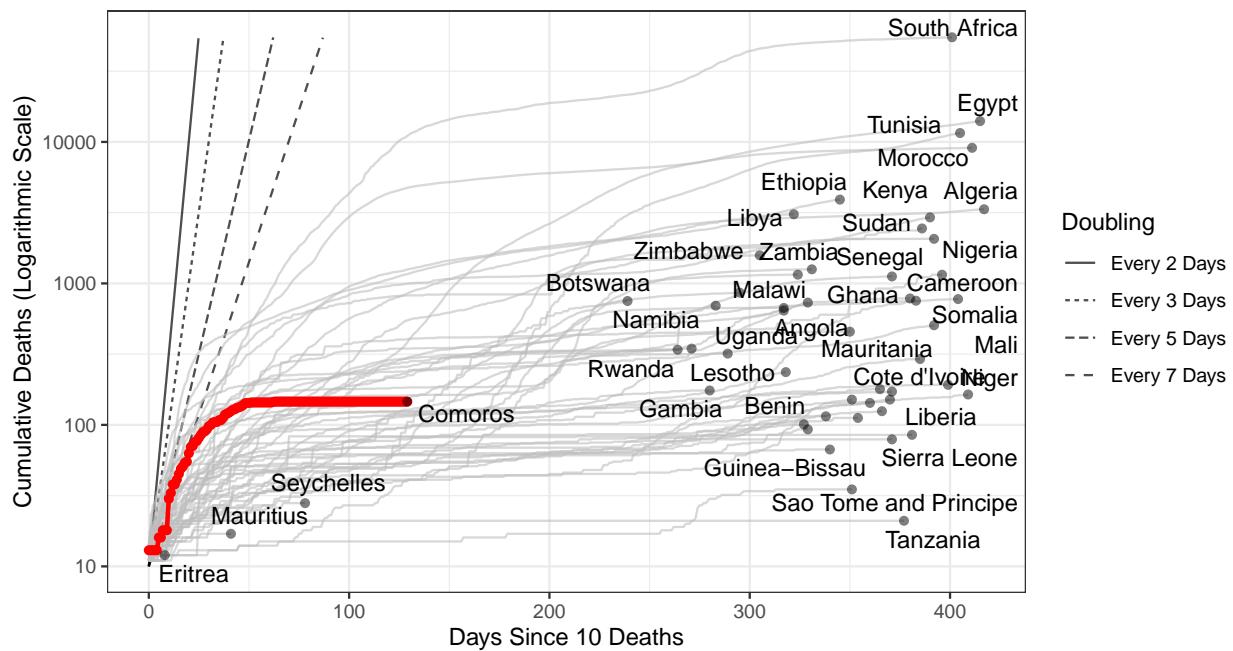


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 14 (95% CI: 11-17) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

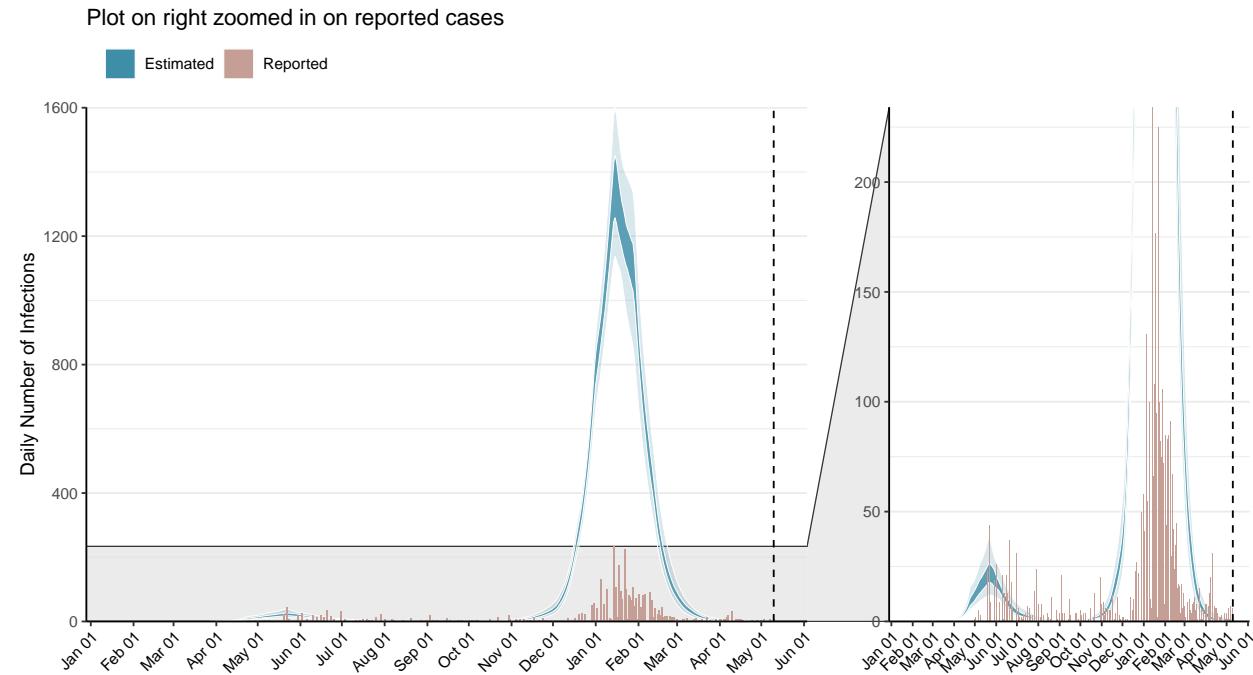
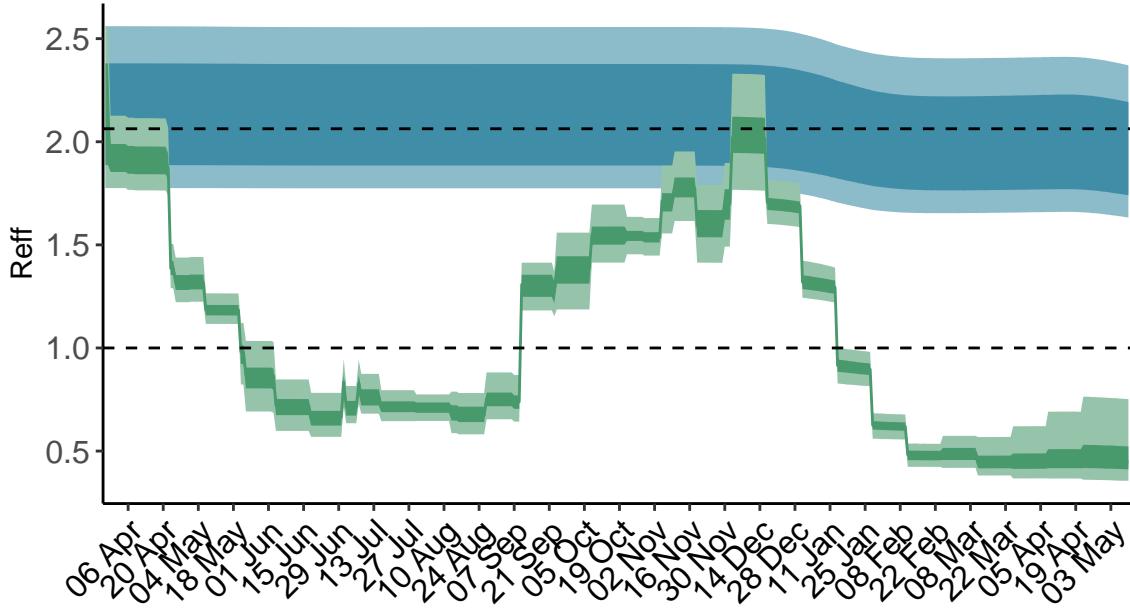


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Comoros is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

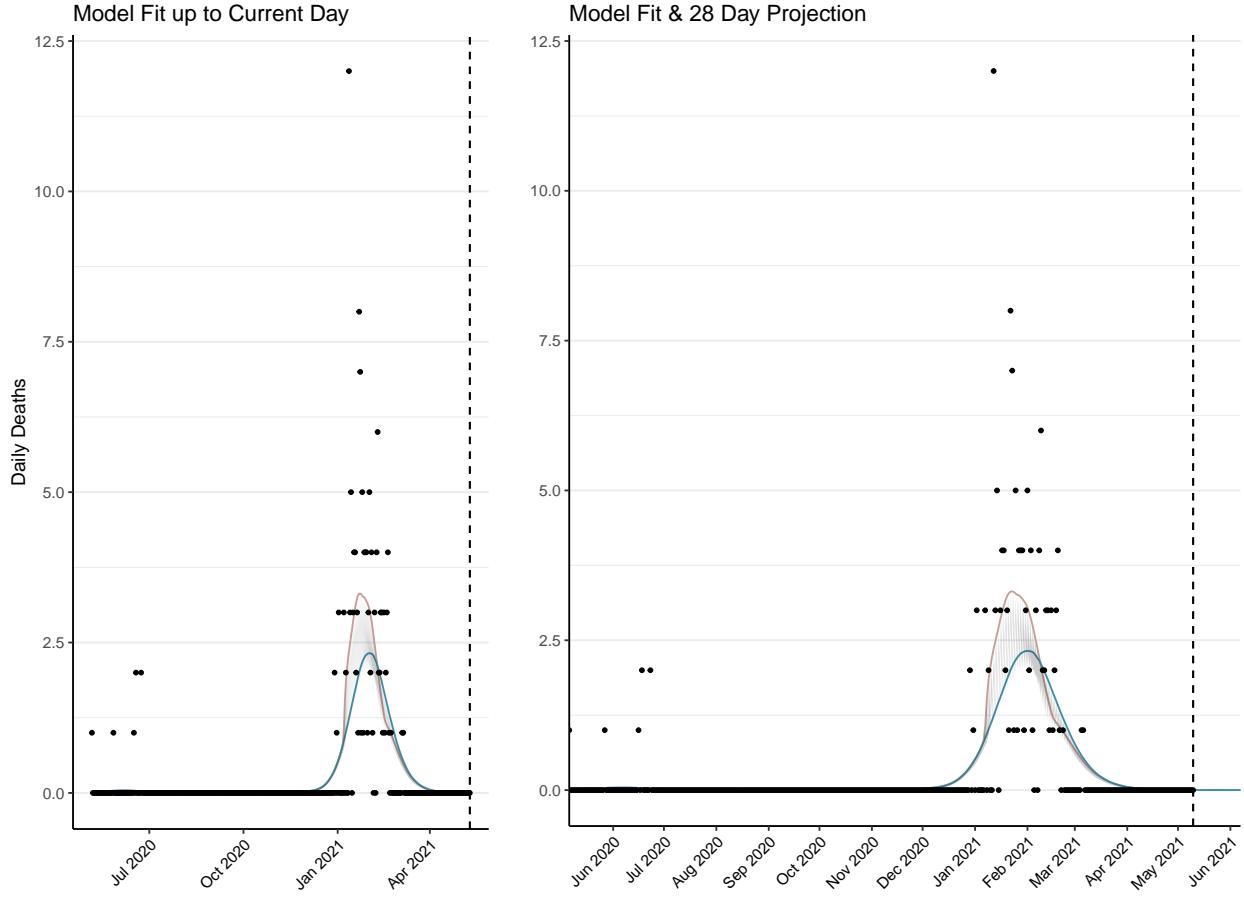


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 0 (95% CI: 0-0) patients requiring treatment with high-pressure oxygen at the current date to 0 (95% CI: 0-0) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 0 (95% CI: 0-0) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

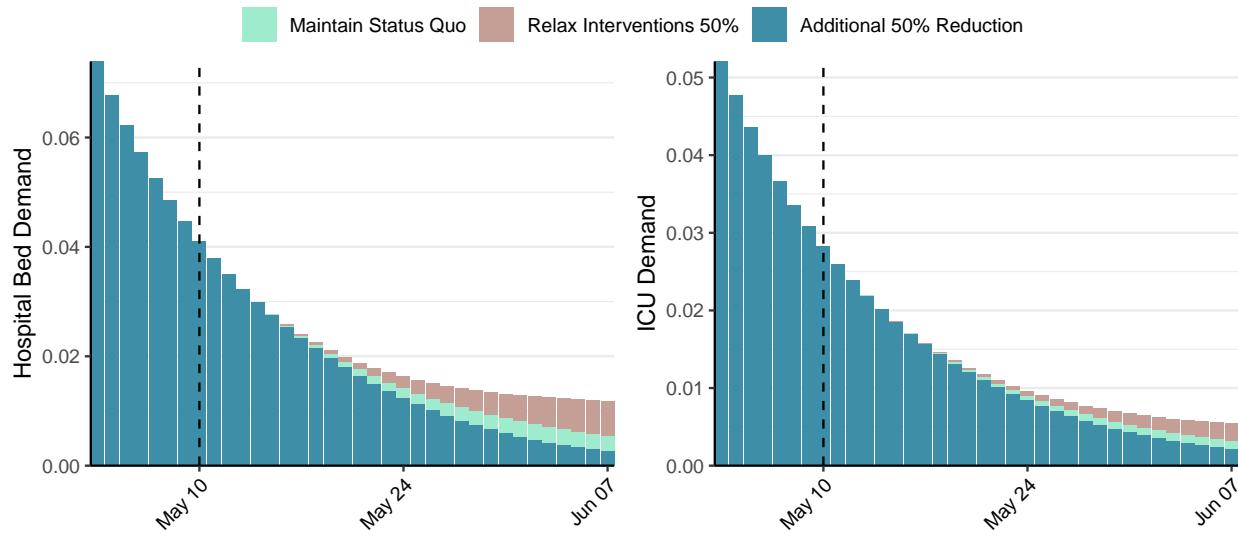


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 0 (95% CI: 0-0) at the current date to 0 (95% CI: 0-0) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 0 (95% CI: 0-0) at the current date to 0 (95% CI: 0-0) by 2021-06-07.

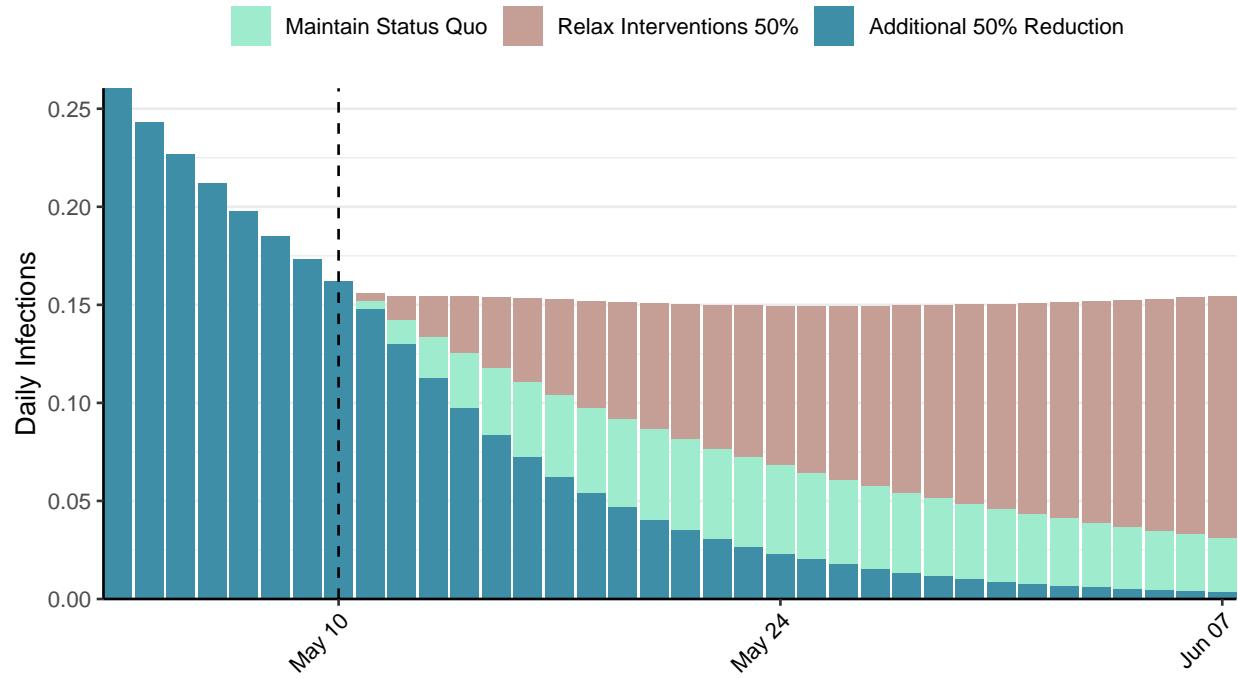


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Cabo Verde, 2021-05-10

[Download the report for Cabo Verde, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
26,578	137	235	3	0.9 (95% CI: 0.83-0.96)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

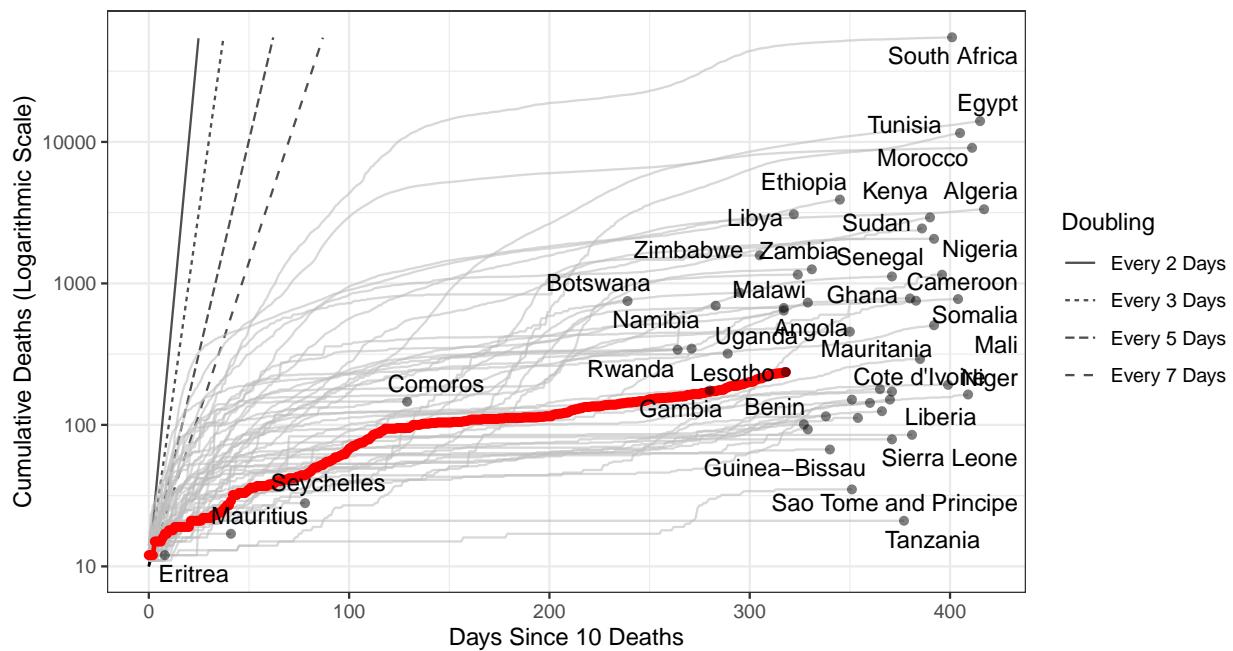


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 20,173 (95% CI: 19,521-20,825) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

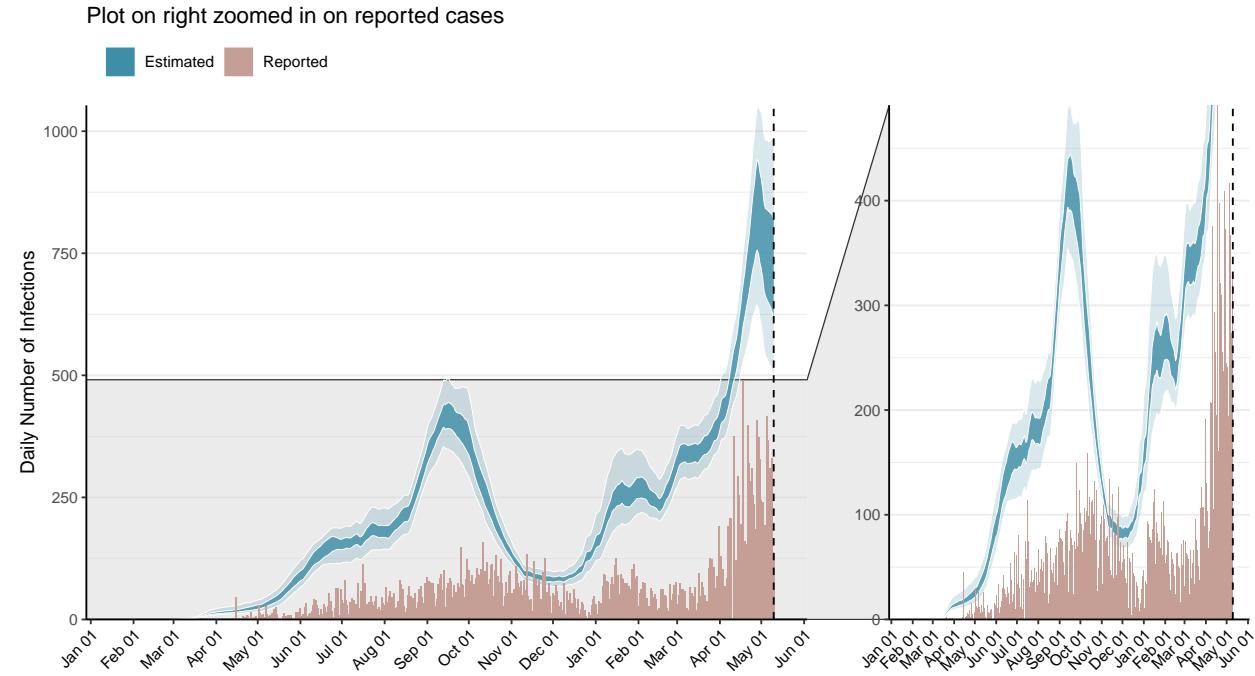
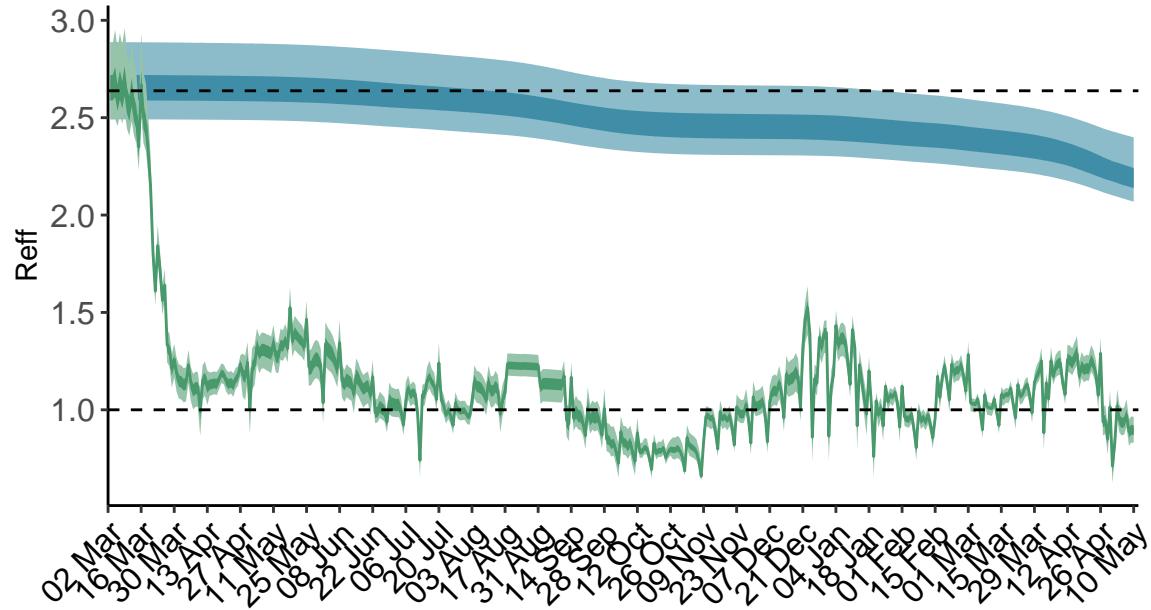


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

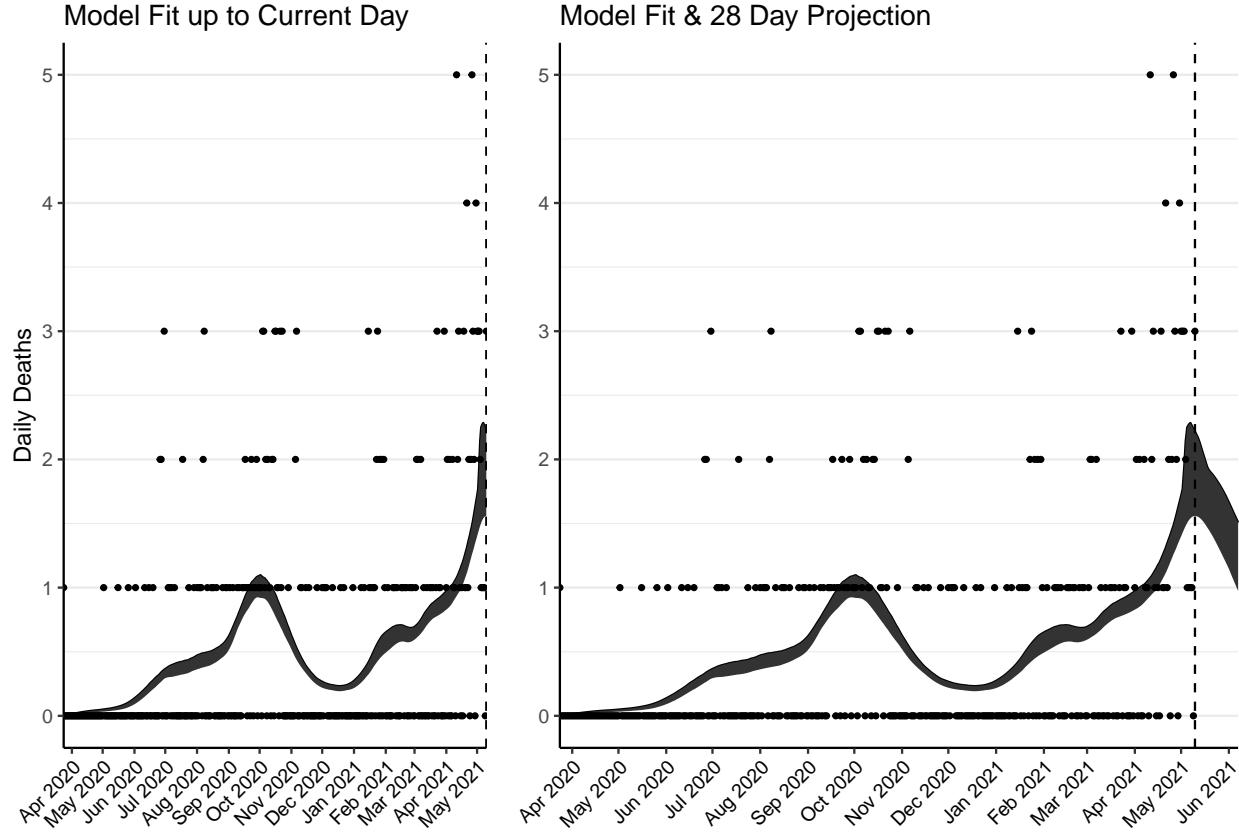


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 75 (95% CI: 73-78) patients requiring treatment with high-pressure oxygen at the current date to 54 (95% CI: 51-57) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 25 (95% CI: 24-25) patients requiring treatment with mechanical ventilation at the current date to 20 (95% CI: 19-21) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

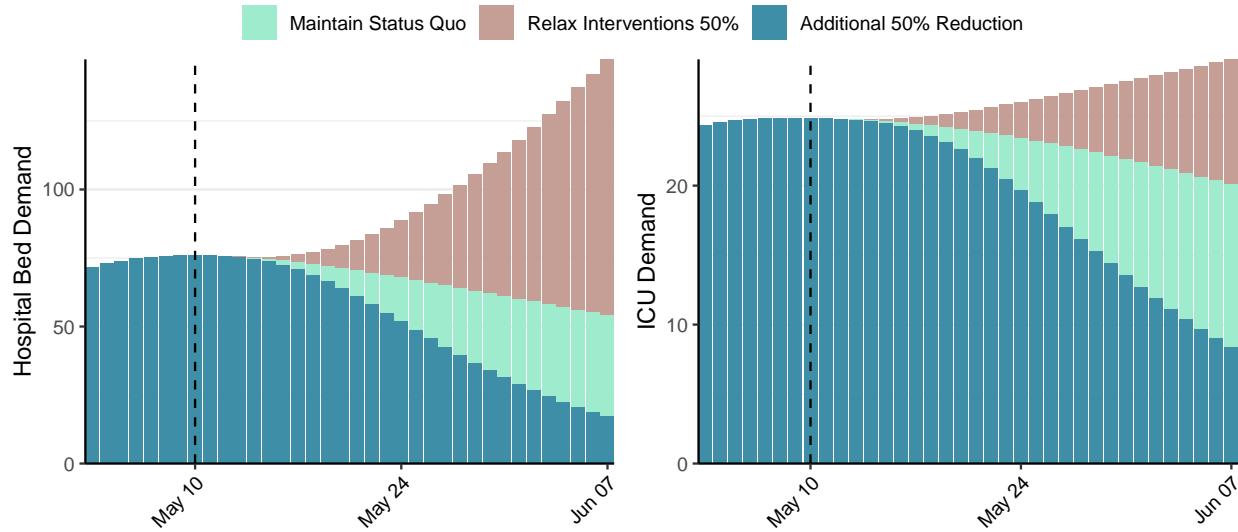


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 713 (95% CI: 683-744) at the current date to 39 (95% CI: 37-42) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 713 (95% CI: 683-744) at the current date to 2,157 (95% CI: 2,020-2,295) by 2021-06-07.

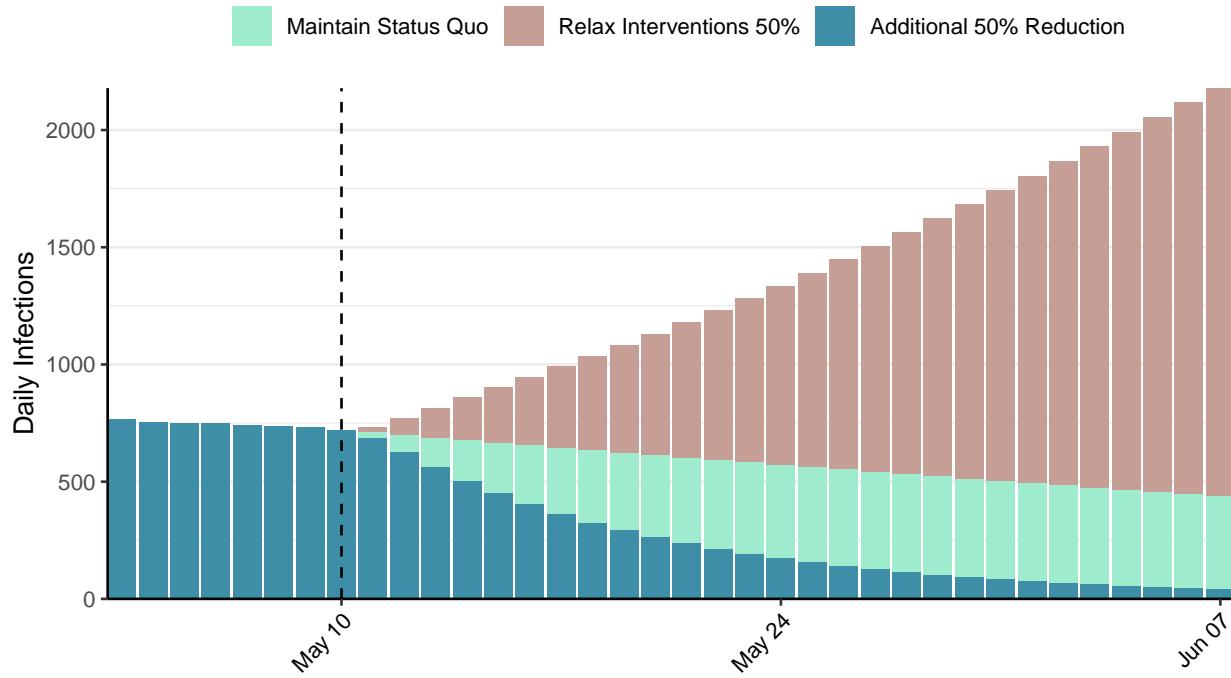


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Costa Rica, 2021-05-10

[Download the report for Costa Rica, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
271,478	5,992	3,430	65	1.21 (95% CI: 1.17-1.27)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

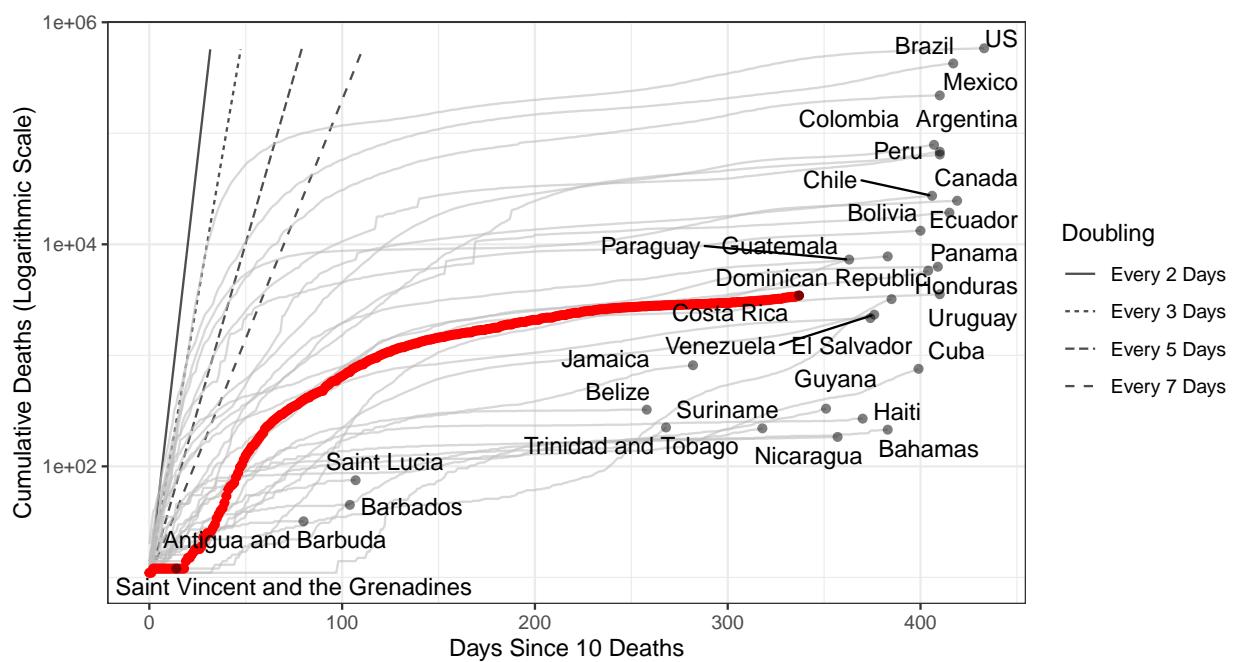


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 281,468 (95% CI: 274,766–288,169) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

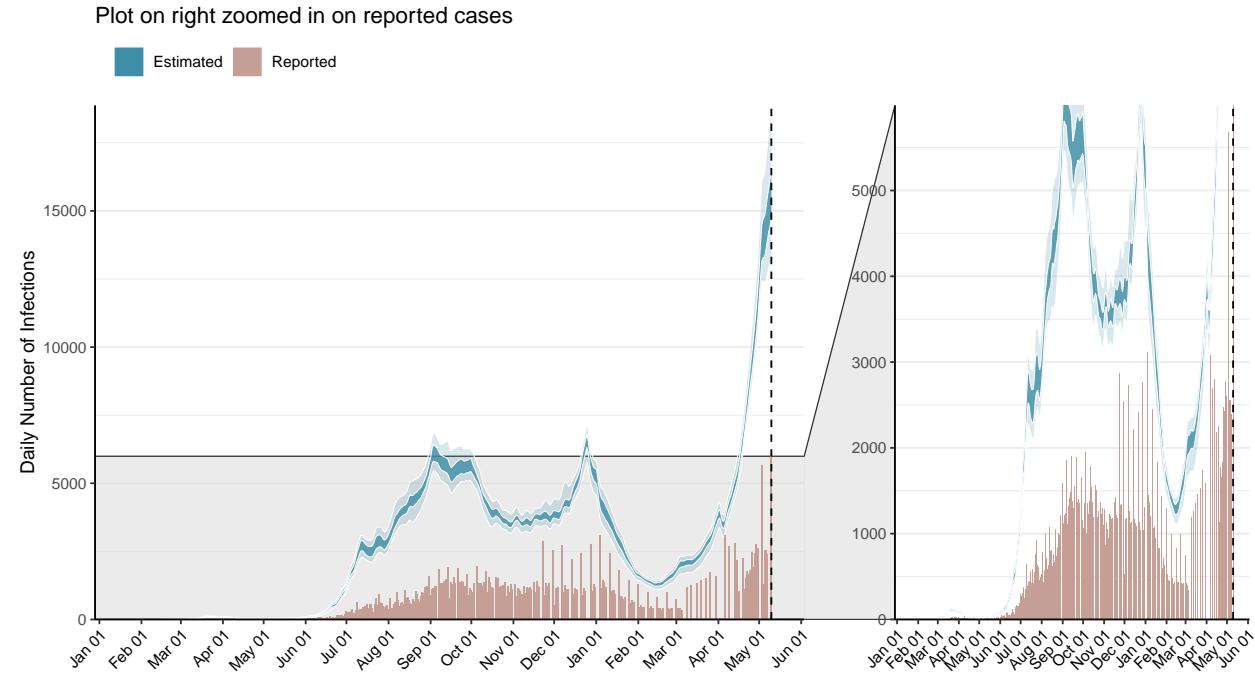
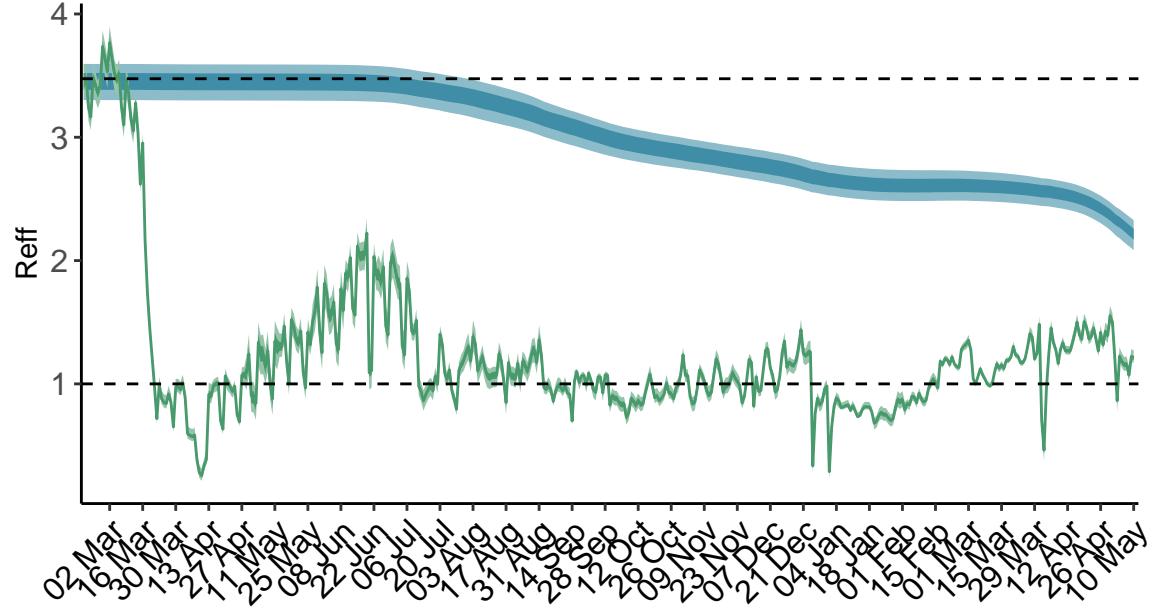


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Costa Rica is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

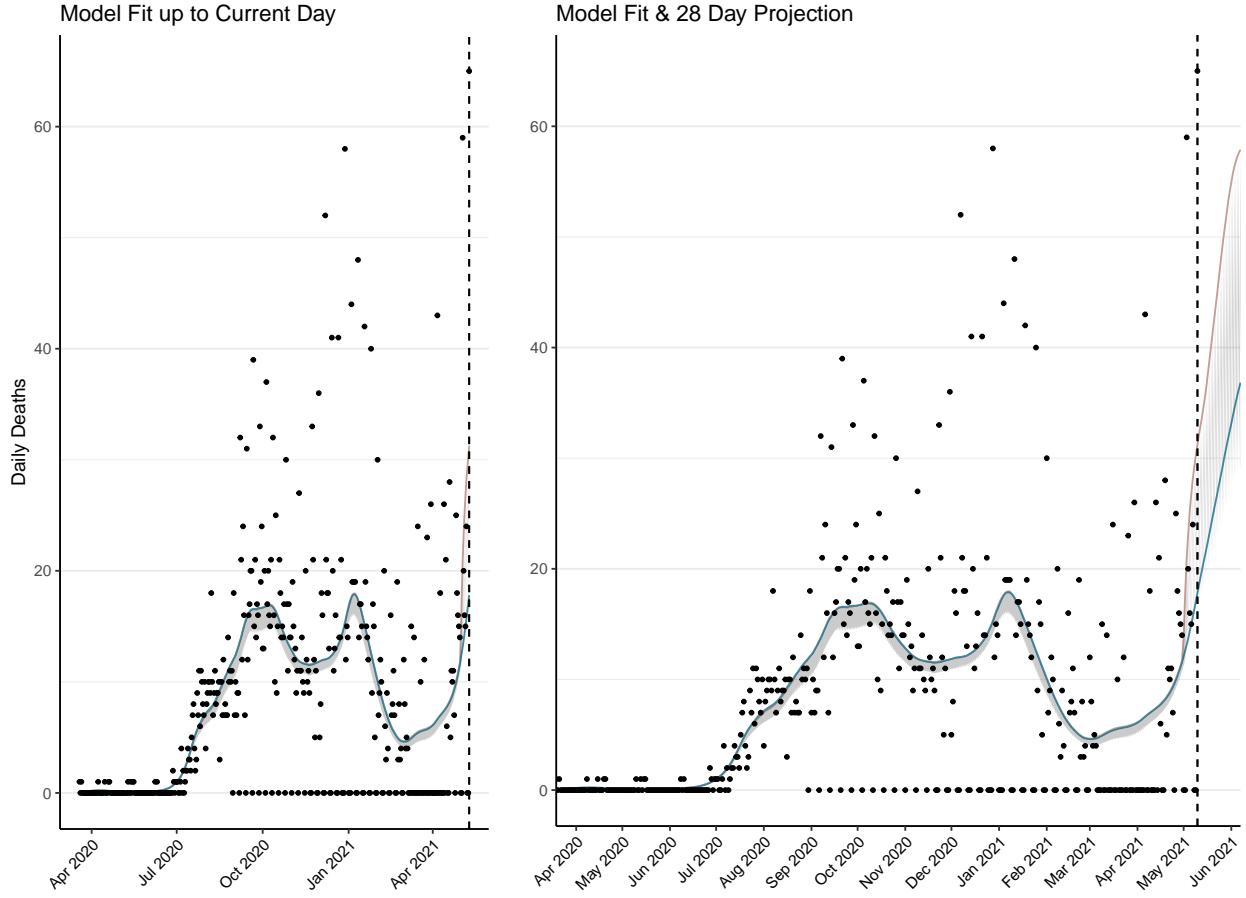


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 863 (95% CI: 842-884) patients requiring treatment with high-pressure oxygen at the current date to 1,608 (95% CI: 1,558-1,659) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 248 (95% CI: 243-253) patients requiring treatment with mechanical ventilation at the current date to 277 (95% CI: 271-283) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

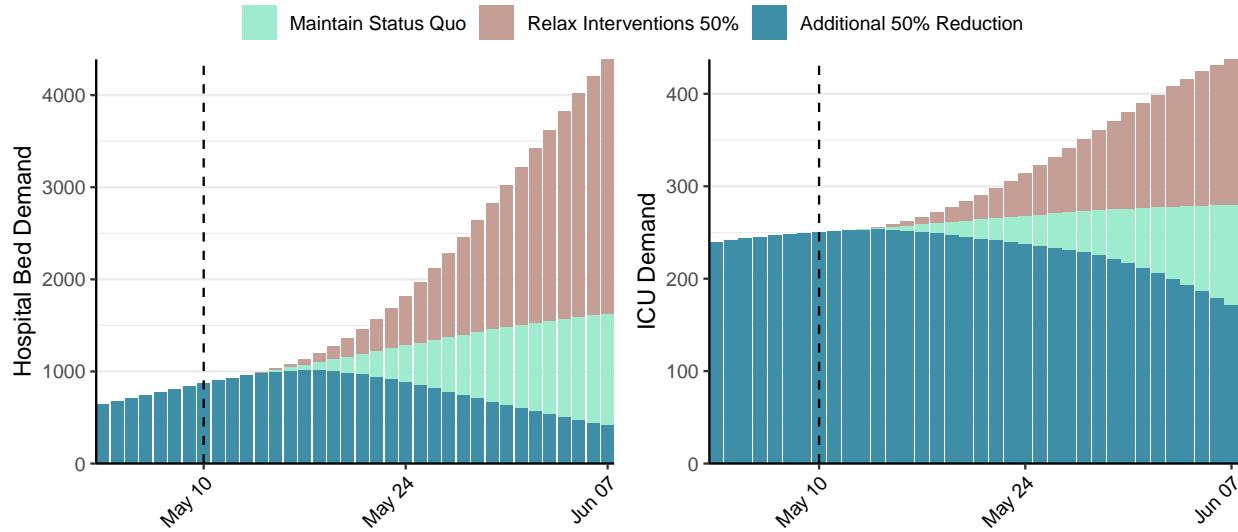
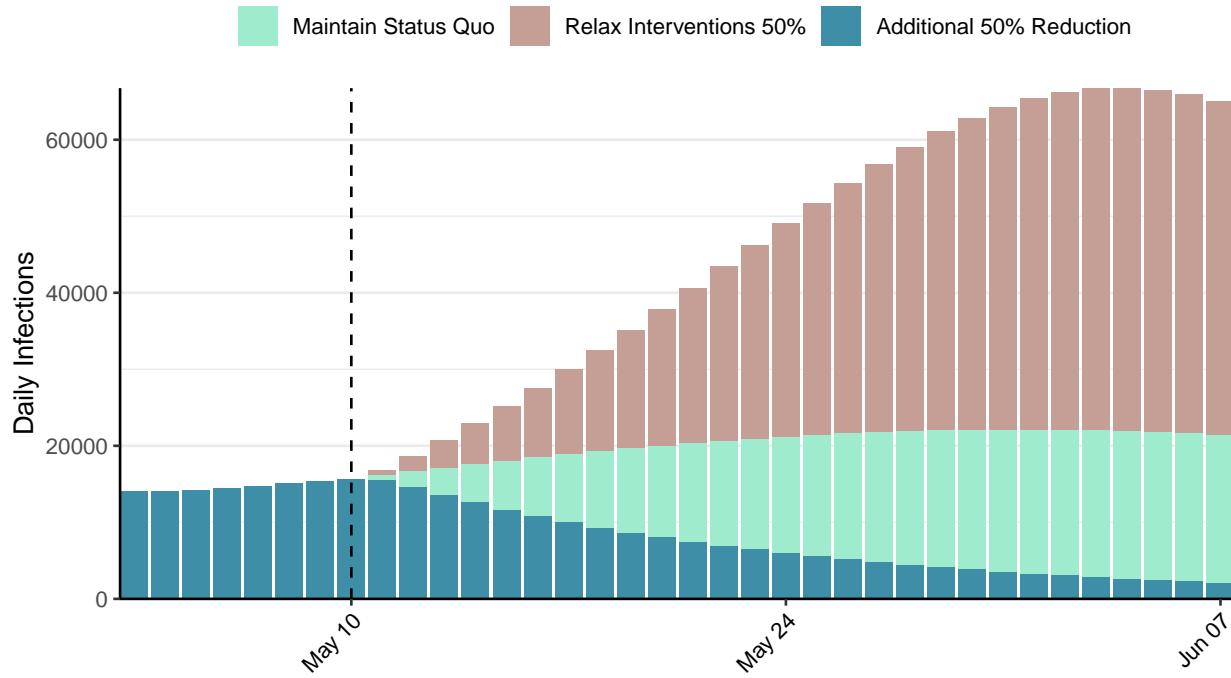


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 15,519 (95% CI: 15,100-15,938) at the current date to 2,049 (95% CI: 1,979-2,119) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 15,519 (95% CI: 15,100-15,938) at the current date to 64,334 (95% CI: 62,928-65,740) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Cuba, 2021-05-10

[Download the report for Cuba, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
117,097	1,116	742	9	0.99 (95% CI: 0.91-1.05)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

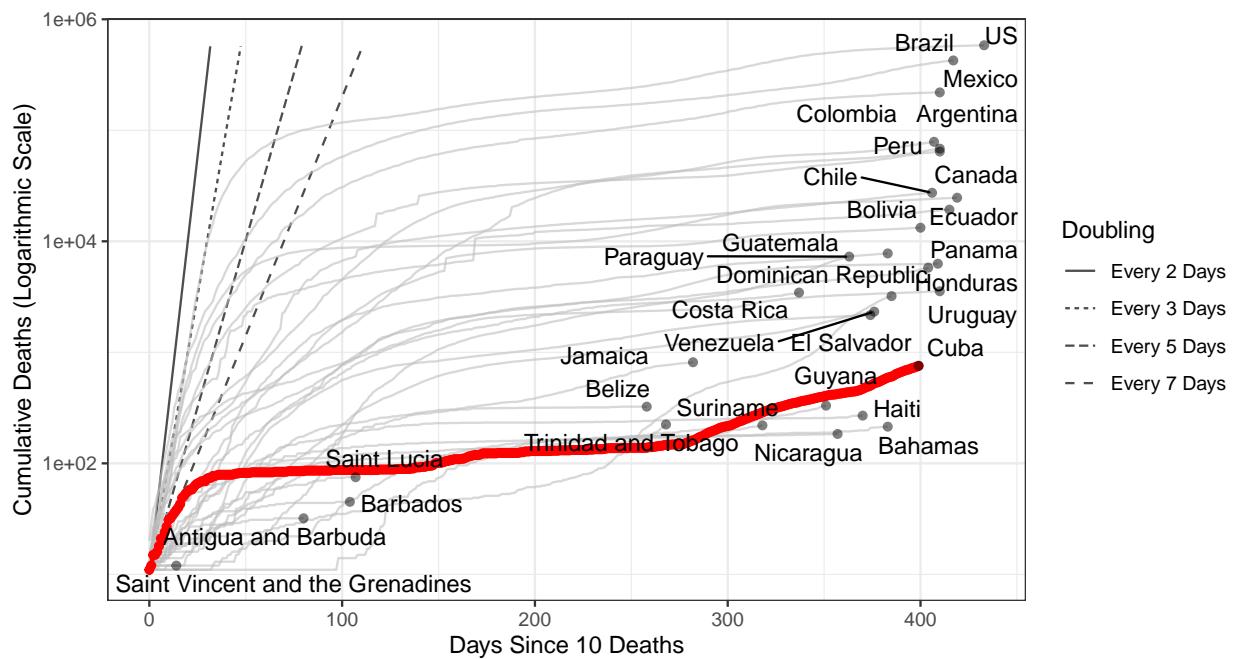


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 72,476 (95% CI: 70,264-74,689) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

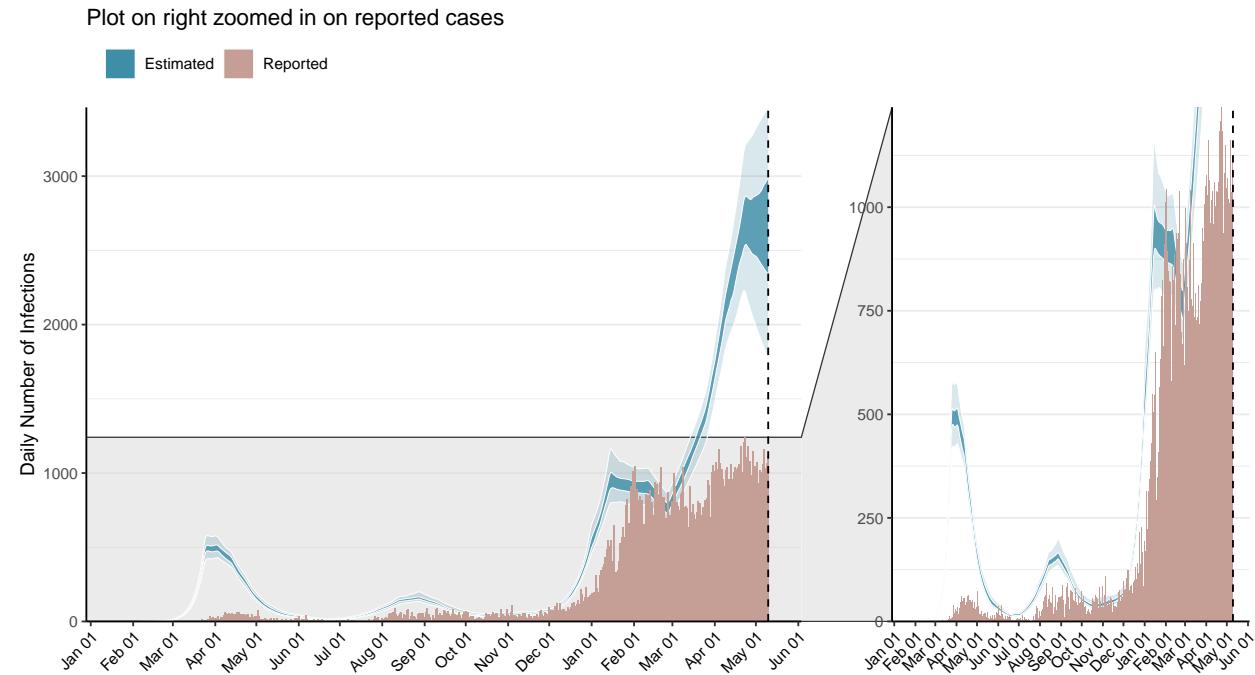
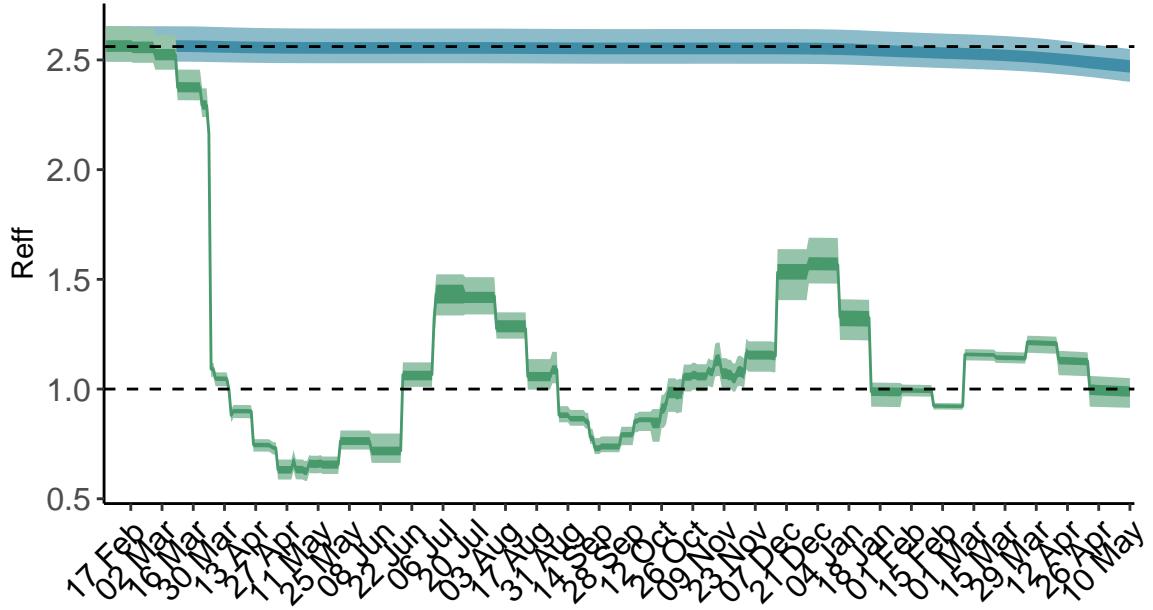


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

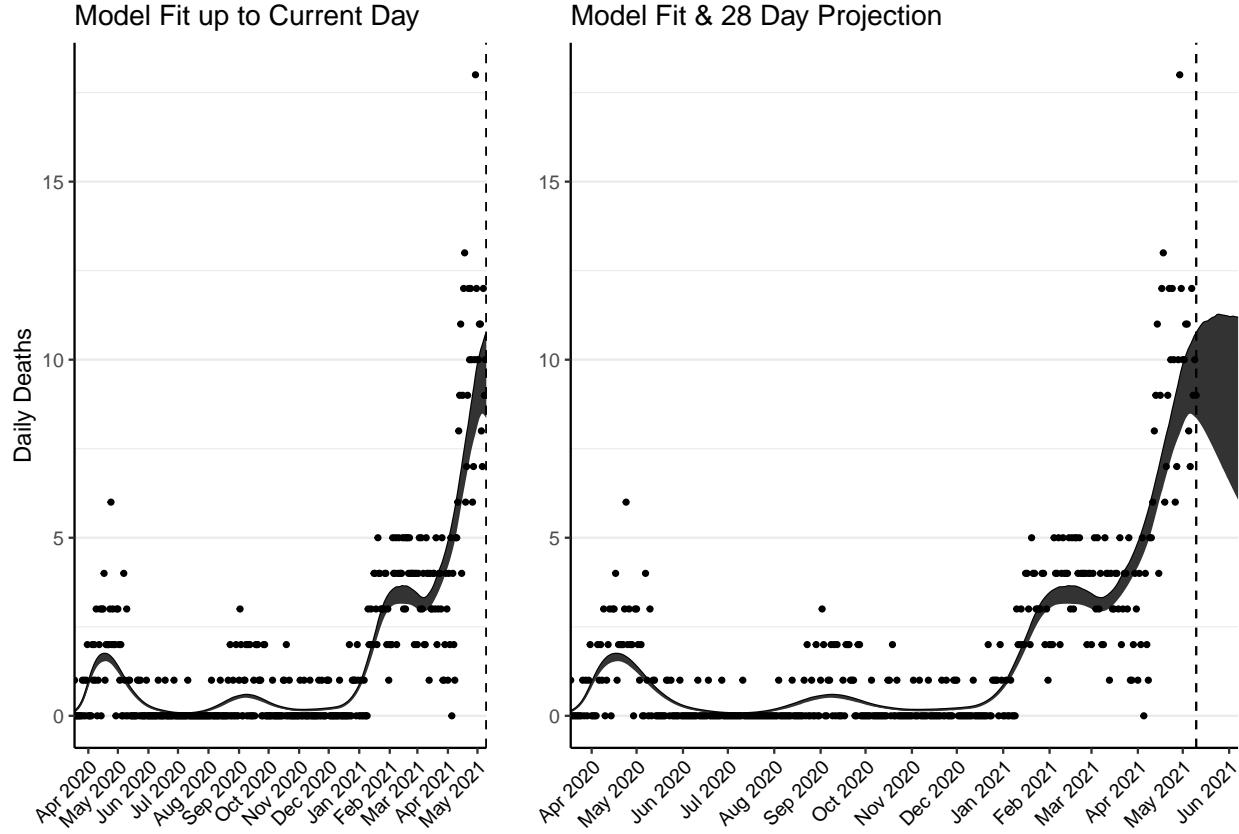


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 354 (95% CI: 343-365) patients requiring treatment with high-pressure oxygen at the current date to 352 (95% CI: 333-372) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 122 (95% CI: 119-126) patients requiring treatment with mechanical ventilation at the current date to 125 (95% CI: 118-132) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

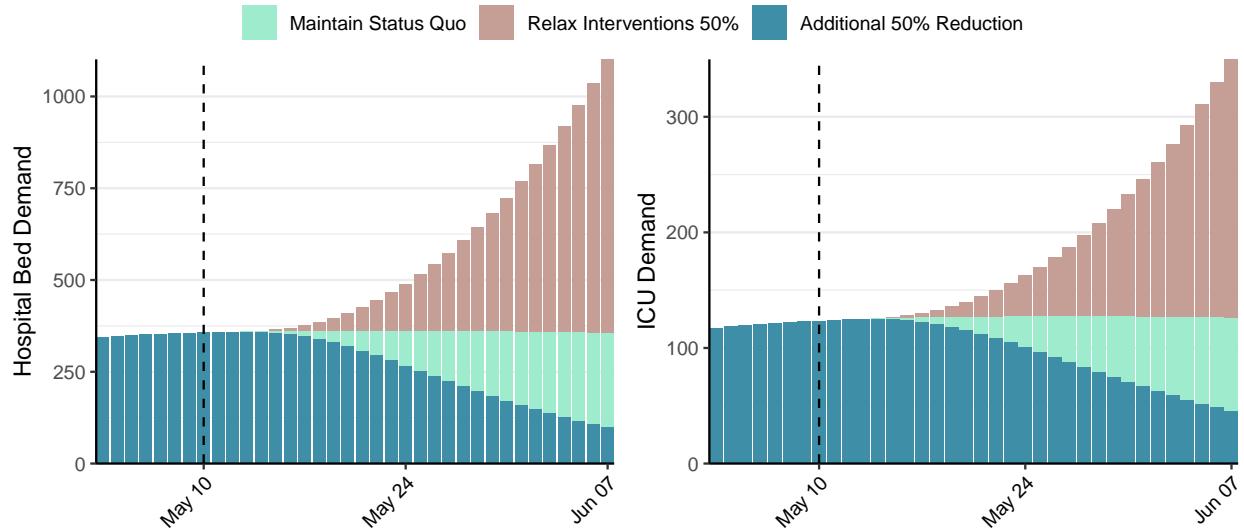
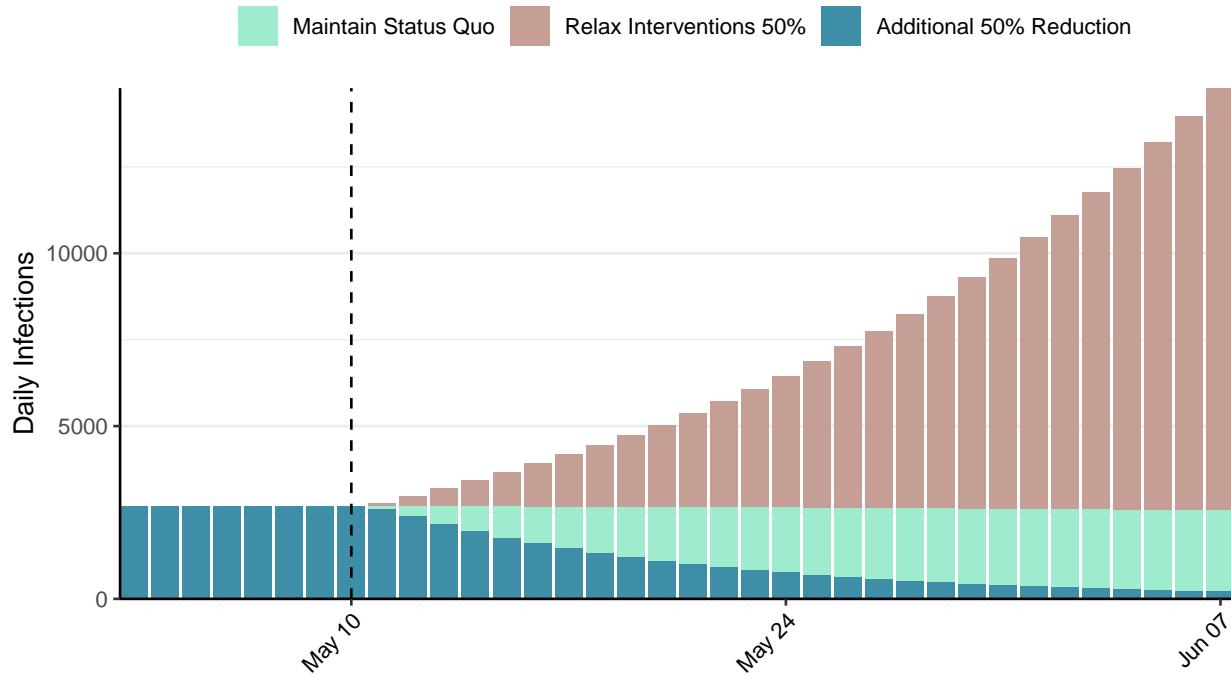


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 2,648 (95% CI: 2,540-2,755) at the current date to 203 (95% CI: 190-215) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 2,648 (95% CI: 2,540-2,755) at the current date to 14,633 (95% CI: 13,649-15,616) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Djibouti, 2021-05-10

[Download the report for Djibouti, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
11,355	20	149	0	0.66 (95% CI: 0.55-0.78)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

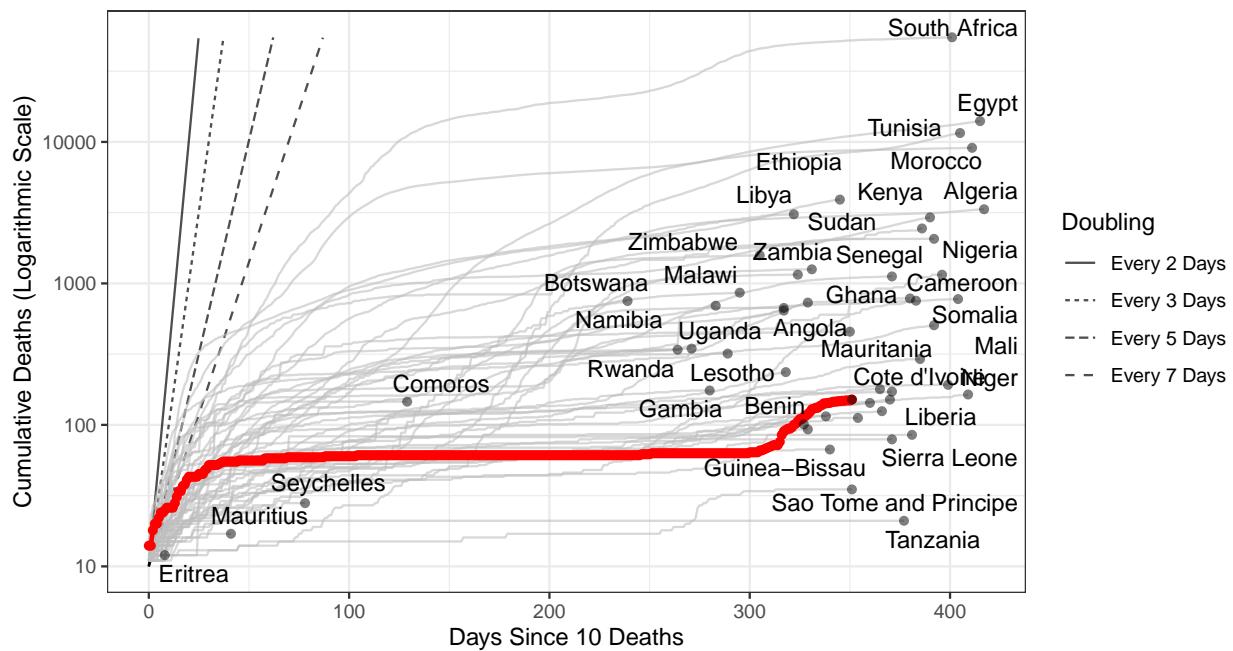


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 19,260 (95% CI: 18,465-20,056) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

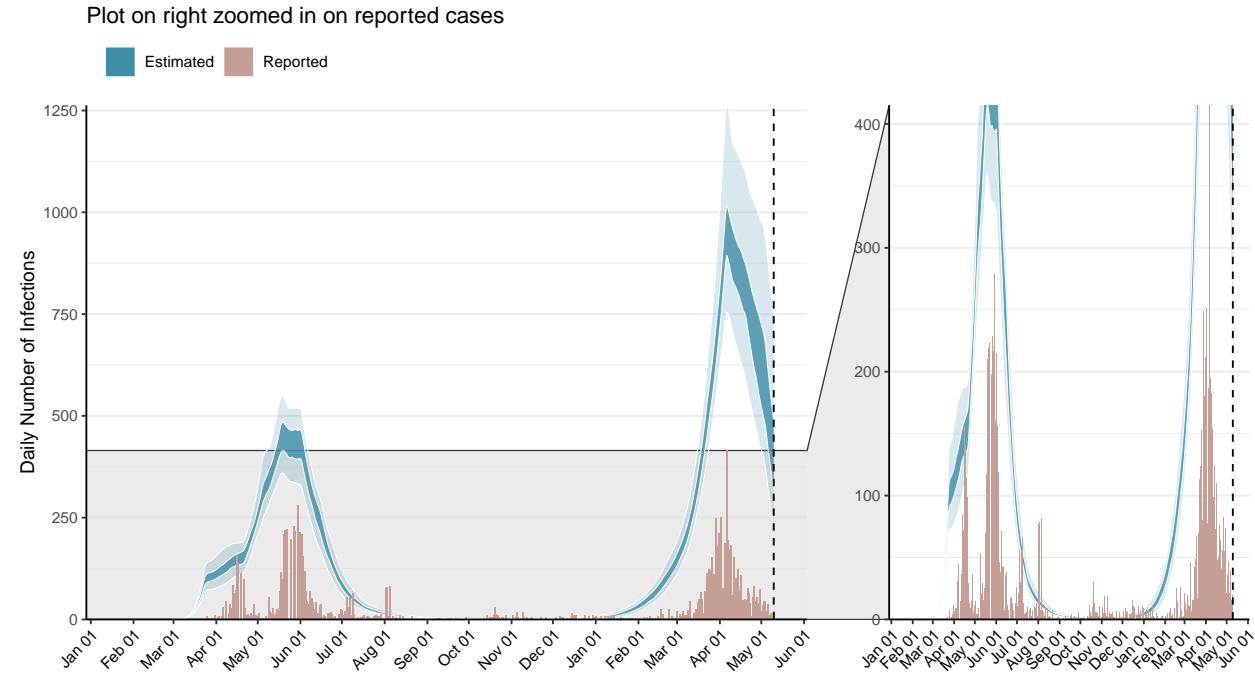
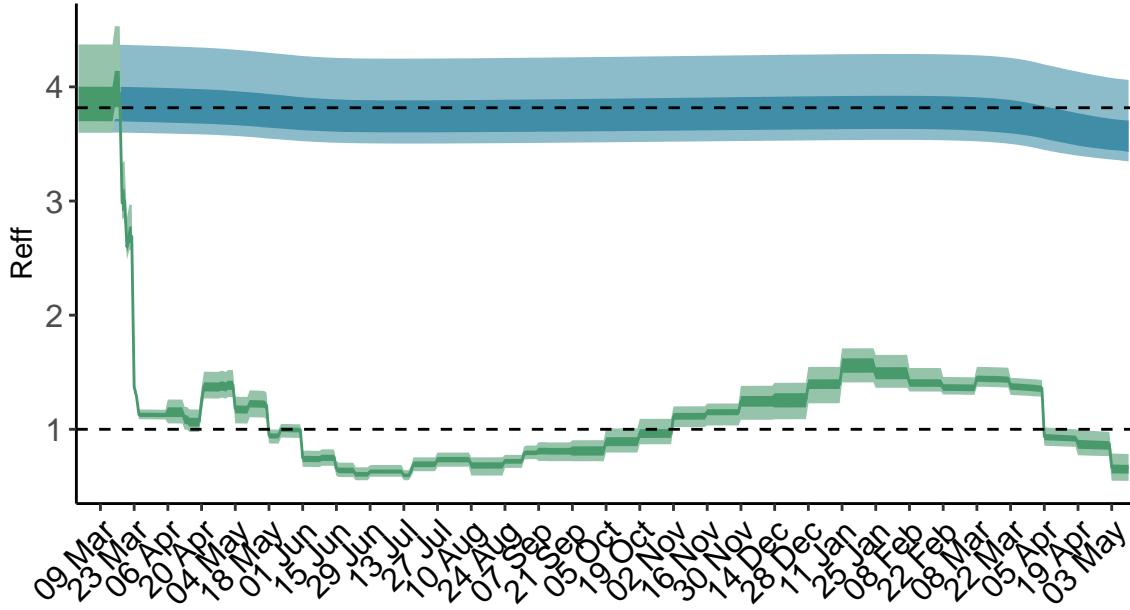


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

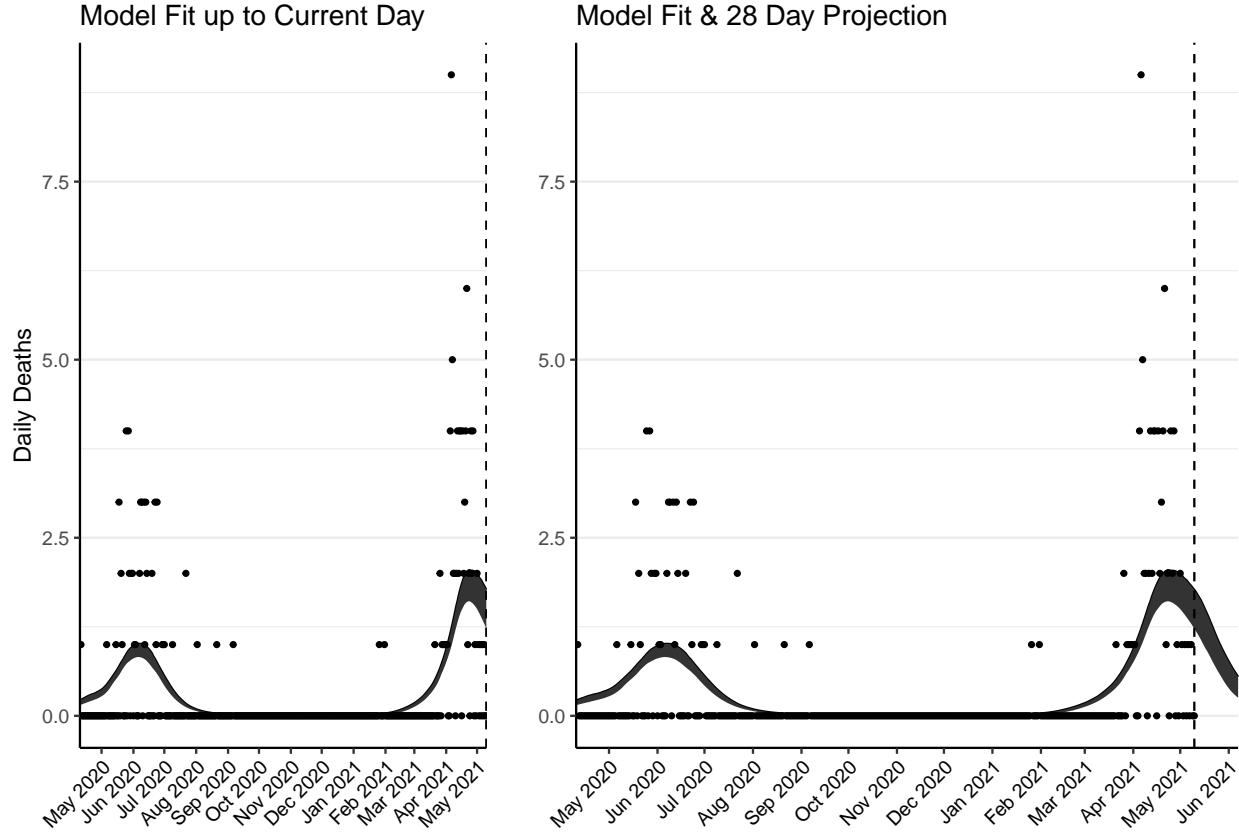


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 63 (95% CI: 60-66) patients requiring treatment with high-pressure oxygen at the current date to 18 (95% CI: 16-20) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 26 (95% CI: 25-27) patients requiring treatment with mechanical ventilation at the current date to 8 (95% CI: 8-9) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

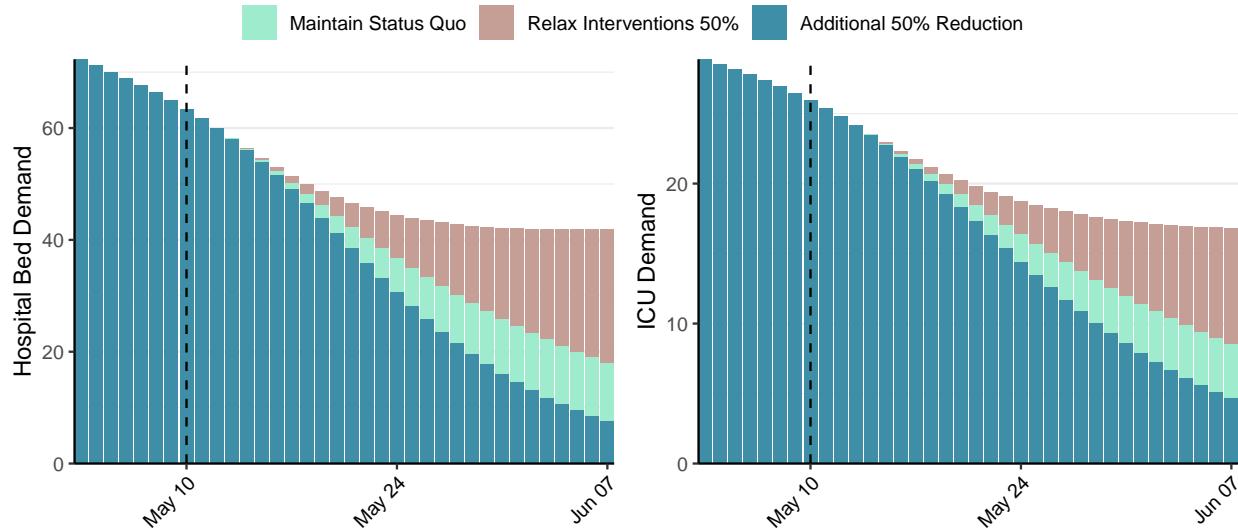
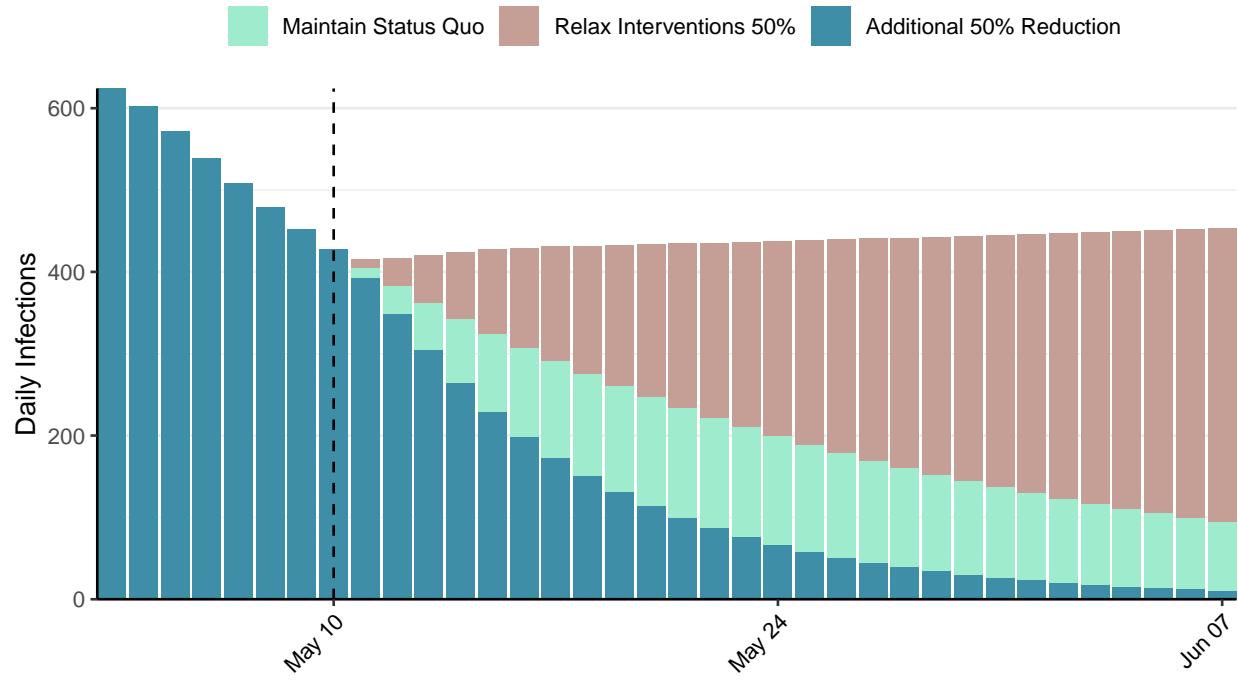


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 423 (95% CI: 395-450) at the current date to 10 (95% CI: 9-11) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 423 (95% CI: 395-450) at the current date to 449 (95% CI: 387-511) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Dominican Republic, 2021-05-10

[Download the report for Dominican Republic, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
272,108	560	3,540	8	0.95 (95% CI: 0.84-0.99)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

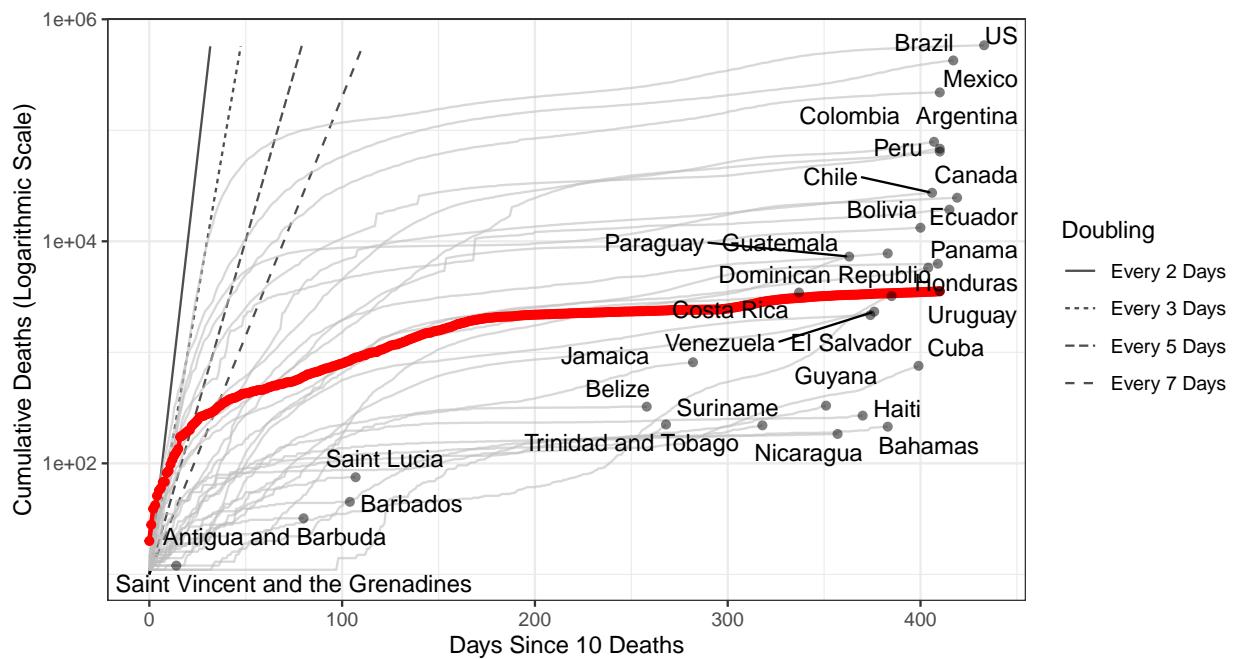


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 177,796 (95% CI: 171,164-184,428) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

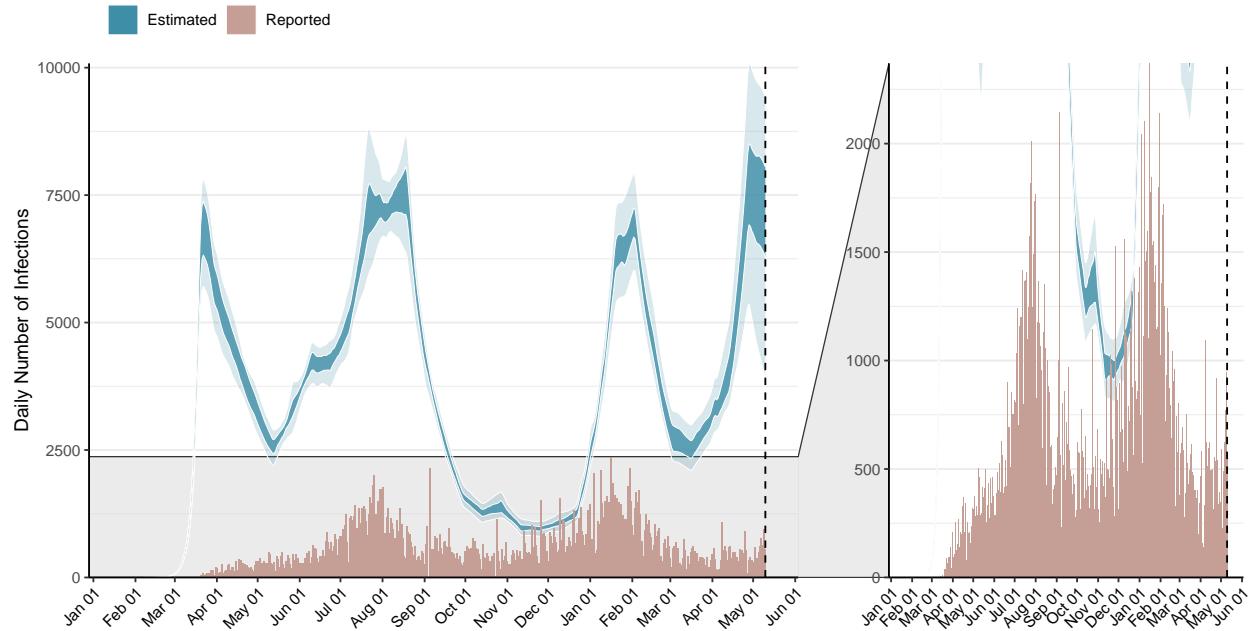
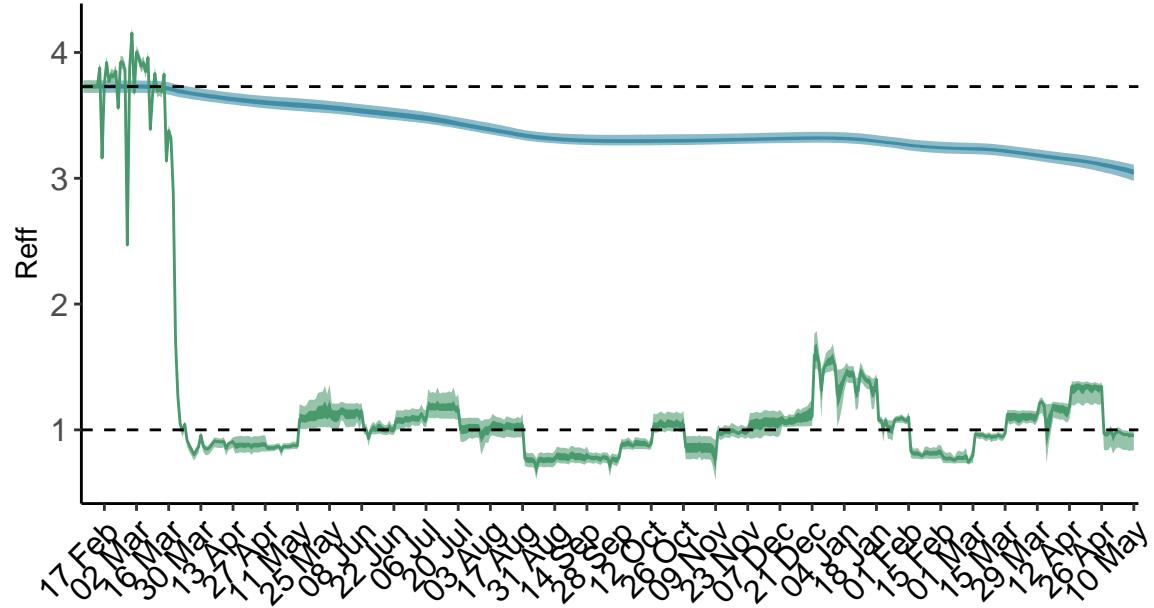


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

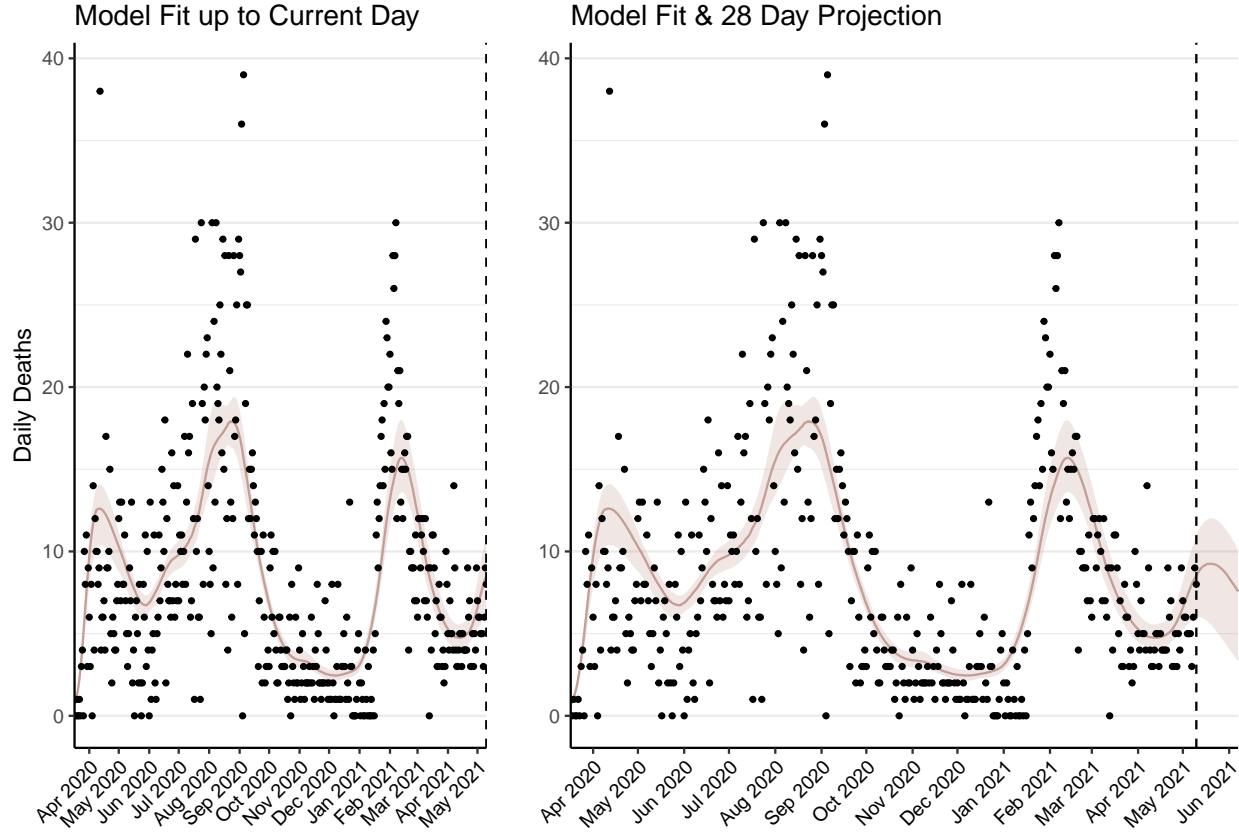


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 403 (95% CI: 387-418) patients requiring treatment with high-pressure oxygen at the current date to 310 (95% CI: 294-325) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 155 (95% CI: 149-161) patients requiring treatment with mechanical ventilation at the current date to 124 (95% CI: 118-130) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

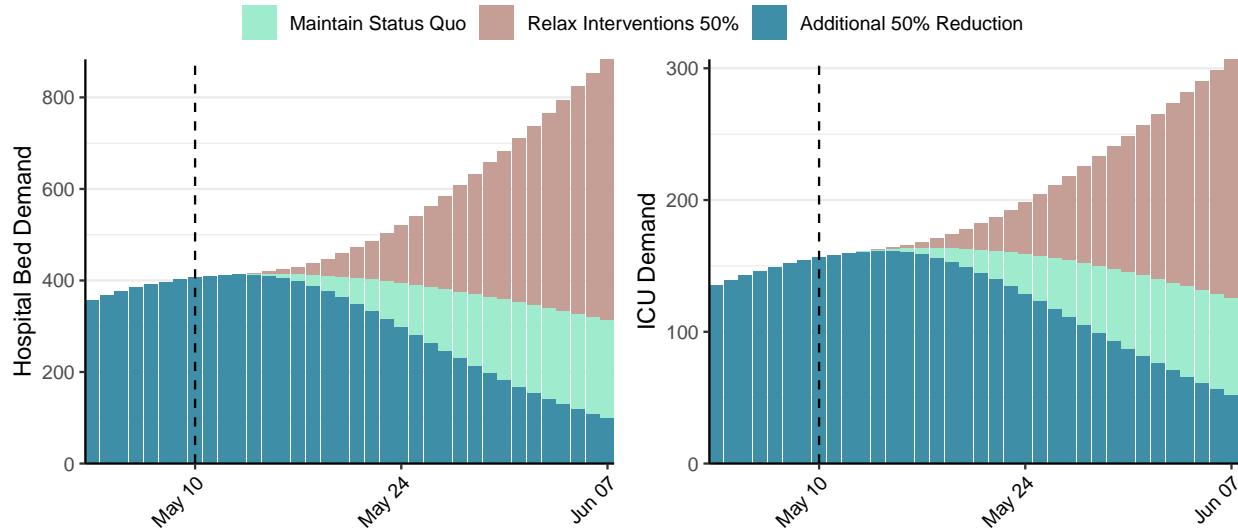


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 7,005 (95% CI: 6,697-7,313) at the current date to 425 (95% CI: 402-448) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 7,005 (95% CI: 6,697-7,313) at the current date to 26,066 (95% CI: 24,653-27,479) by 2021-06-07.

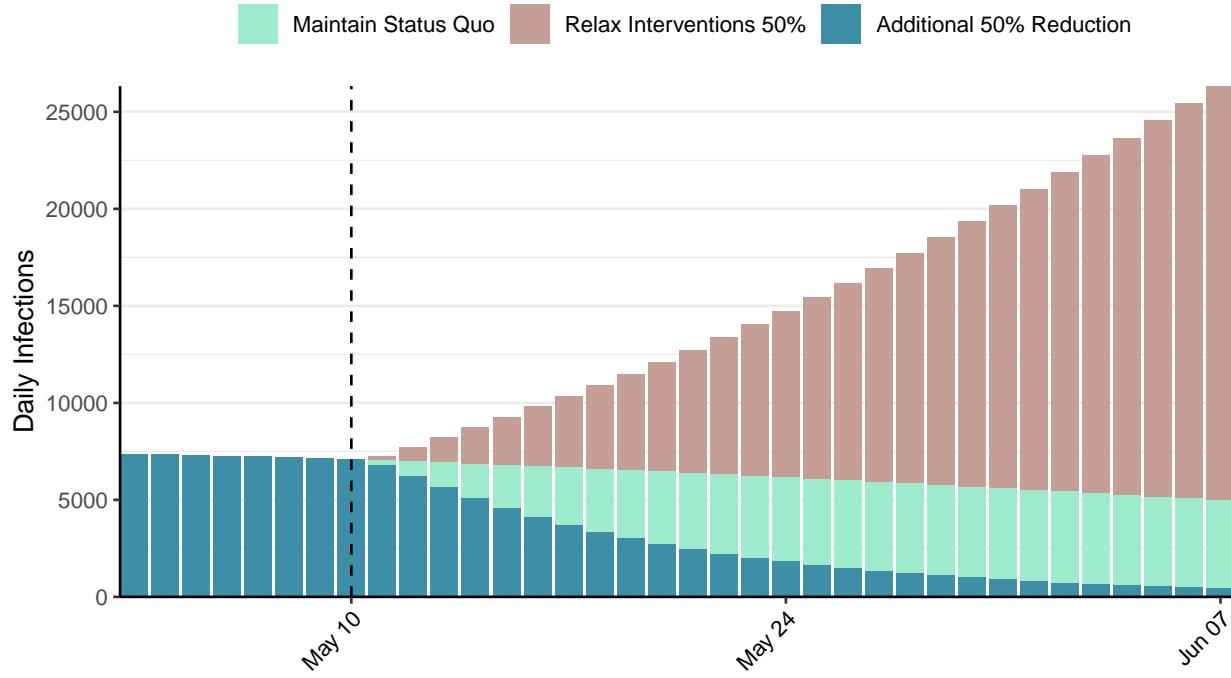


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Algeria, 2021-05-10

[Download the report for Algeria, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
124,288	184	3,335	7	1.05 (95% CI: 0.97-1.14)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

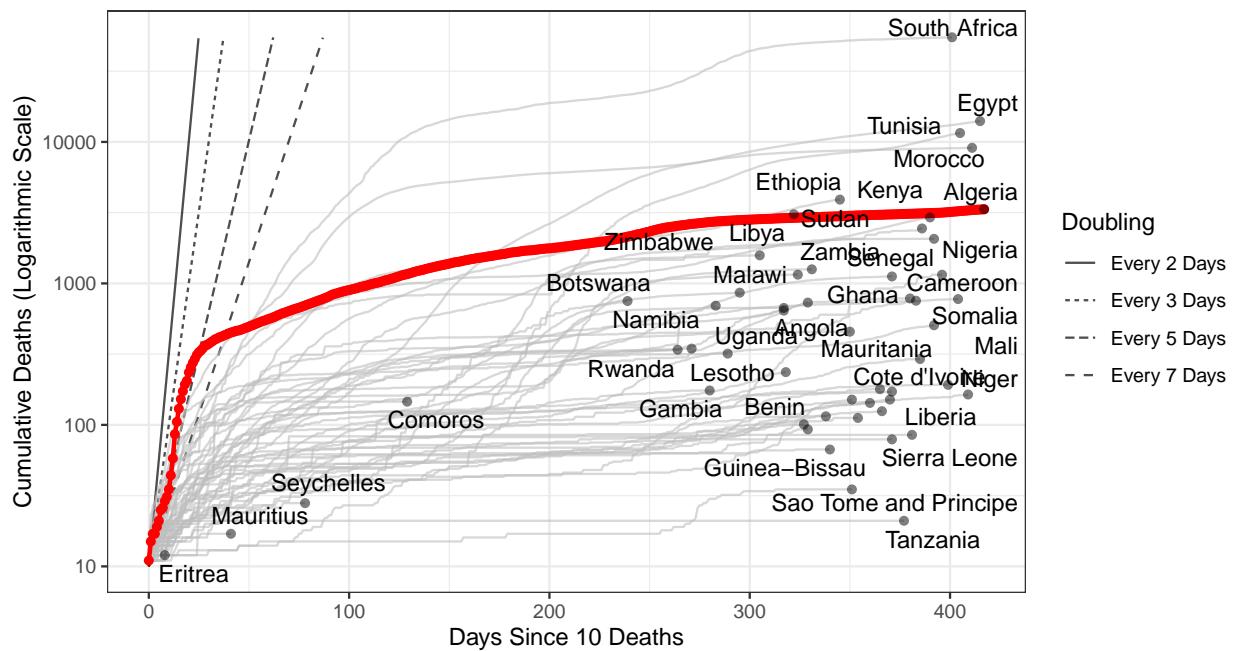


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 73,661 (95% CI: 70,508-76,814) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

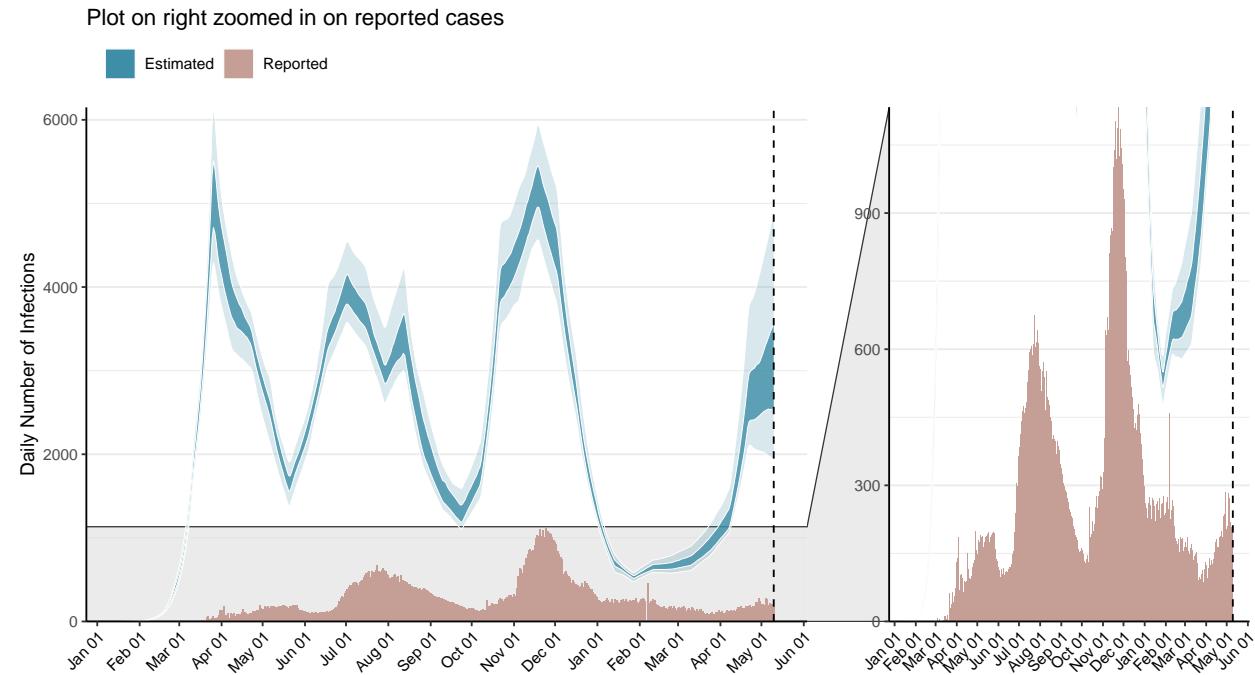
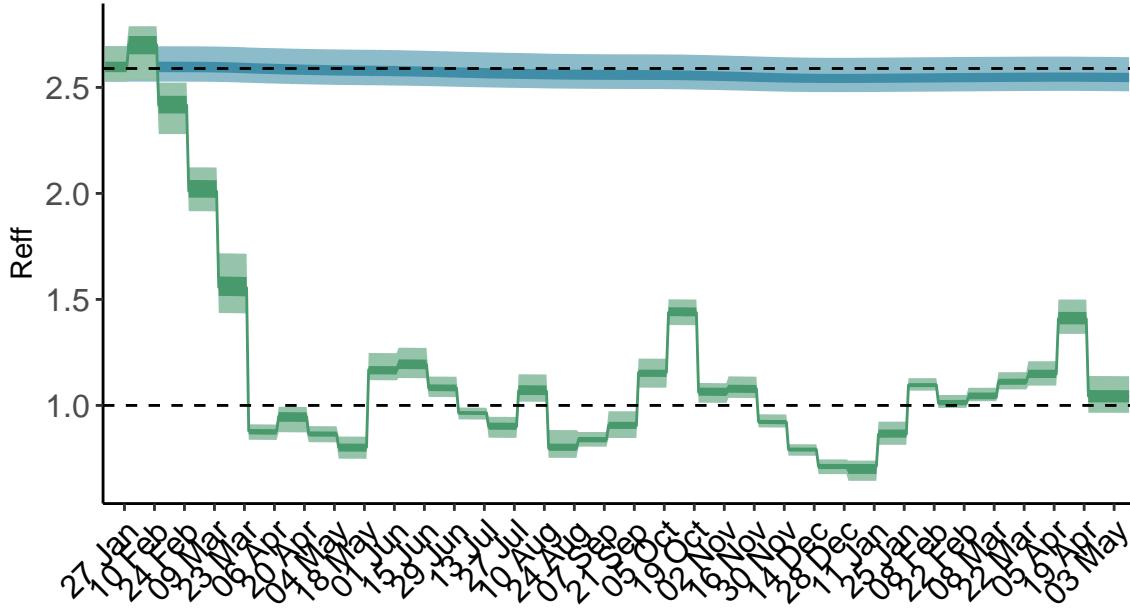


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

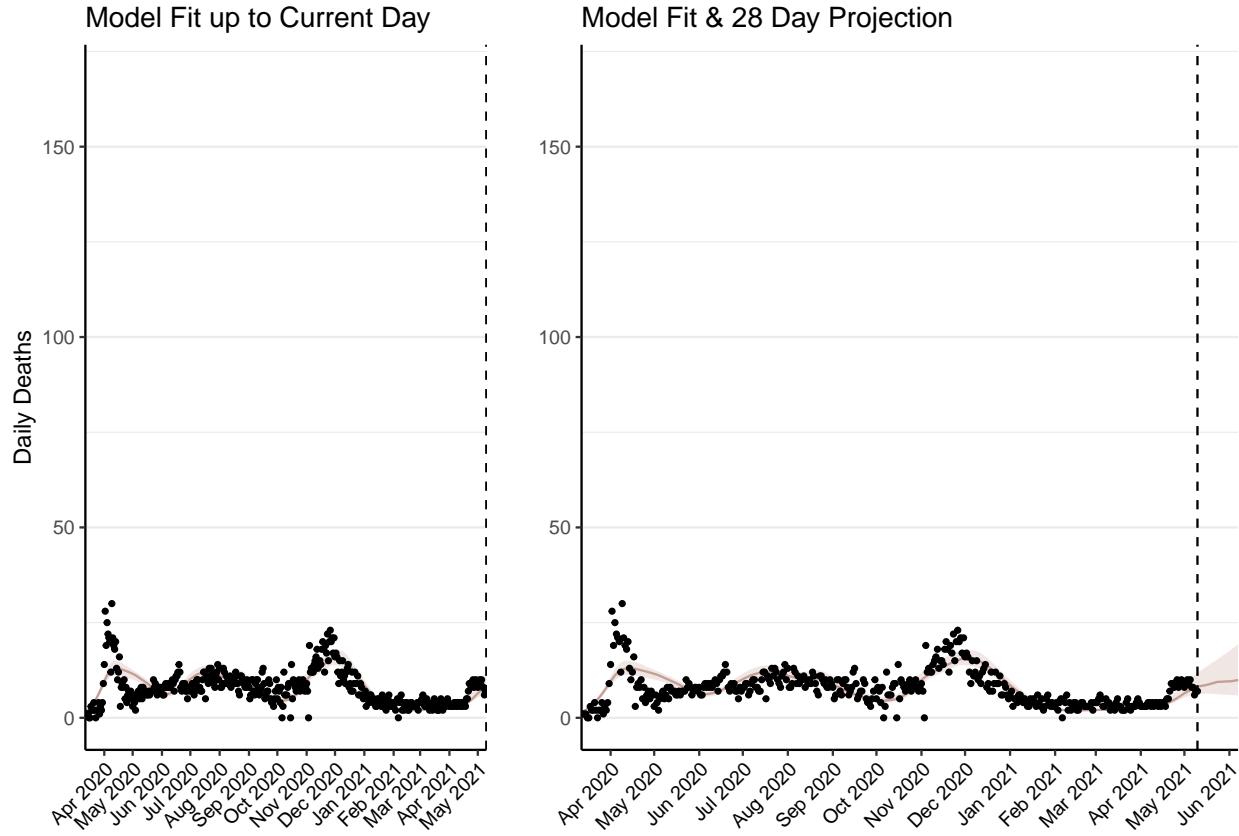


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 327 (95% CI: 312-341) patients requiring treatment with high-pressure oxygen at the current date to 421 (95% CI: 390-453) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 120 (95% CI: 114-125) patients requiring treatment with mechanical ventilation at the current date to 159 (95% CI: 147-170) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

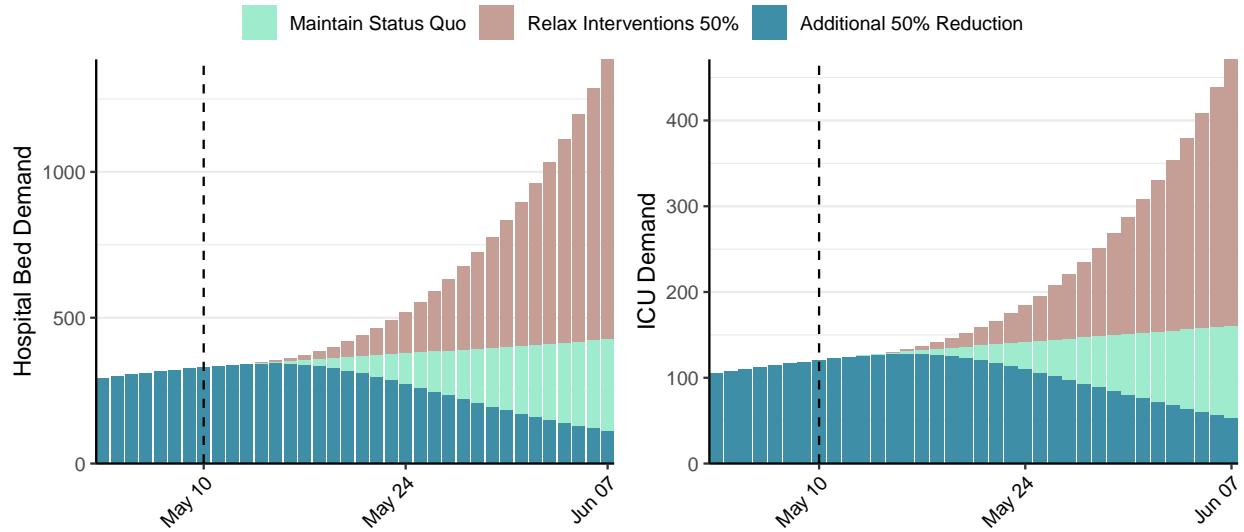


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 3,062 (95% CI: 2,894-3,230) at the current date to 291 (95% CI: 267-315) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 3,062 (95% CI: 2,894-3,230) at the current date to 24,123 (95% CI: 21,852-26,394) by 2021-06-07.

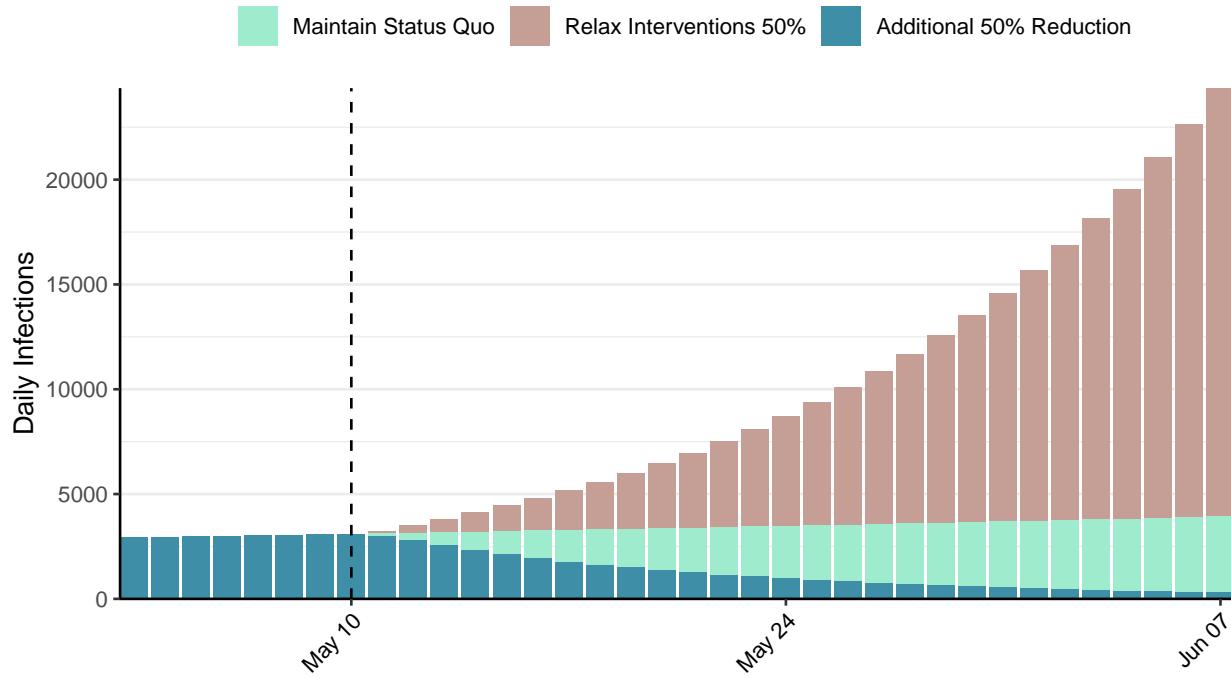


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Ecuador, 2021-05-10

[Download the report for Ecuador, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
402,594	535	19,286	44	0.95 (95% CI: 0.83-1.04)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

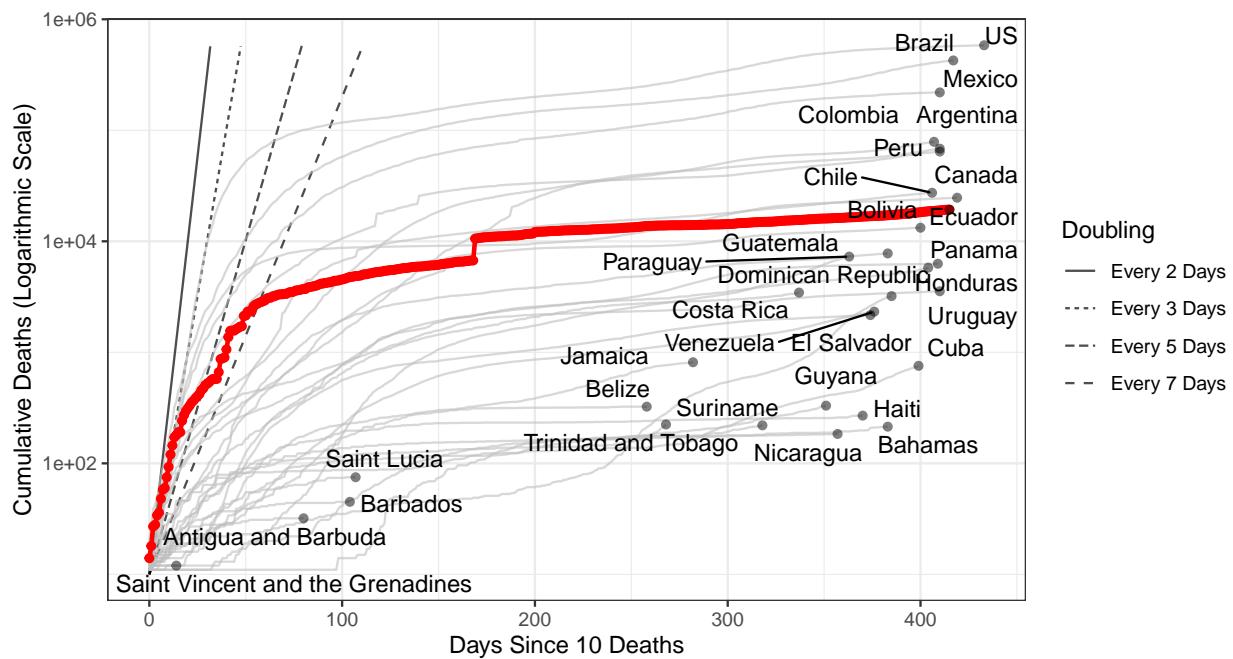


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 719,729 (95% CI: 698,639–740,820) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

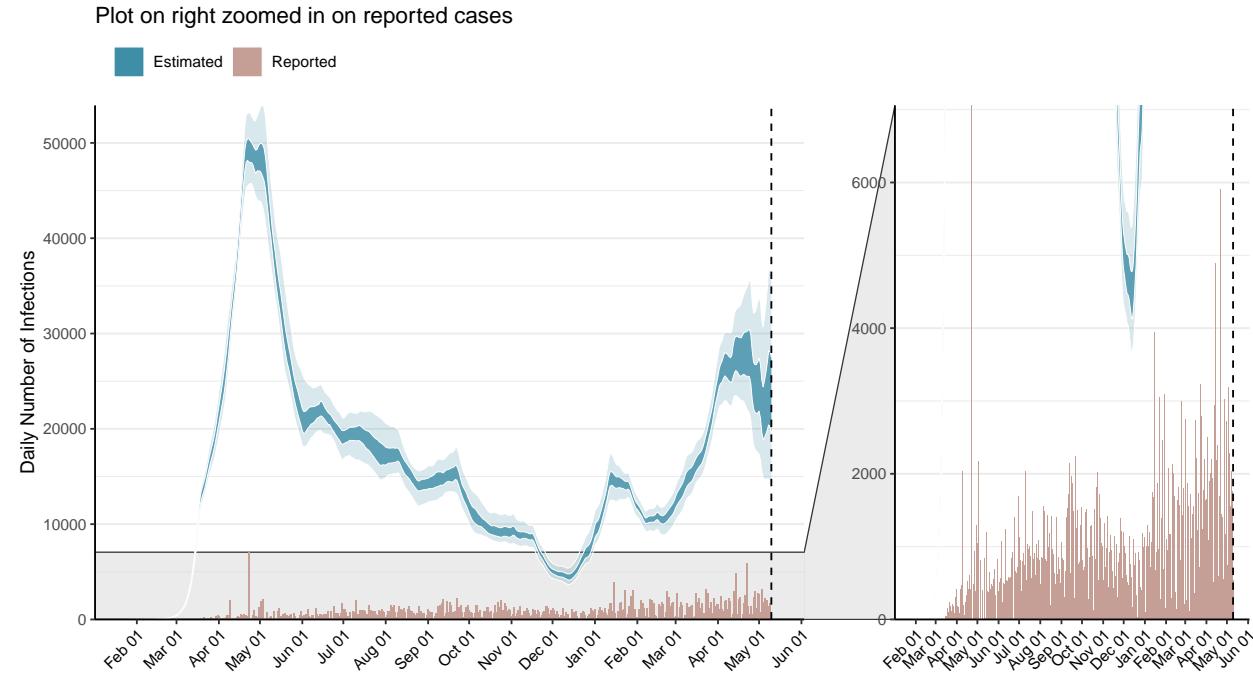
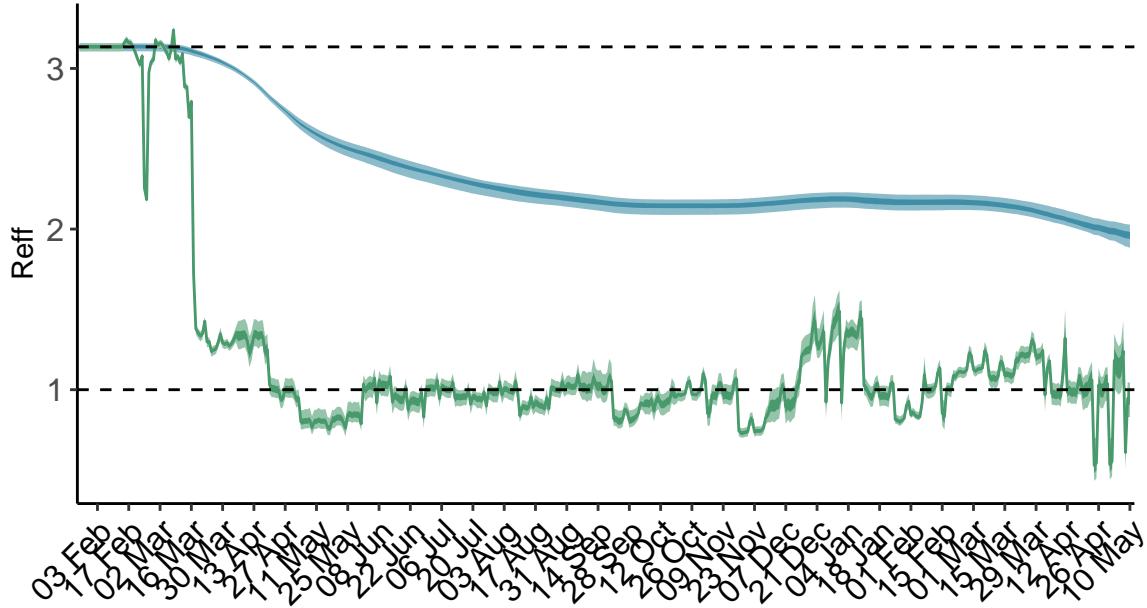


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Ecuador is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

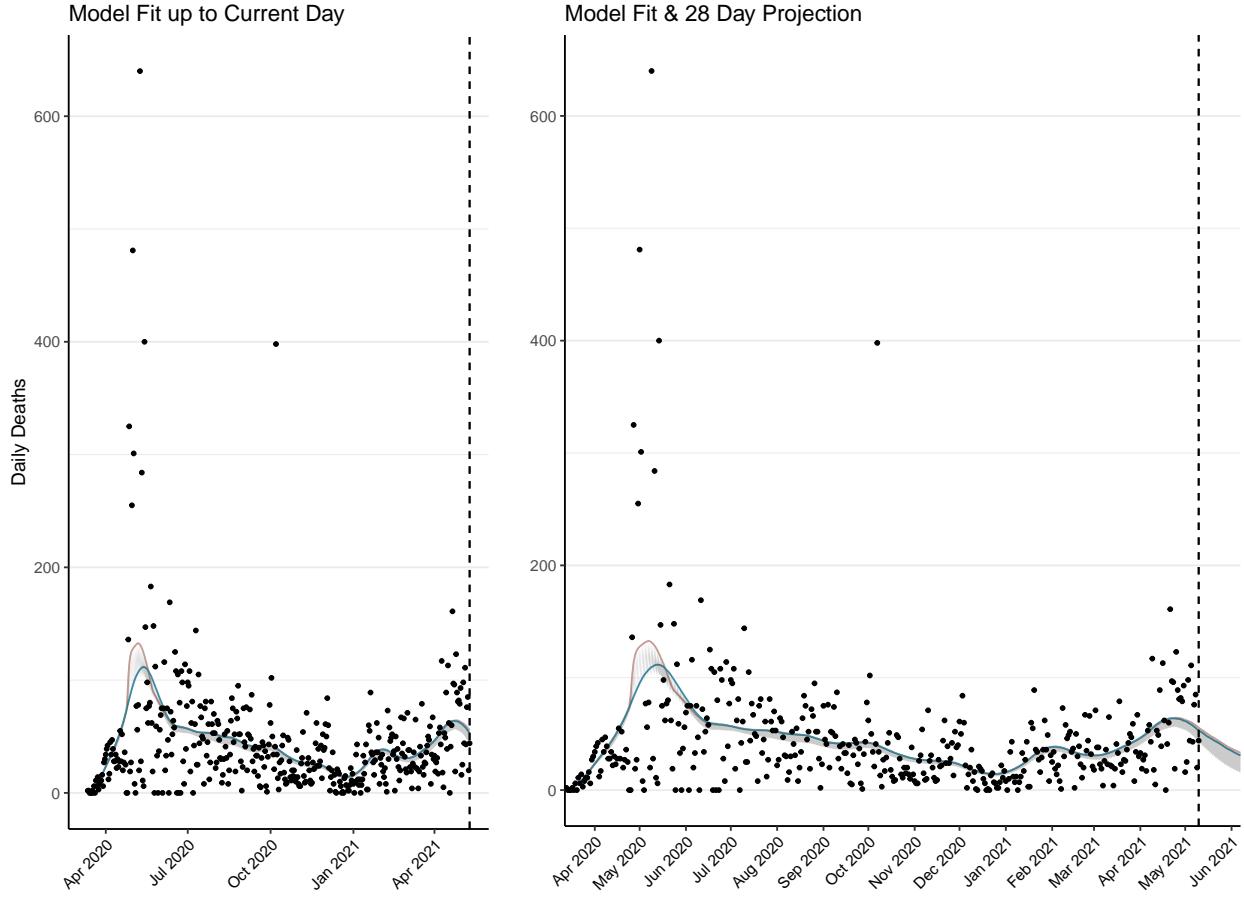


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 2,131 (95% CI: 2,064-2,198) patients requiring treatment with high-pressure oxygen at the current date to 1,430 (95% CI: 1,326-1,535) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 889 (95% CI: 867-911) patients requiring treatment with mechanical ventilation at the current date to 620 (95% CI: 579-661) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

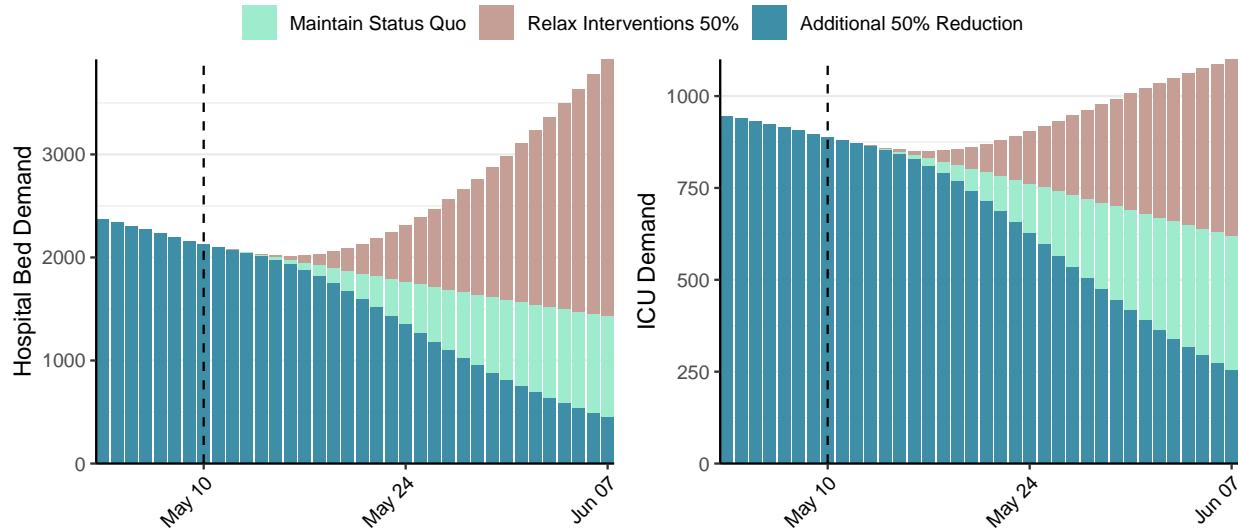
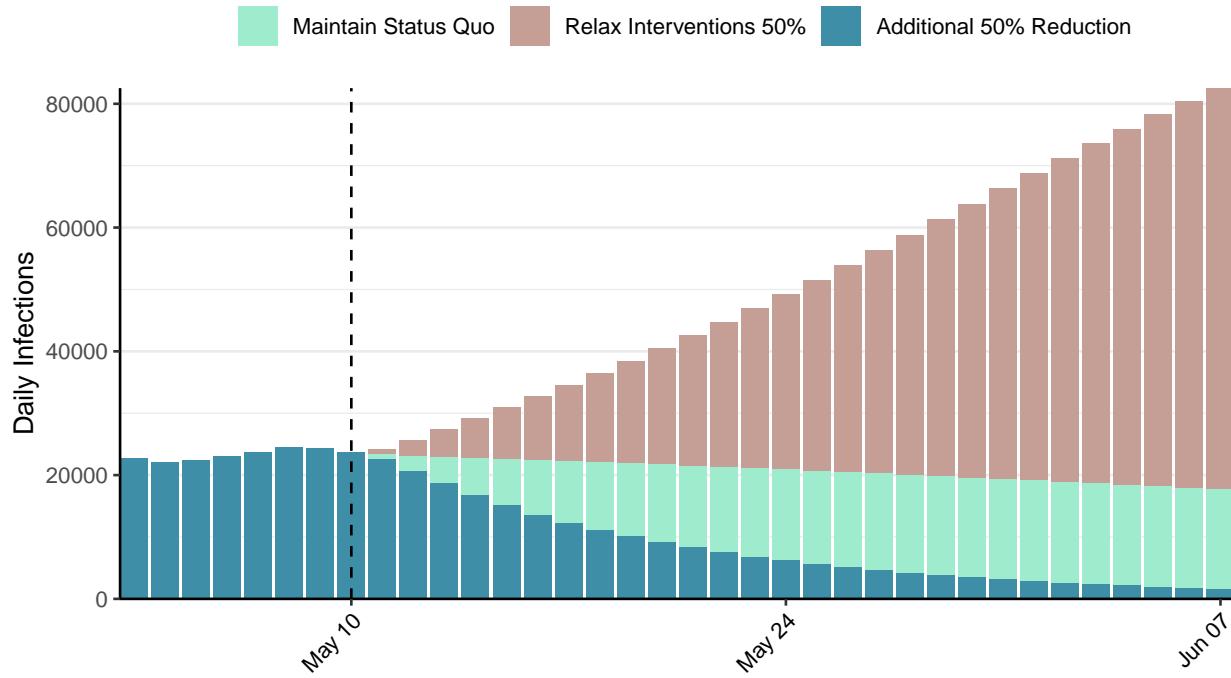


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 23,730 (95% CI: 22,549-24,912) at the current date to 1,570 (95% CI: 1,438-1,702) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 23,730 (95% CI: 22,549-24,912) at the current date to 82,535 (95% CI: 76,361-88,708) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Egypt, 2021-05-10

[Download the report for Egypt, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
238,560	1,150	13,972	68	0.88 (95% CI: 0.81-0.95)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

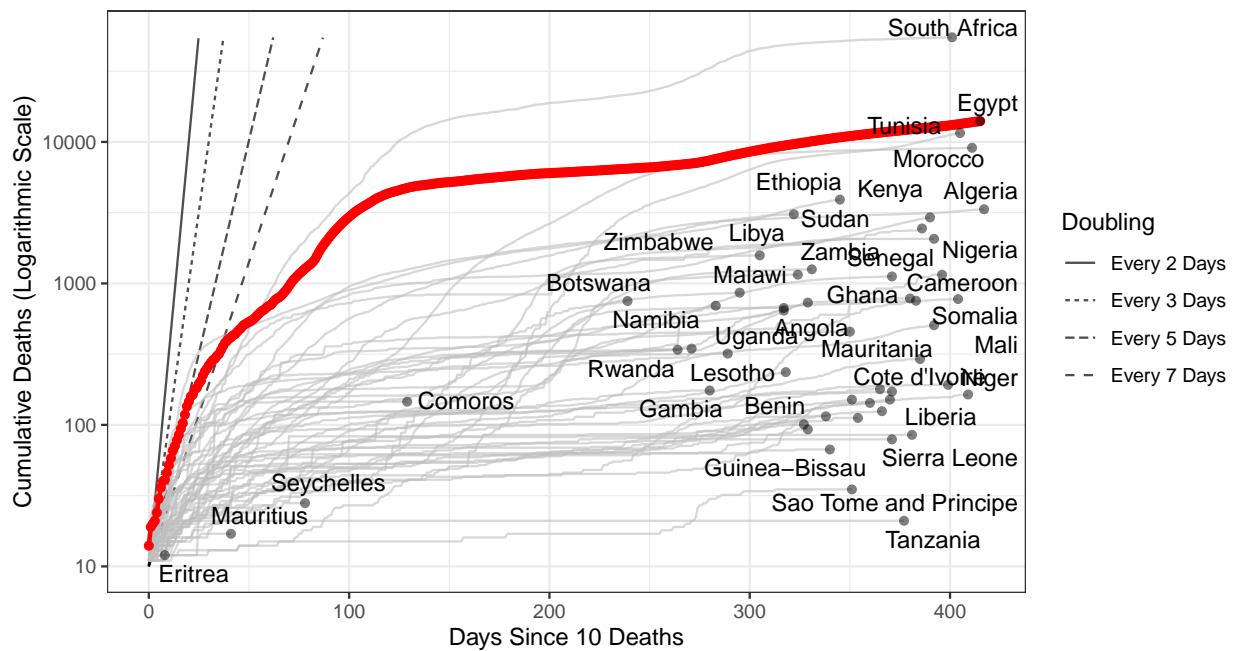


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 644,030 (95% CI: 622,520–665,541) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

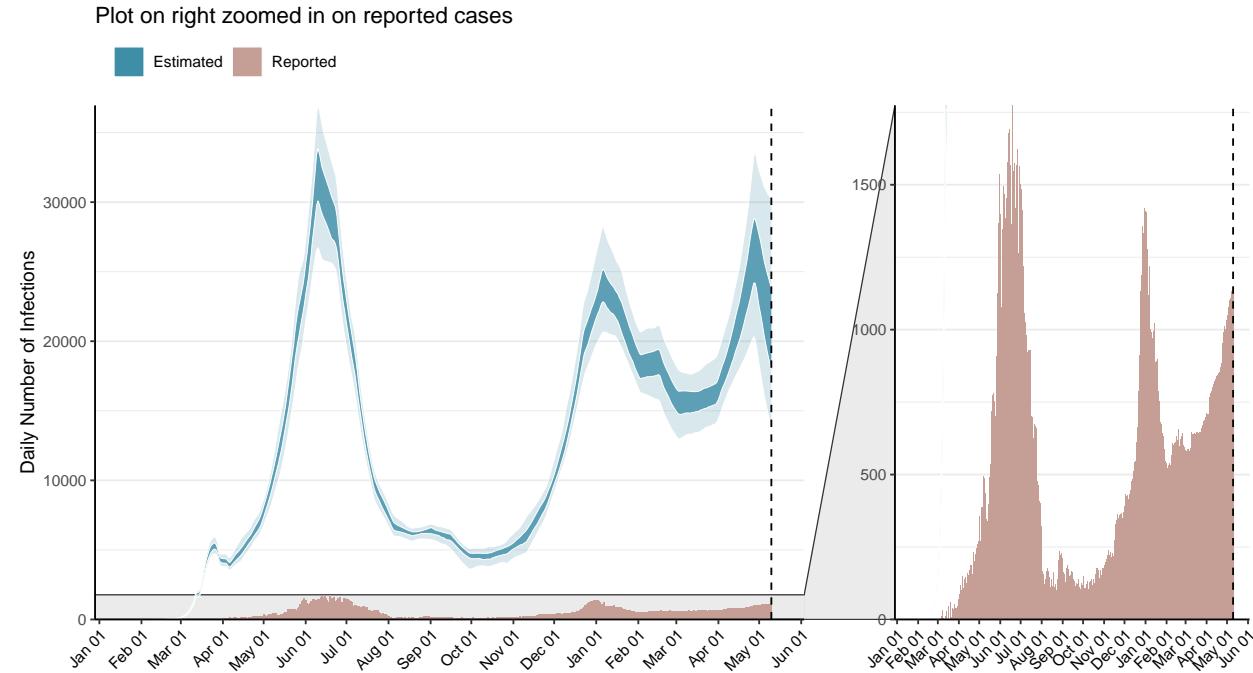
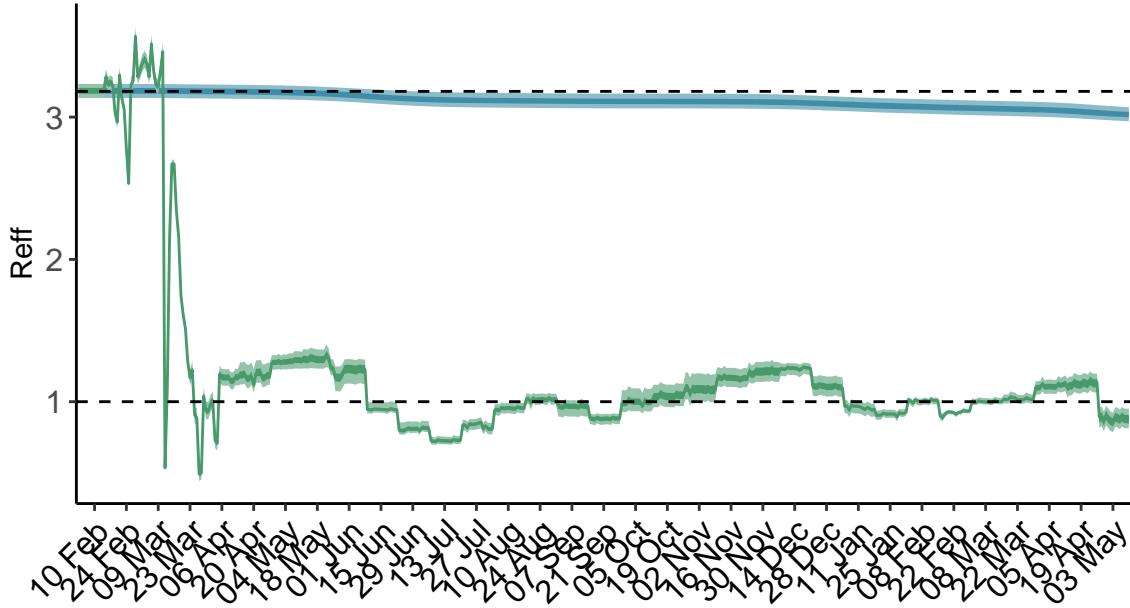


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

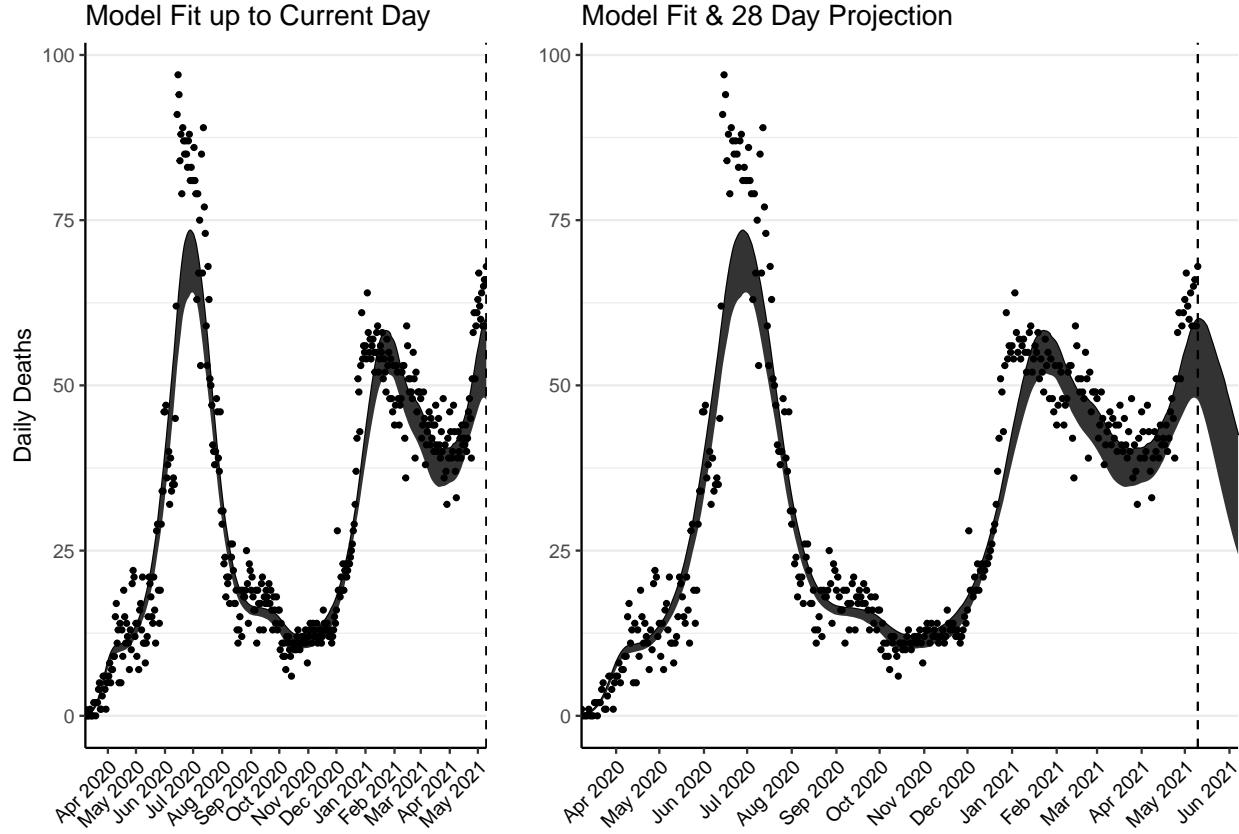


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 2,278 (95% CI: 2,199-2,357) patients requiring treatment with high-pressure oxygen at the current date to 1,511 (95% CI: 1,418-1,603) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 880 (95% CI: 851-909) patients requiring treatment with mechanical ventilation at the current date to 623 (95% CI: 587-659) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

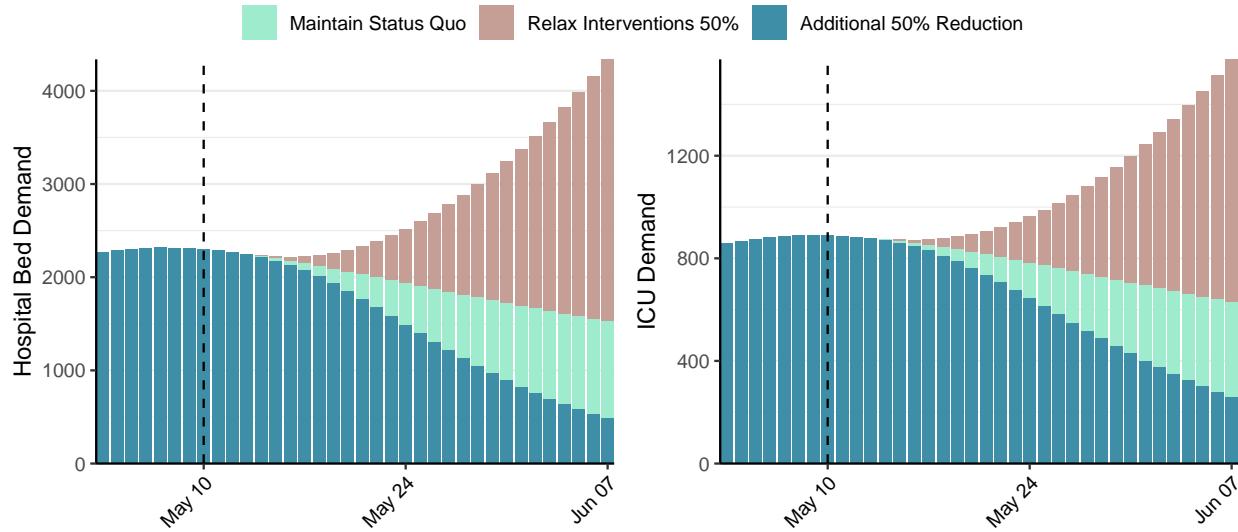


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 20,792 (95% CI: 19,850-21,734) at the current date to 1,111 (95% CI: 1,034-1,188) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 20,792 (95% CI: 19,850-21,734) at the current date to 70,784 (95% CI: 65,191-76,376) by 2021-06-07.

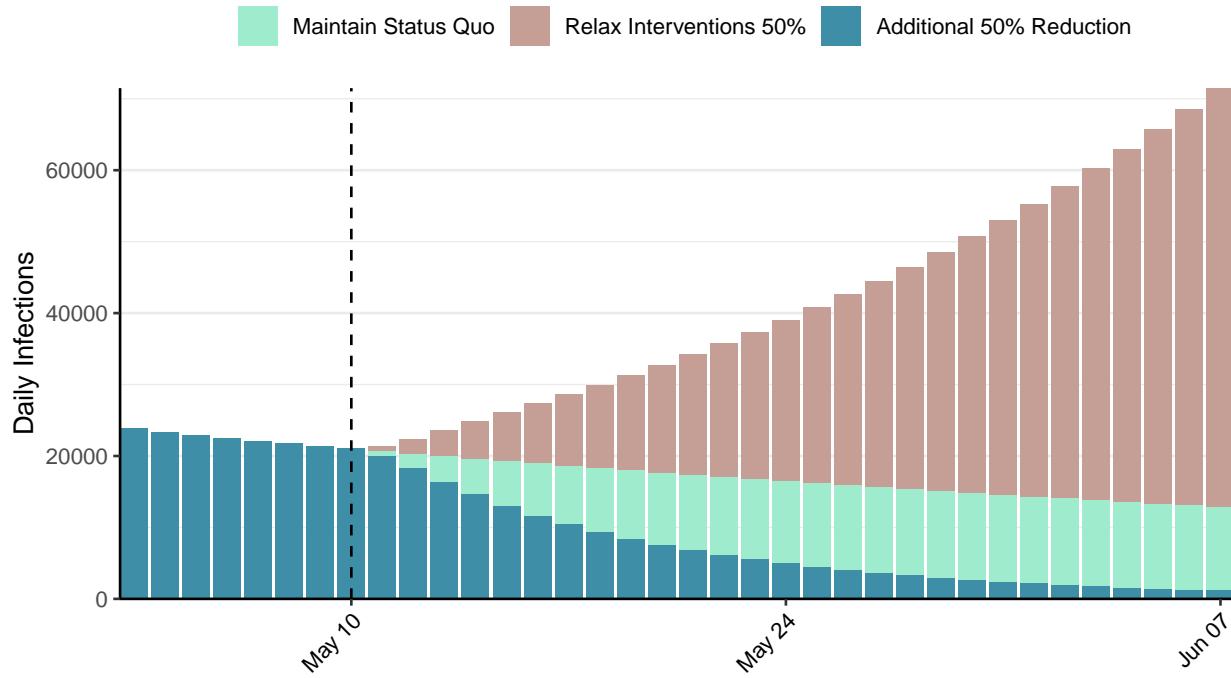


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool - https://covid19sim.org/](https://covid19sim.org/), which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Eritrea, 2021-05-10

[Download the report for Eritrea, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
3,754	12	12	0	0.78 (95% CI: 0.49-1.1)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

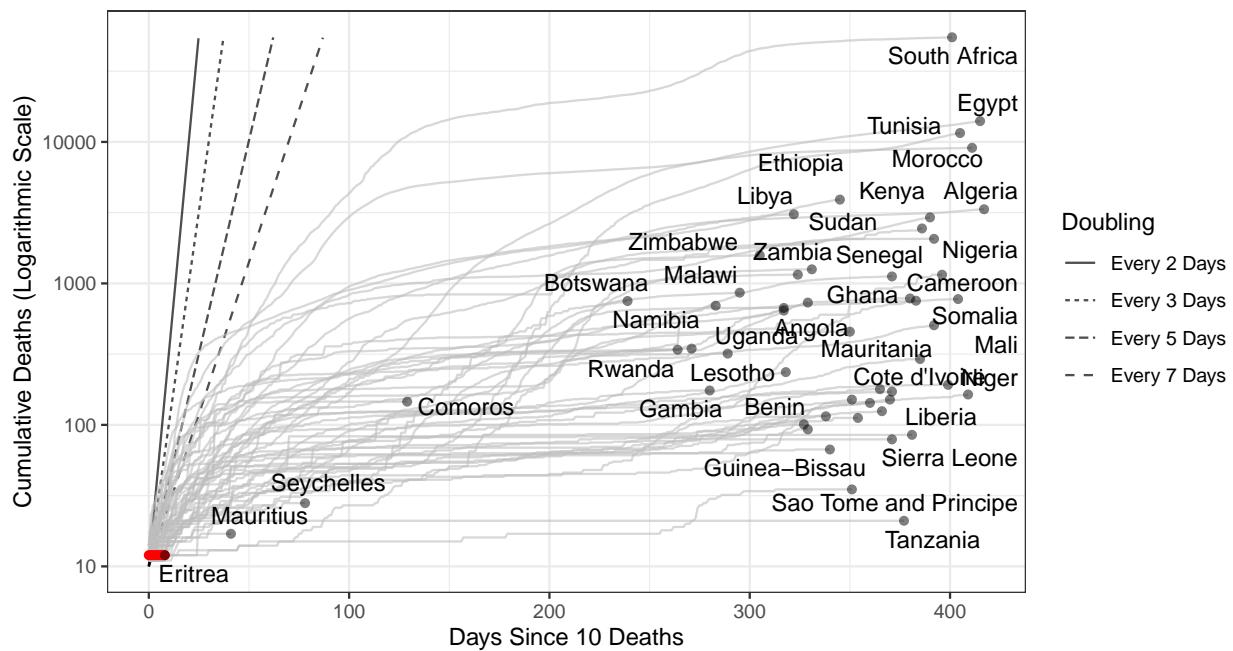


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 463 (95% CI: 401-526) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

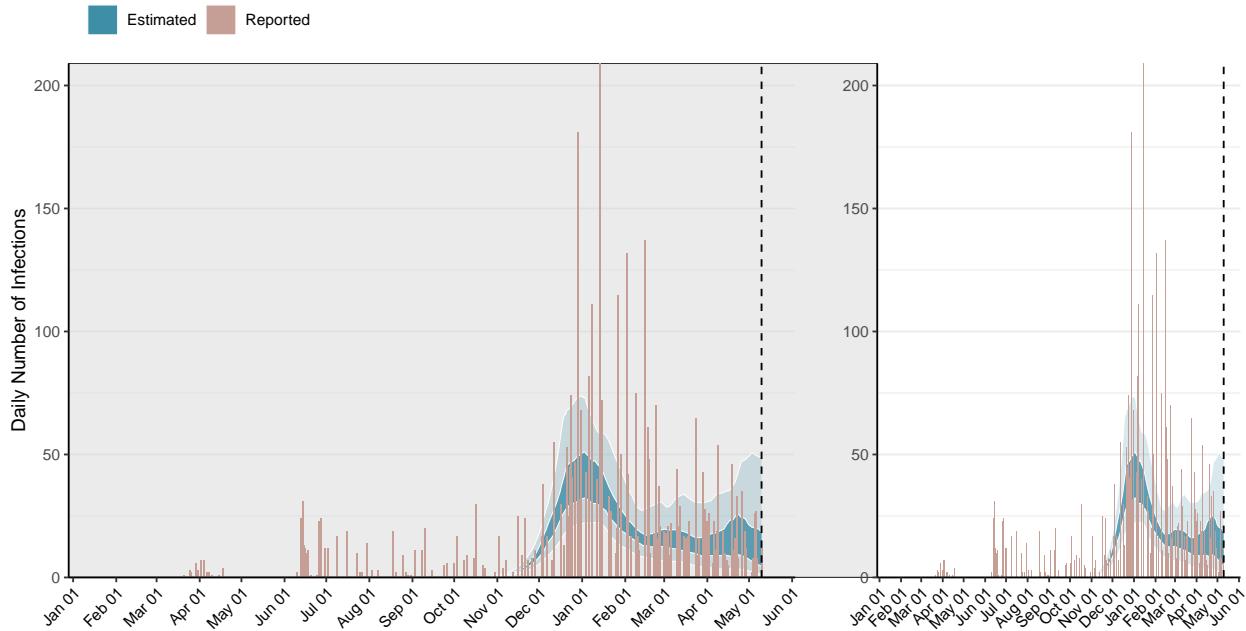
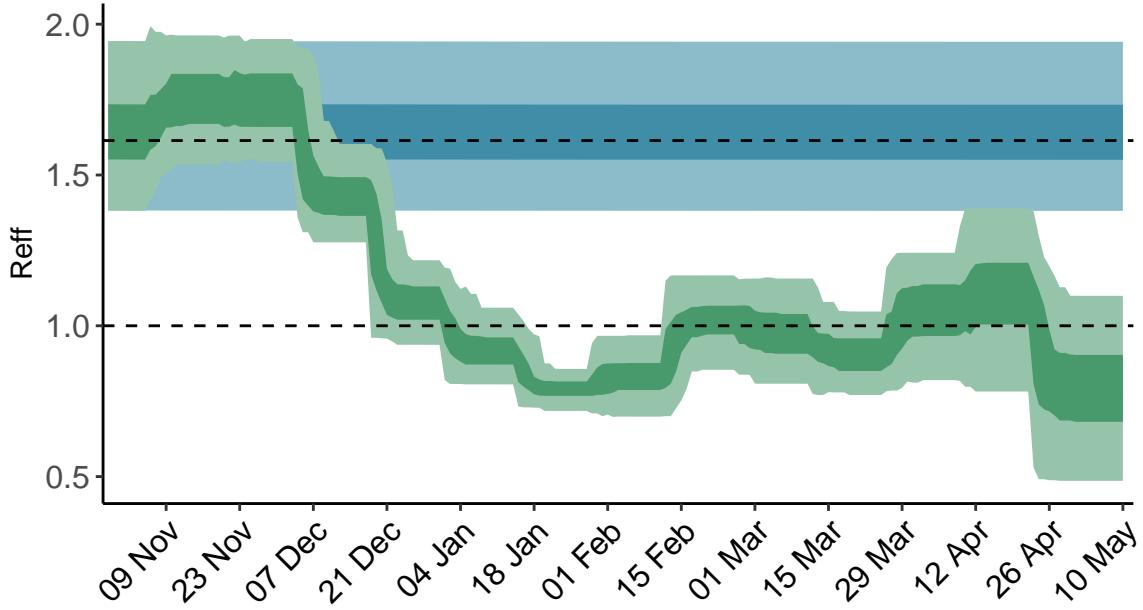


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

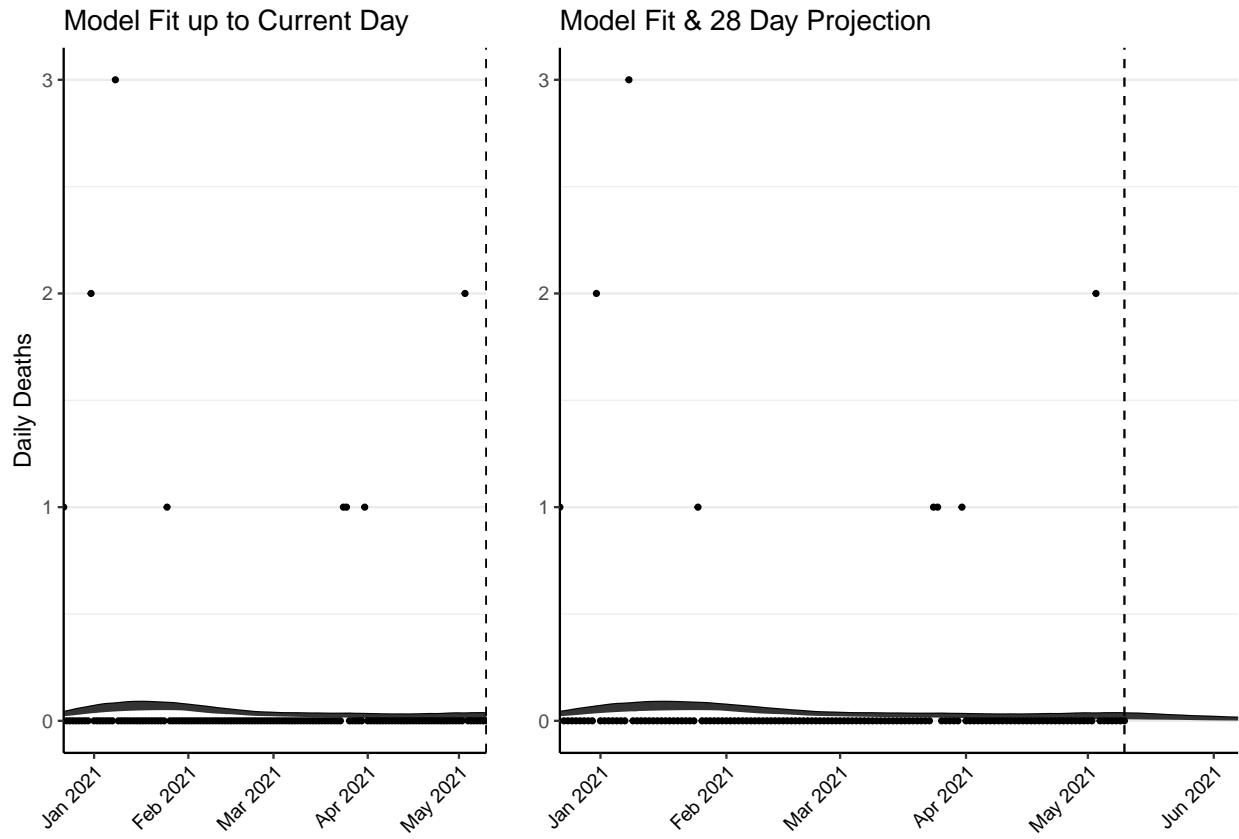


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 1 (95% CI: 1-2) patients requiring treatment with high-pressure oxygen at the current date to 1 (95% CI: 1-1) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1 (95% CI: 0-1) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

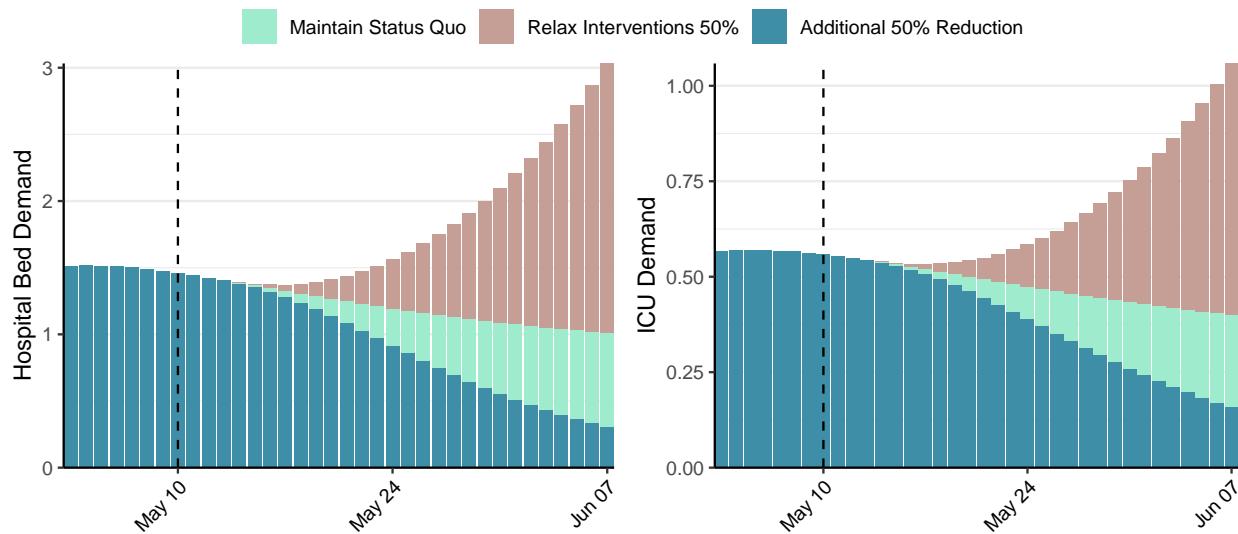


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 14 (95% CI: 11-17) at the current date to 1 (95% CI: 1-1) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 14 (95% CI: 11-17) at the current date to 64 (95% CI: 40-87) by 2021-06-07.

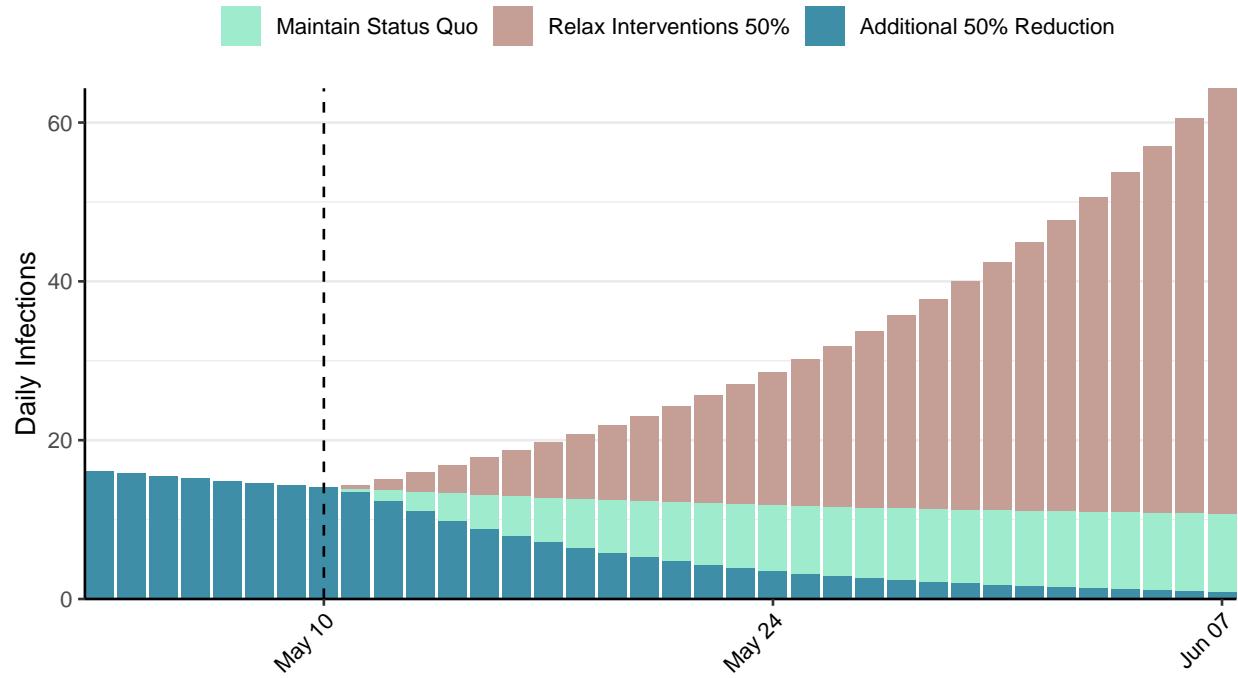


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Ethiopia, 2021-05-10

[Download the report for Ethiopia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
263,120	418	3,897	9	0.78 (95% CI: 0.72-0.85)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

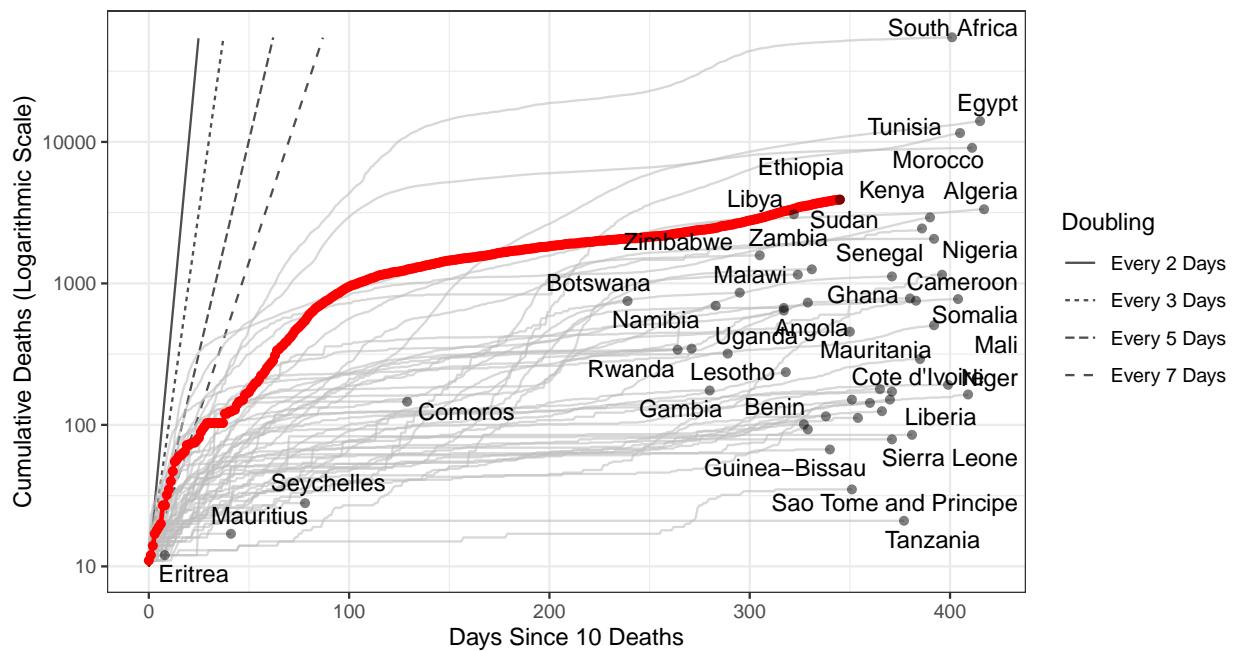


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 274,016 (95% CI: 265,073–282,958) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

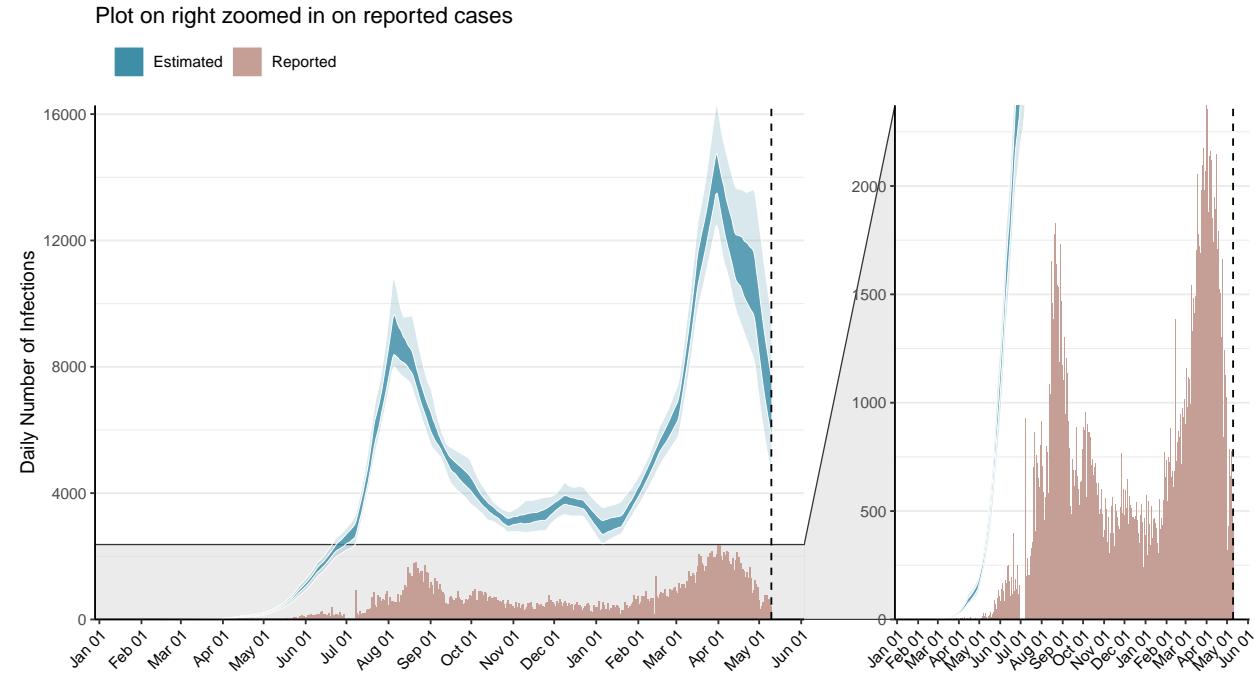
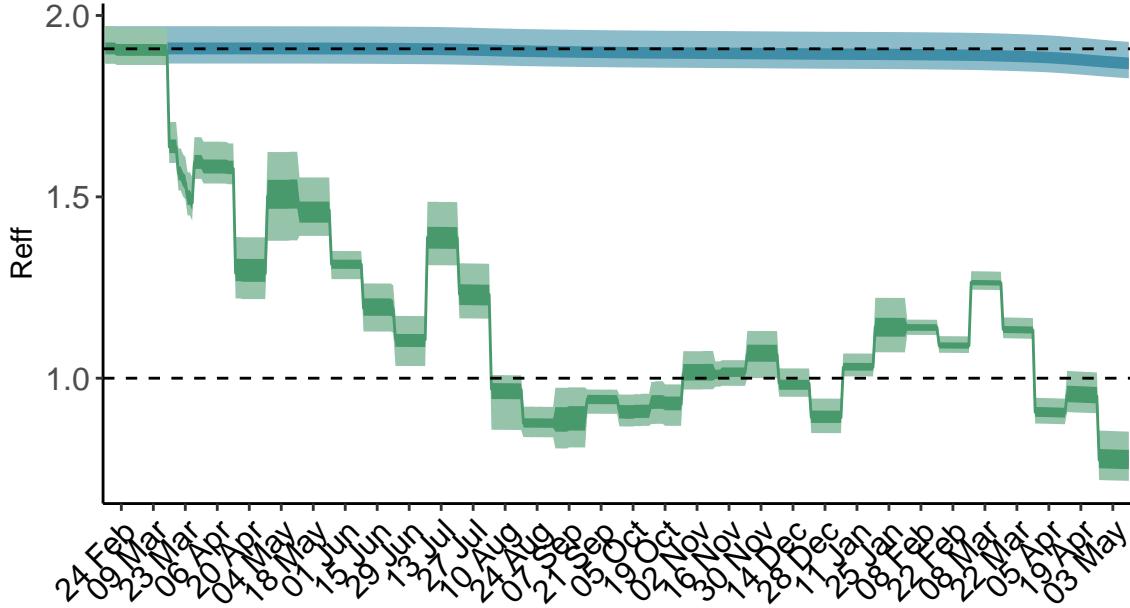


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

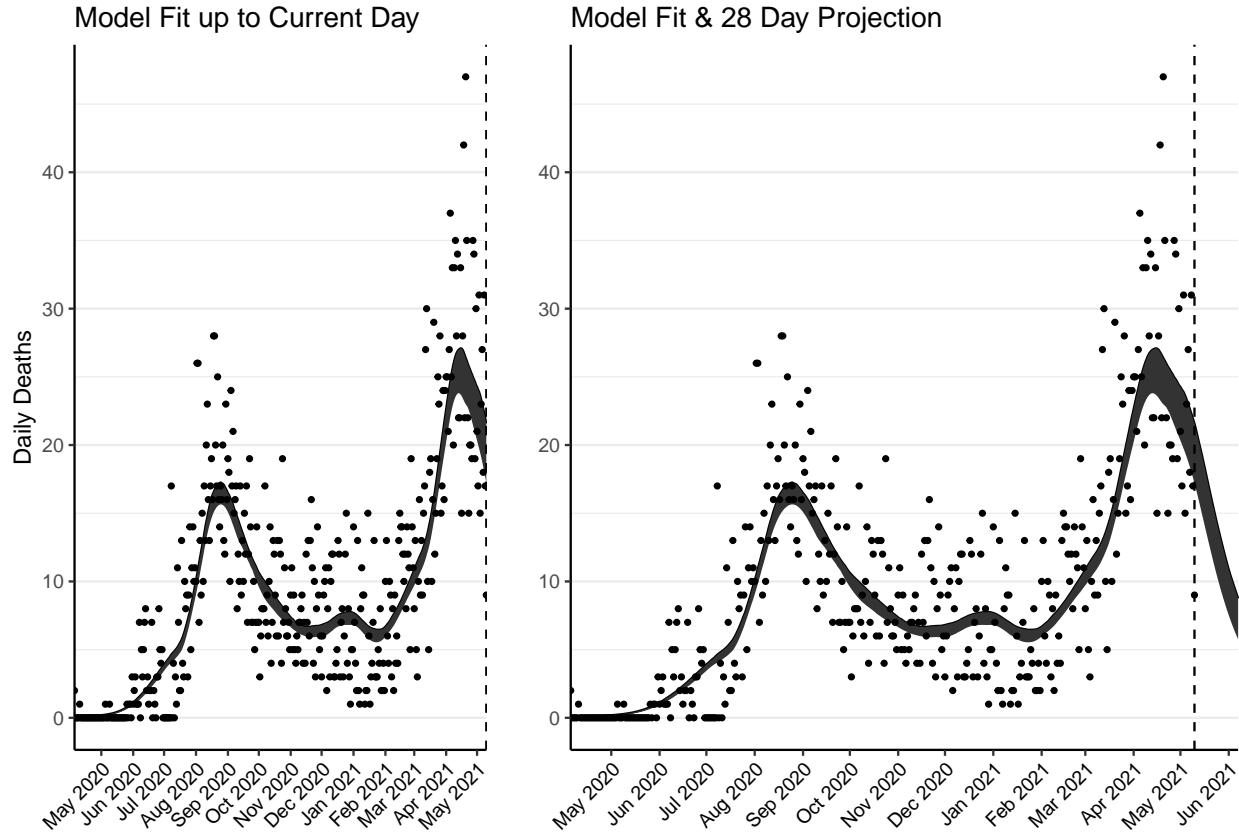


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 780 (95% CI: 754-807) patients requiring treatment with high-pressure oxygen at the current date to 317 (95% CI: 298-337) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 314 (95% CI: 304-324) patients requiring treatment with mechanical ventilation at the current date to 137 (95% CI: 129-145) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

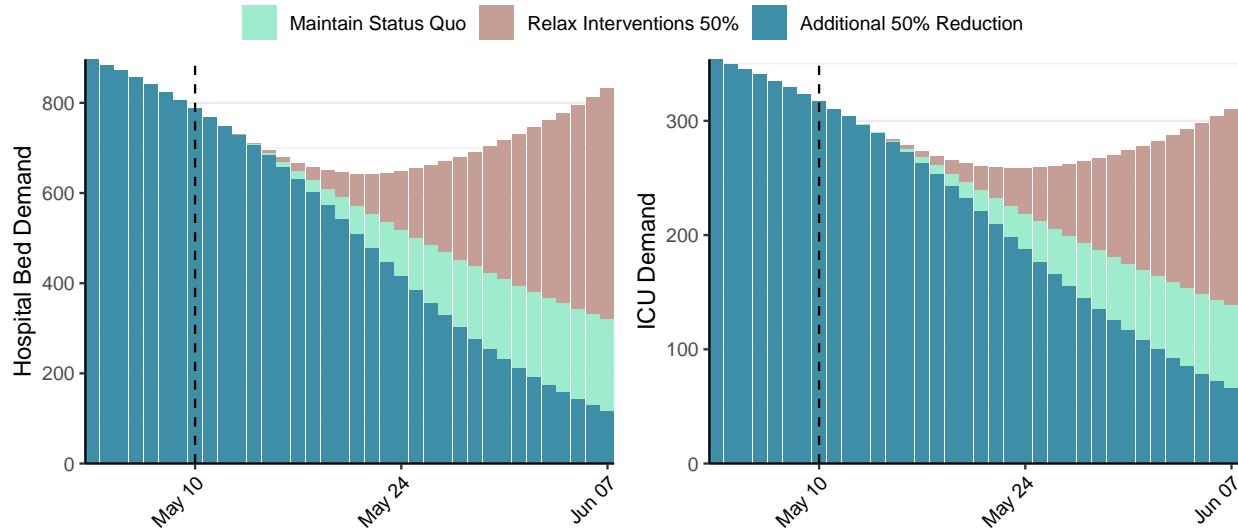
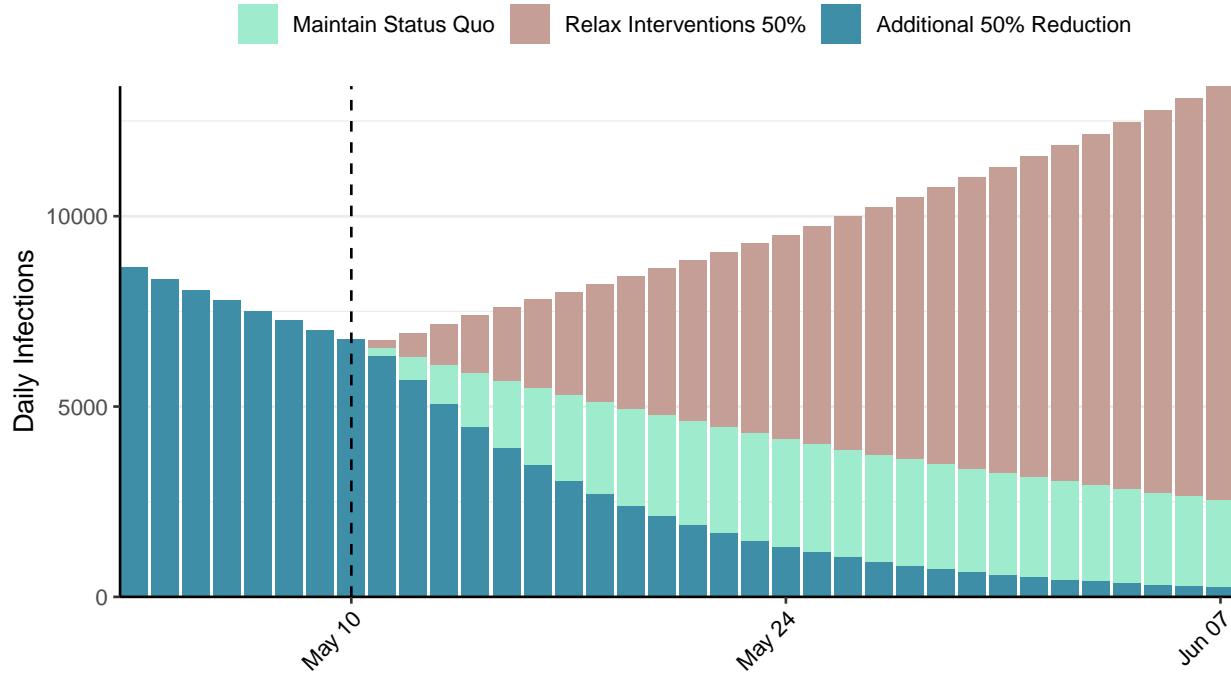


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 6,693 (95% CI: 6,386-7,000) at the current date to 242 (95% CI: 225-260) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 6,693 (95% CI: 6,386-7,000) at the current date to 13,283 (95% CI: 12,154-14,413) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Fiji, 2021-05-10

[Download the report for Fiji, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
140	1	3	0	0.75 (95% CI: 0.45-1.13)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease. **N.B.** Fiji is not shown in the following plot as only 3 deaths have been reported to date

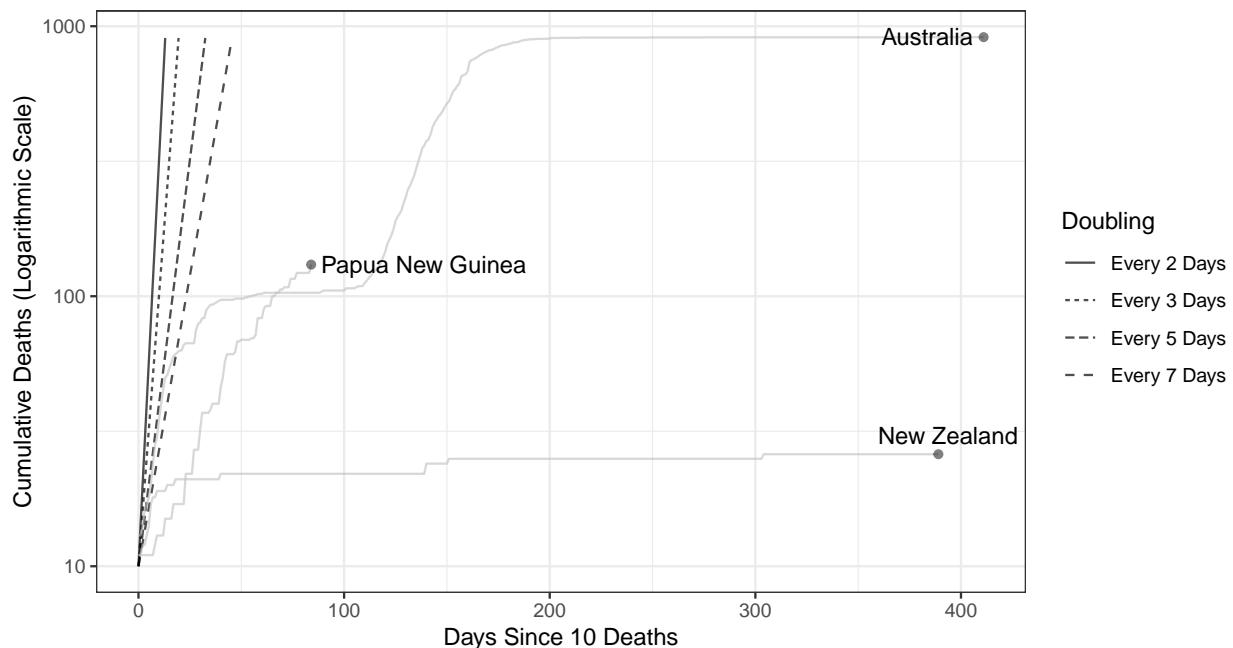


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 363 (95% CI: 304-421) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

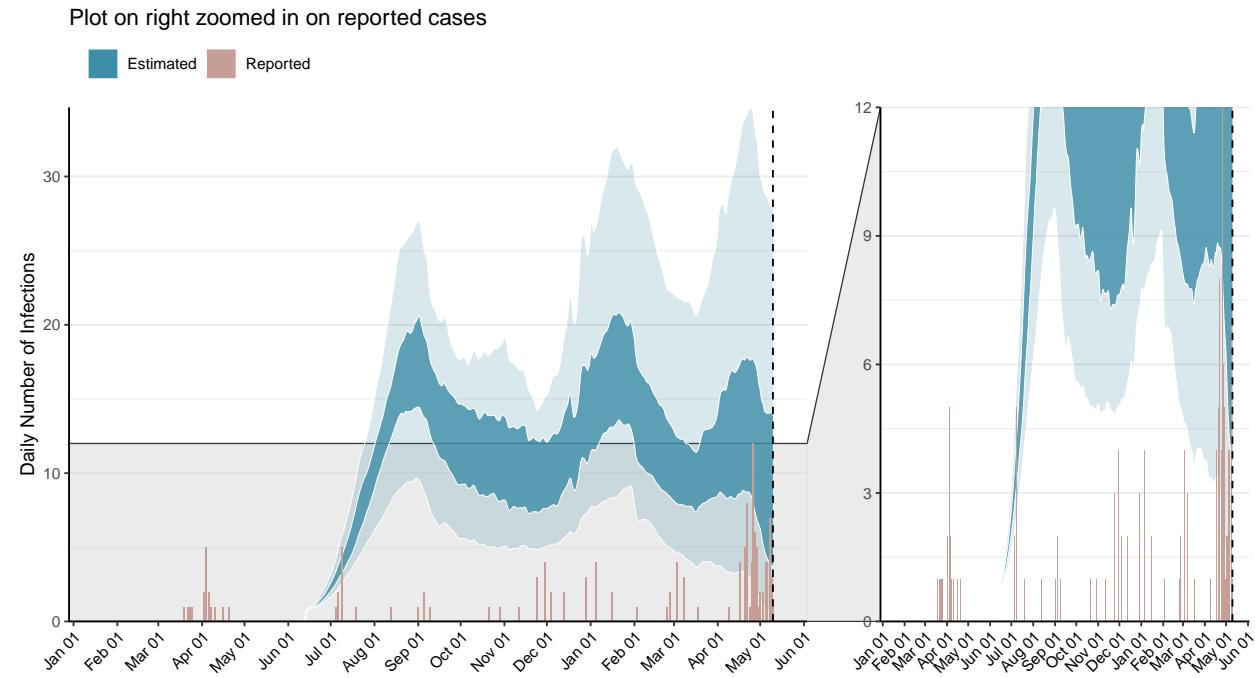
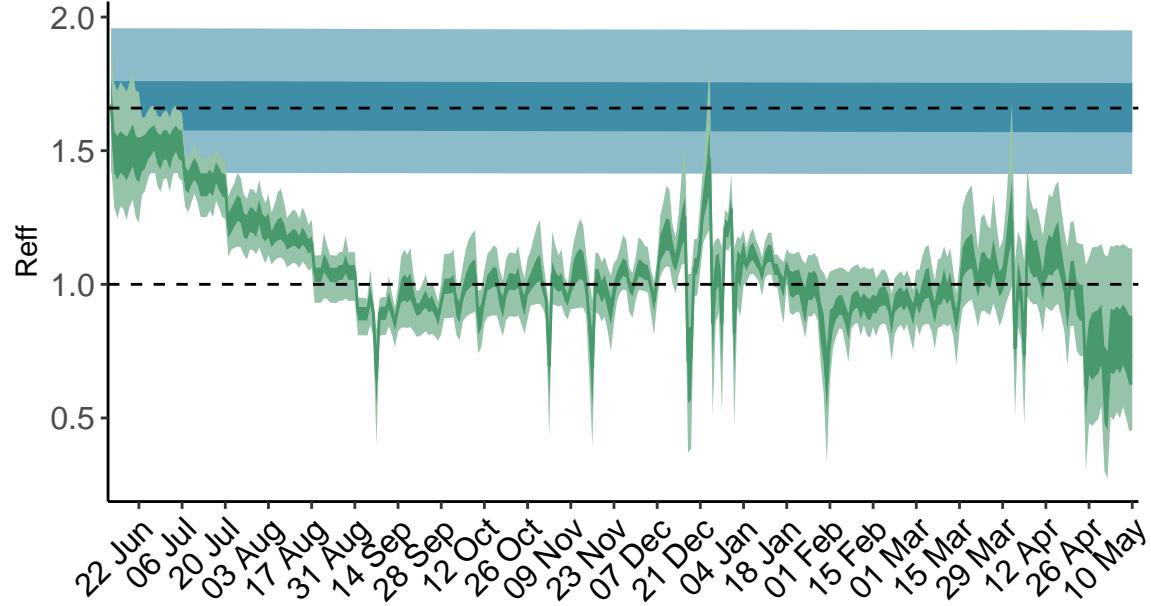


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

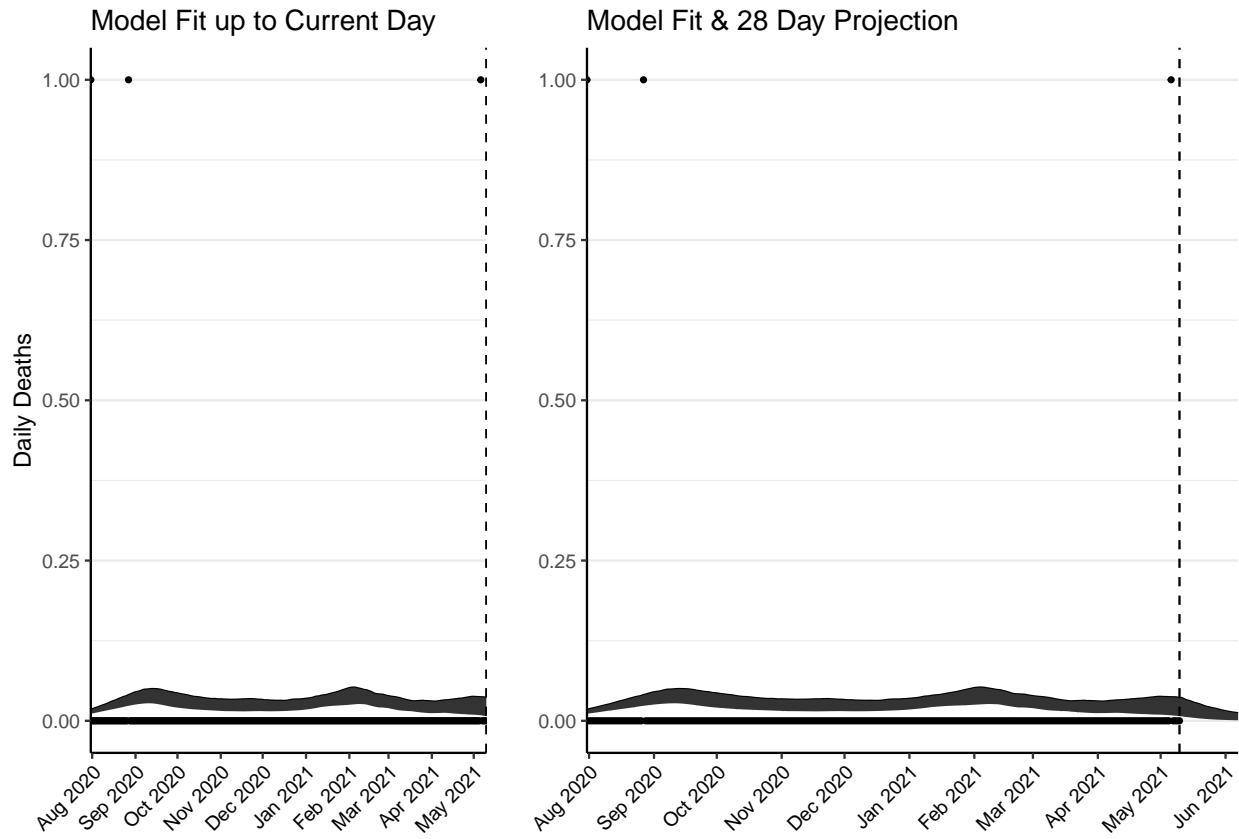


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 1 (95% CI: 1-2) patients requiring treatment with high-pressure oxygen at the current date to 1 (95% CI: 0-2) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1 (95% CI: 1-1) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-1) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

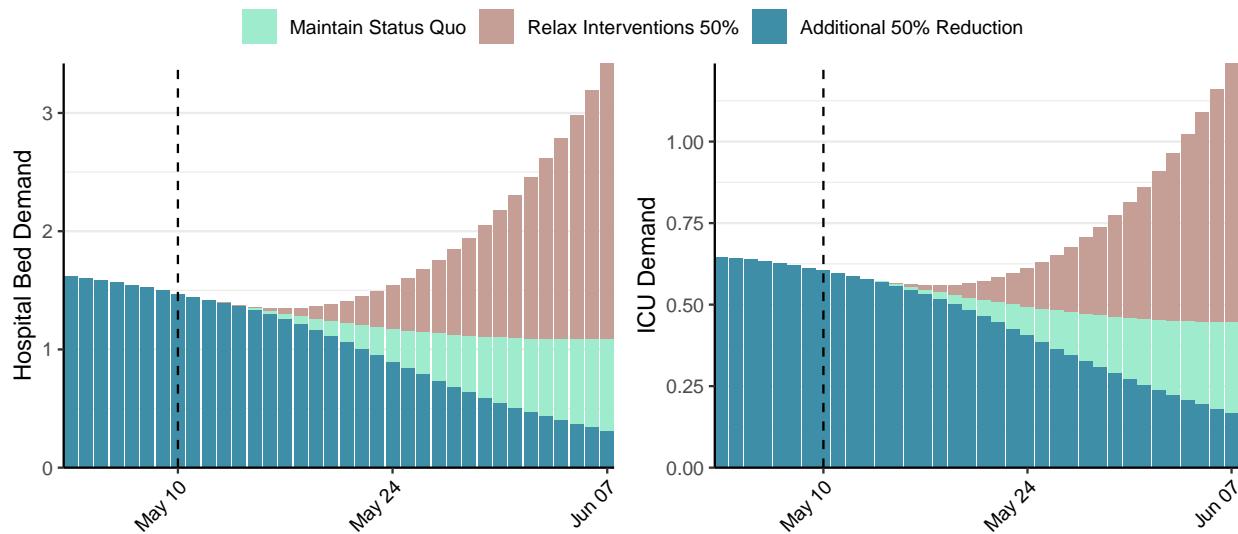


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 10 (95% CI: 7-13) at the current date to 1 (95% CI: 0-1) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 10 (95% CI: 7-13) at the current date to 62 (95% CI: 7-117) by 2021-06-07.

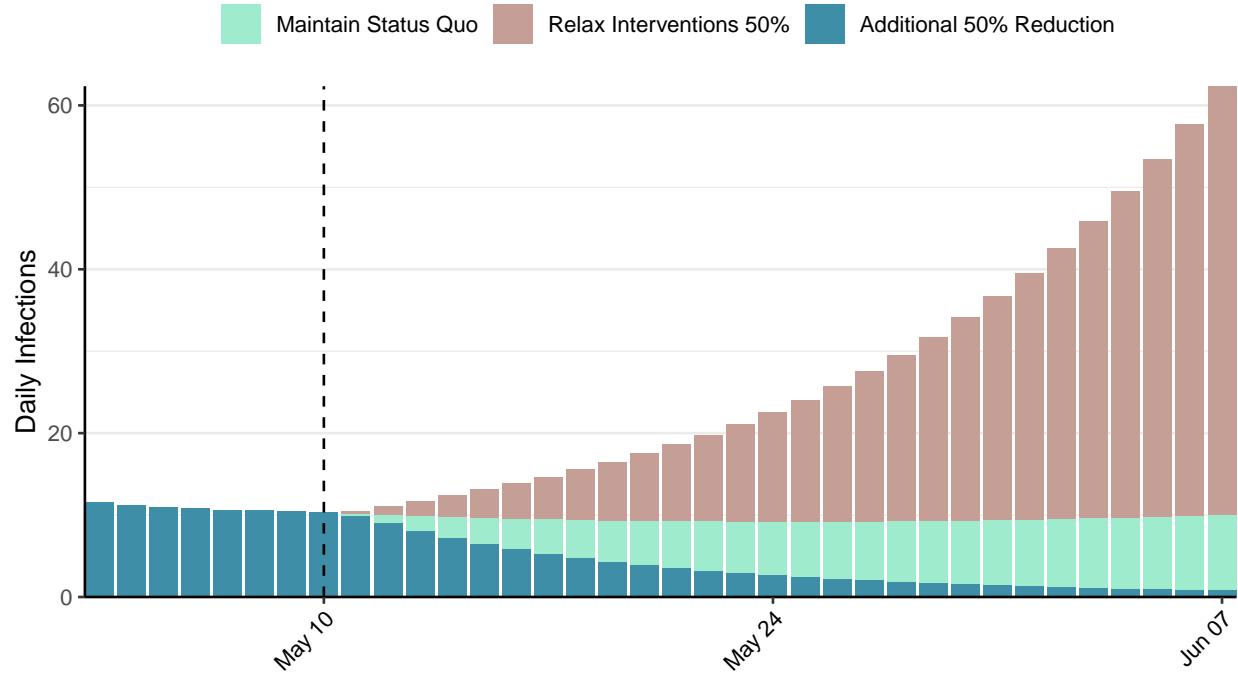


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Gabon, 2021-05-10

[Download the report for Gabon, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
23,565	133	143	0	0.64 (95% CI: 0.53-0.74)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

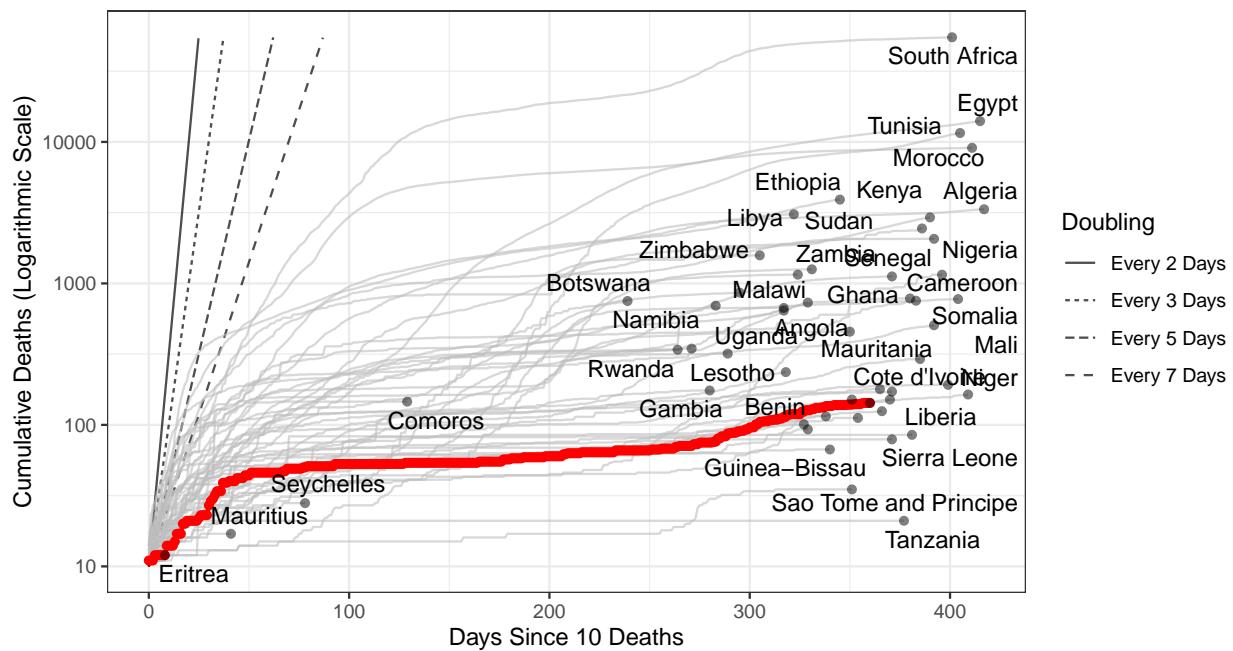


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 4,484 (95% CI: 4,223-4,745) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

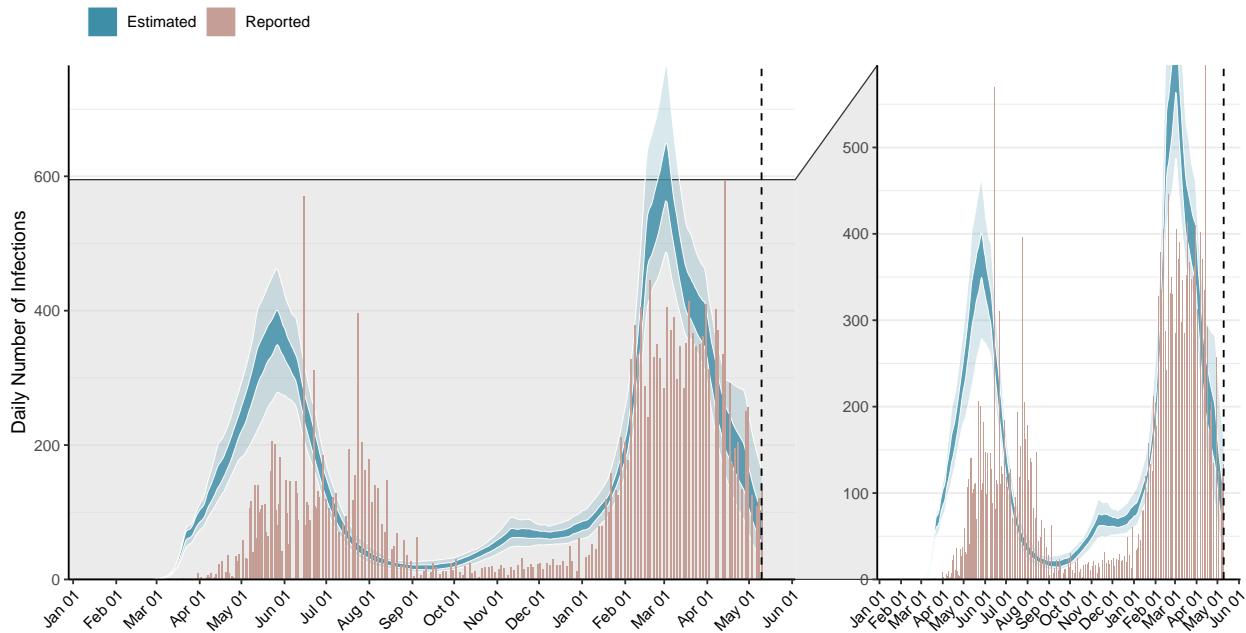
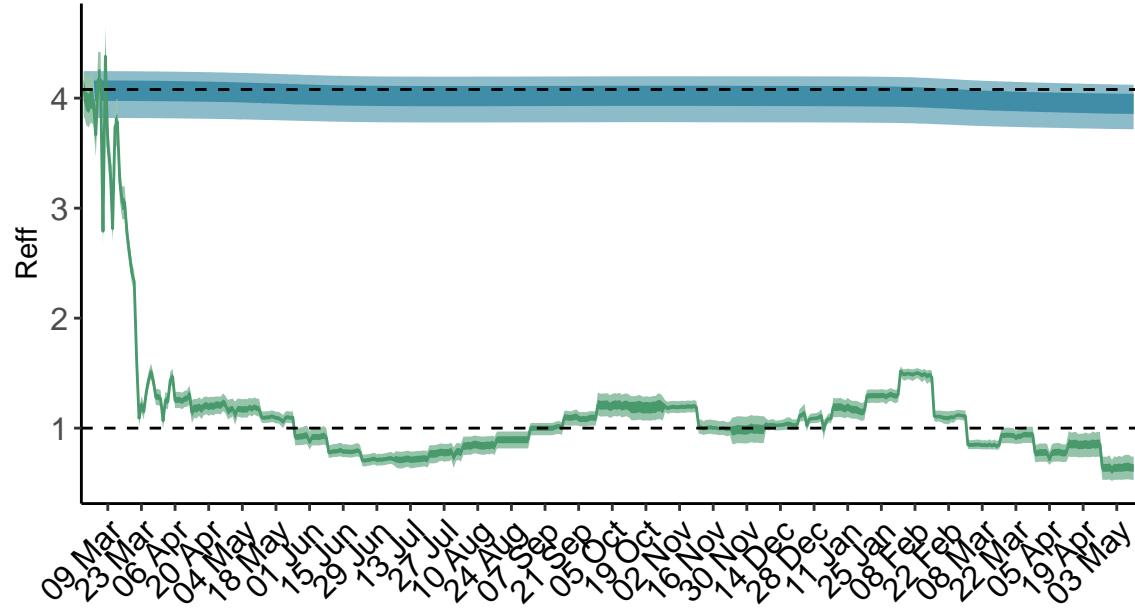


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

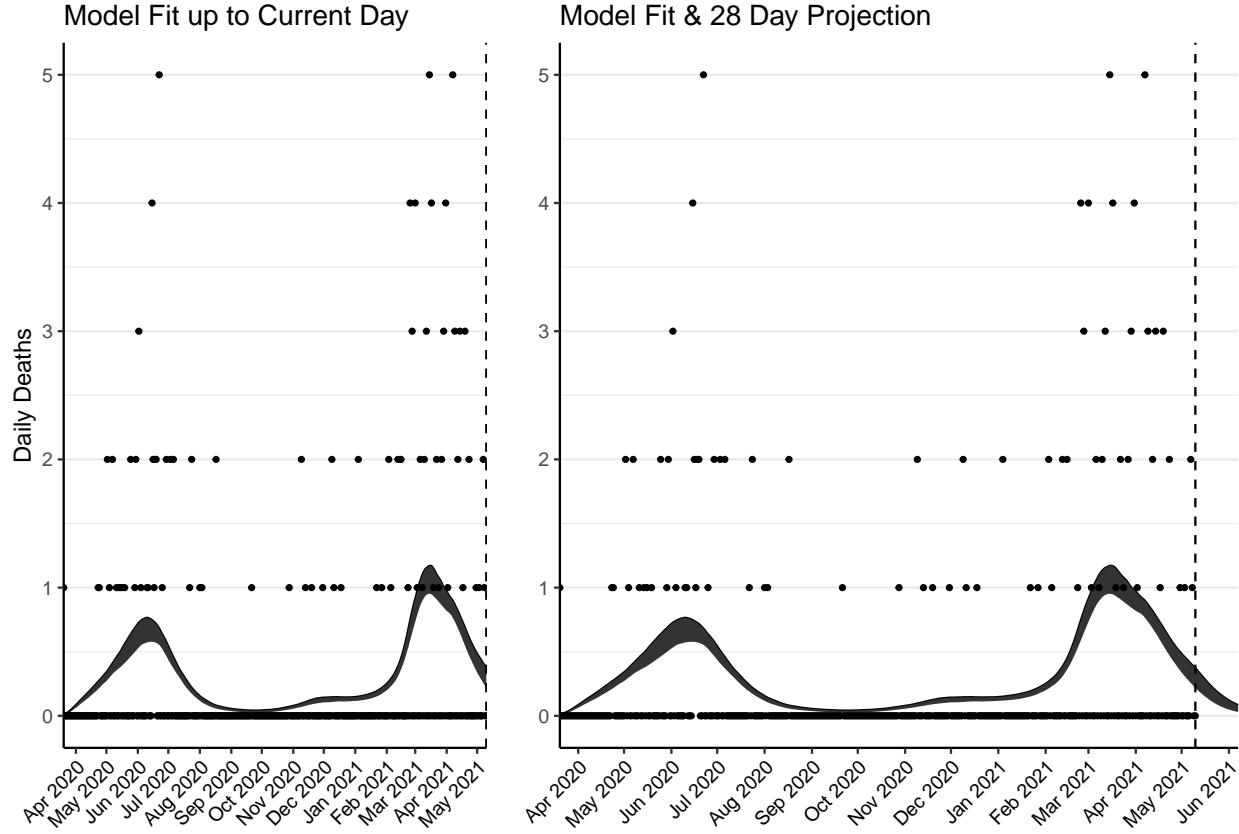


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 13 (95% CI: 12-14) patients requiring treatment with high-pressure oxygen at the current date to 3 (95% CI: 3-3) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 6 (95% CI: 5-6) patients requiring treatment with mechanical ventilation at the current date to 1 (95% CI: 1-2) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

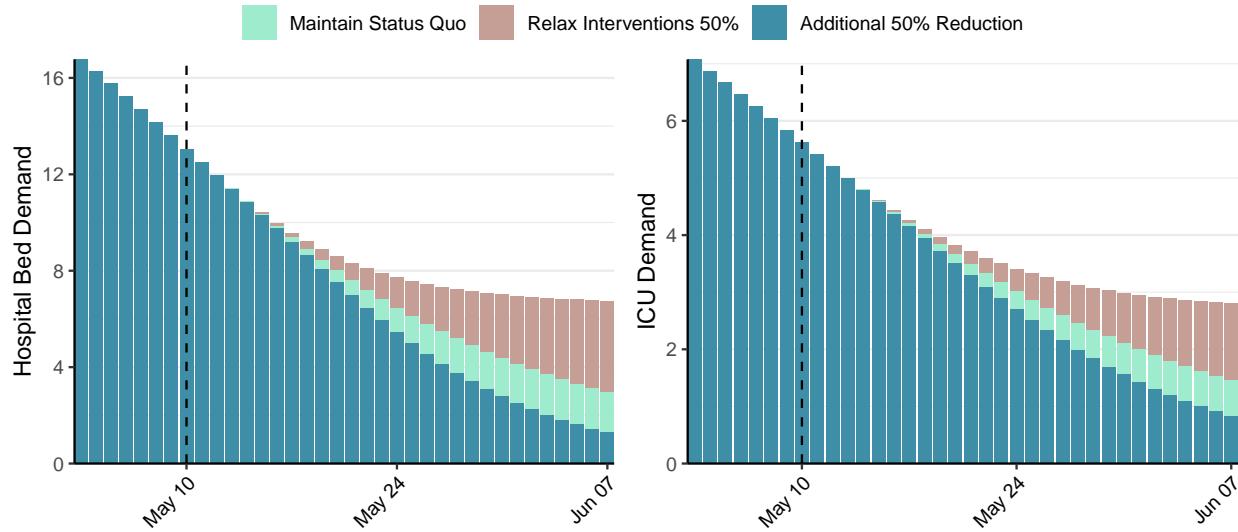
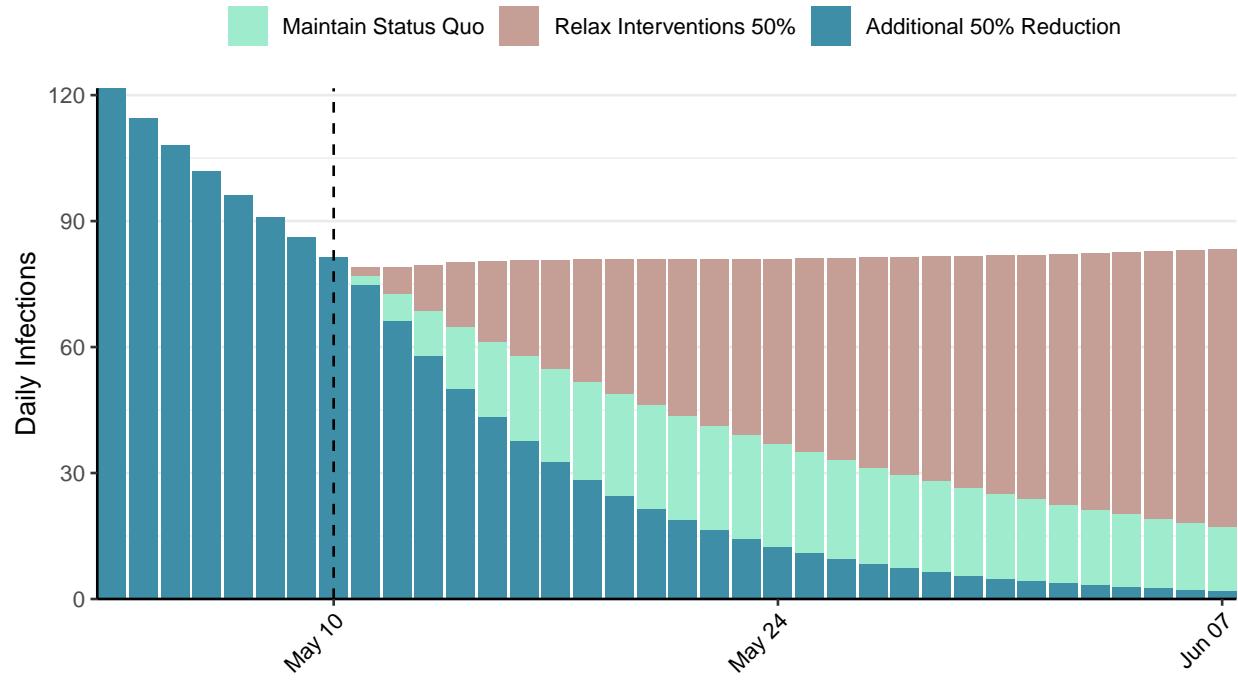


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 80 (95% CI: 73-88) at the current date to 2 (95% CI: 2-2) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 80 (95% CI: 73-88) at the current date to 82 (95% CI: 68-97) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Georgia, 2021-05-10

[Download the report for Georgia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
322,468	549	4,305	24	1.01 (95% CI: 0.92-1.08)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

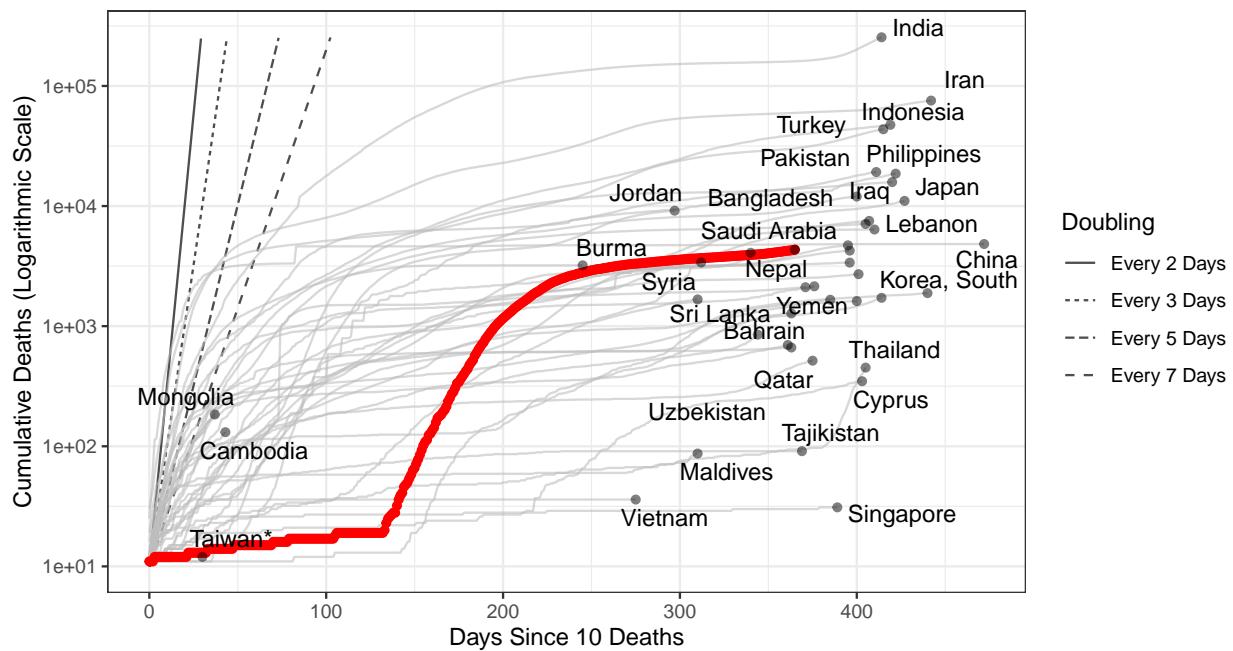


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 168,176 (95% CI: 163,173-173,180) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

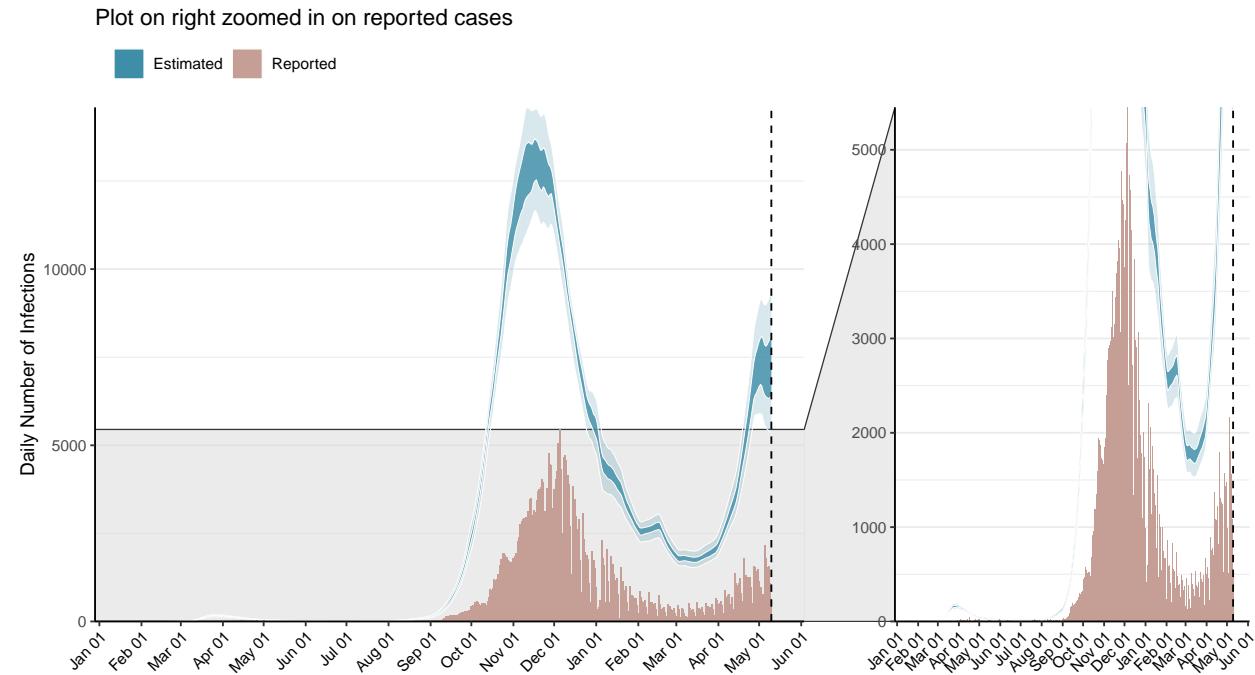
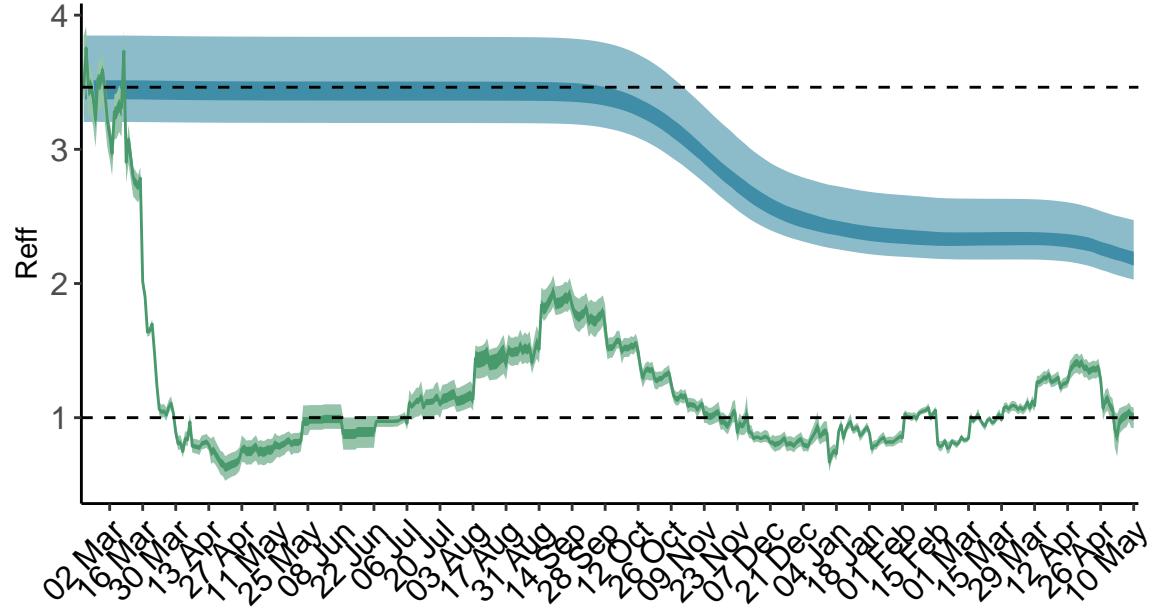


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

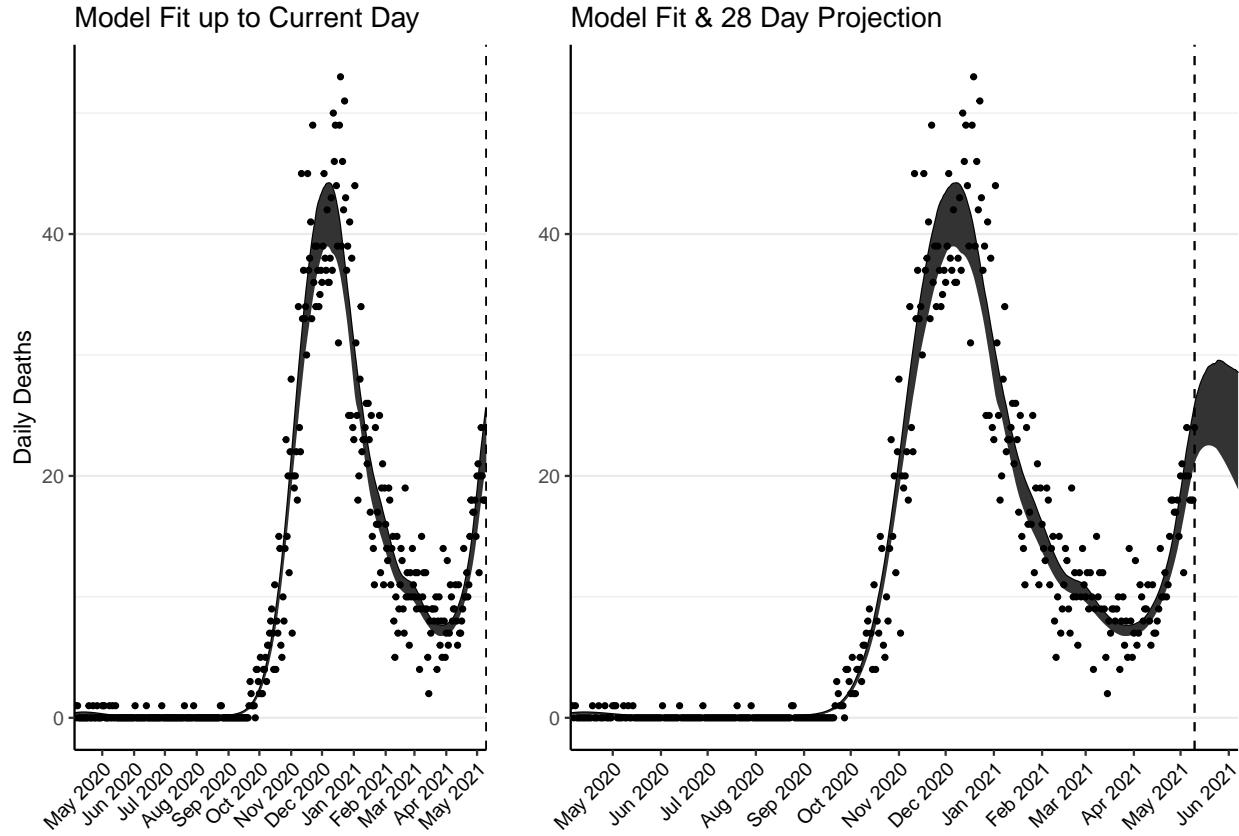


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 945 (95% CI: 915-974) patients requiring treatment with high-pressure oxygen at the current date to 1,011 (95% CI: 960-1,062) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 330 (95% CI: 320-340) patients requiring treatment with mechanical ventilation at the current date to 390 (95% CI: 372-409) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

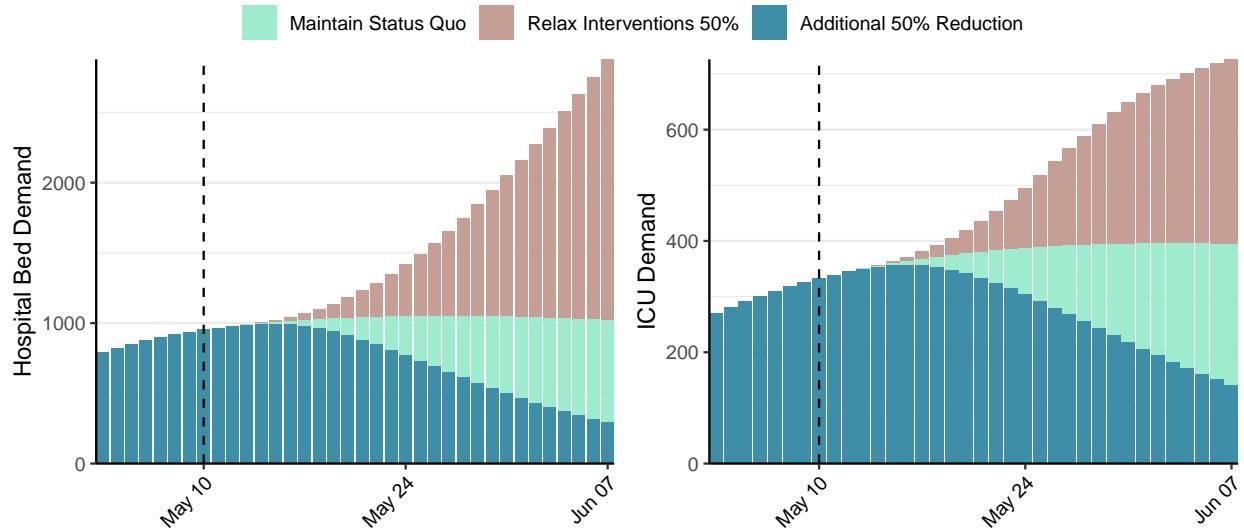
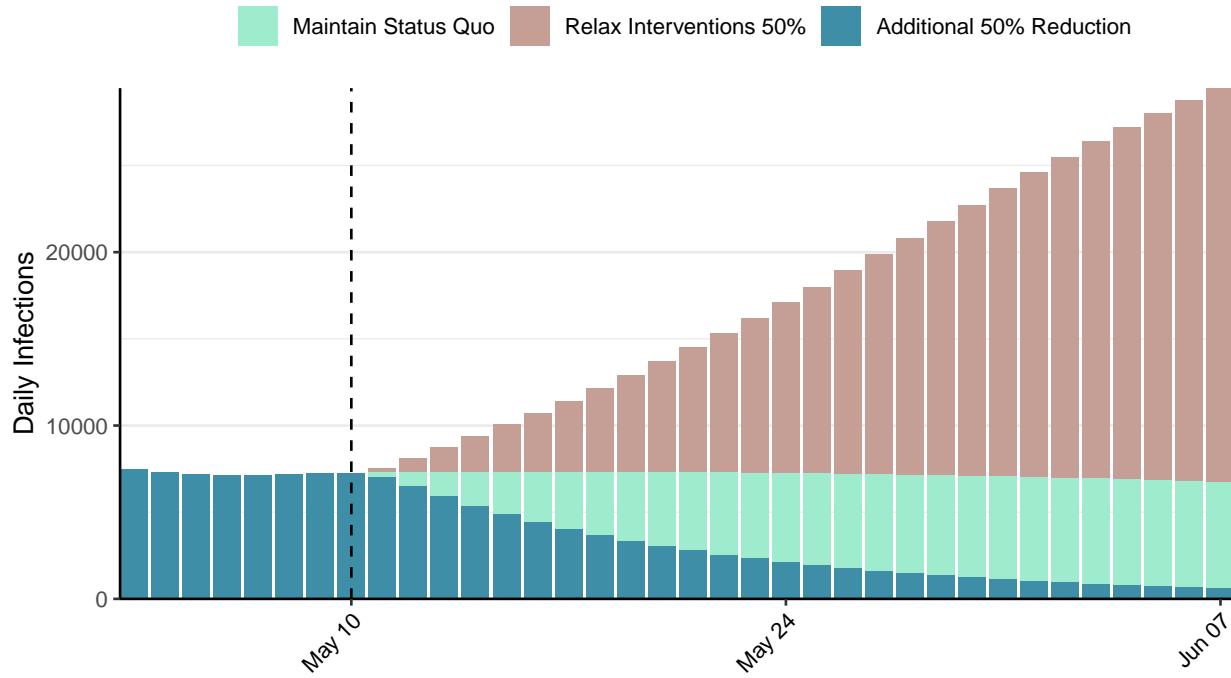


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 7,190 (95% CI: 6,921-7,458) at the current date to 593 (95% CI: 560-626) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 7,190 (95% CI: 6,921-7,458) at the current date to 29,172 (95% CI: 27,886-30,457) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Ghana, 2021-05-10

[Download the report for Ghana, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
93,011	60	783	0	0.68 (95% CI: 0.59-0.8)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

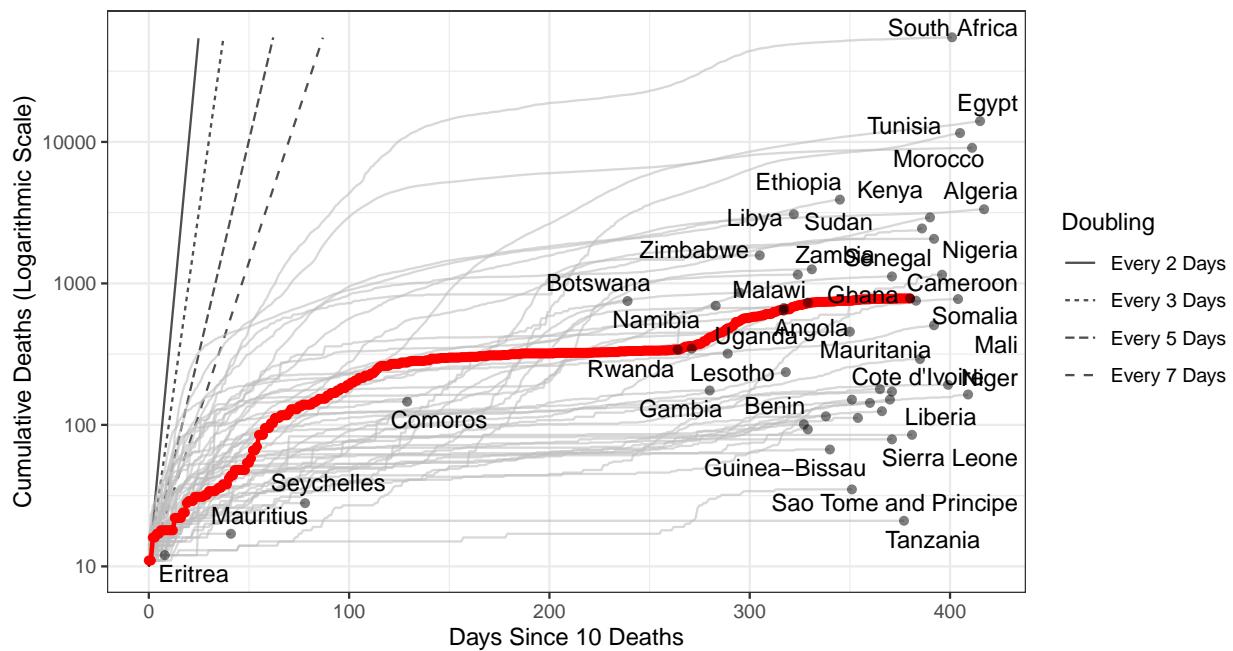


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 3,684 (95% CI: 3,473-3,894) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

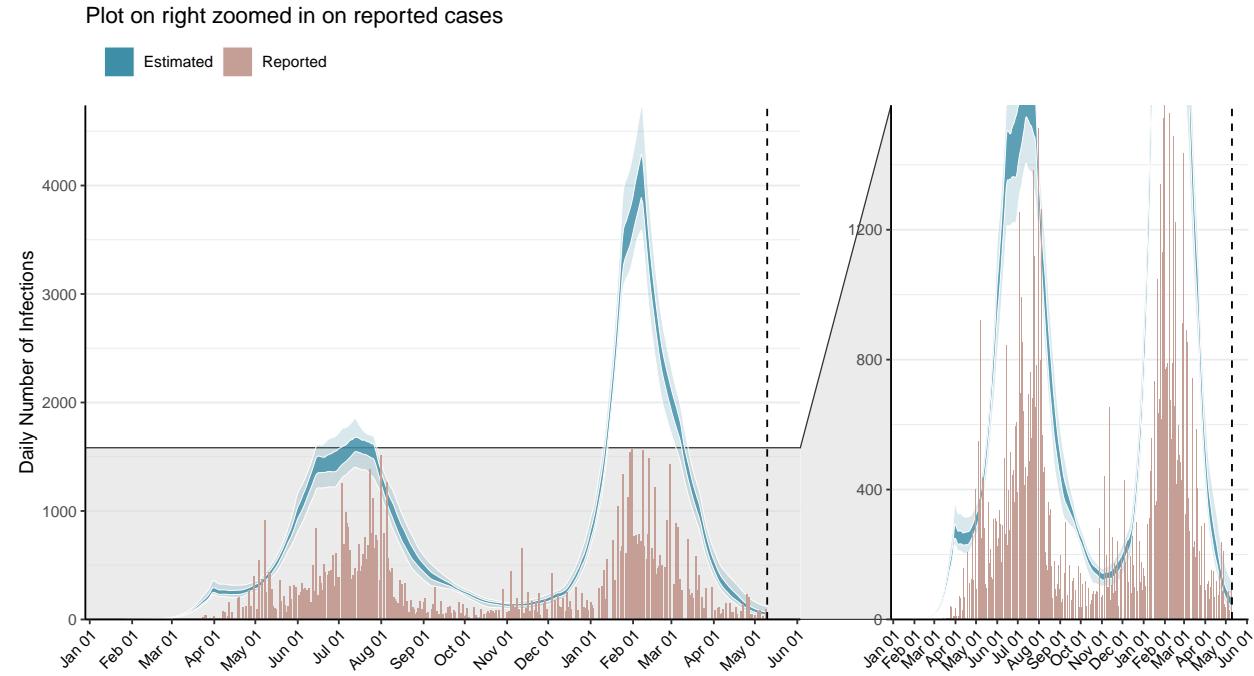
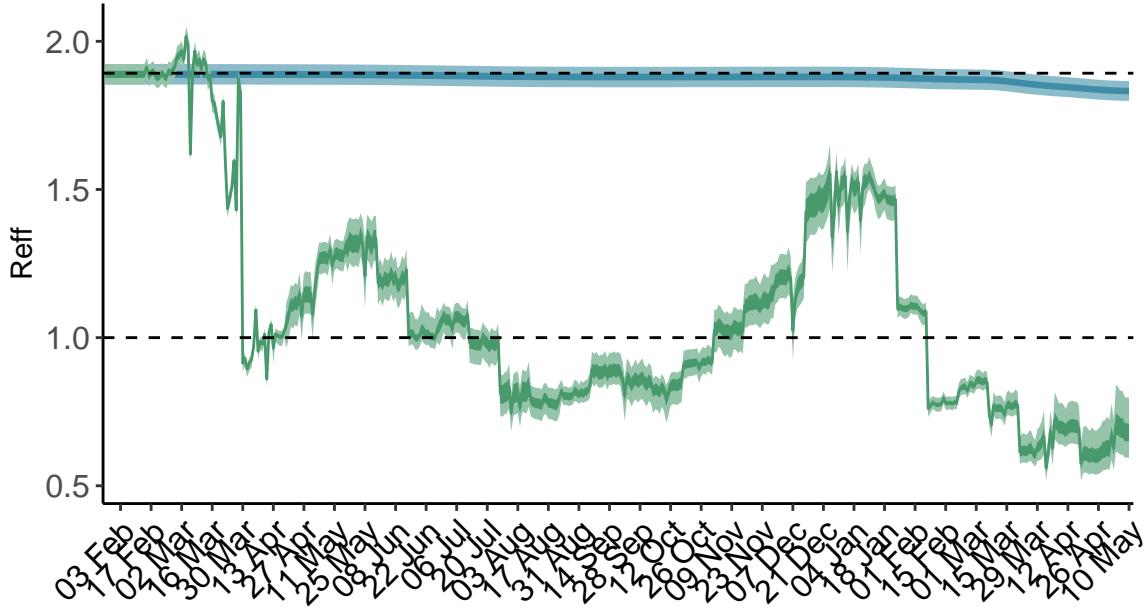


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

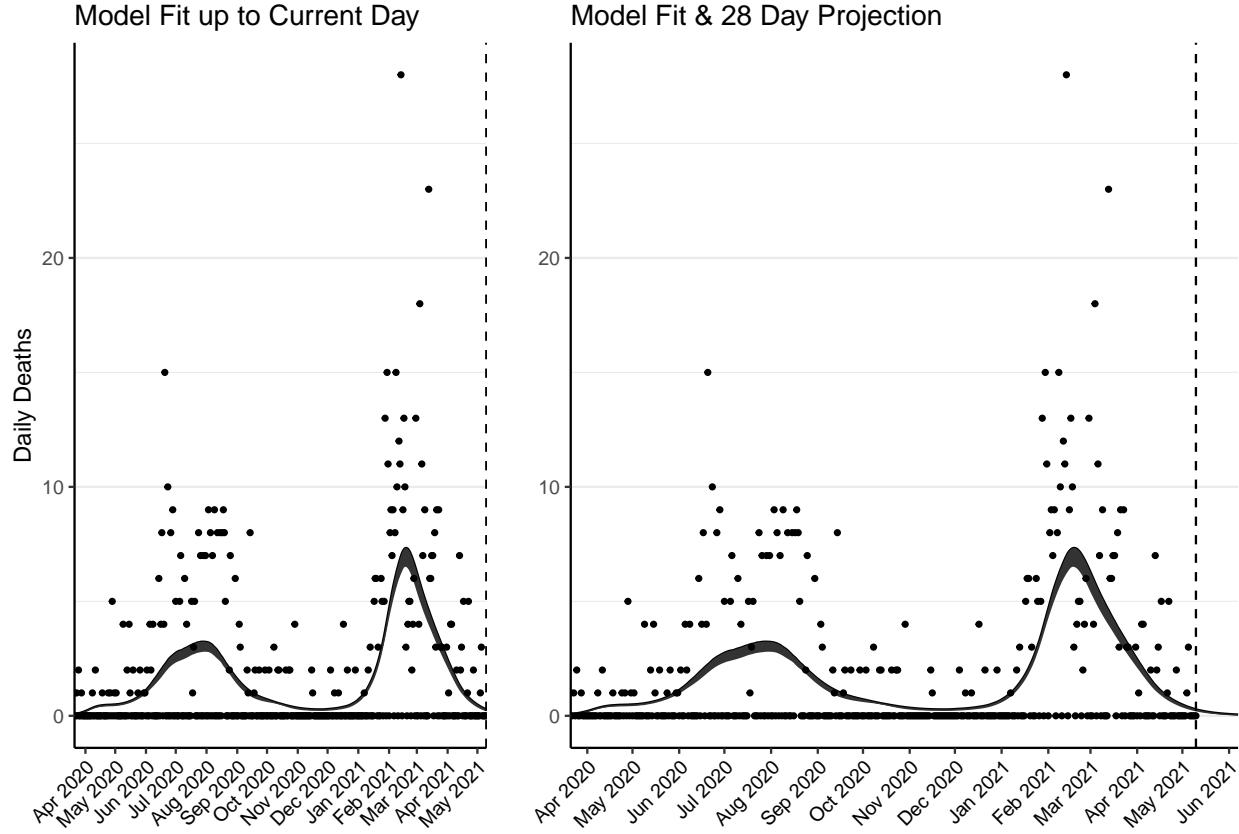


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 9 (95% CI: 9-10) patients requiring treatment with high-pressure oxygen at the current date to 2 (95% CI: 2-2) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 5 (95% CI: 5-5) patients requiring treatment with mechanical ventilation at the current date to 1 (95% CI: 1-1) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

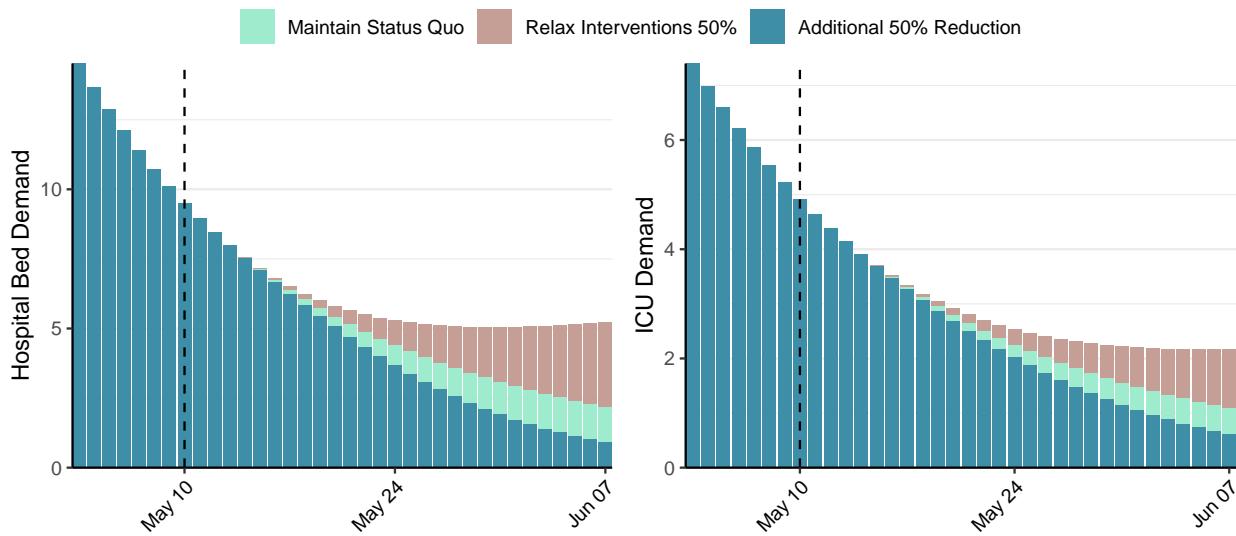
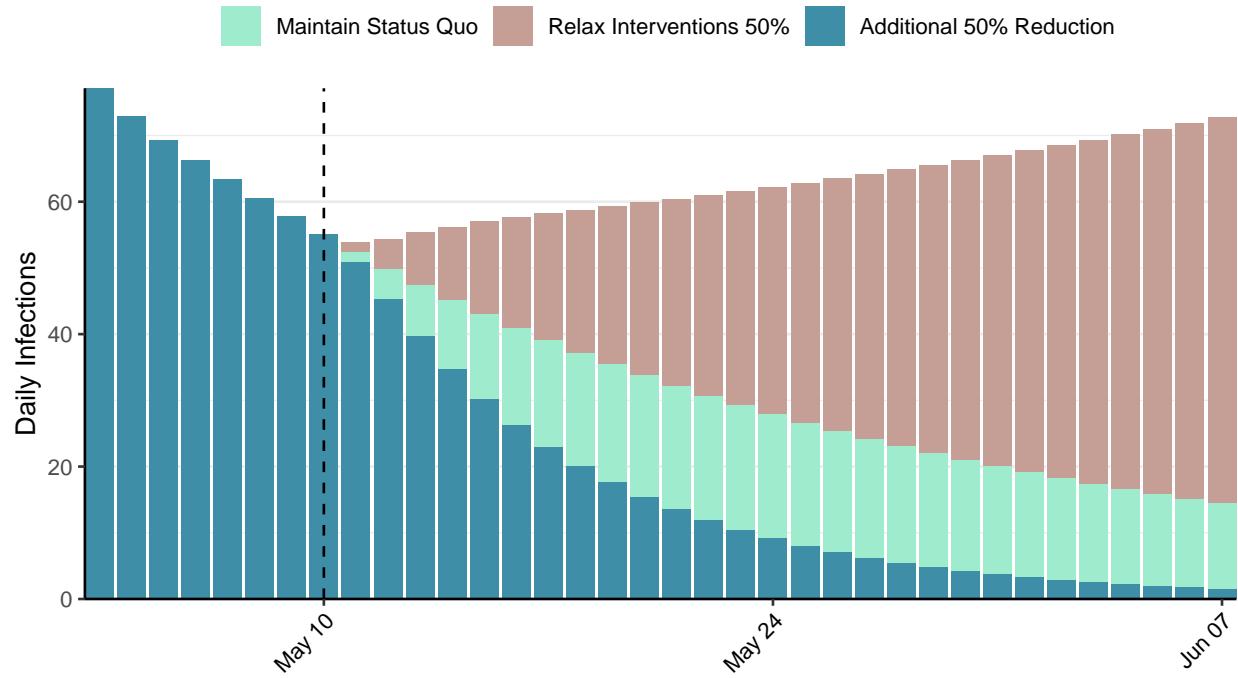


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 54 (95% CI: 50-59) at the current date to 1 (95% CI: 1-2) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 54 (95% CI: 50-59) at the current date to 72 (95% CI: 59-85) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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## Situation Report for COVID-19: Guinea, 2021-05-10

[Download the report for Guinea, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
22,633	0	150	0	0.68 (95% CI: 0.59-0.76)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

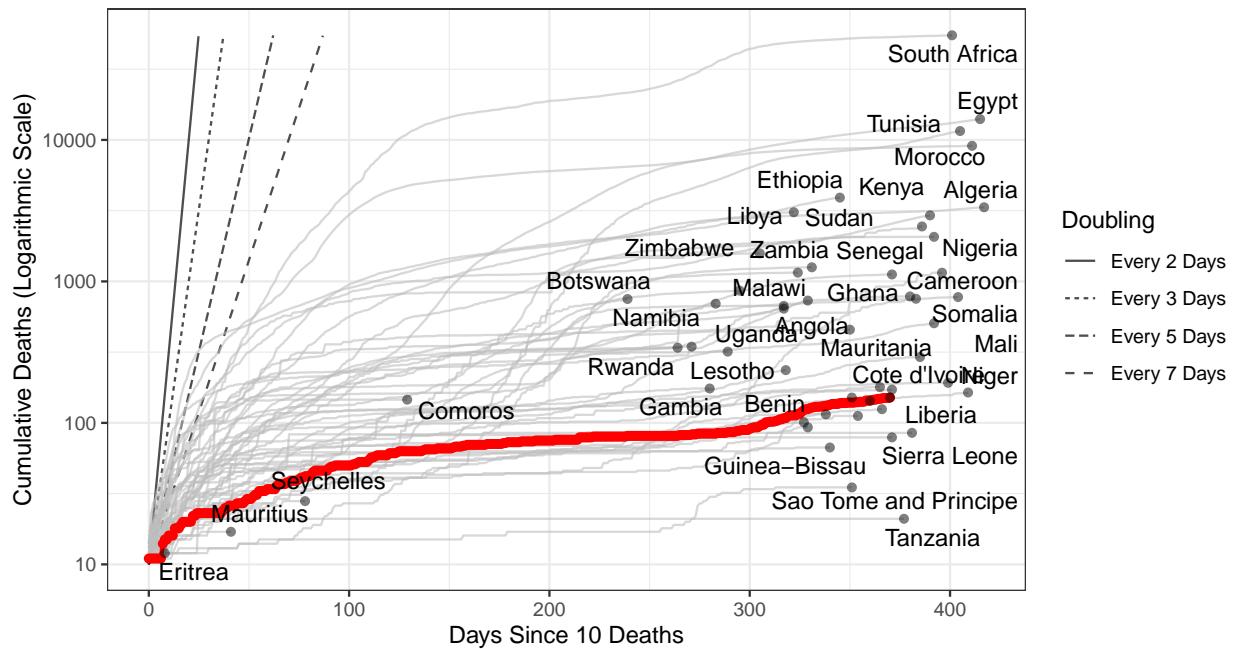


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 5,734 (95% CI: 5,429-6,039) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

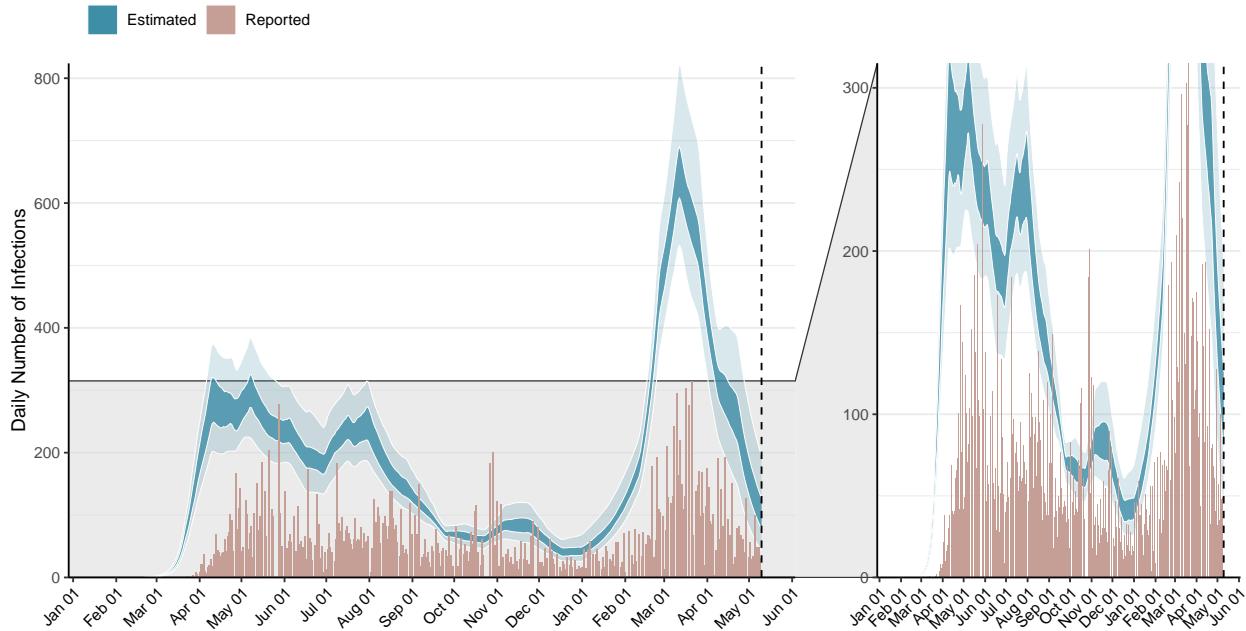
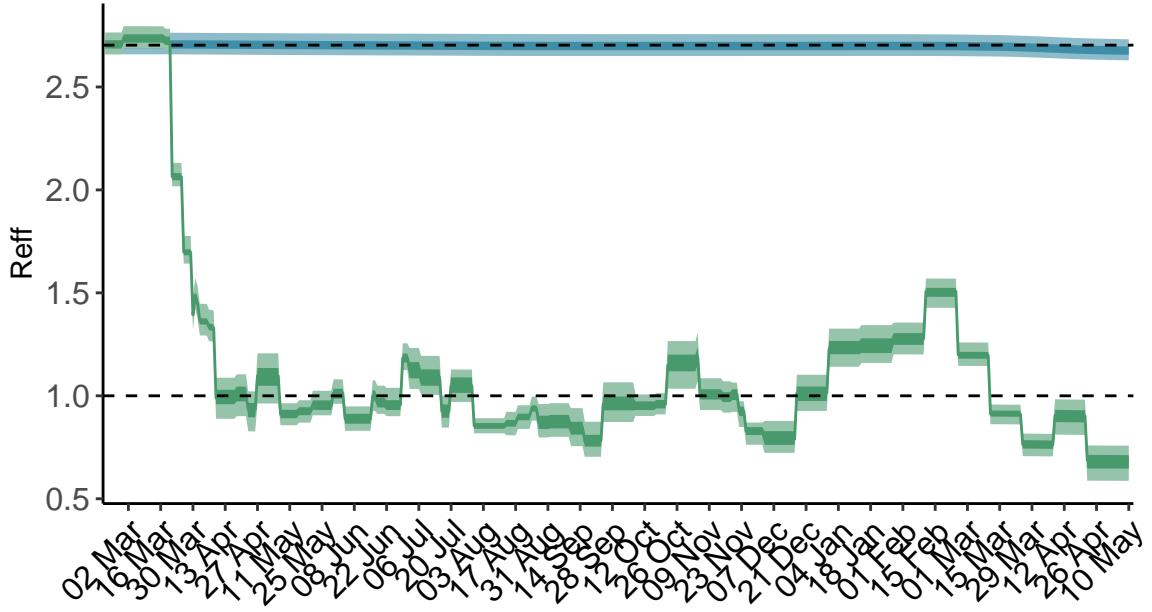


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

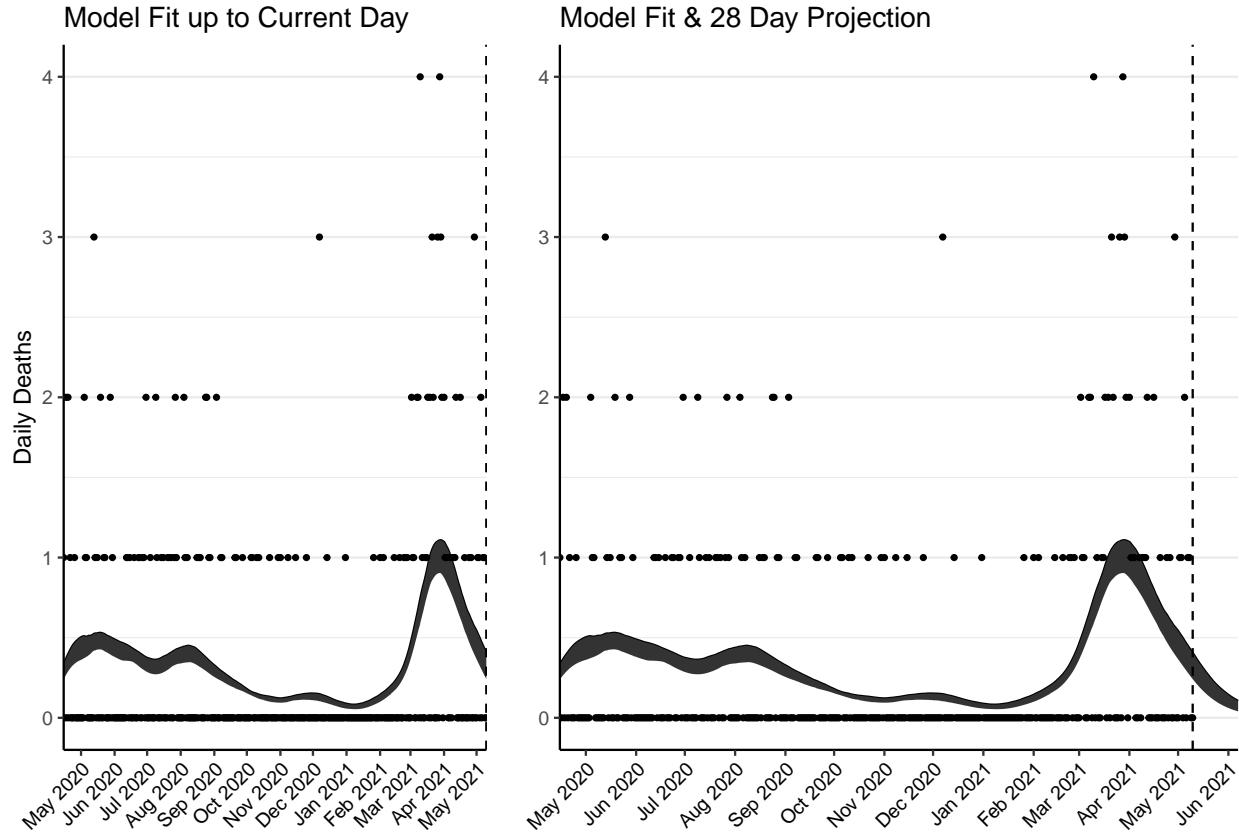


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 14 (95% CI: 14-15) patients requiring treatment with high-pressure oxygen at the current date to 4 (95% CI: 3-4) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 6 (95% CI: 6-7) patients requiring treatment with mechanical ventilation at the current date to 2 (95% CI: 2-2) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

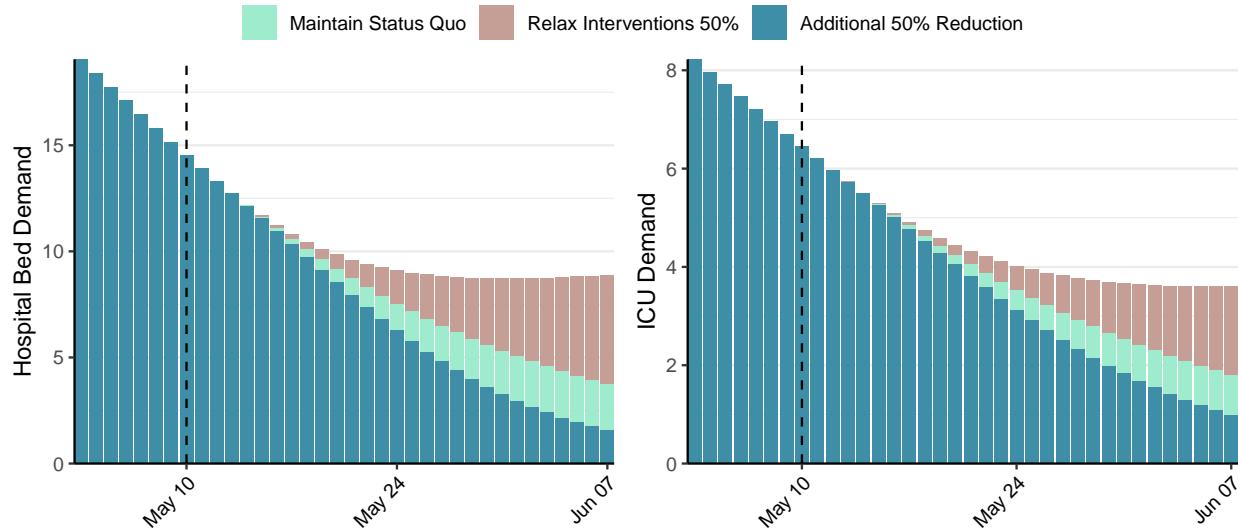
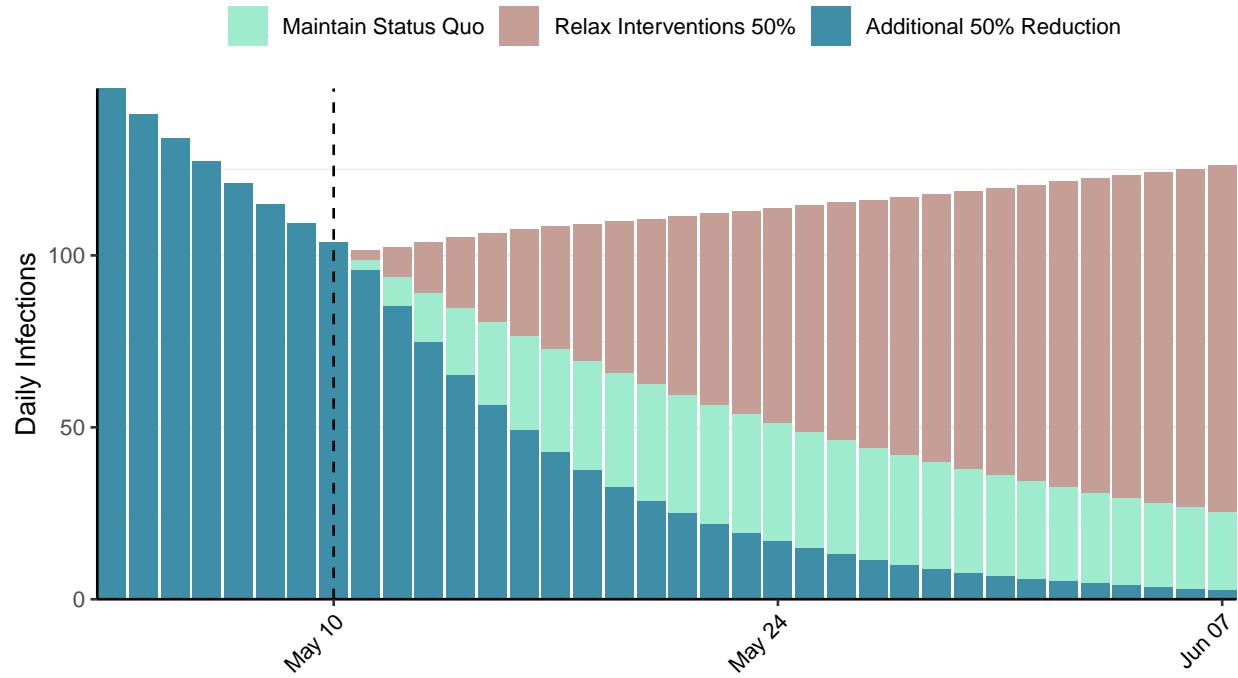


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 103 (95% CI: 95-111) at the current date to 3 (95% CI: 2-3) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 103 (95% CI: 95-111) at the current date to 125 (95% CI: 109-141) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Gambia, 2021-05-10

[Download the report for Gambia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
5,929	0	175	0	0.86 (95% CI: 0.76-0.99)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

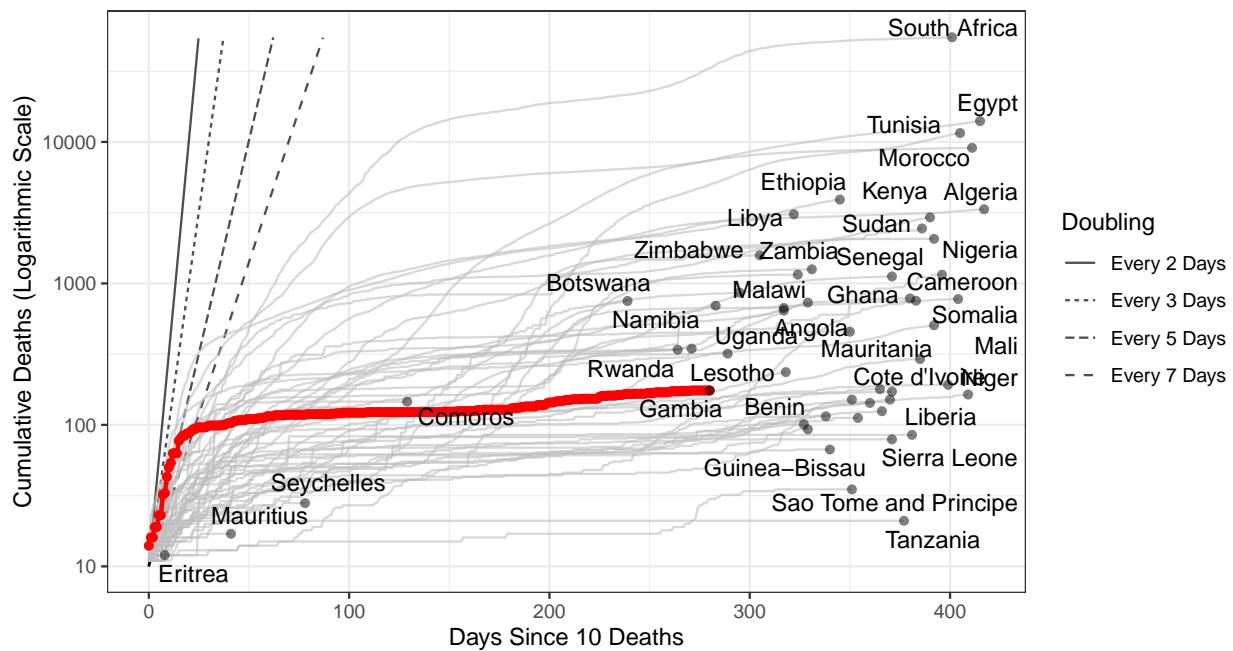


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 2,108 (95% CI: 1,970-2,247) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Gambia has revised their historic reported cases and thus have reported negative cases.**

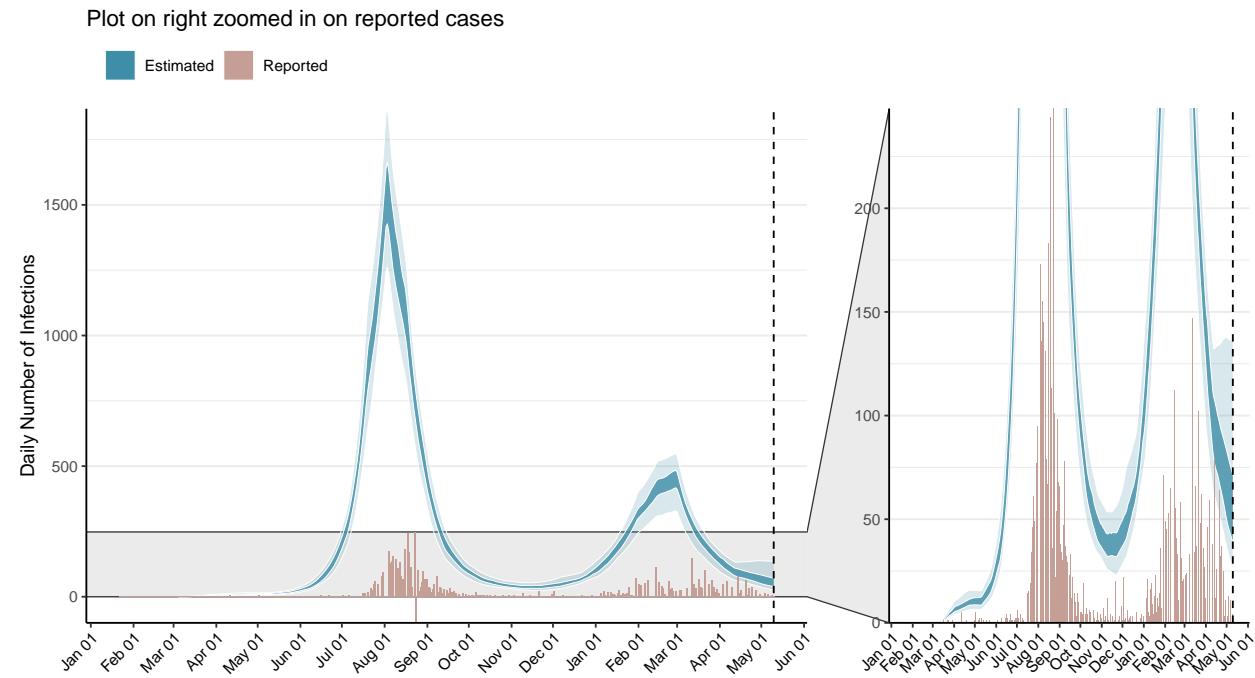
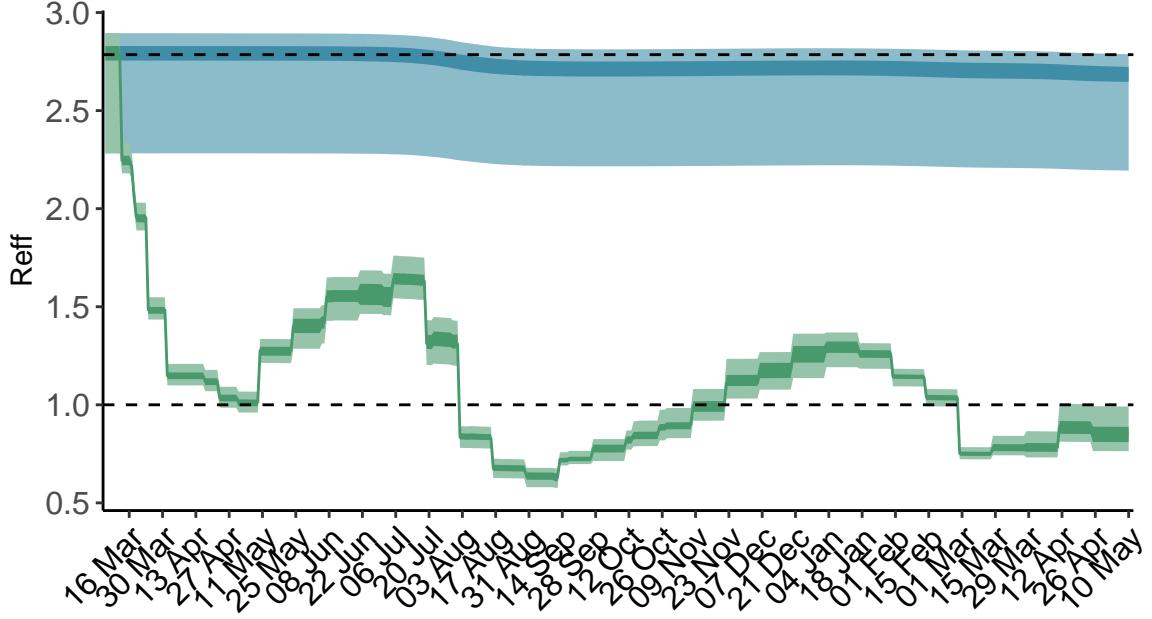


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

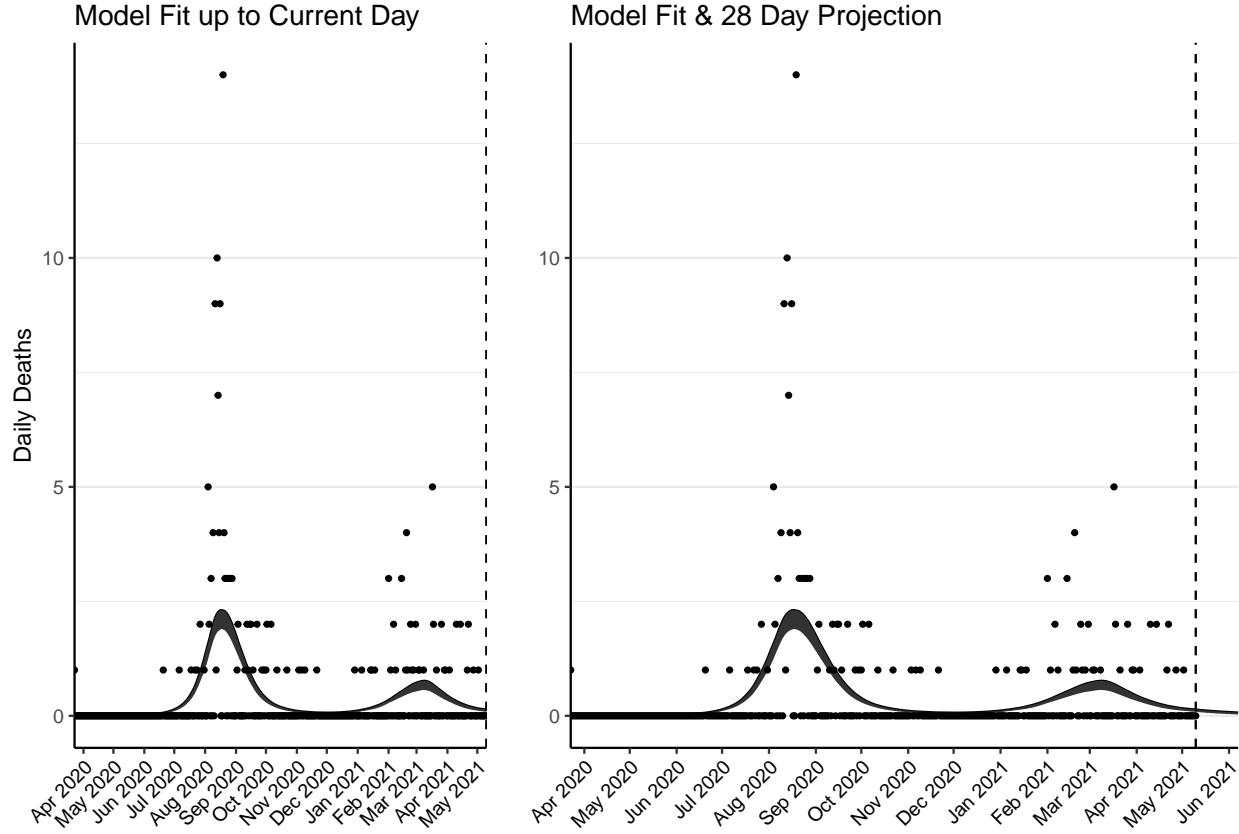


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 5 (95% CI: 5-6) patients requiring treatment with high-pressure oxygen at the current date to 3 (95% CI: 3-4) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 2 (95% CI: 2-2) patients requiring treatment with mechanical ventilation at the current date to 1 (95% CI: 1-2) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

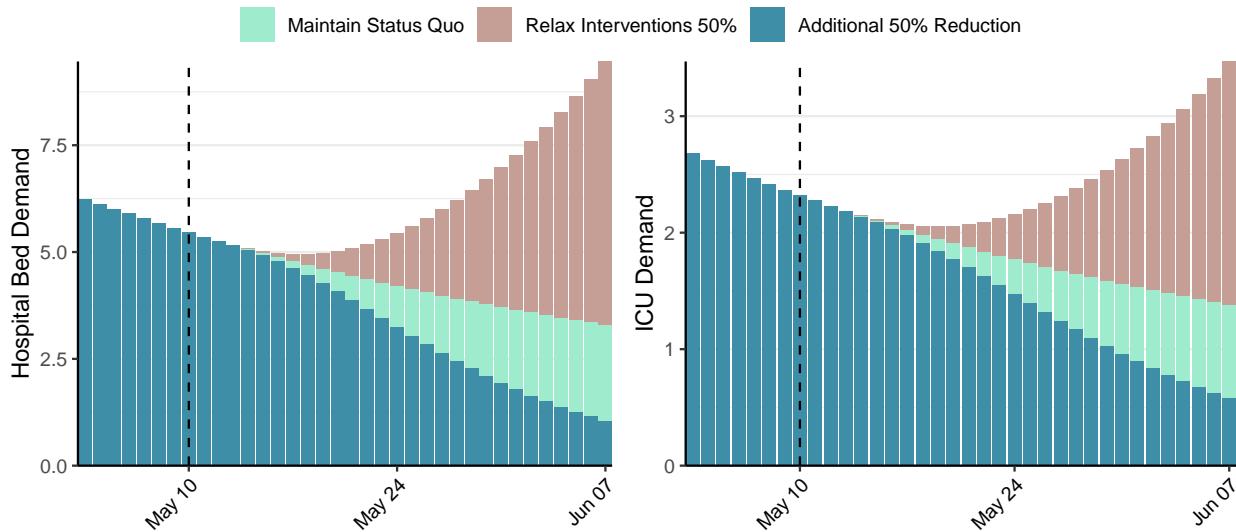


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 58 (95% CI: 53-64) at the current date to 3 (95% CI: 3-4) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 58 (95% CI: 53-64) at the current date to 210 (95% CI: 168-252) by 2021-06-07.

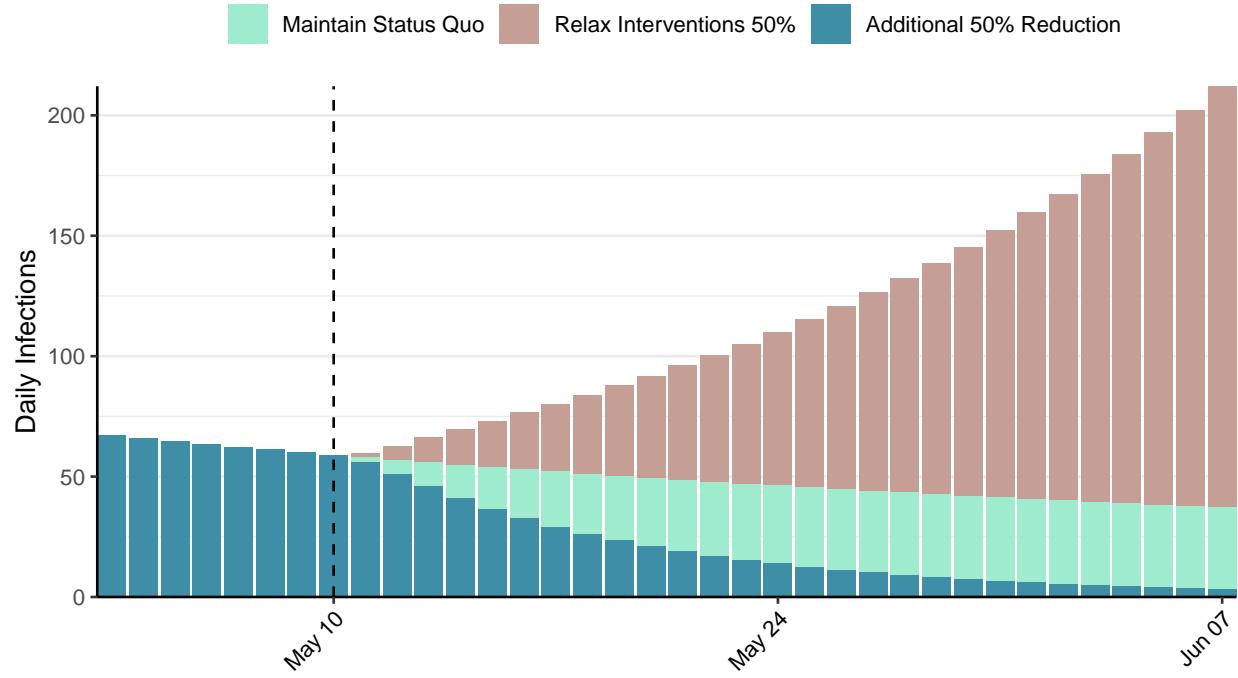


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Guinea-Bissau, 2021-05-10

[Download the report for Guinea-Bissau, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
3,741	0	67	0	0.7 (95% CI: 0.63-0.81)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

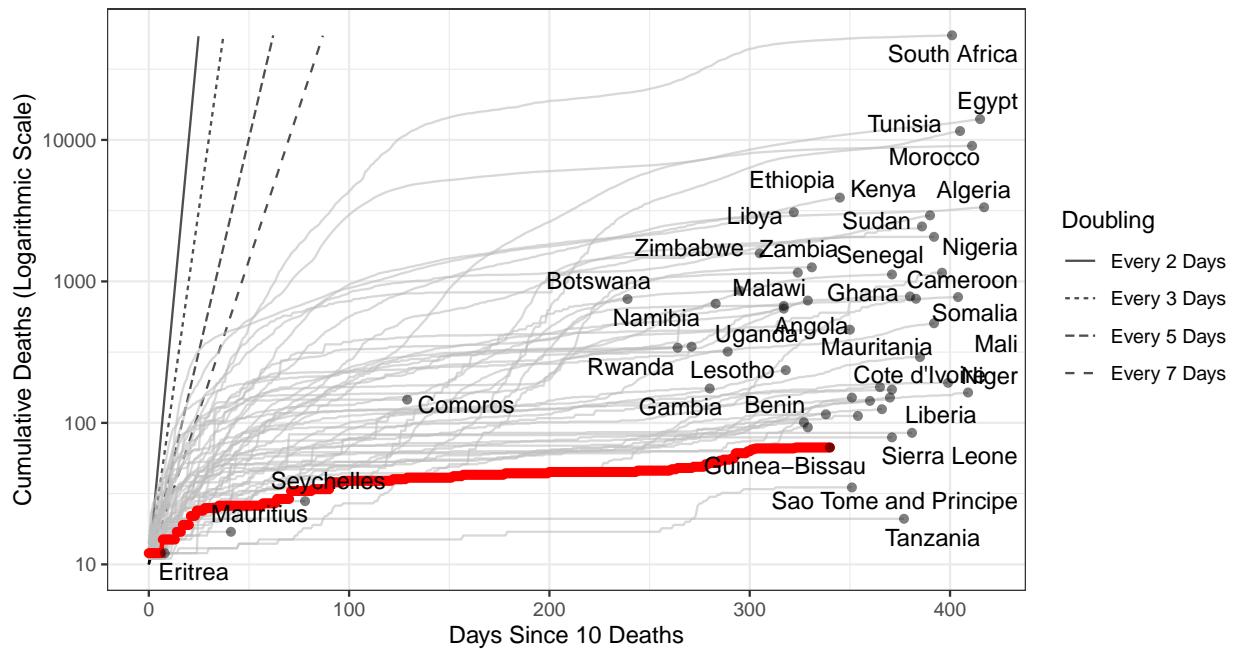


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 1,194 (95% CI: 1,107-1,281) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

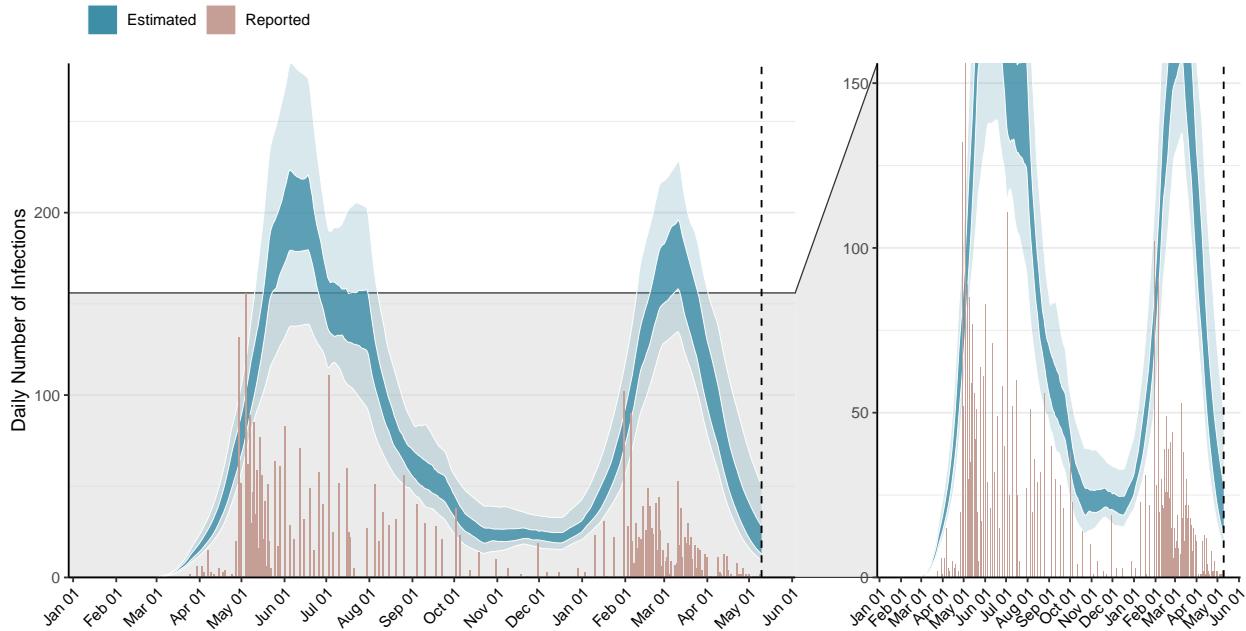
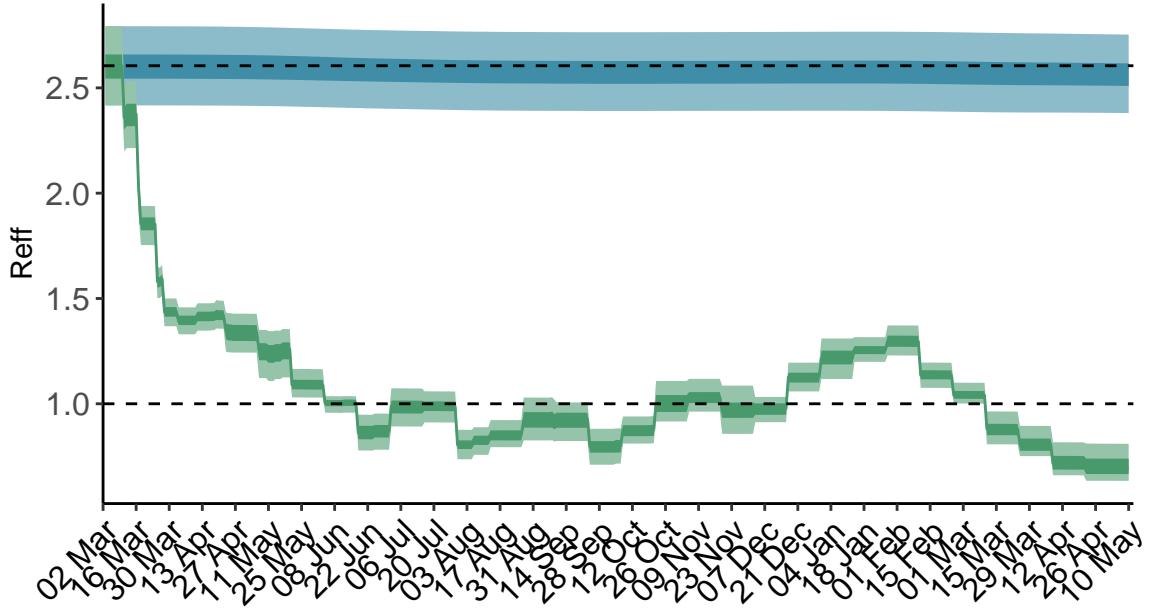


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

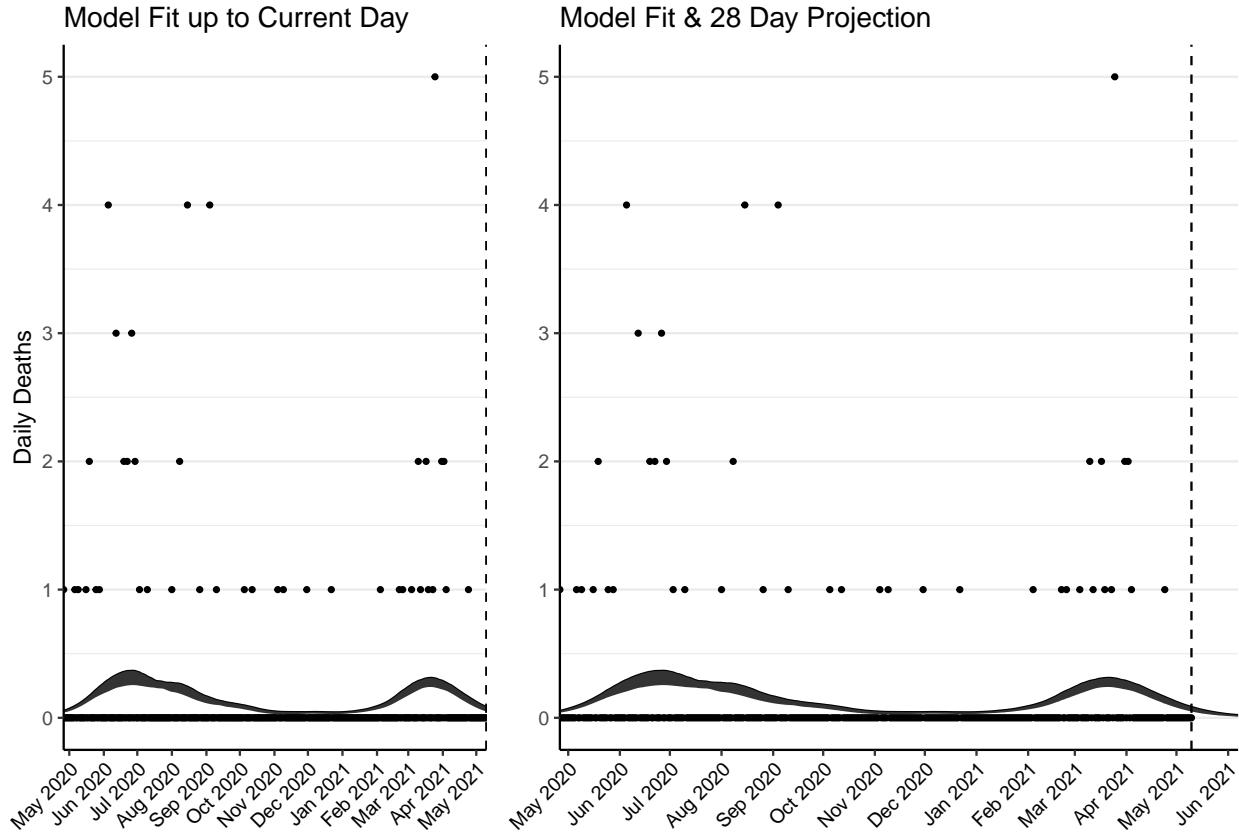


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 3 (95% CI: 3-3) patients requiring treatment with high-pressure oxygen at the current date to 1 (95% CI: 1-1) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1 (95% CI: 1-1) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

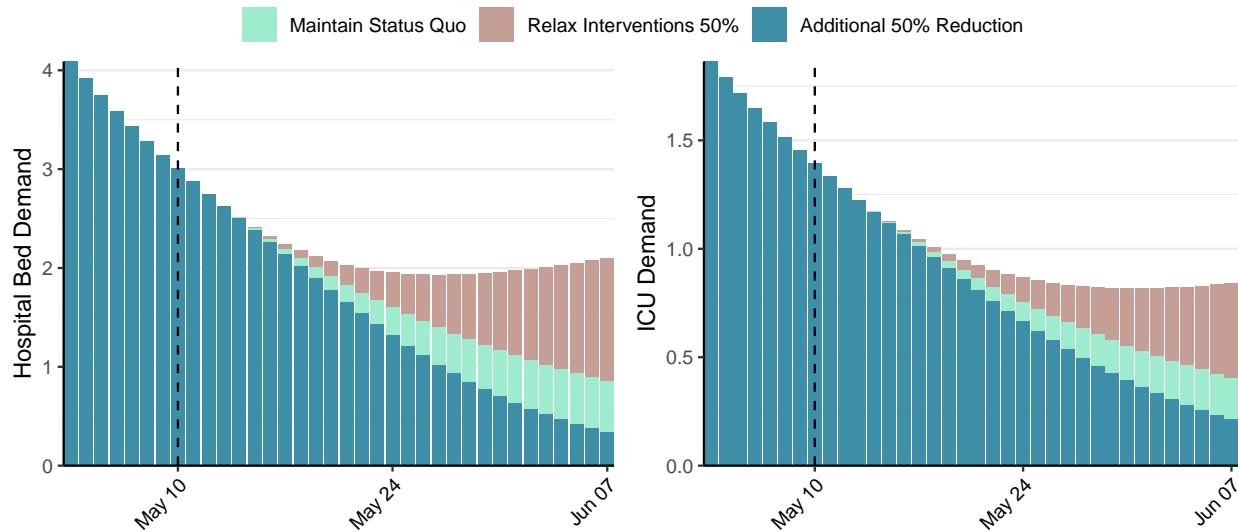


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 22 (95% CI: 19-24) at the current date to 1 (95% CI: 1-1) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 22 (95% CI: 19-24) at the current date to 32 (95% CI: 26-37) by 2021-06-07.

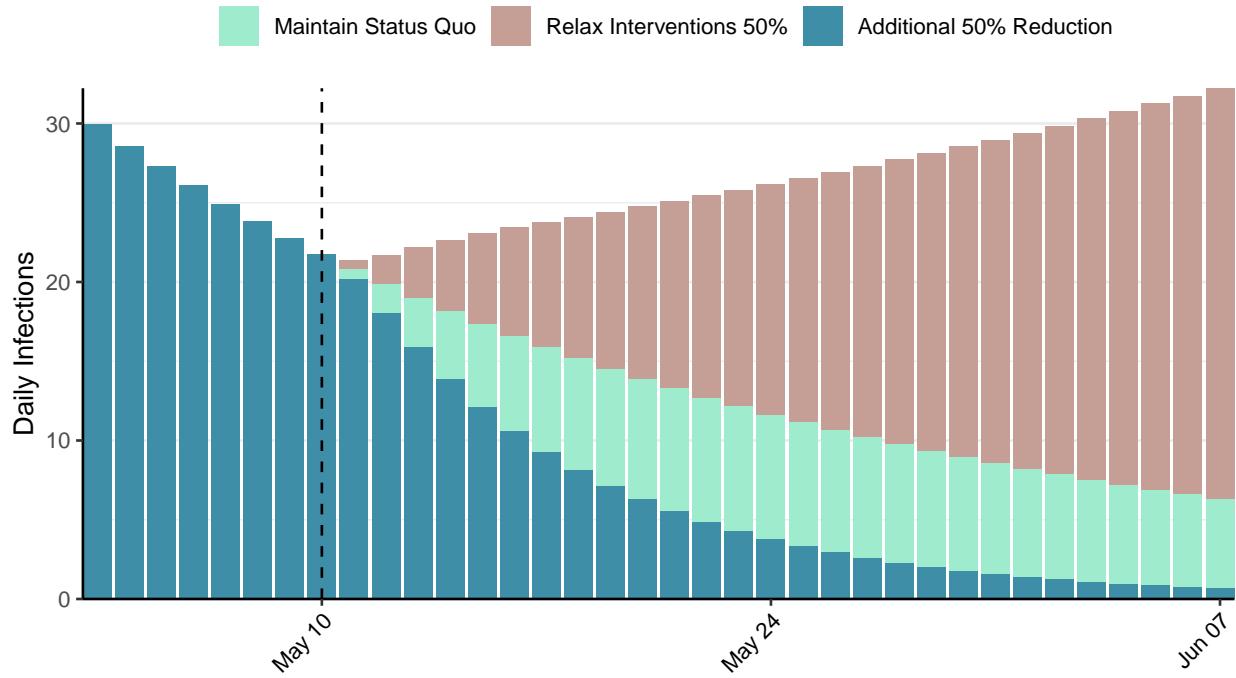


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool - https://covid19sim.org/](https://covid19sim.org/), which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Equatorial Guinea, 2021-05-10

[Download the report for Equatorial Guinea, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
7,694	0	112	0	0.75 (95% CI: 0.56-0.98)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

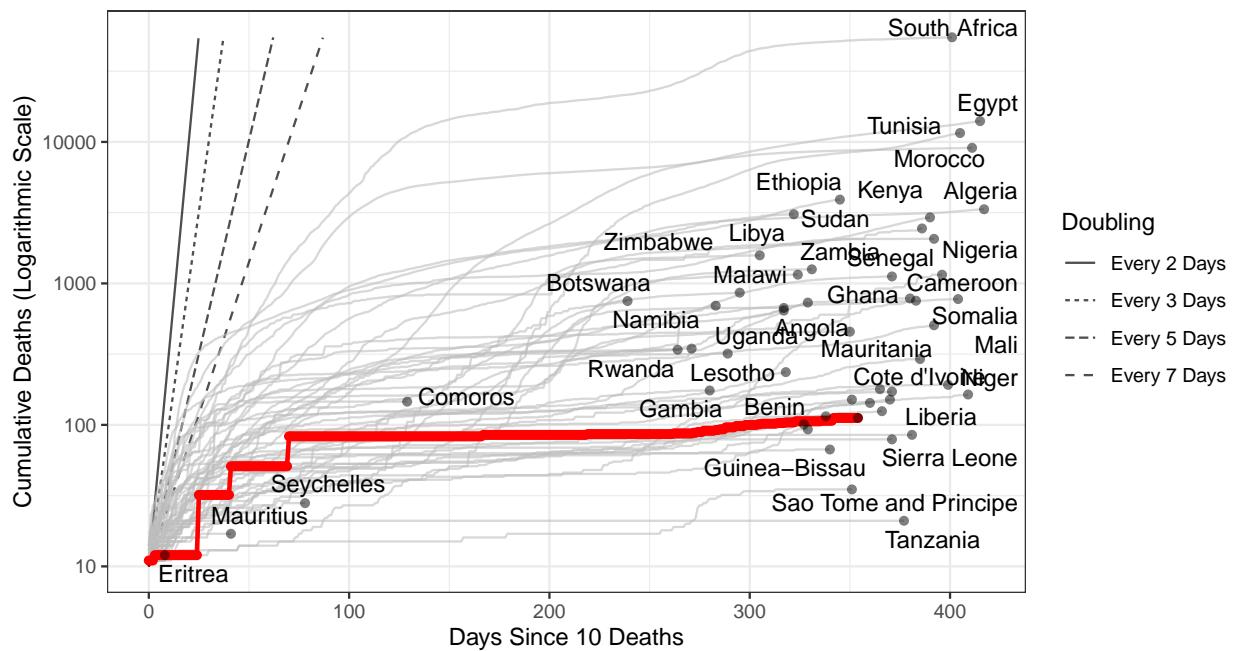


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 3,536 (95% CI: 3,192-3,881) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

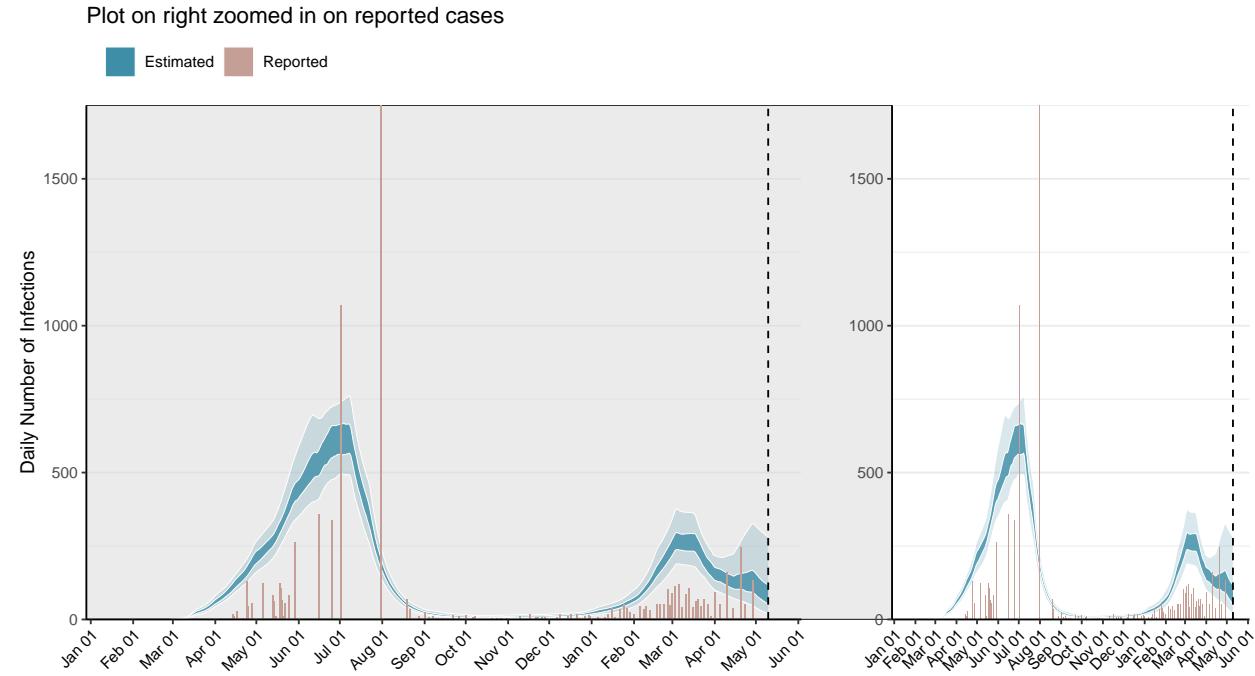
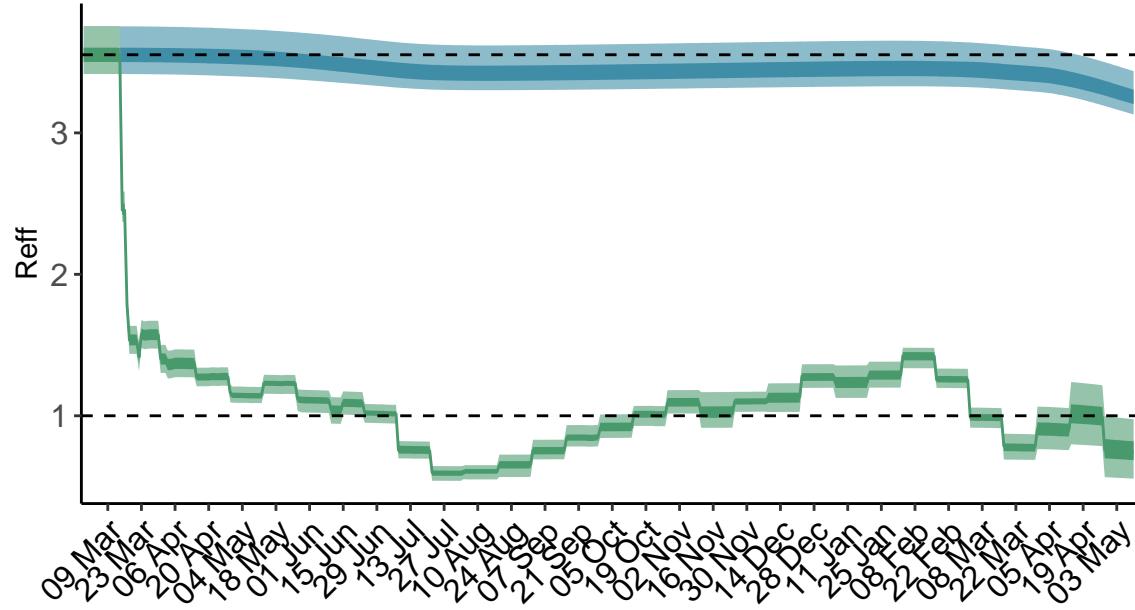


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

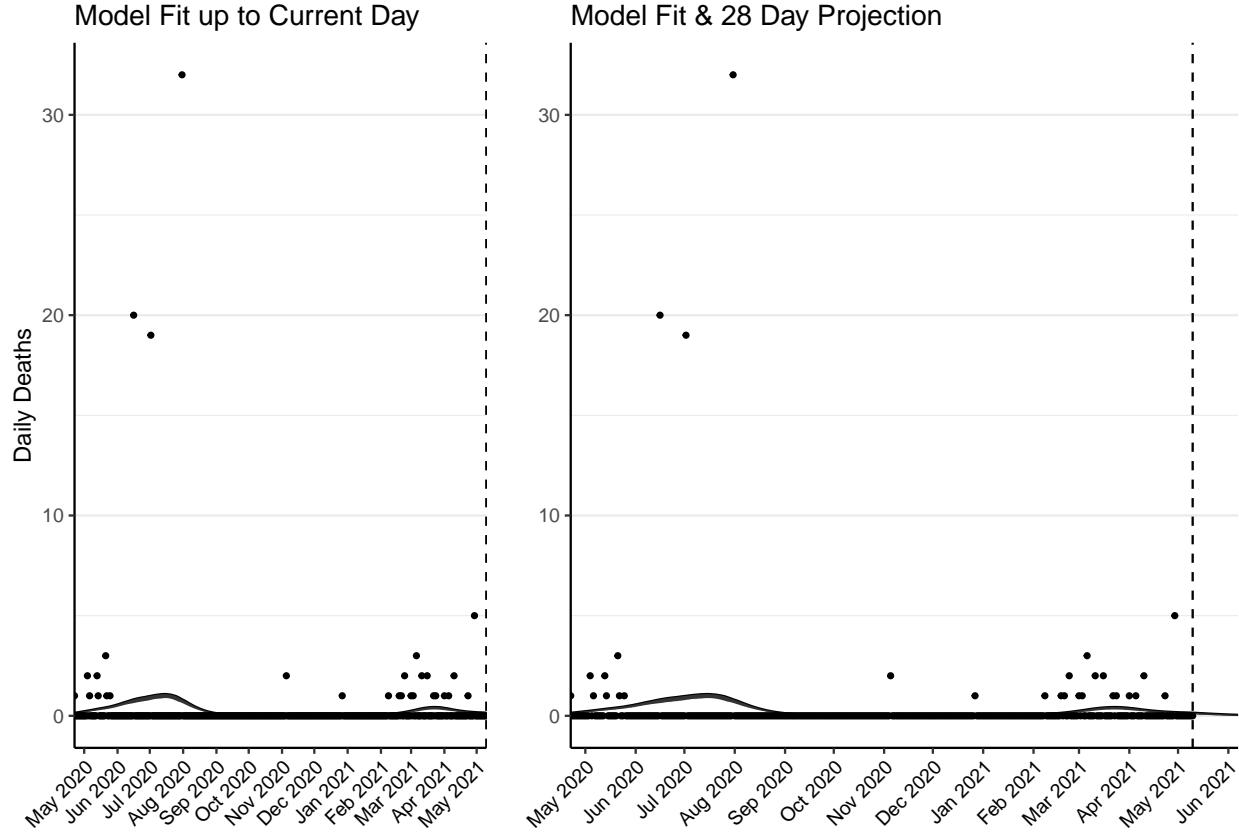


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 7 (95% CI: 7-8) patients requiring treatment with high-pressure oxygen at the current date to 3 (95% CI: 2-4) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 3 (95% CI: 3-3) patients requiring treatment with mechanical ventilation at the current date to 1 (95% CI: 1-2) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

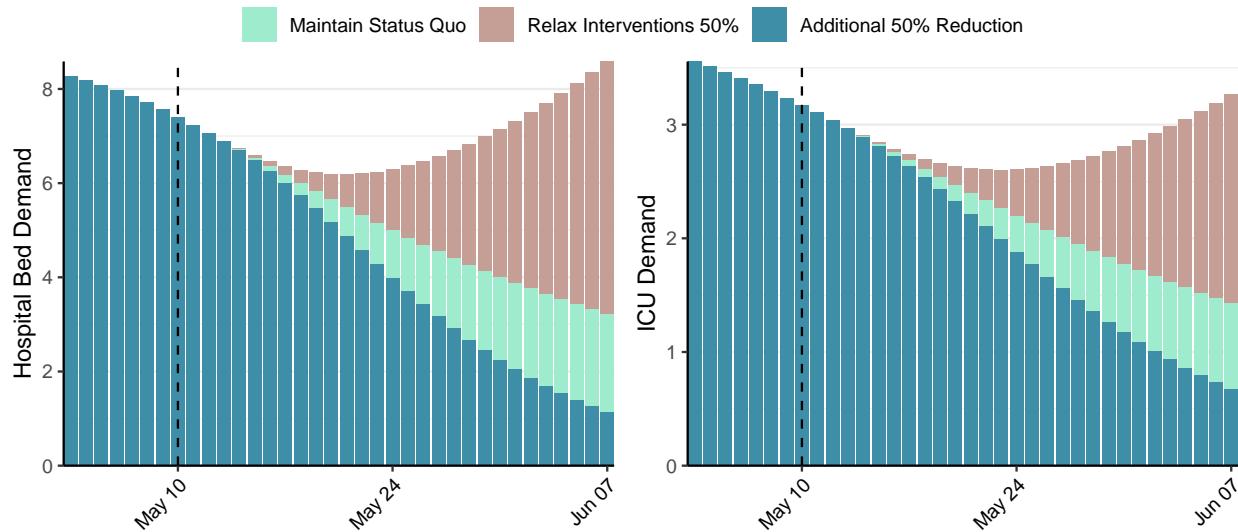


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 96 (95% CI: 81-111) at the current date to 4 (95% CI: 3-5) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 96 (95% CI: 81-111) at the current date to 232 (95% CI: 151-313) by 2021-06-07.

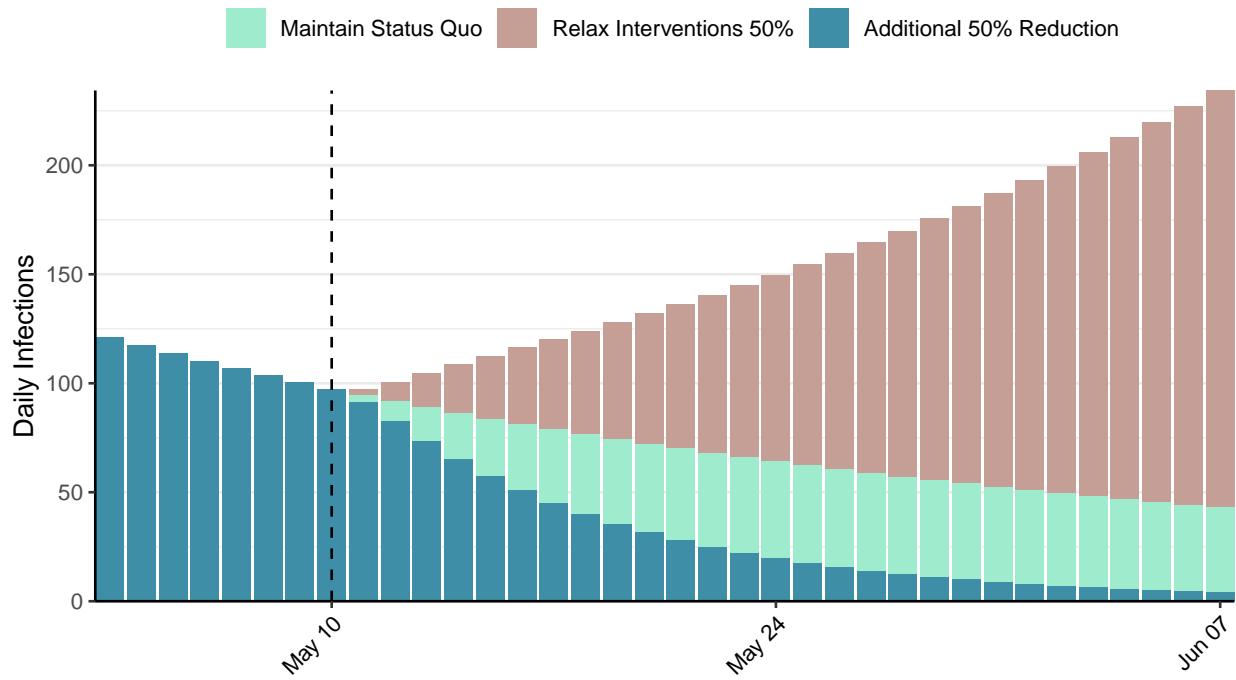


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Grenada, 2021-05-10

[Download the report for Grenada, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
160	0	1	0	0.87 (95% CI: 0.53-1.23)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease. **N.B. Grenada is not shown in the following plot as only 1 deaths have been reported to date**

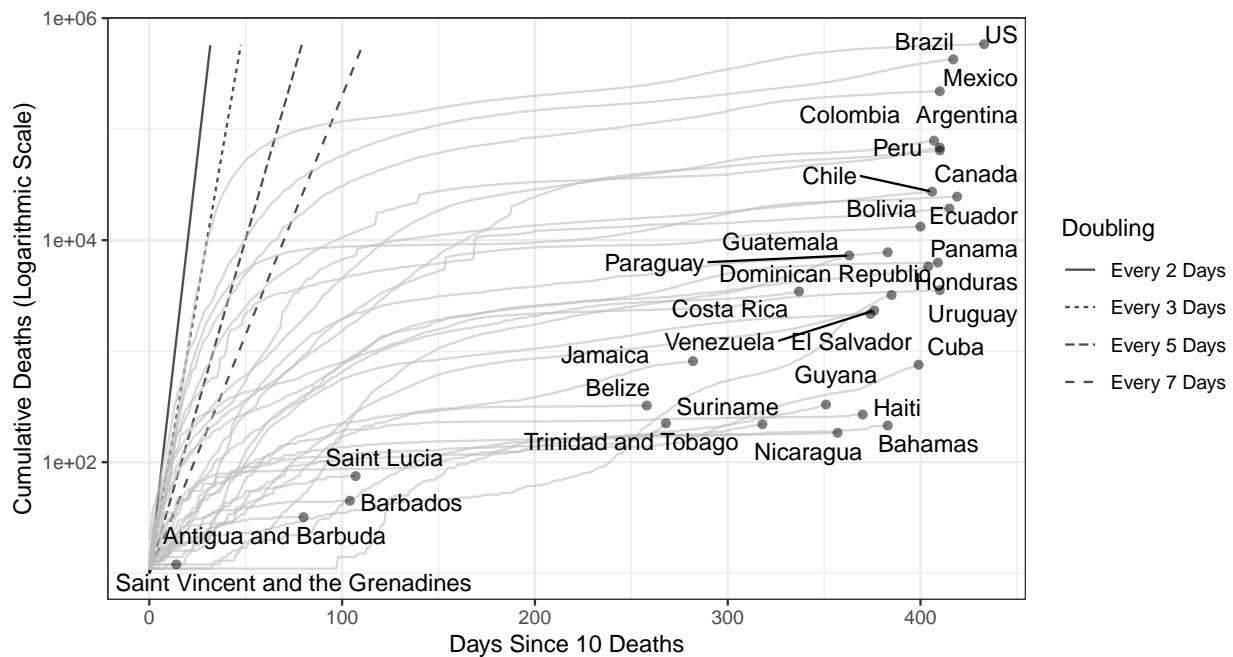


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 30 (95% CI: 20-40) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

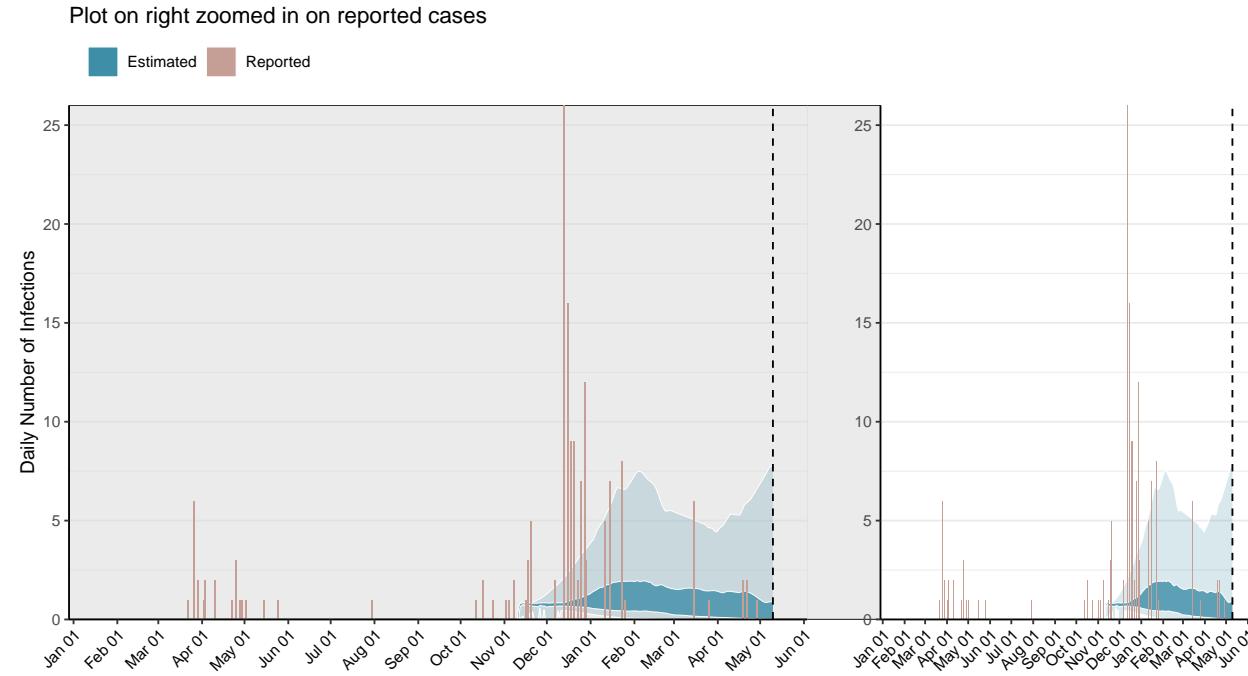
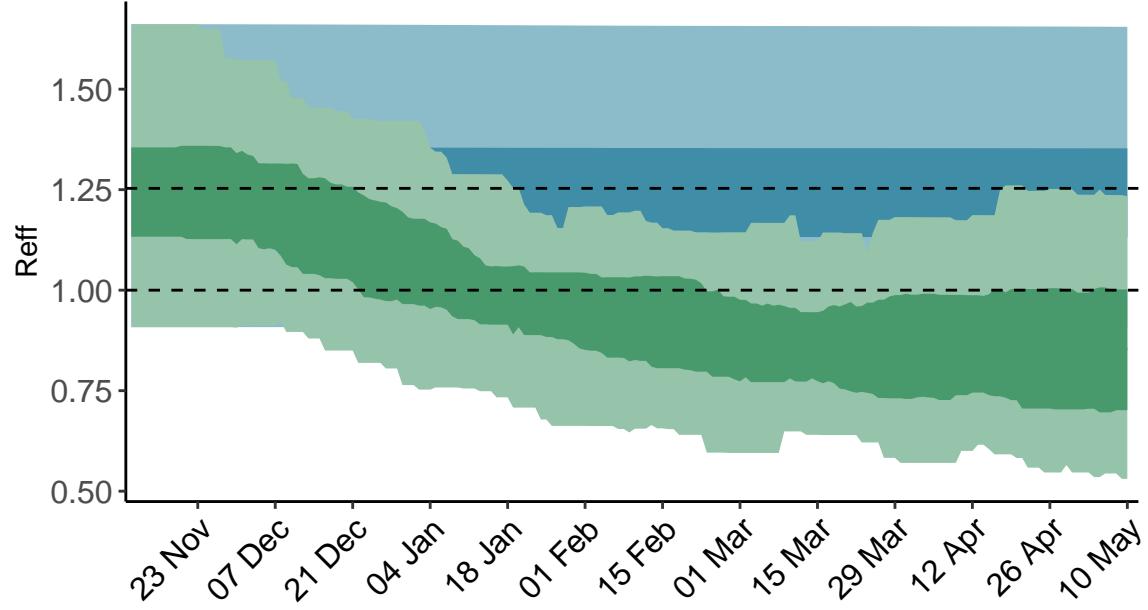


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

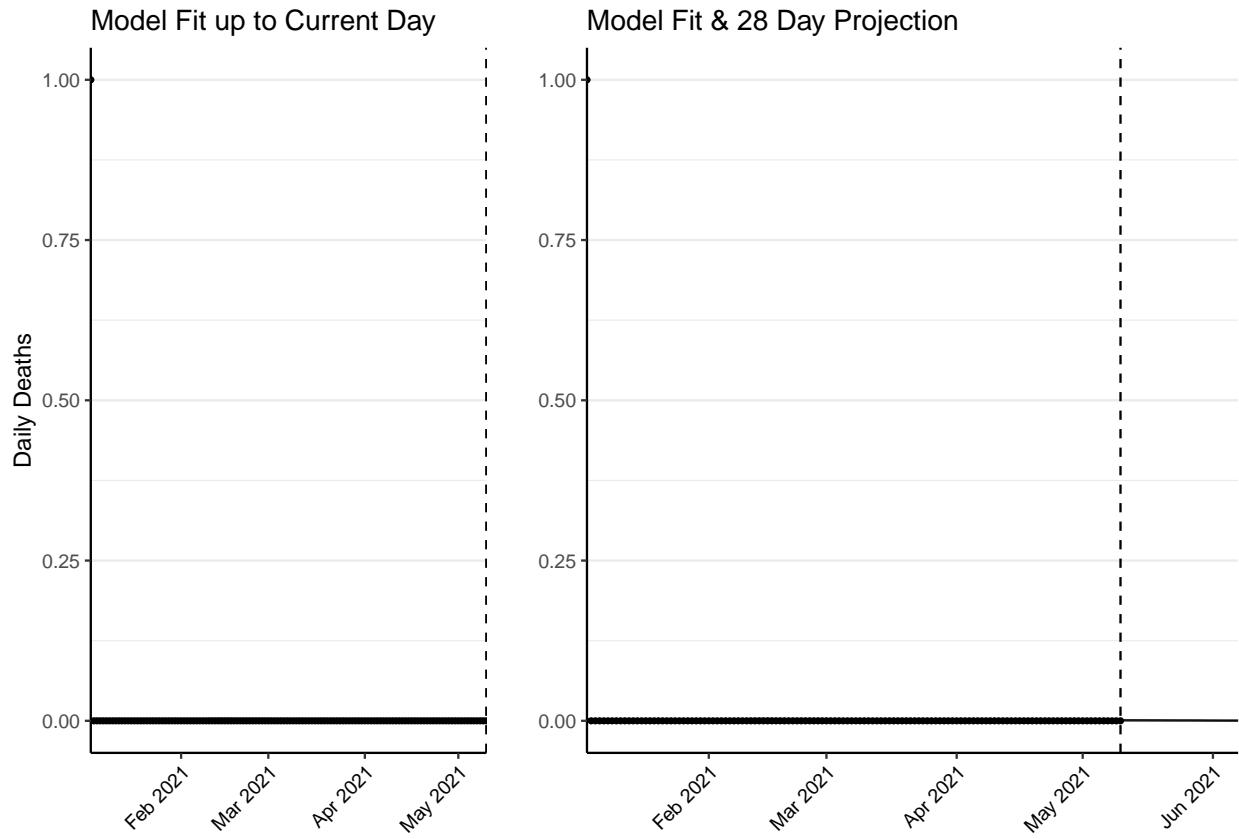


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 0 (95% CI: 0-0) patients requiring treatment with high-pressure oxygen at the current date to 0 (95% CI: 0-0) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 0 (95% CI: 0-0) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

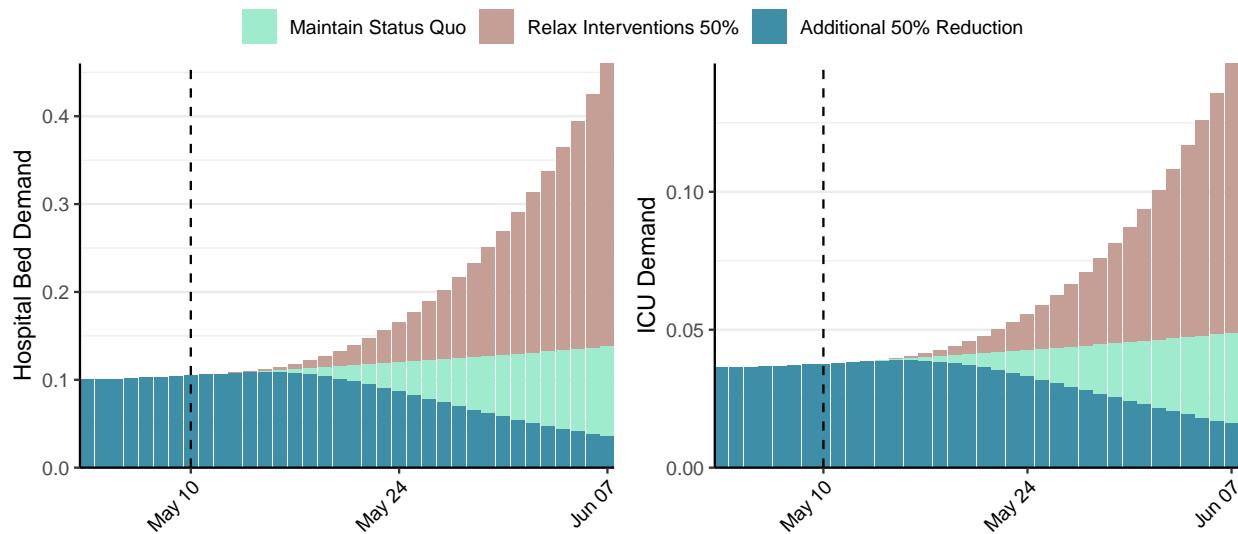


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1 (95% CI: 1-2) at the current date to 0 (95% CI: 0-0) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1 (95% CI: 1-2) at the current date to 10 (95% CI: 5-15) by 2021-06-07.

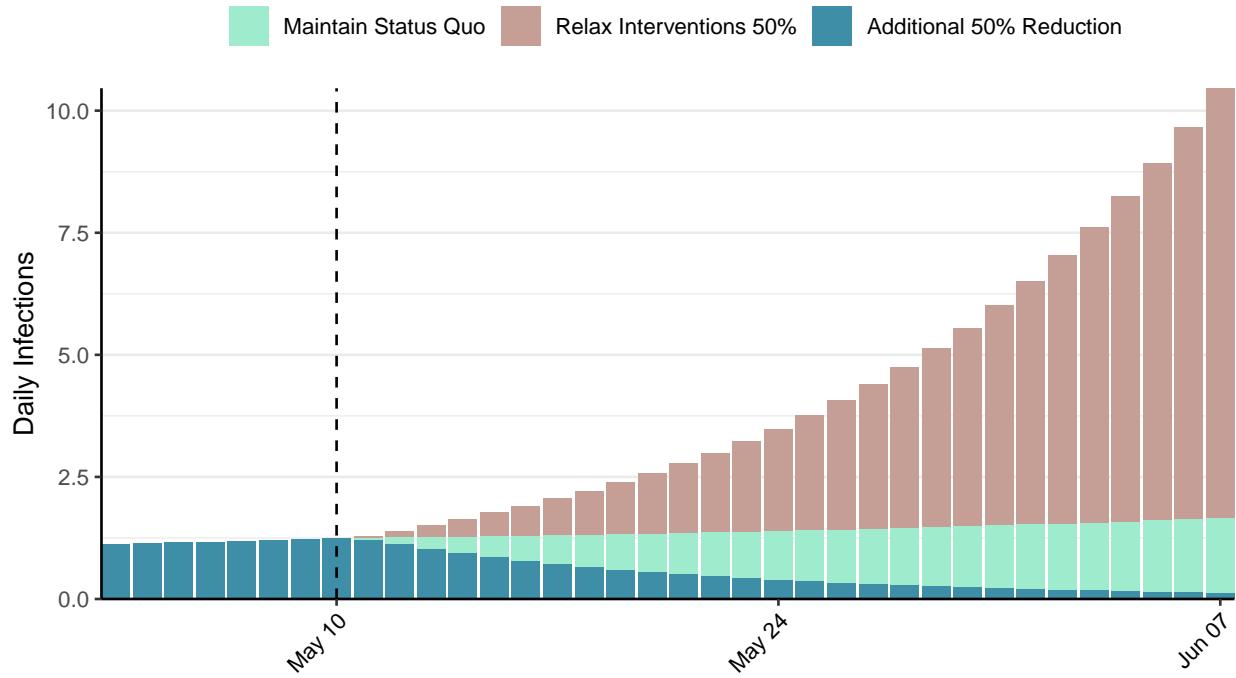


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Guatemala, 2021-05-10

[Download the report for Guatemala, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
235,304	206	7,739	3	0.78 (95% CI: 0.74-0.82)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

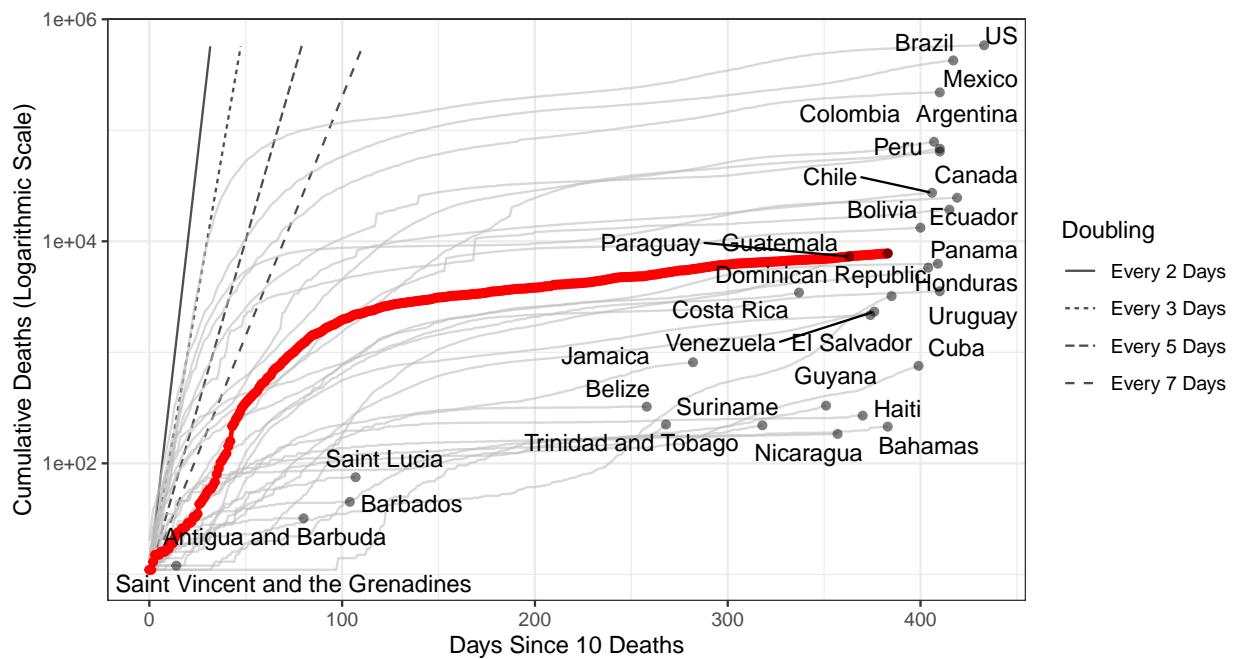


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 327,457 (95% CI: 317,922–336,993) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

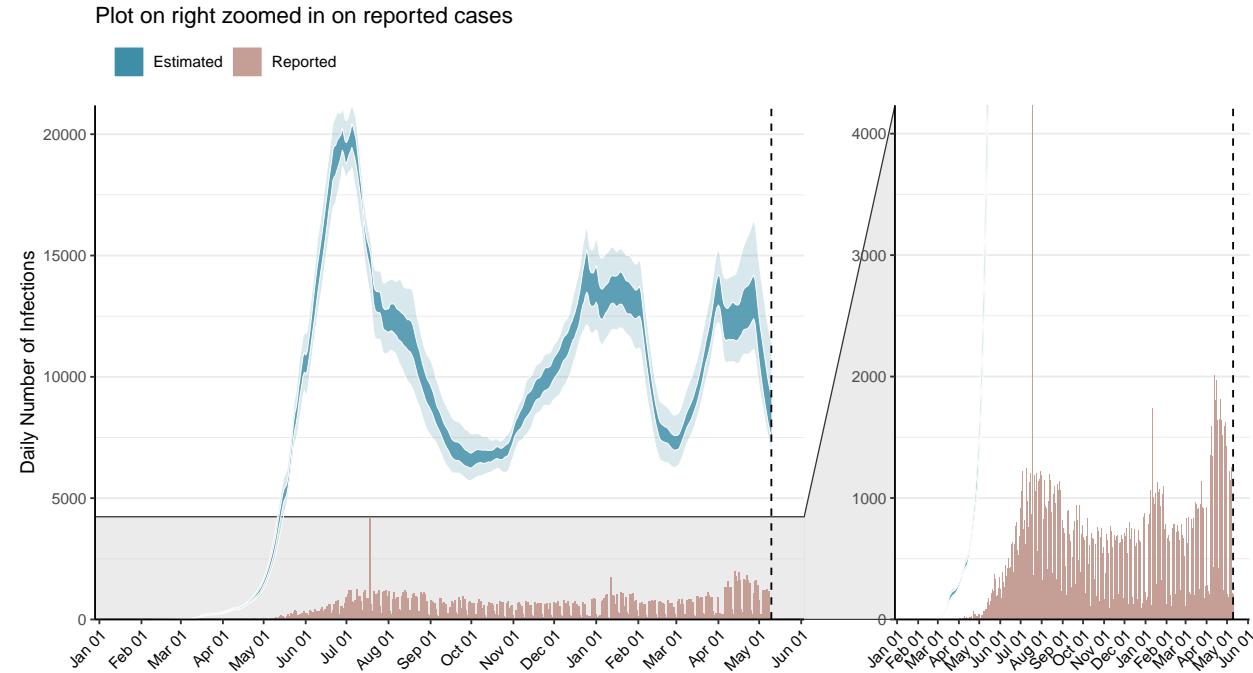
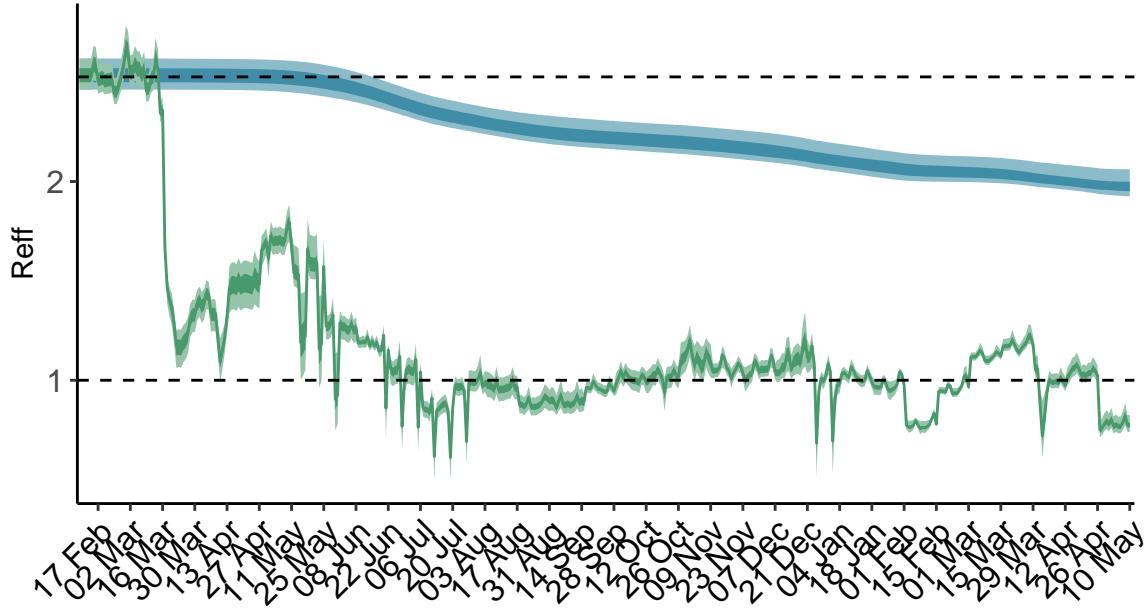


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

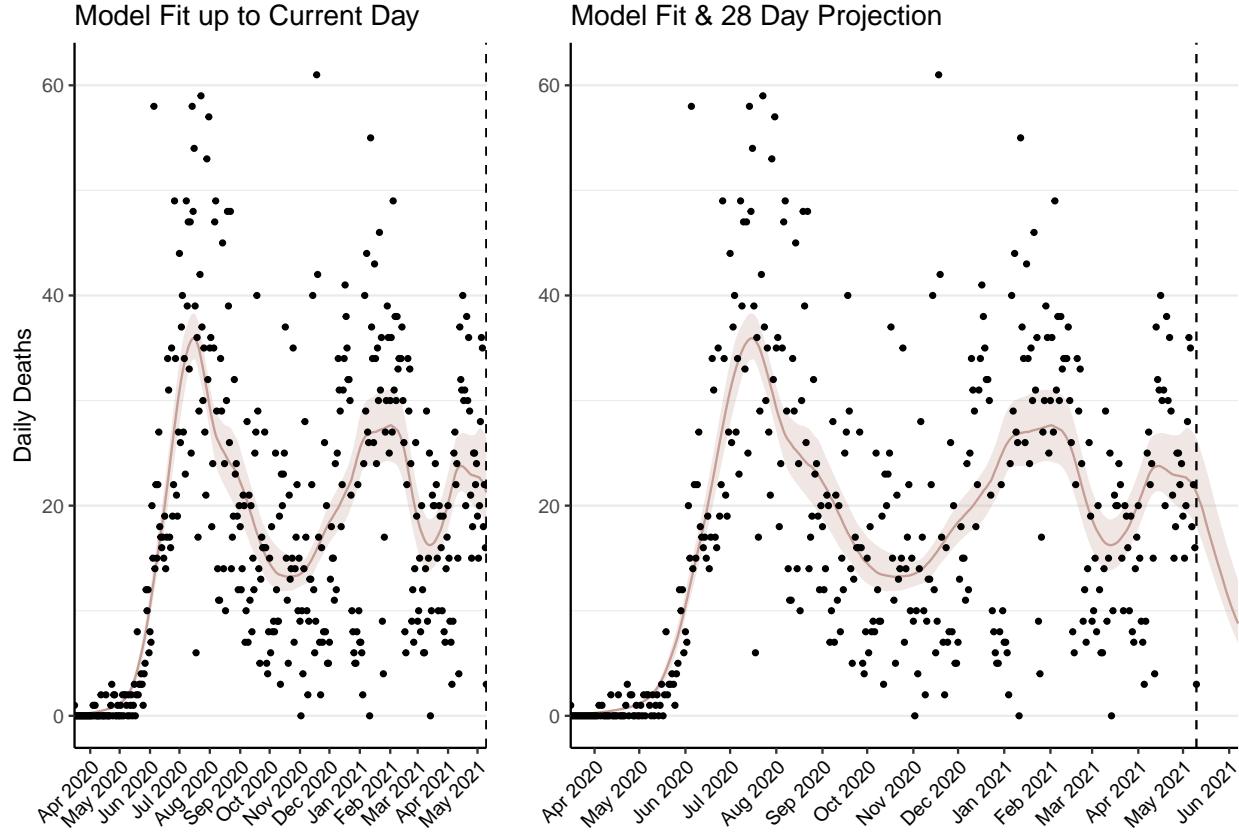


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 828 (95% CI: 803-853) patients requiring treatment with high-pressure oxygen at the current date to 328 (95% CI: 313-342) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 327 (95% CI: 317-336) patients requiring treatment with mechanical ventilation at the current date to 148 (95% CI: 142-154) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

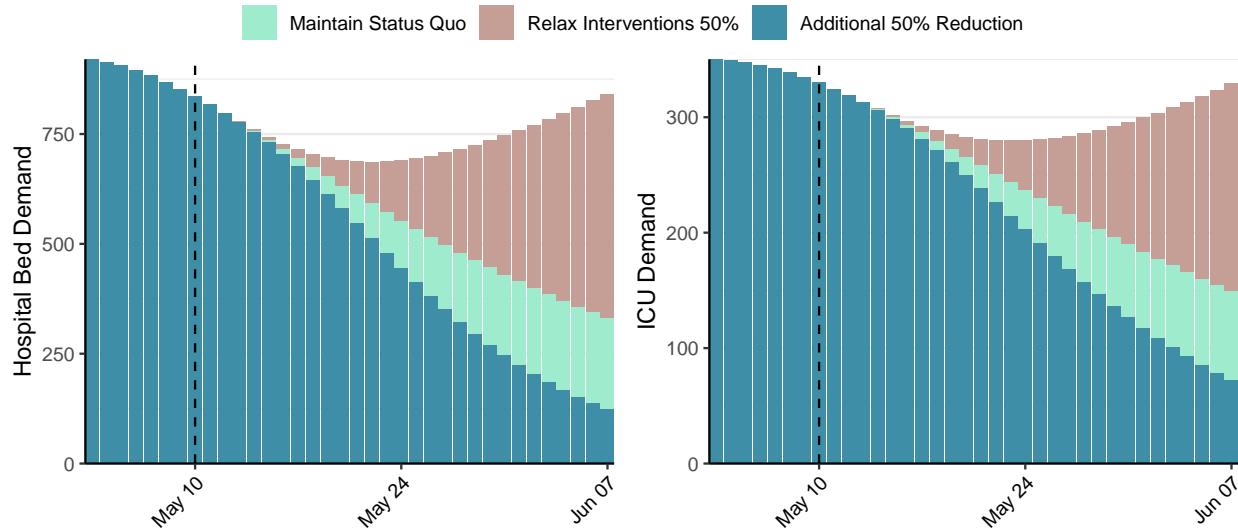


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 8,477 (95% CI: 8,173-8,781) at the current date to 306 (95% CI: 290-321) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 8,477 (95% CI: 8,173-8,781) at the current date to 15,980 (95% CI: 15,107-16,852) by 2021-06-07.

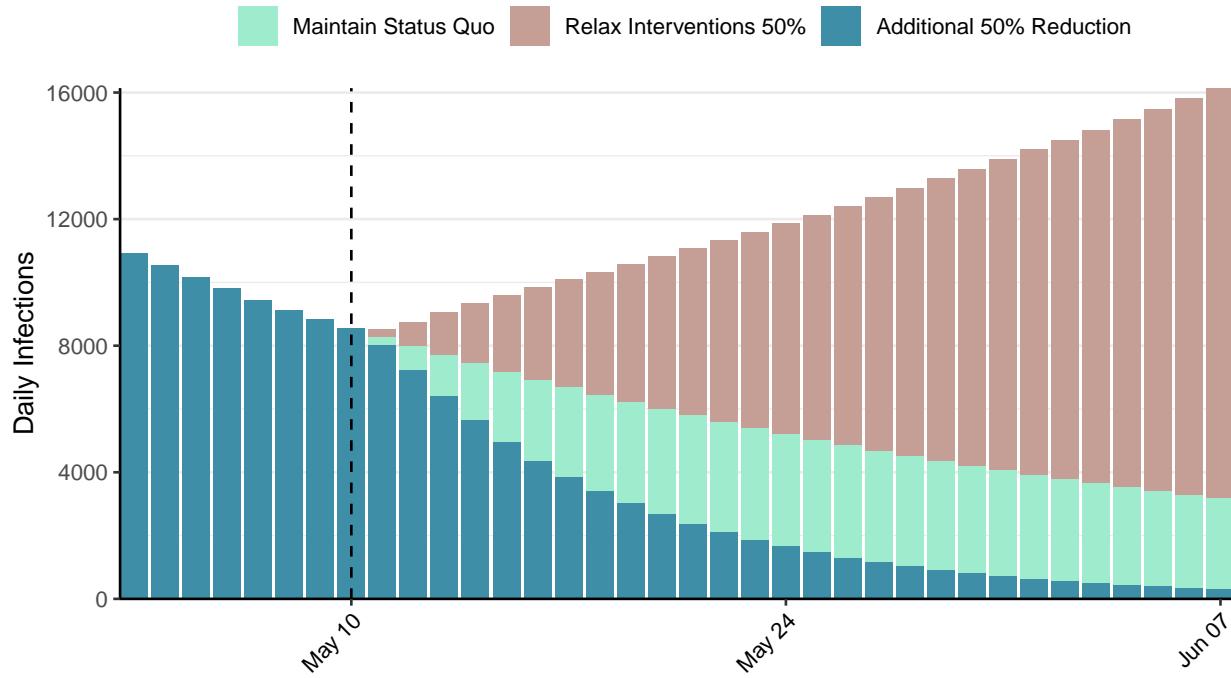


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: French Guiana, 2021-05-10

[Download the report for French Guiana, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
20,872	233	106	0	0.88 (95% CI: 0.74-1.03)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

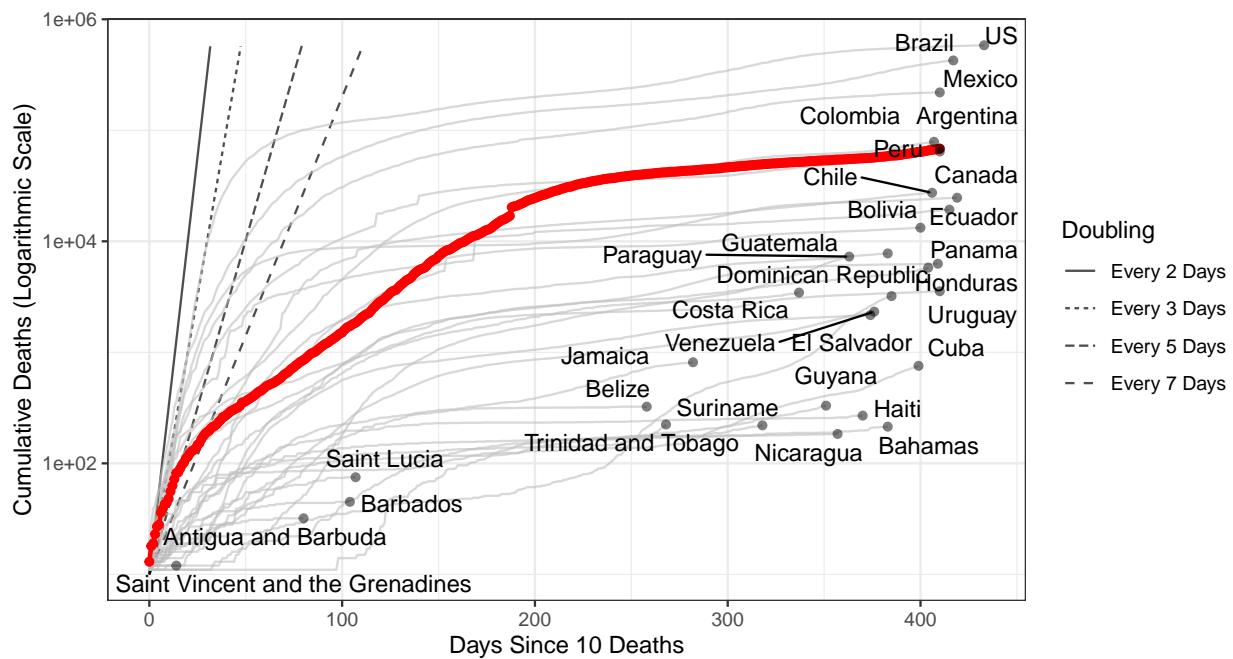


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 6,026 (95% CI: 5,702-6,351) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

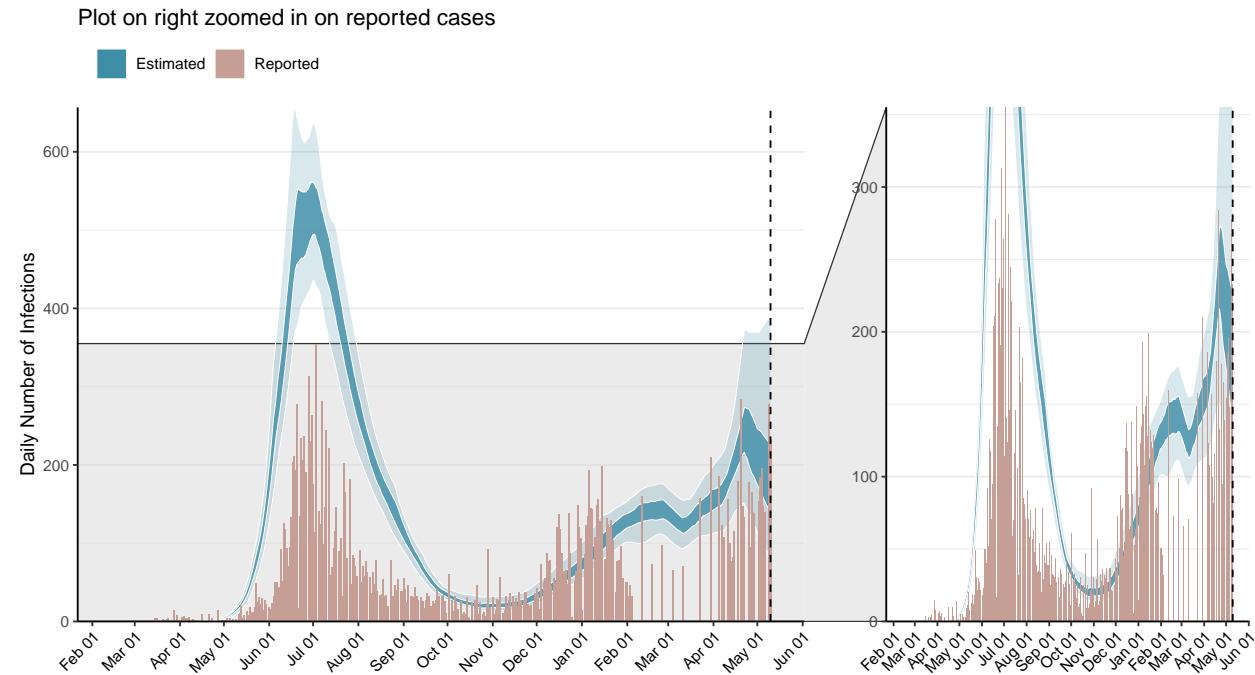
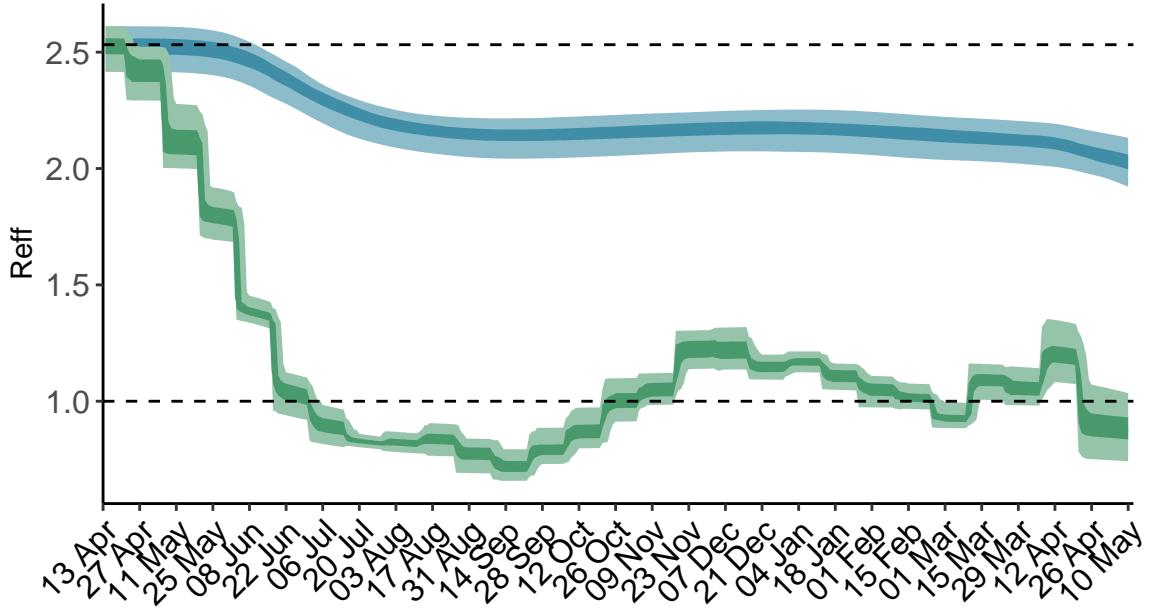


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

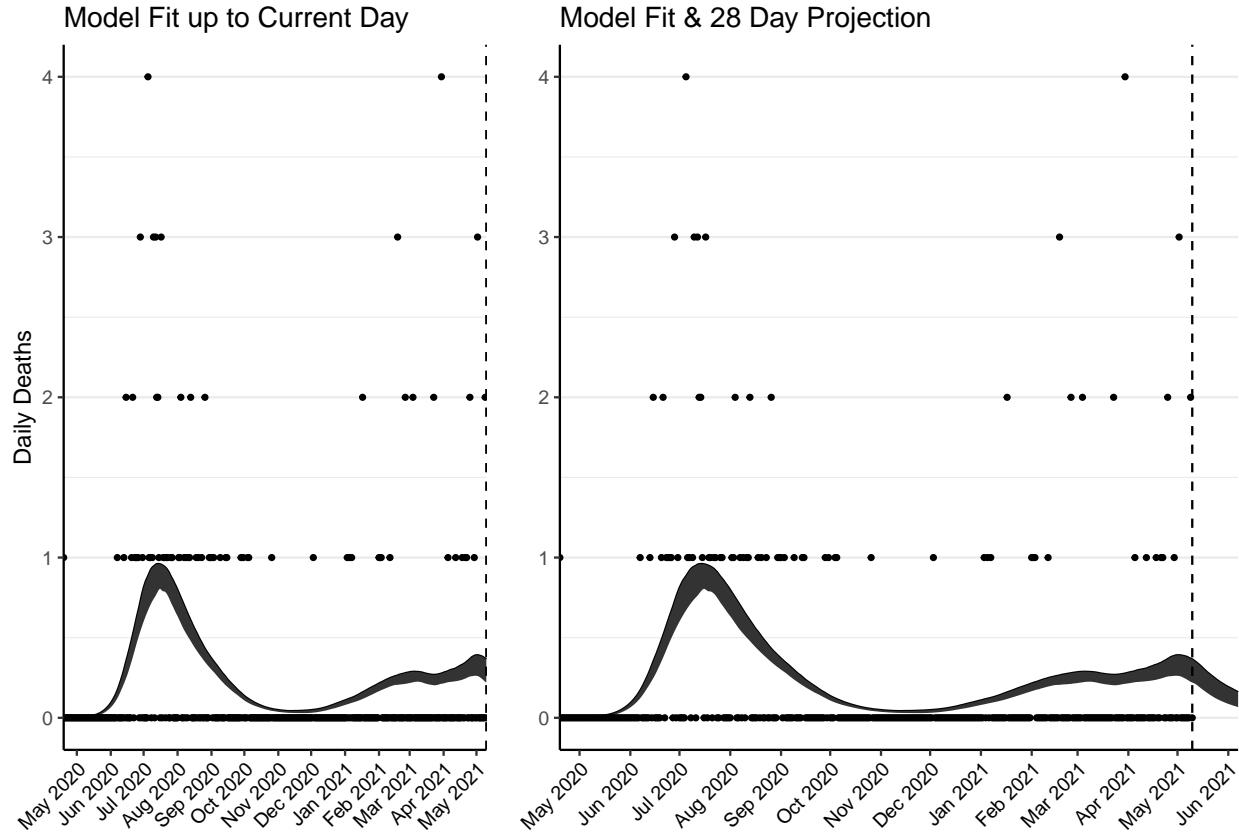


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 15 (95% CI: 14-16) patients requiring treatment with high-pressure oxygen at the current date to 8 (95% CI: 7-9) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 6 (95% CI: 6-7) patients requiring treatment with mechanical ventilation at the current date to 4 (95% CI: 3-4) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

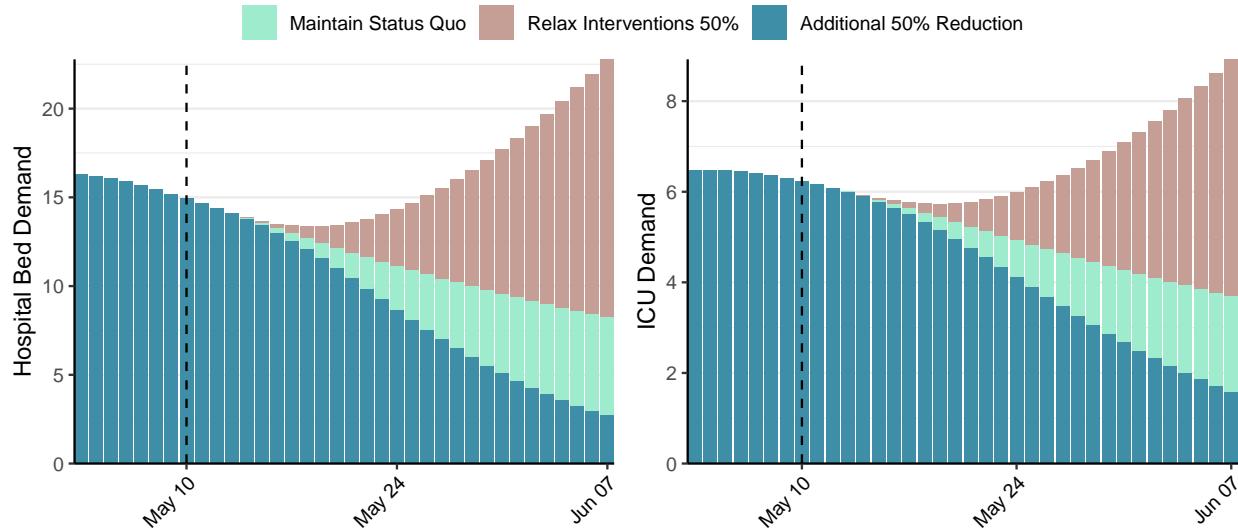


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 189 (95% CI: 174-204) at the current date to 10 (95% CI: 9-12) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 189 (95% CI: 174-204) at the current date to 602 (95% CI: 519-685) by 2021-06-07.

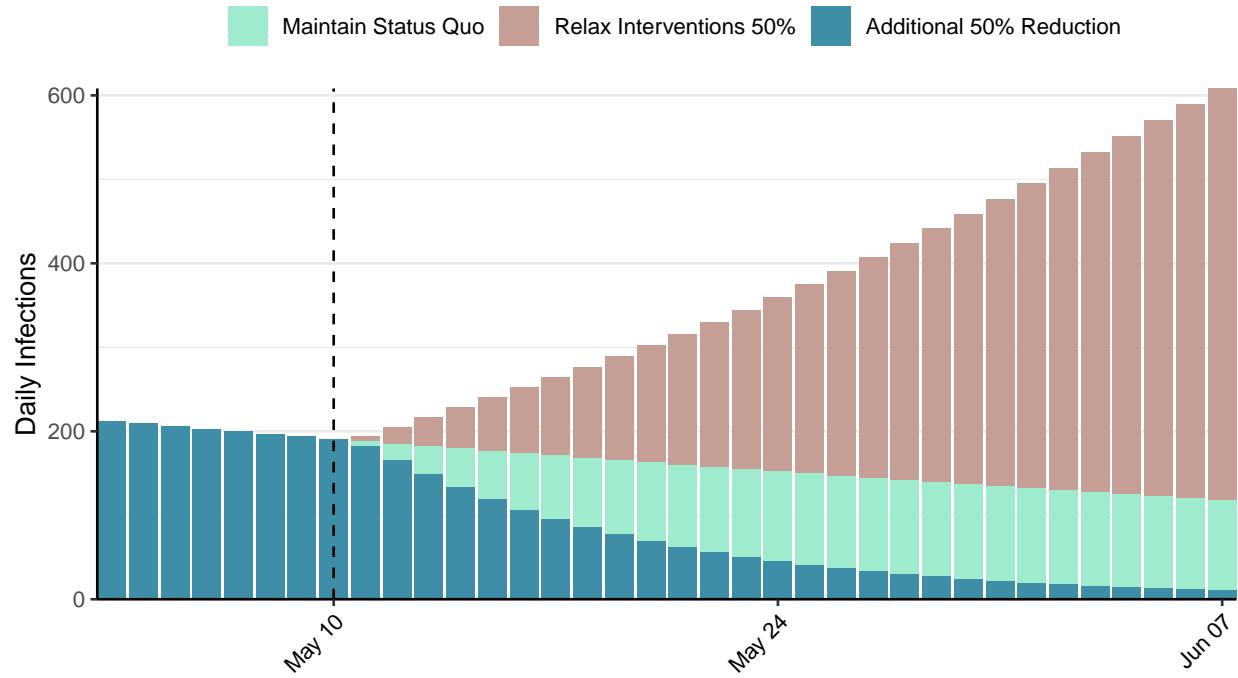


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Guyana, 2021-05-10

[Download the report for Guyana, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
14,442	80	327	2	1.08 (95% CI: 0.97-1.16)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

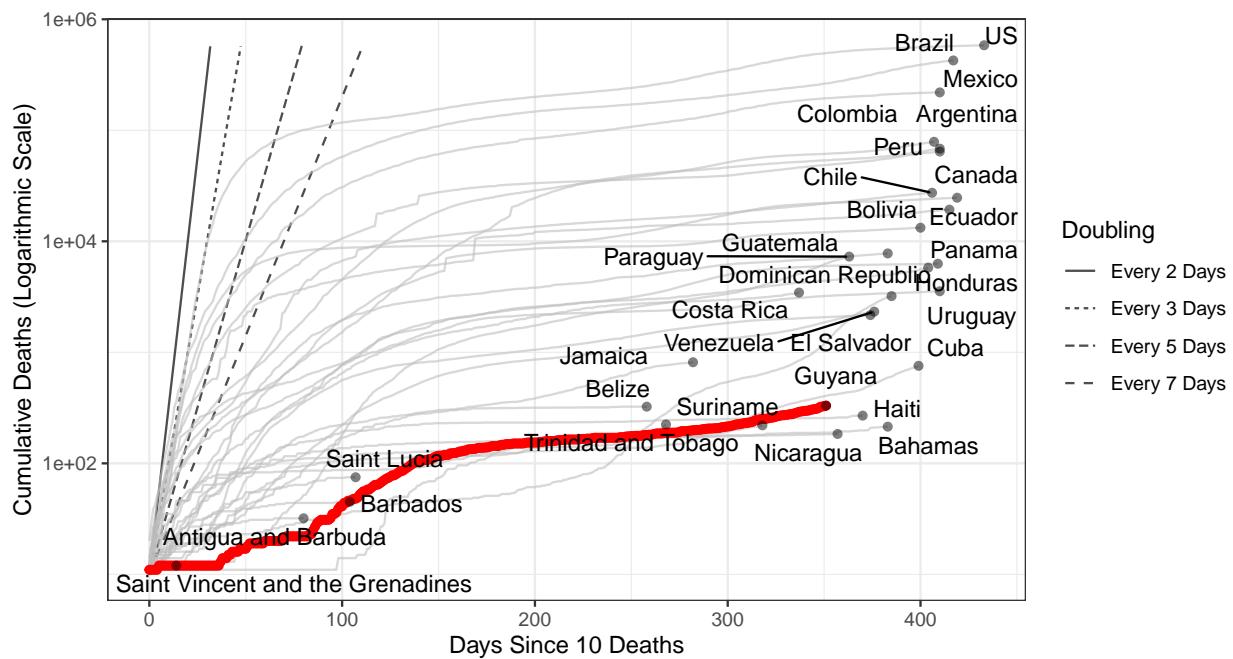


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 38,895 (95% CI: 37,551-40,239) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Guyana has revised their historic reported cases and thus have reported negative cases.**

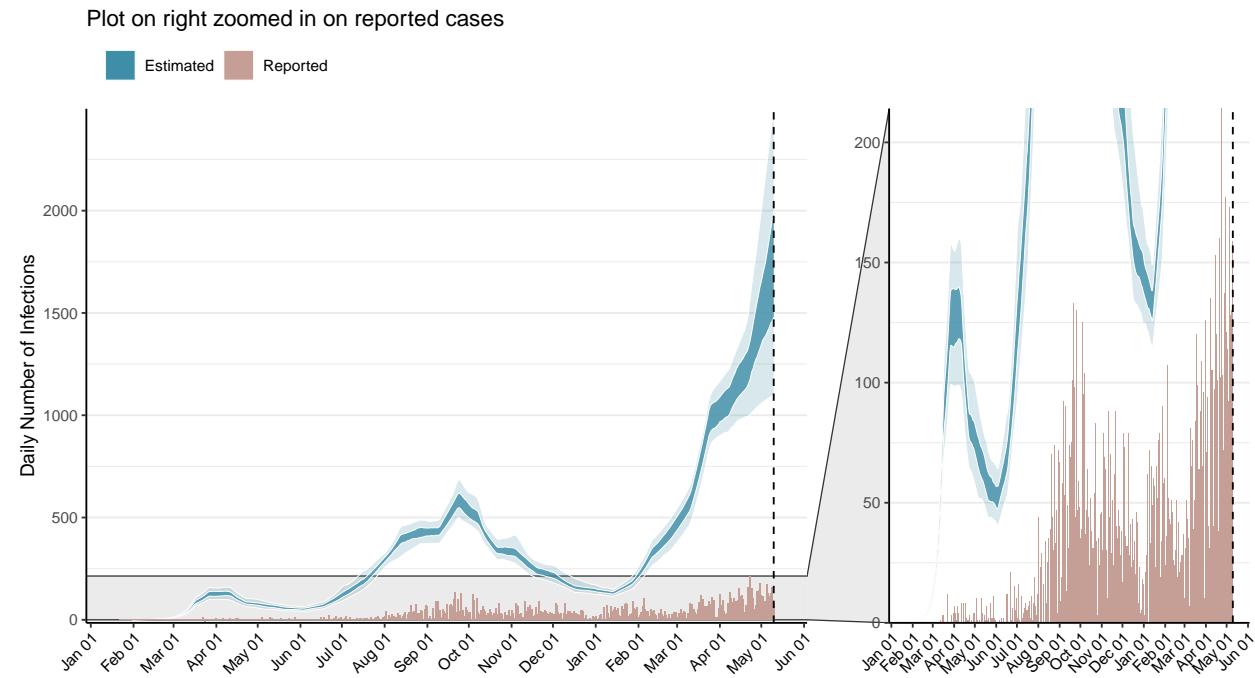
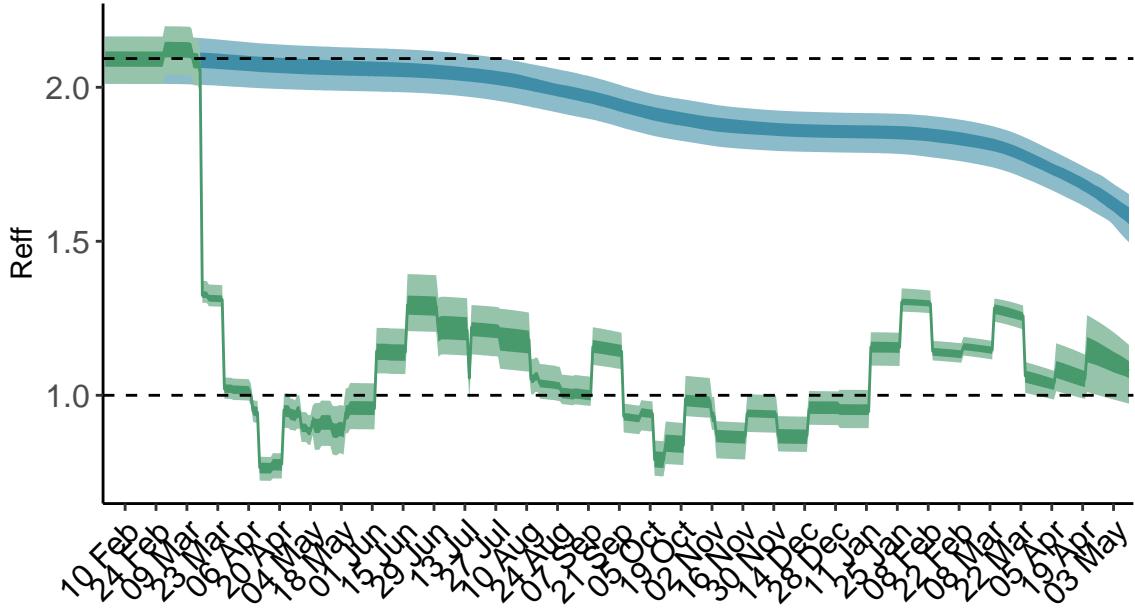


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Guyana is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

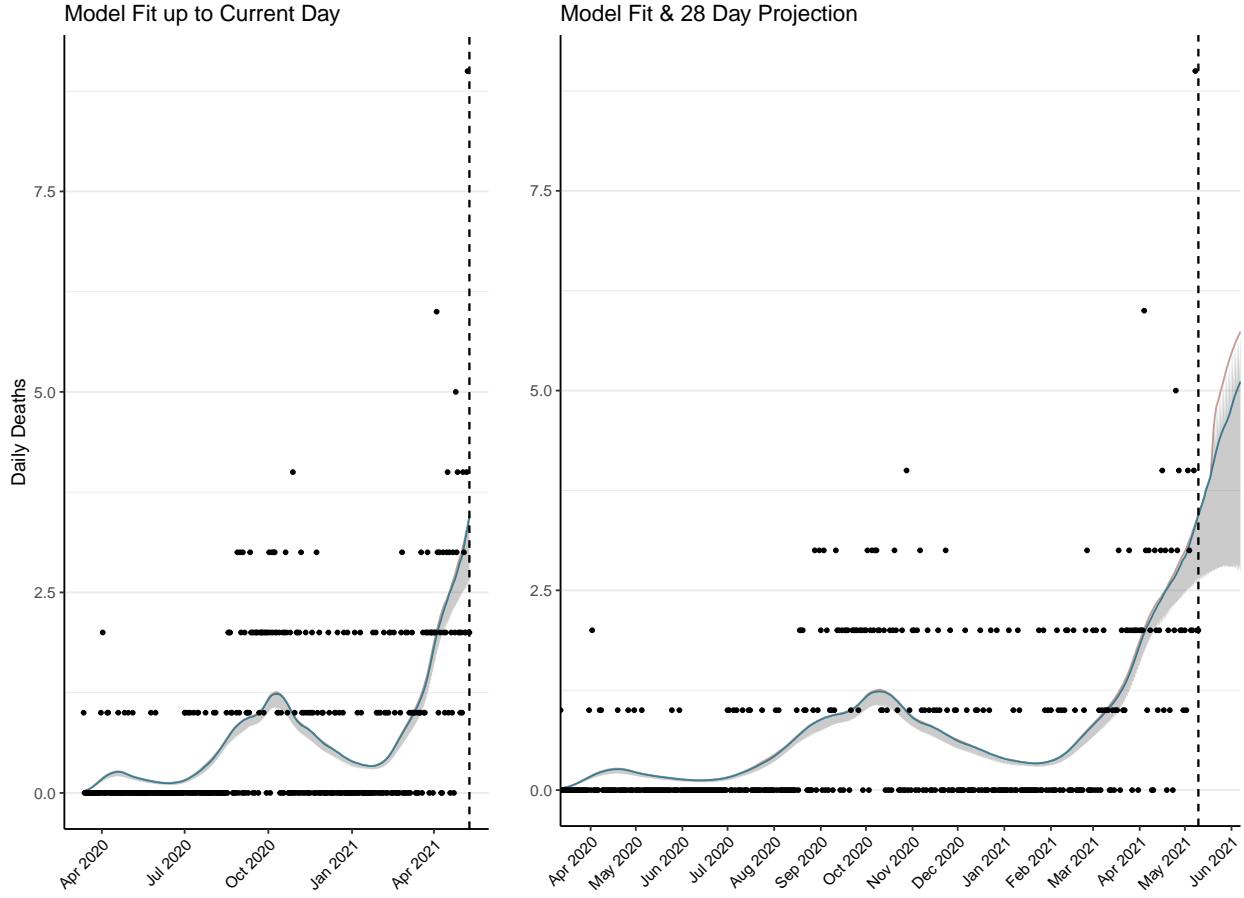


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 134 (95% CI: 129-139) patients requiring treatment with high-pressure oxygen at the current date to 190 (95% CI: 179-202) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 47 (95% CI: 46-49) patients requiring treatment with mechanical ventilation at the current date to 54 (95% CI: 53-56) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

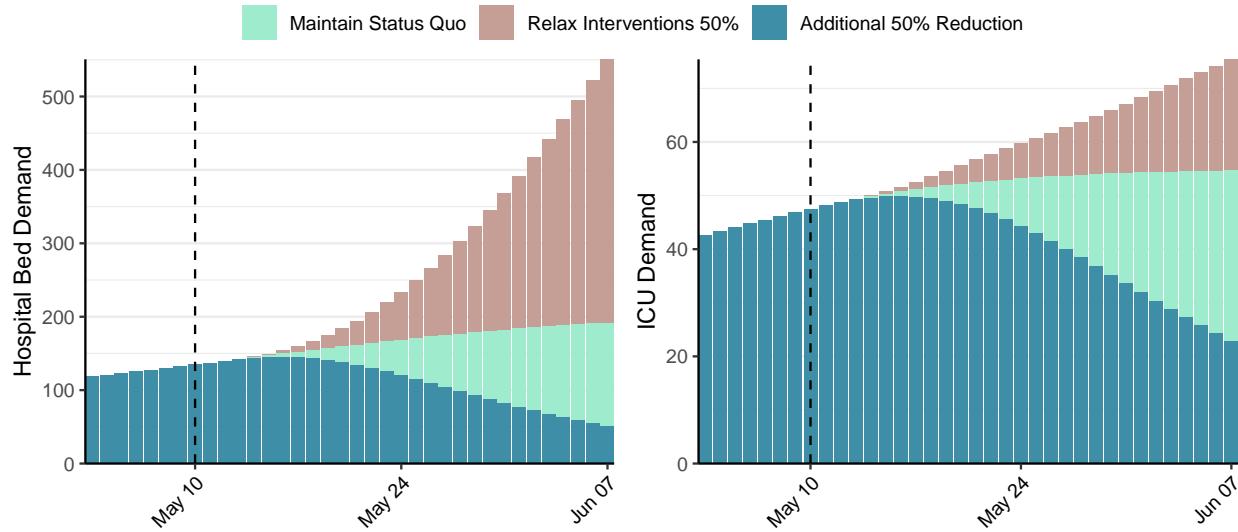


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,717 (95% CI: 1,637-1,798) at the current date to 174 (95% CI: 162-186) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,717 (95% CI: 1,637-1,798) at the current date to 8,162 (95% CI: 7,790-8,535) by 2021-06-07.

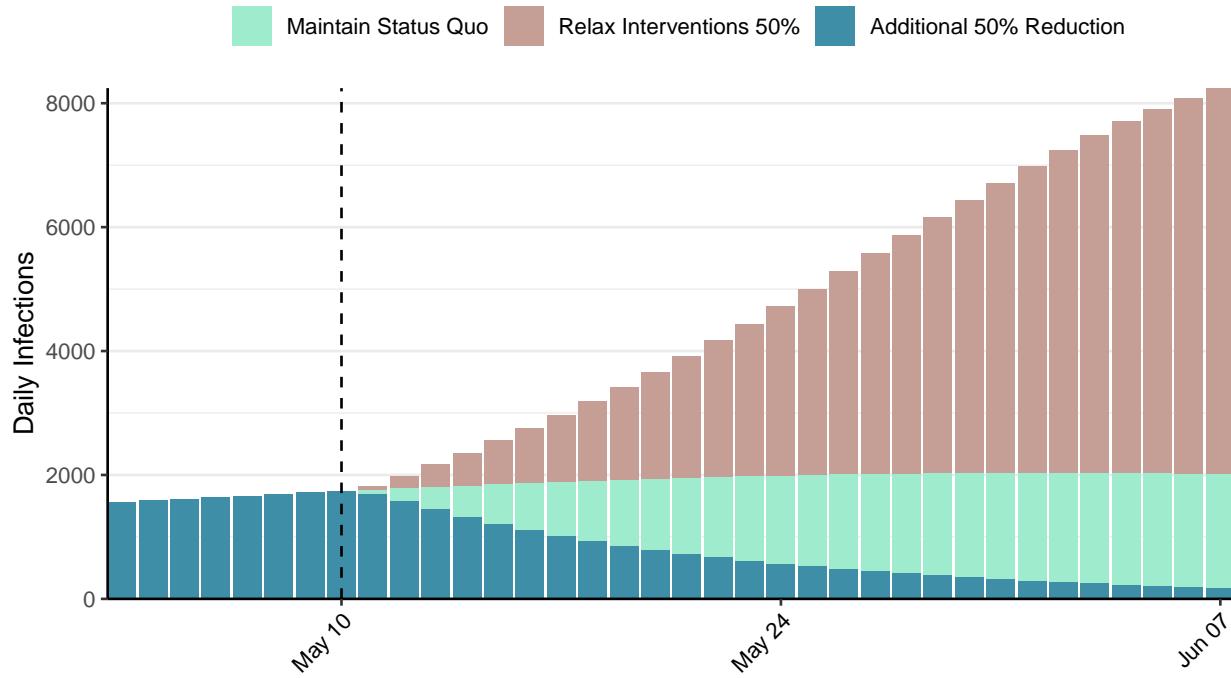


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Honduras, 2021-05-10

[Download the report for Honduras, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
220,185	897	5,665	48	0.97 (95% CI: 0.9-1.03)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

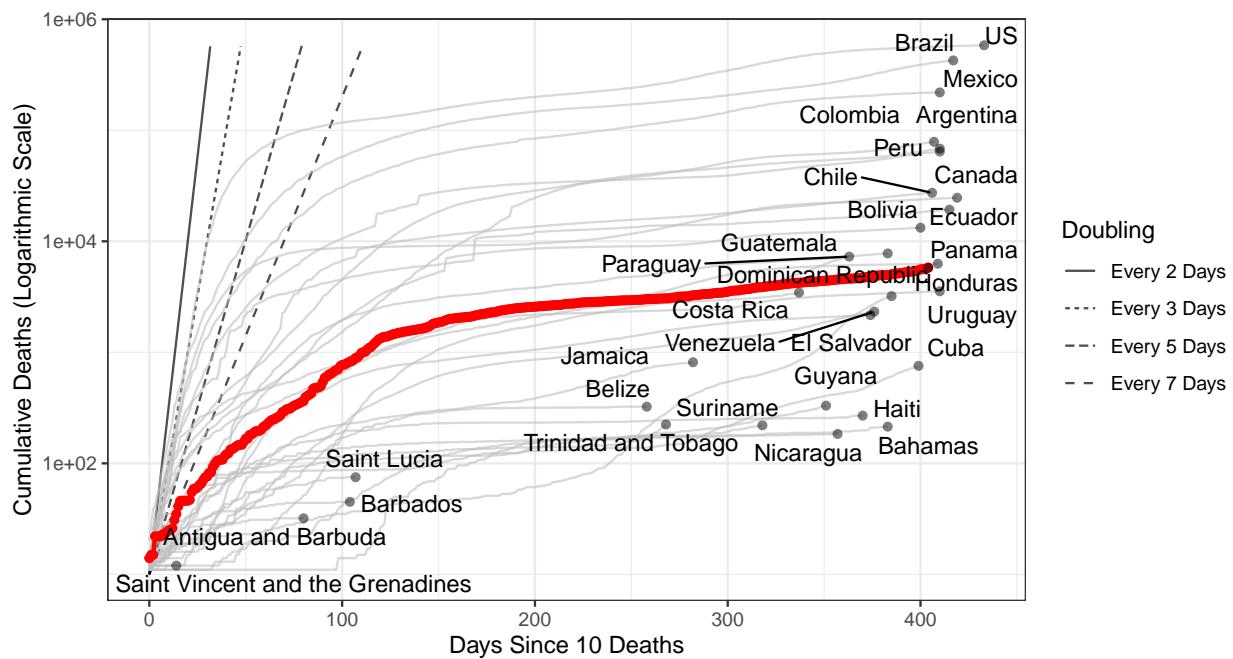


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 400,143 (95% CI: 387,062-413,223) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Honduras has revised their historic reported cases and thus have reported negative cases.**

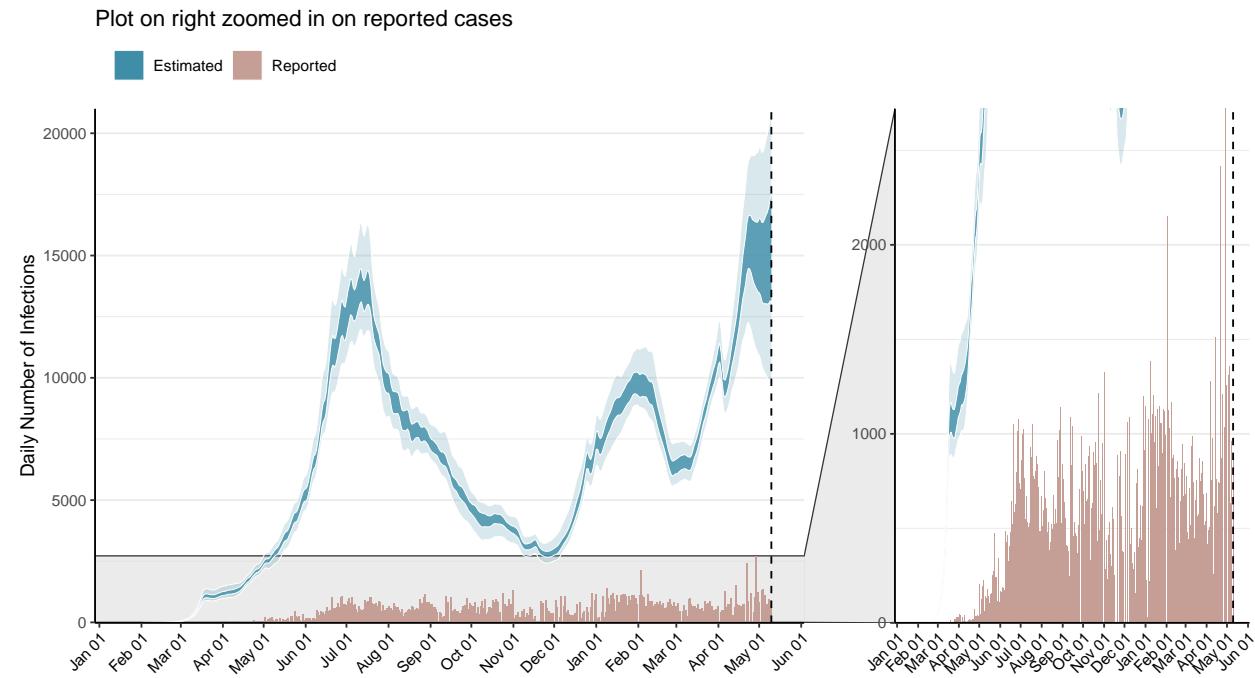
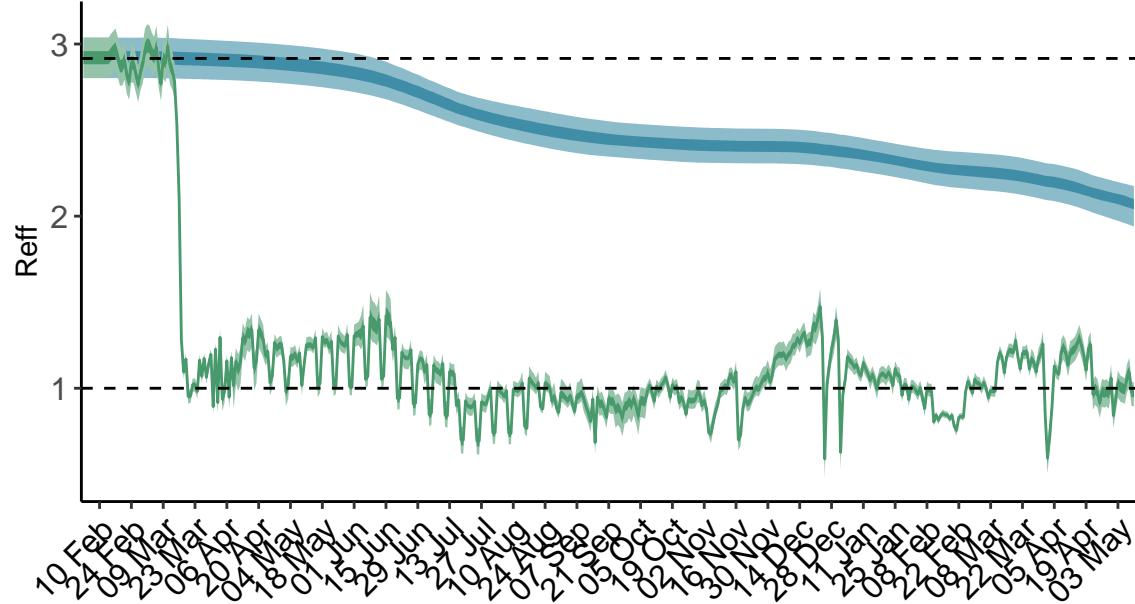


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

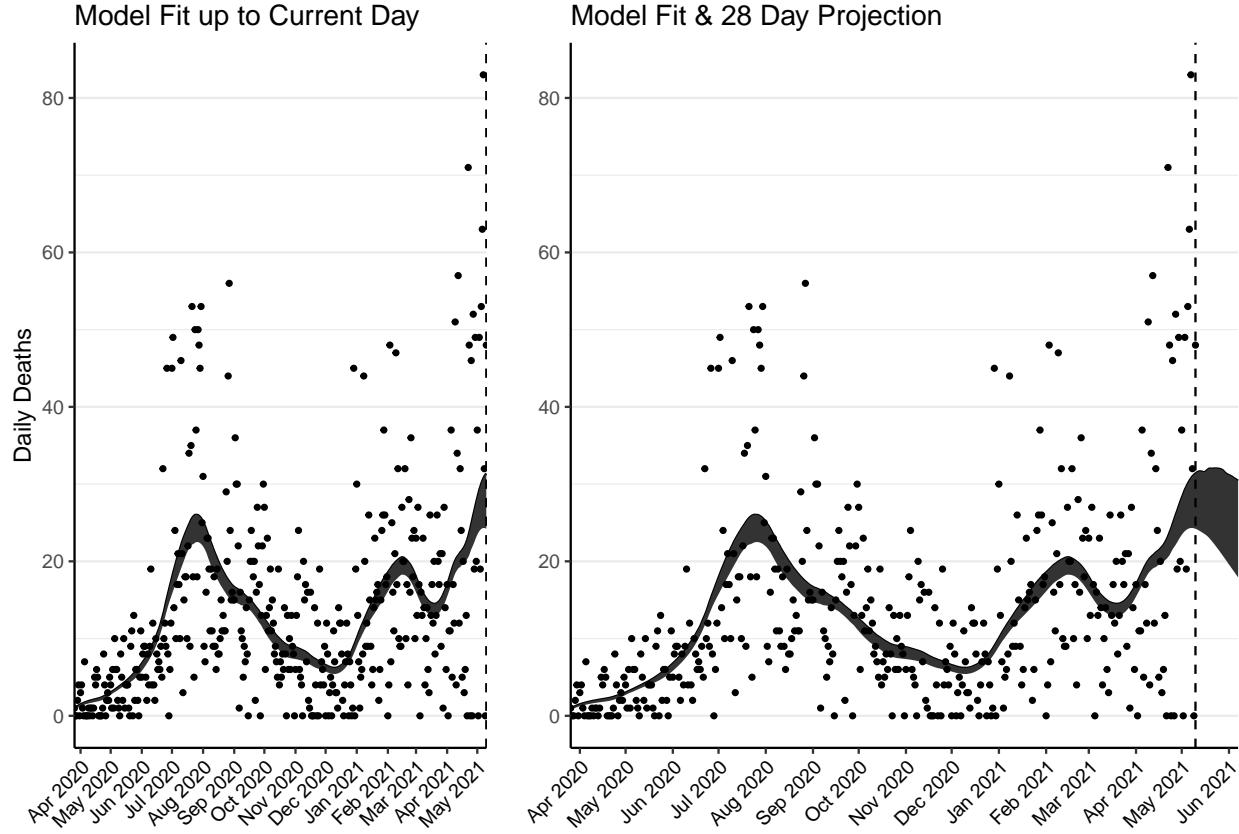


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 1,207 (95% CI: 1,166-1,249) patients requiring treatment with high-pressure oxygen at the current date to 1,167 (95% CI: 1,098-1,236) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 424 (95% CI: 410-438) patients requiring treatment with mechanical ventilation at the current date to 413 (95% CI: 393-434) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

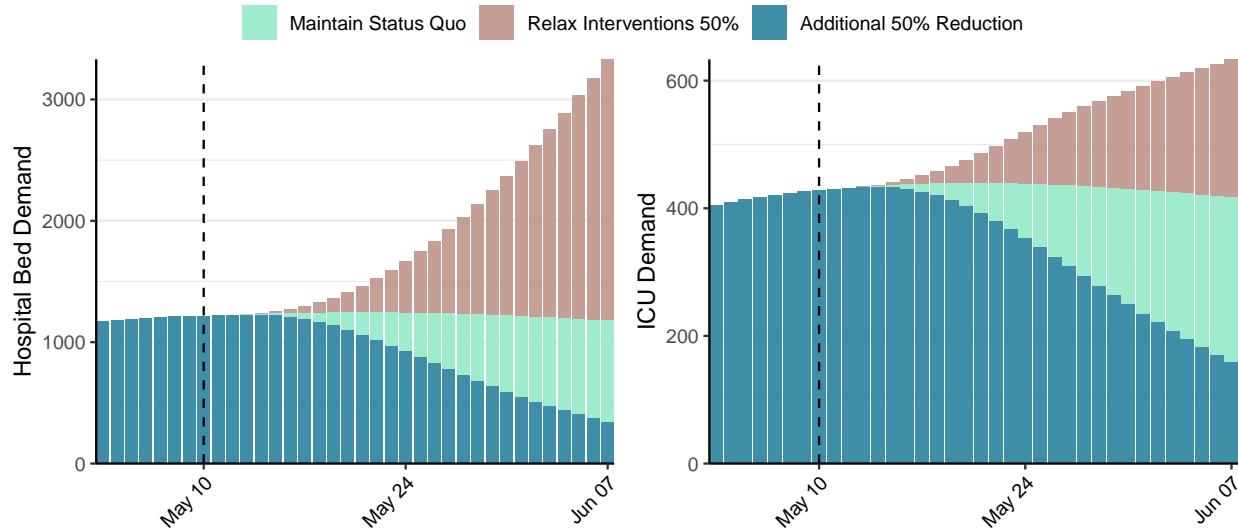
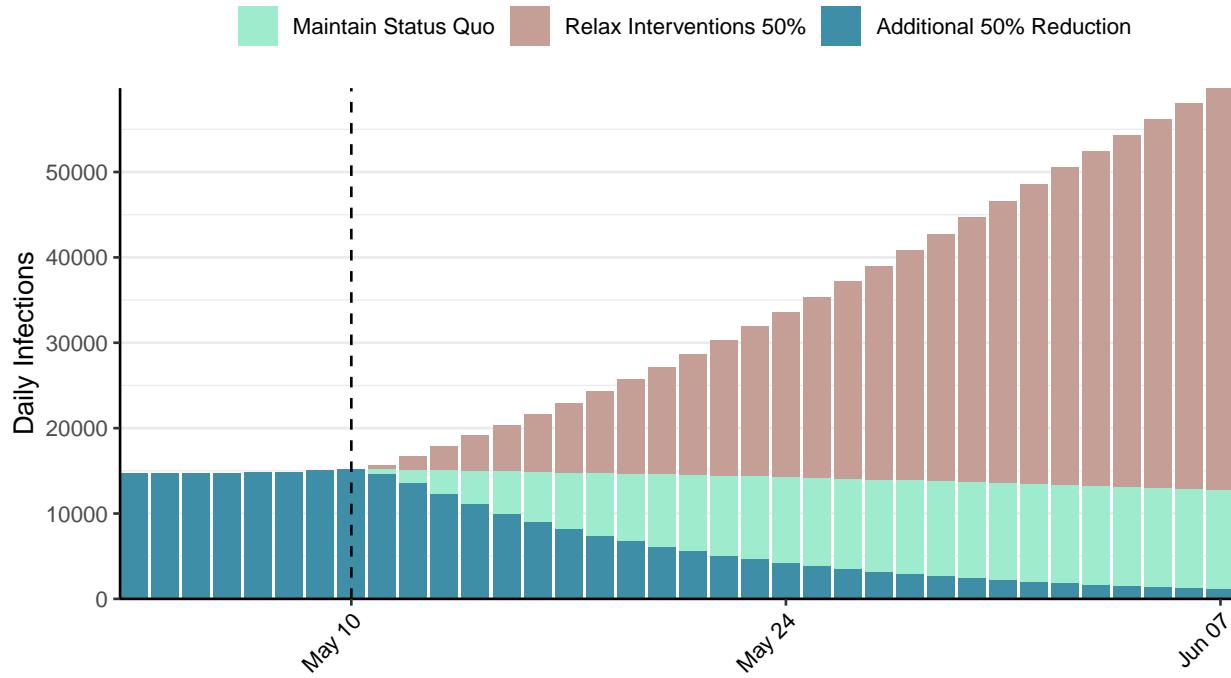


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 15,009 (95% CI: 14,334-15,685) at the current date to 1,108 (95% CI: 1,035-1,181) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 15,009 (95% CI: 14,334-15,685) at the current date to 59,236 (95% CI: 55,849-62,624) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Haiti, 2021-05-10

[Download the report for Haiti, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
13,164	0	268	0	1.16 (95% CI: 1.02-1.37)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

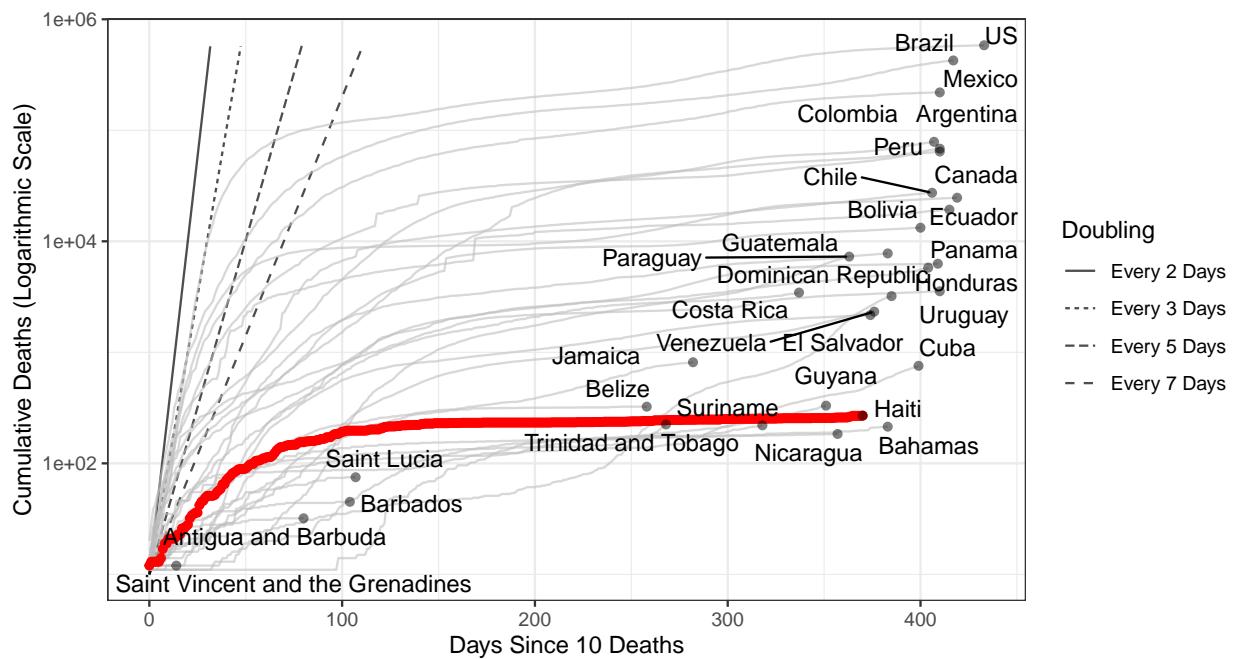


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 10,595 (95% CI: 9,795-11,395) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

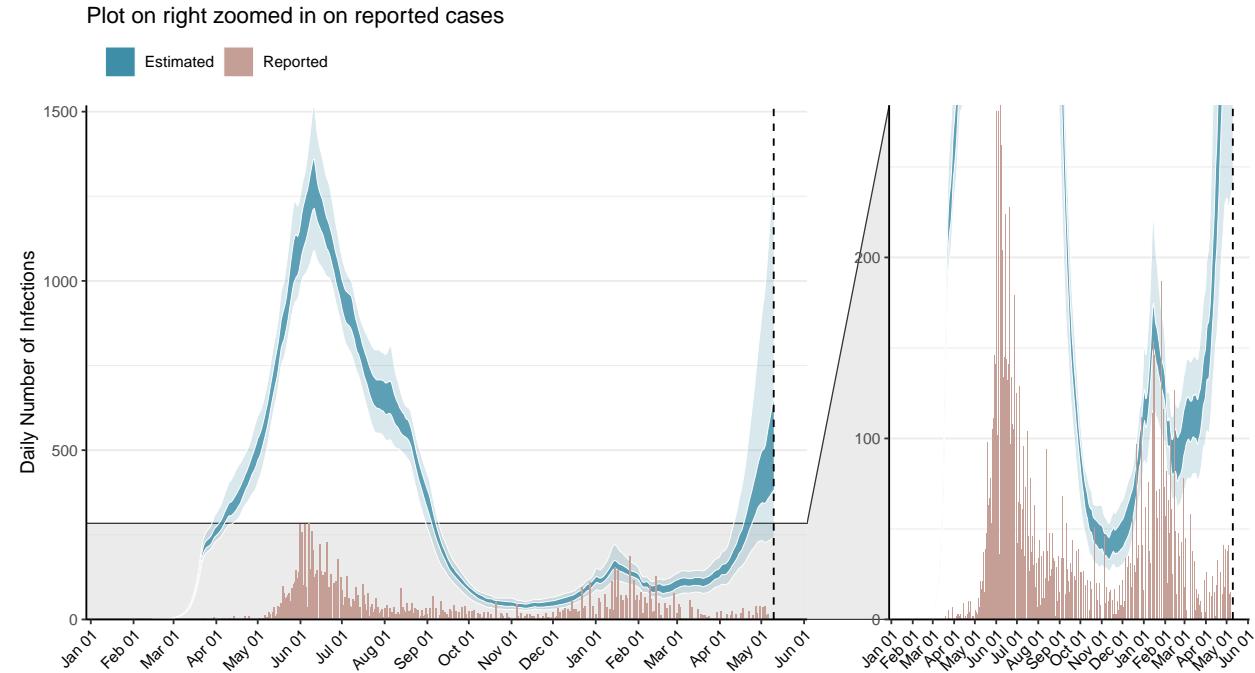
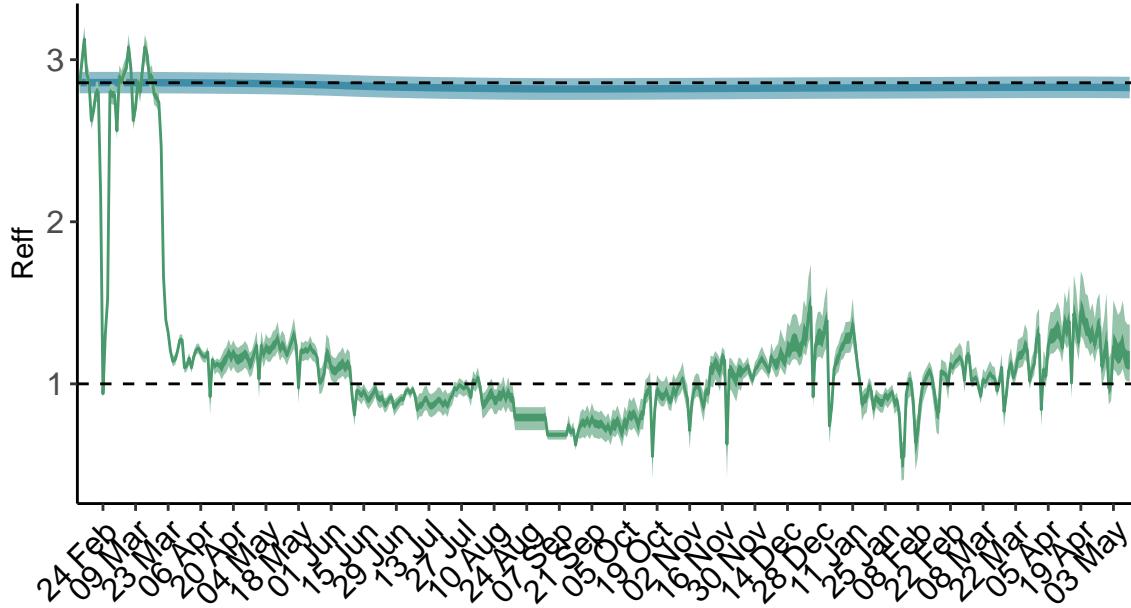


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

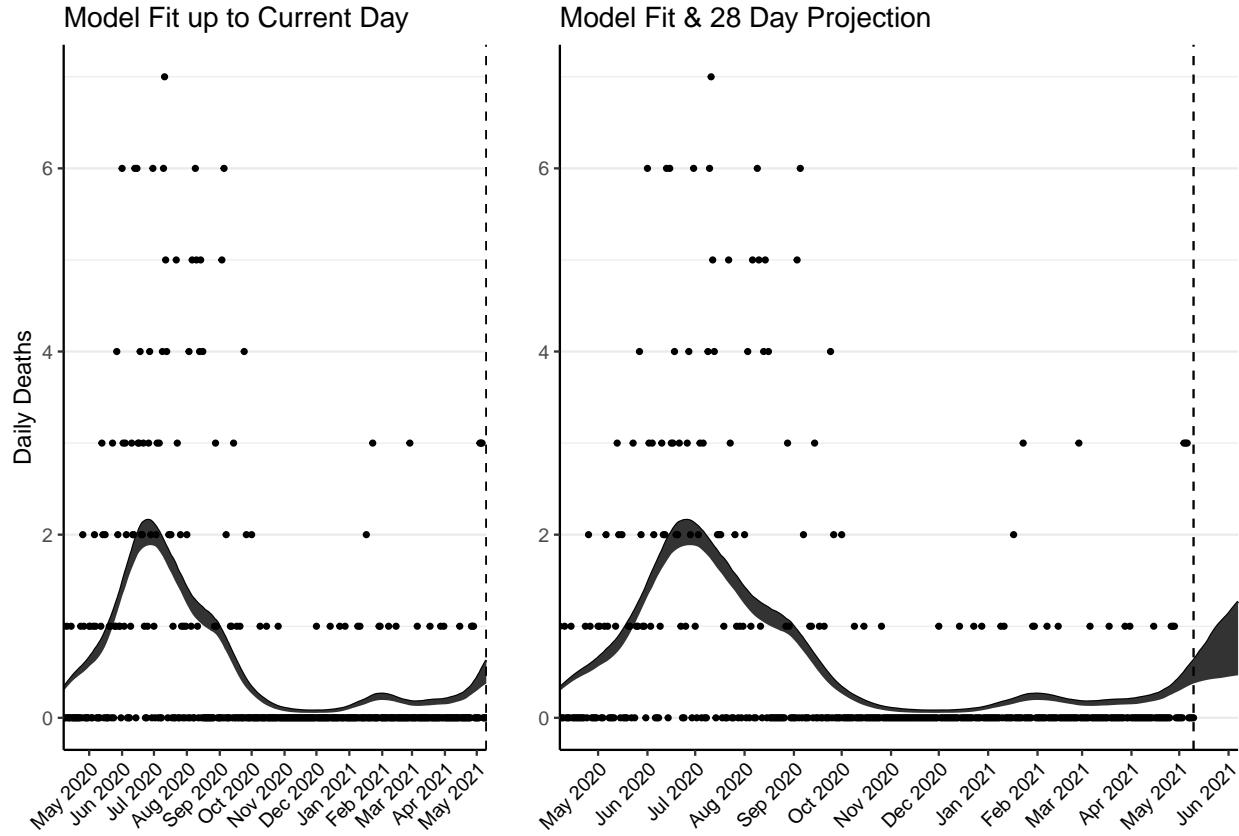


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 29 (95% CI: 27-31) patients requiring treatment with high-pressure oxygen at the current date to 68 (95% CI: 55-81) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 10 (95% CI: 9-11) patients requiring treatment with mechanical ventilation at the current date to 23 (95% CI: 19-28) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

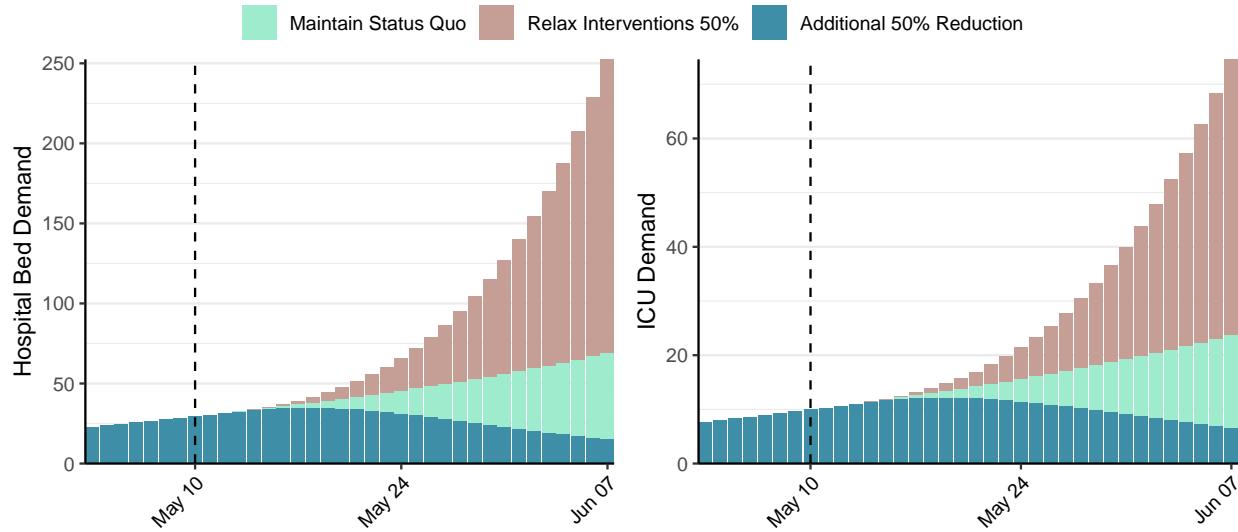


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 579 (95% CI: 515-642) at the current date to 87 (95% CI: 68-106) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 579 (95% CI: 515-642) at the current date to 9,044 (95% CI: 6,708-11,381) by 2021-06-07.

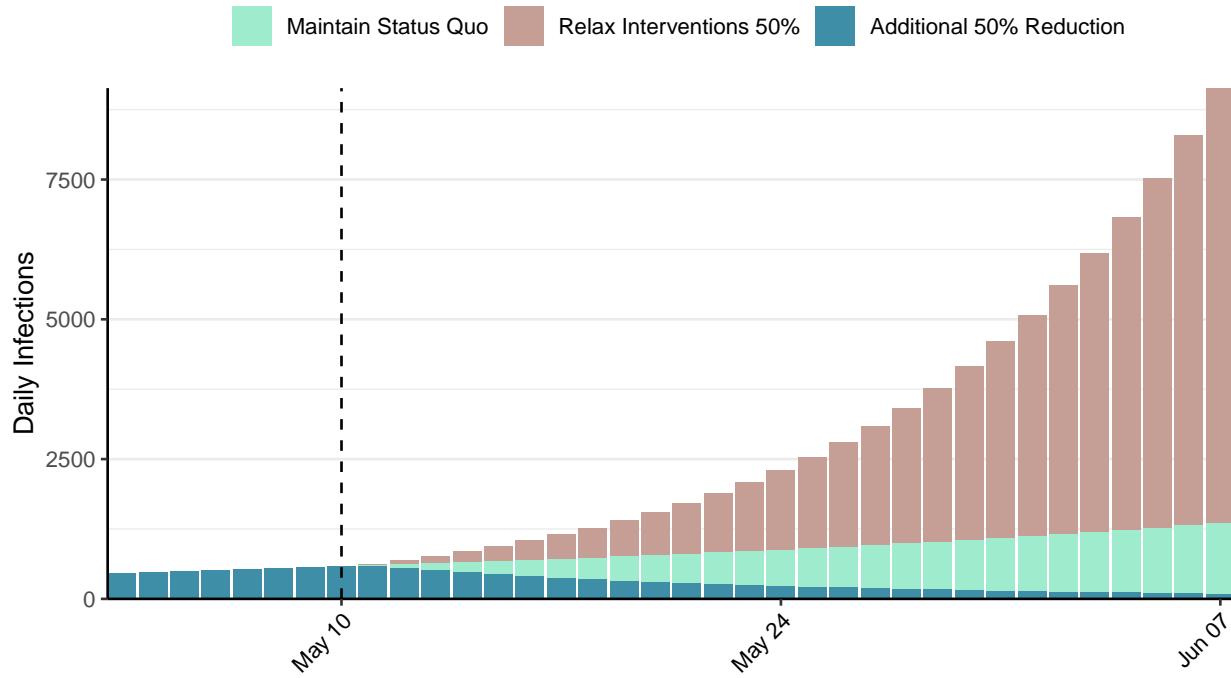


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Indonesia, 2021-05-10

[Download the report for Indonesia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
1,718,575	4,891	47,218	206	1.16 (95% CI: 1.07-1.24)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

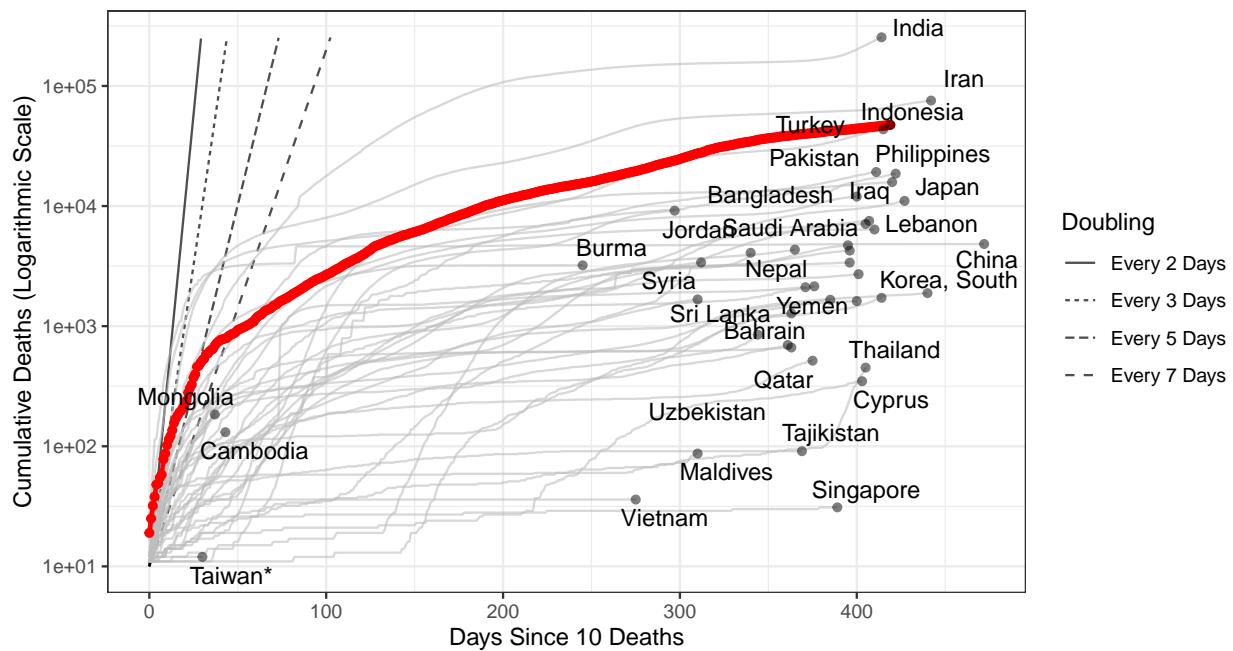


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 1,422,103 (95% CI: 1,373,027-1,471,179) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

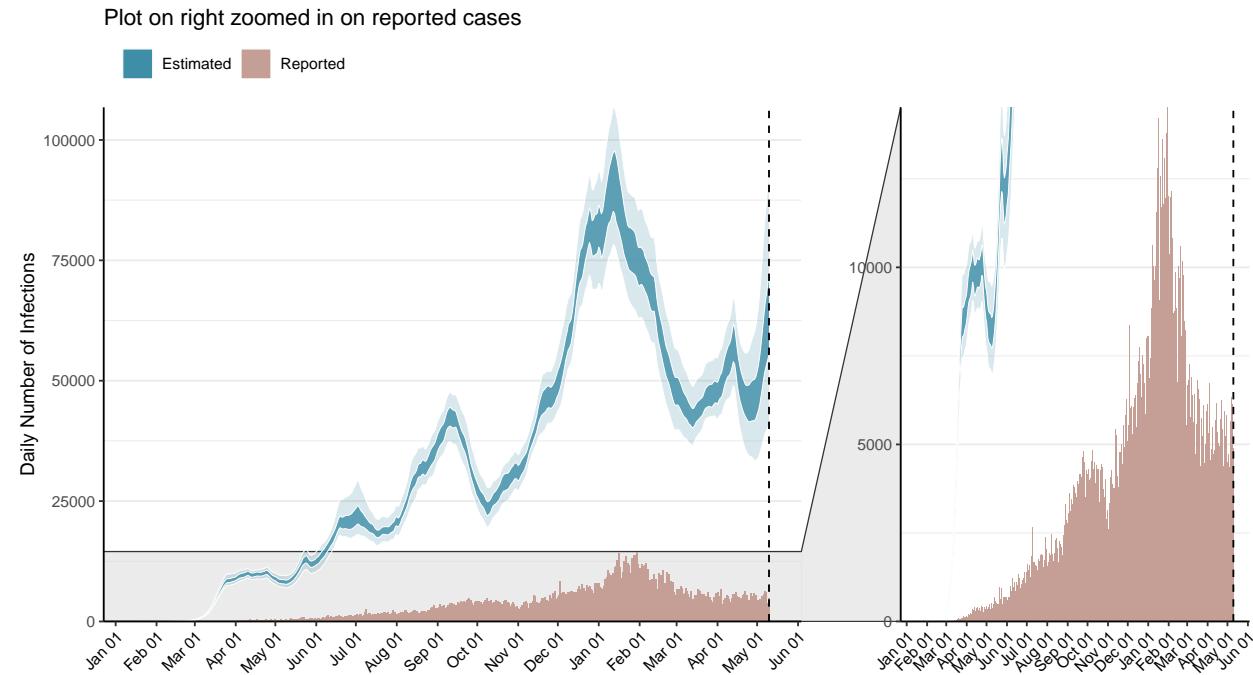
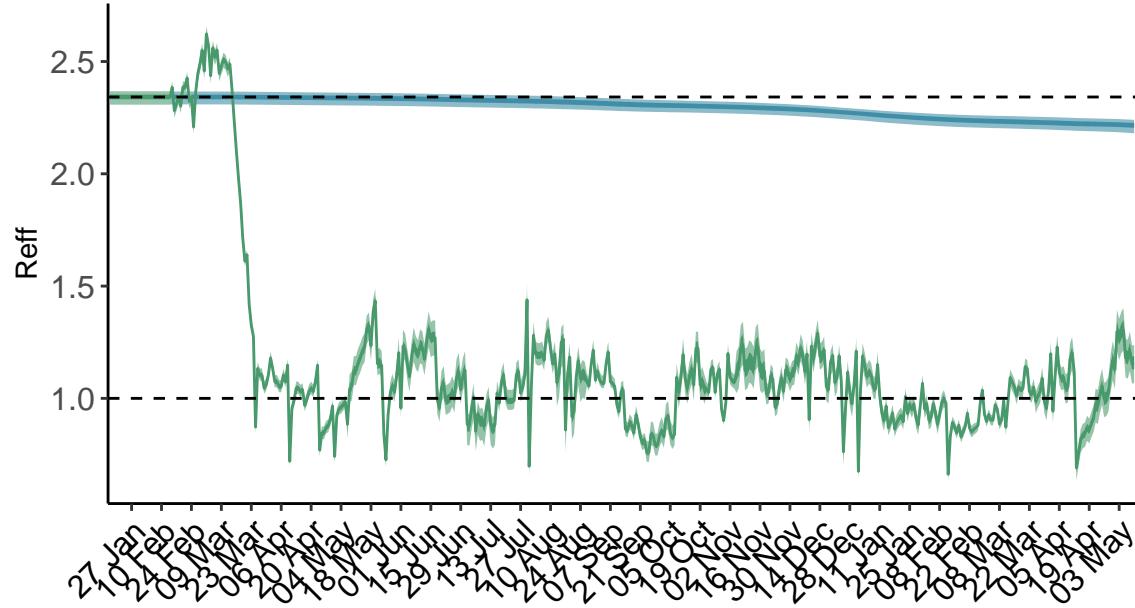


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Indonesia is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

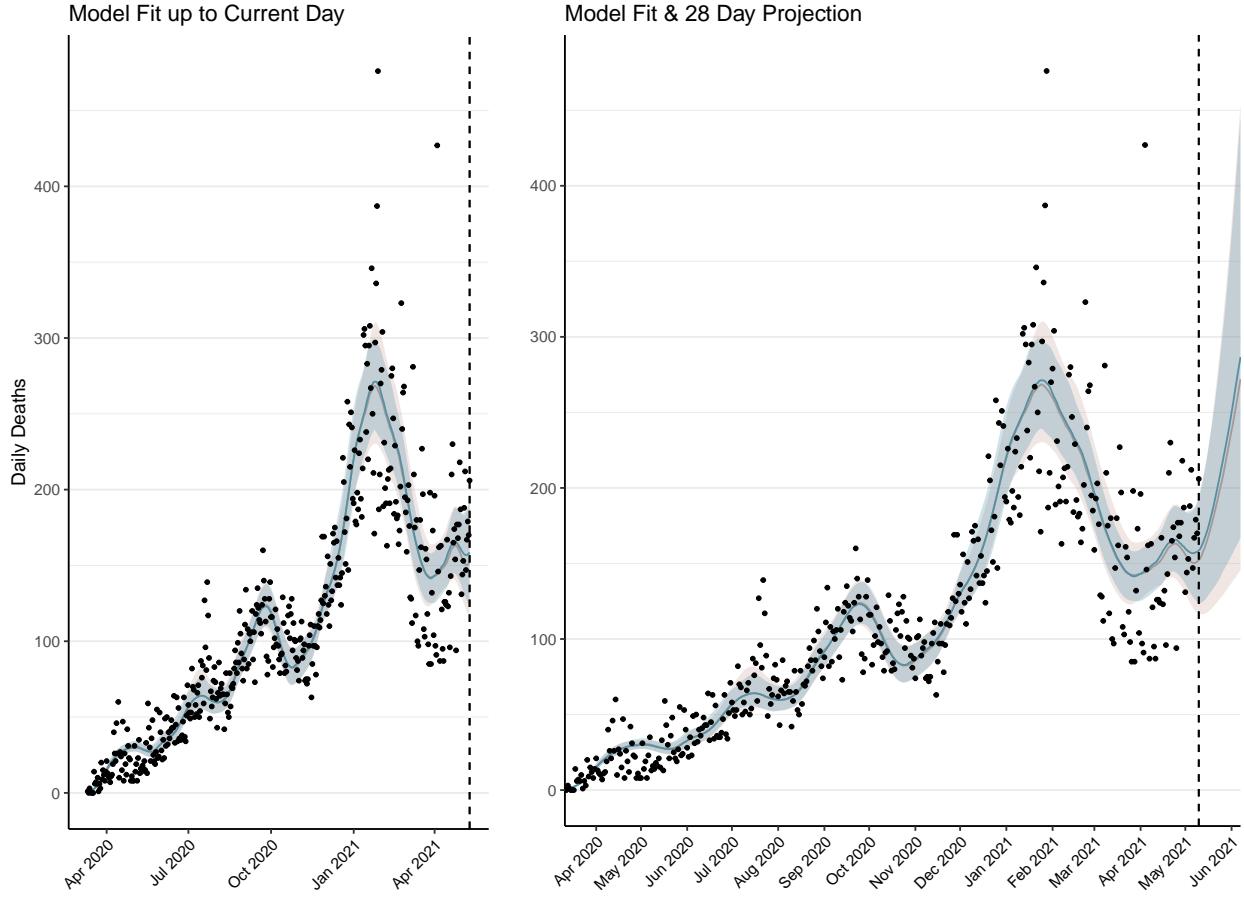


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 5,933 (95% CI: 5,721-6,146) patients requiring treatment with high-pressure oxygen at the current date to 11,249 (95% CI: 10,535-11,963) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 2,351 (95% CI: 2,271-2,430) patients requiring treatment with mechanical ventilation at the current date to 4,249 (95% CI: 3,989-4,510) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

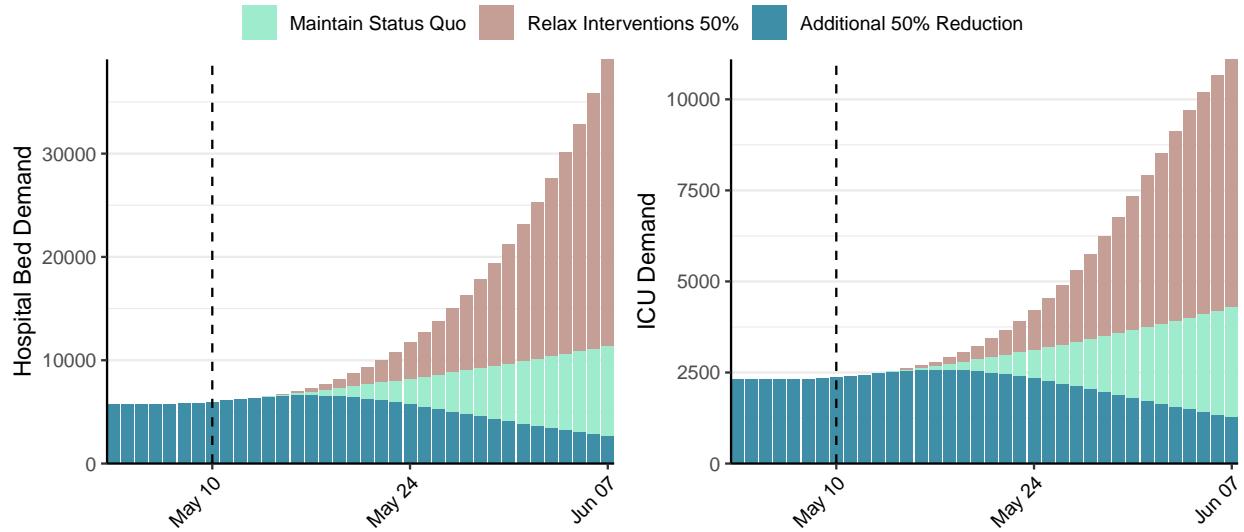
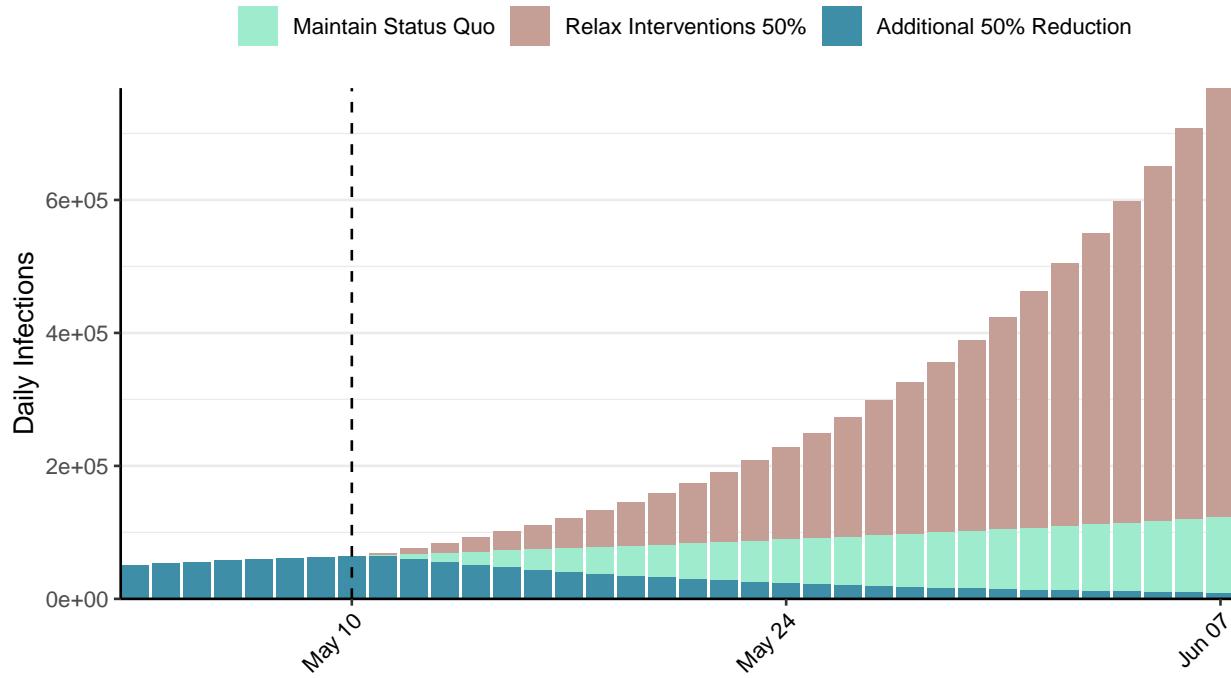


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 63,916 (95% CI: 60,974-66,858) at the current date to 8,452 (95% CI: 7,868-9,035) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 63,916 (95% CI: 60,974-66,858) at the current date to 760,601 (95% CI: 703,603-817,598) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: India, 2021-05-10

[Download the report for India, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
22,992,517	329,942	249,993	3,876	0.96 (95% CI: 0.9-1.04)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

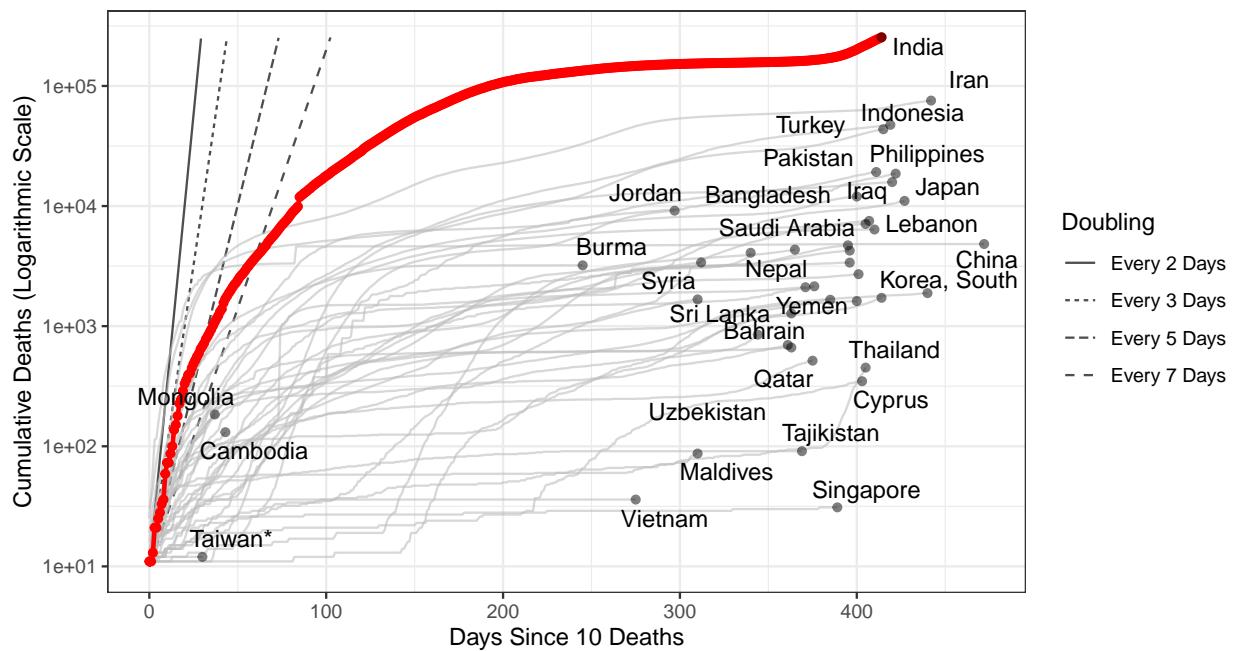


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 40,594,908 (95% CI: 39,895,185-41,294,630) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

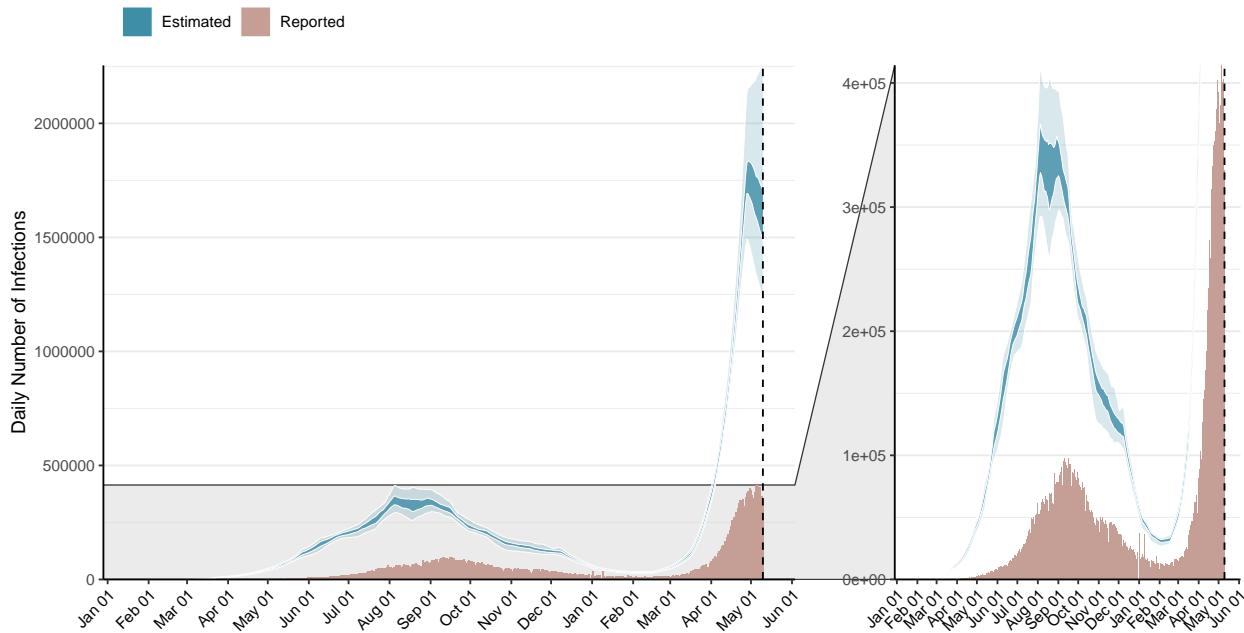
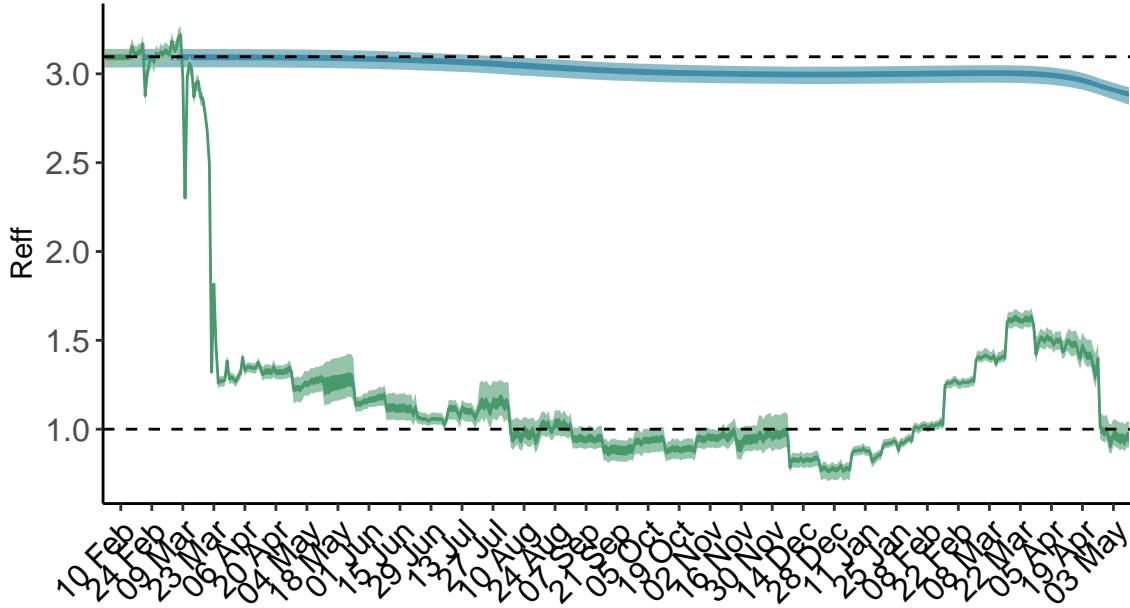


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

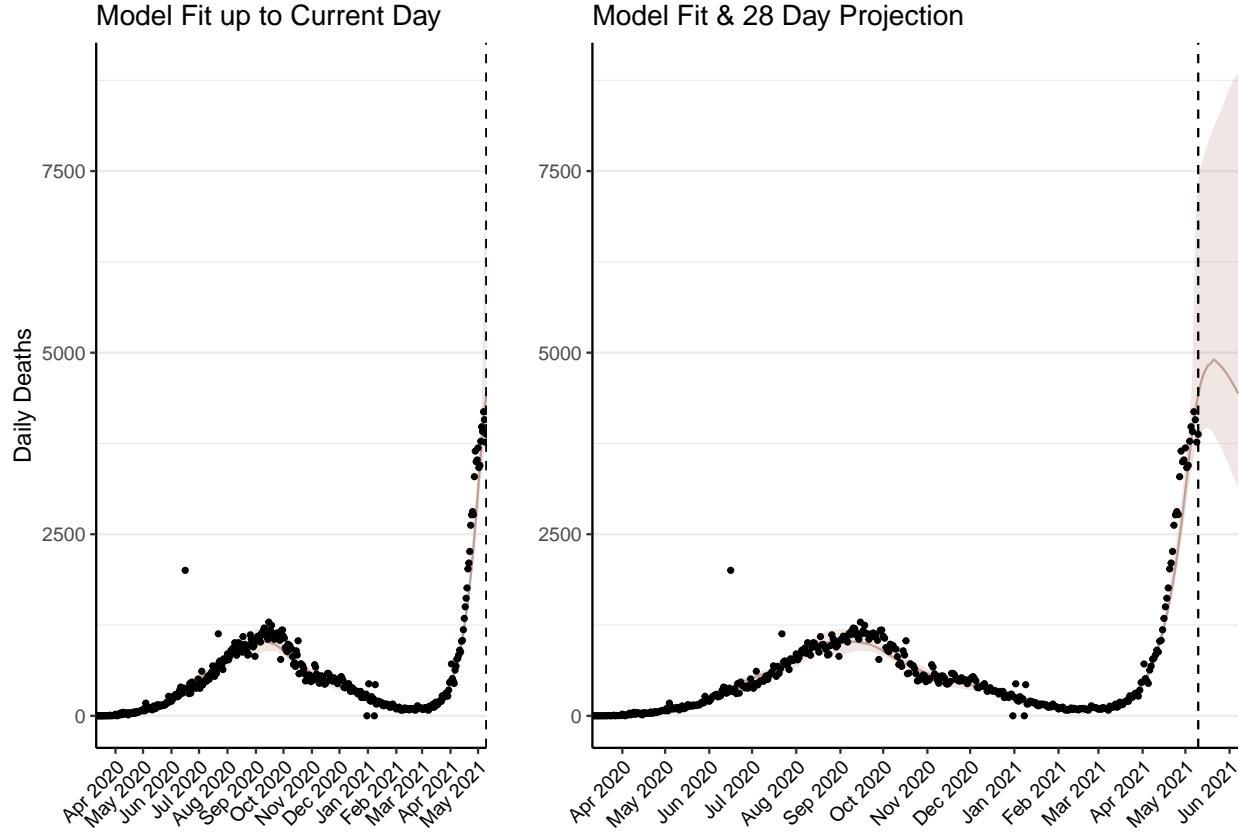


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 176,127 (95% CI: 172,917-179,338) patients requiring treatment with high-pressure oxygen at the current date to 163,919 (95% CI: 156,448-171,391) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 63,899 (95% CI: 63,066-64,733) patients requiring treatment with mechanical ventilation at the current date to 61,728 (95% CI: 60,158-63,298) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B.** These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.

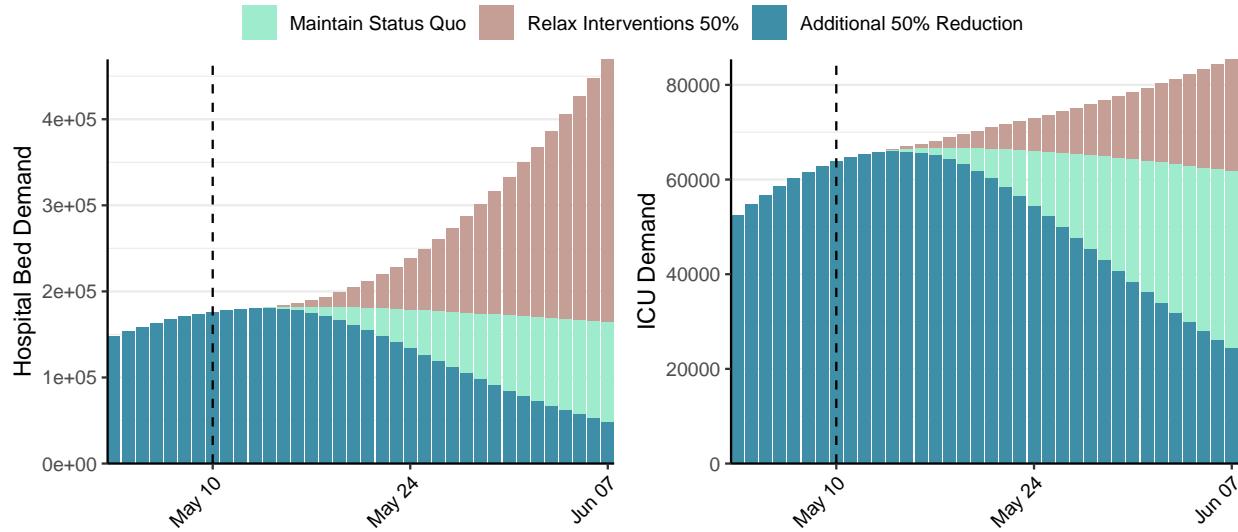


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,636,719 (95% CI: 1,589,239-1,684,199) at the current date to 113,242 (95% CI: 107,049-119,435) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,636,719 (95% CI: 1,589,239-1,684,199) at the current date to 6,876,041 (95% CI: 6,493,938-7,258,144) by 2021-06-07.

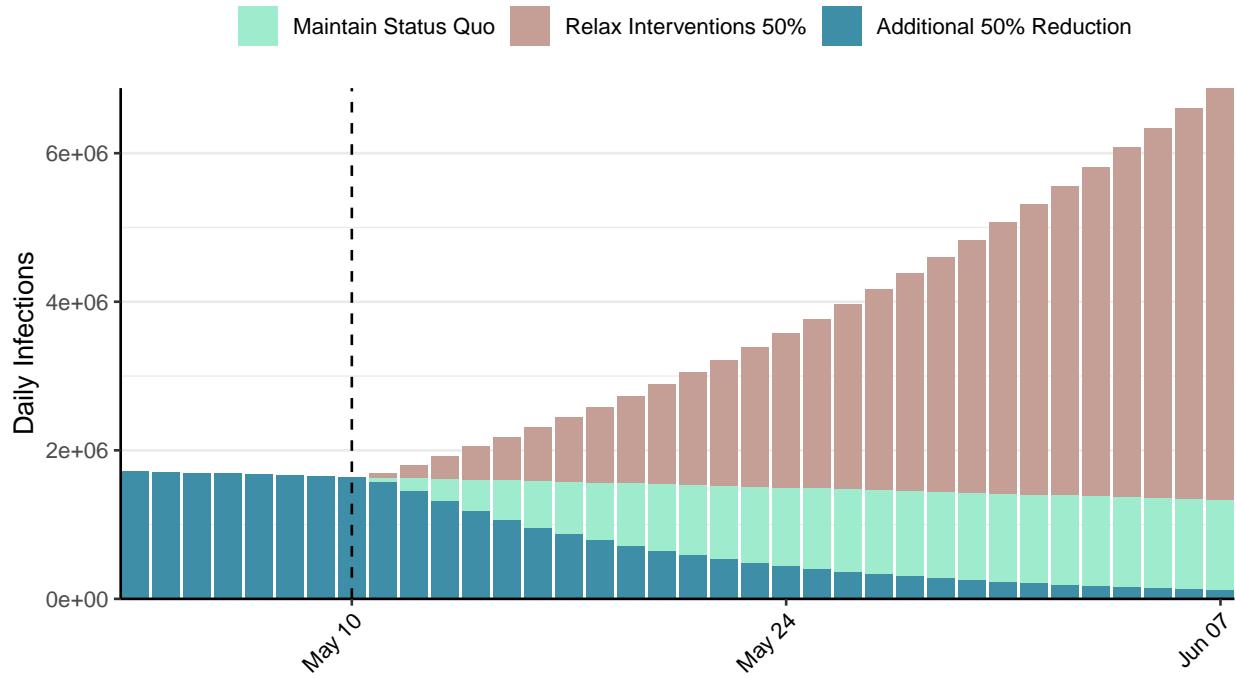


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Iraq, 2021-05-10

[Download the report for Iraq, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
1,117,627	4,902	15,800	29	1.03 (95% CI: 0.95-1.09)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

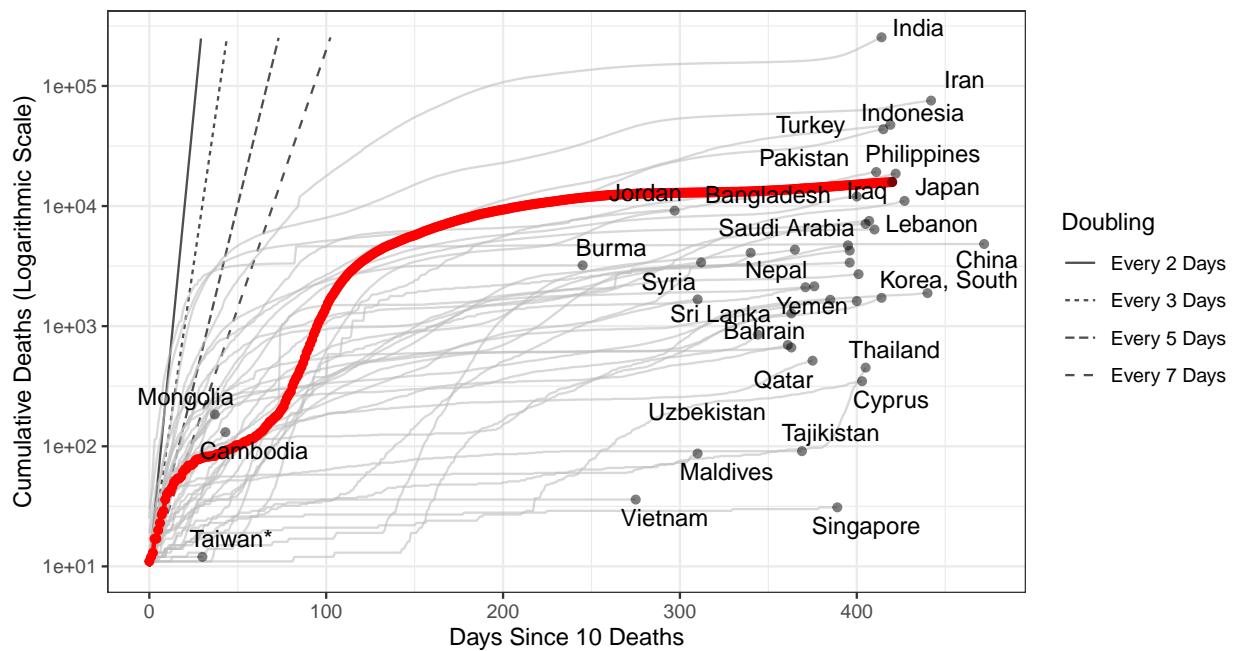


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 439,529 (95% CI: 423,852-455,206) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

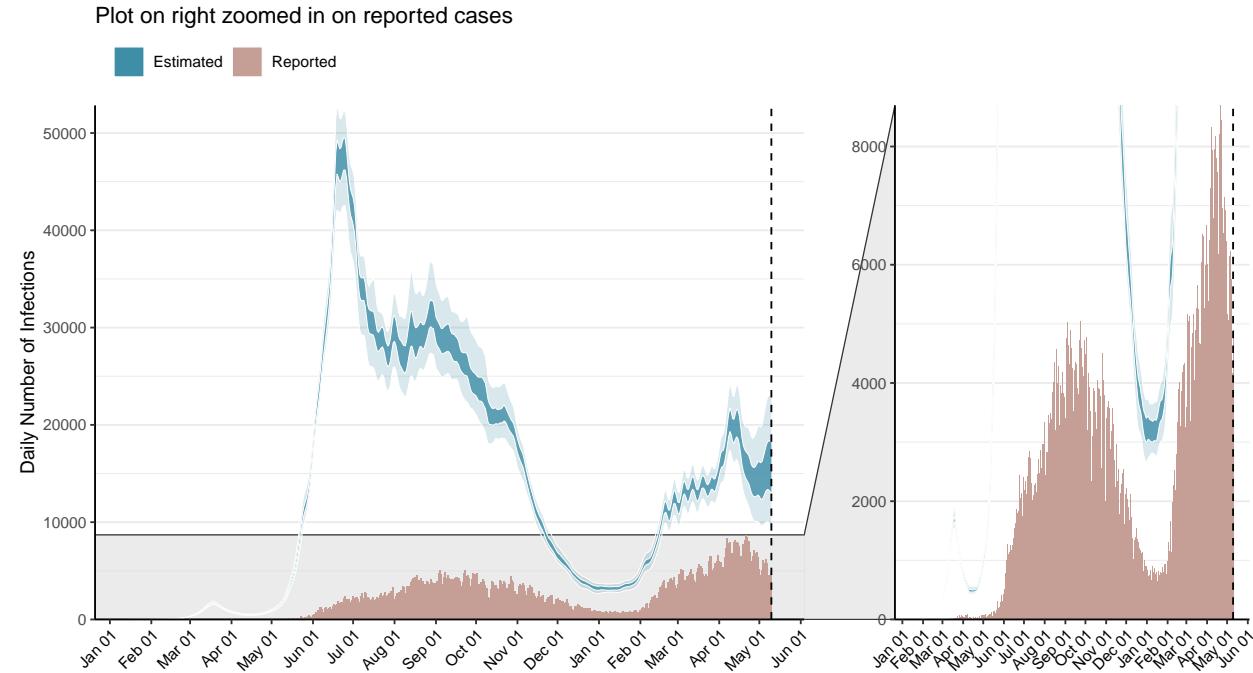
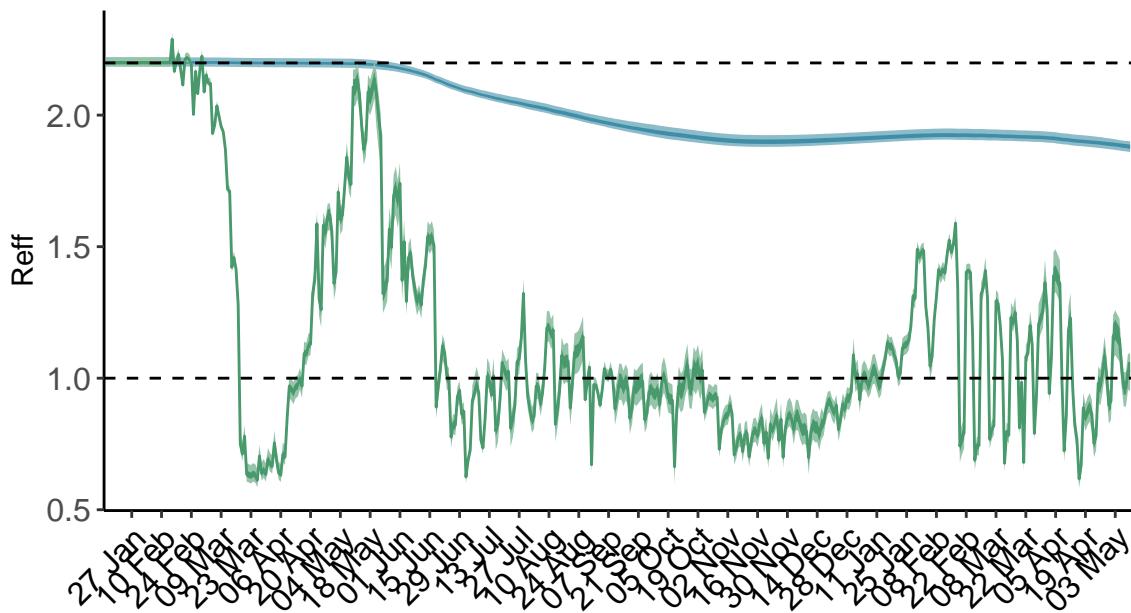


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Iraq is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

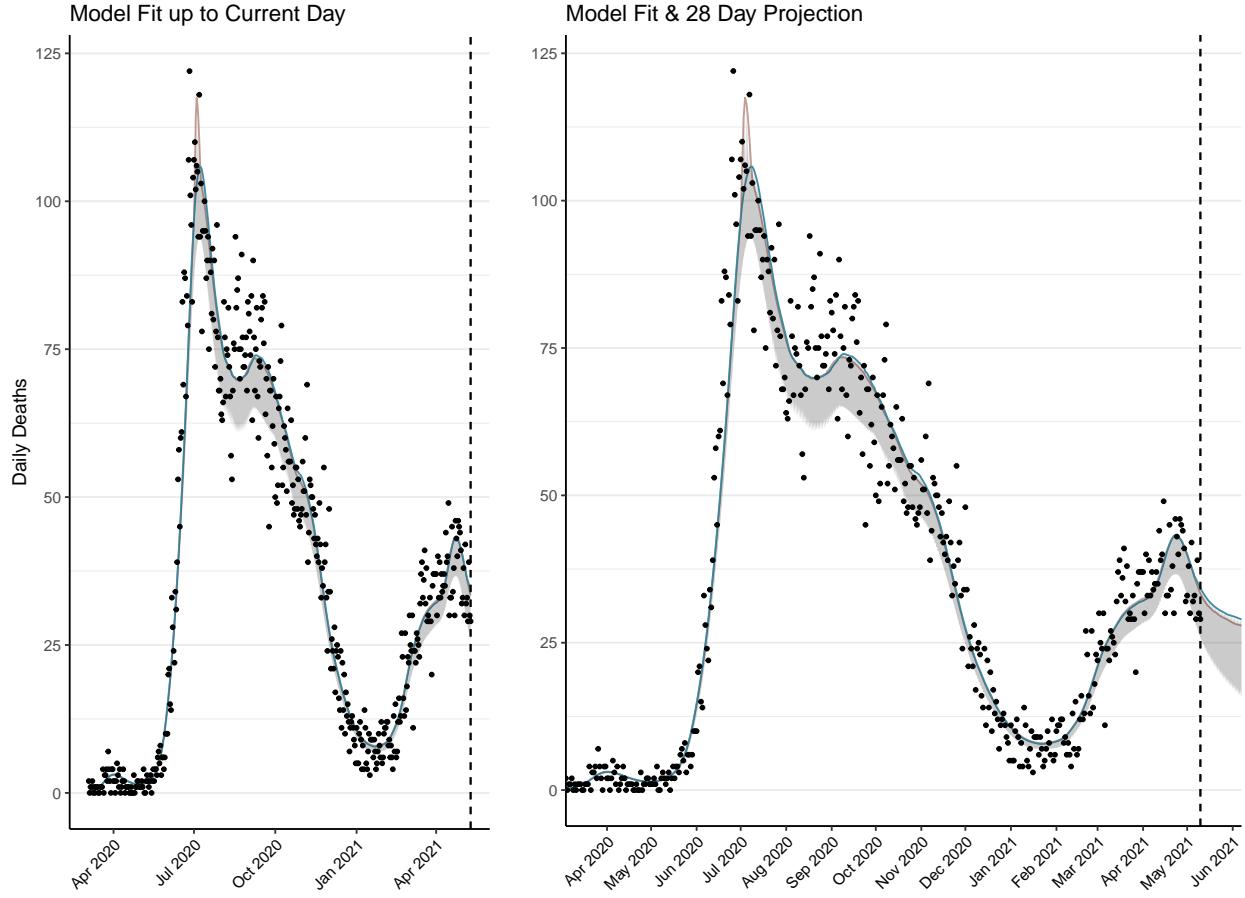


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 1,345 (95% CI: 1,295-1,394) patients requiring treatment with high-pressure oxygen at the current date to 1,304 (95% CI: 1,218-1,390) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 561 (95% CI: 542-581) patients requiring treatment with mechanical ventilation at the current date to 557 (95% CI: 522-592) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

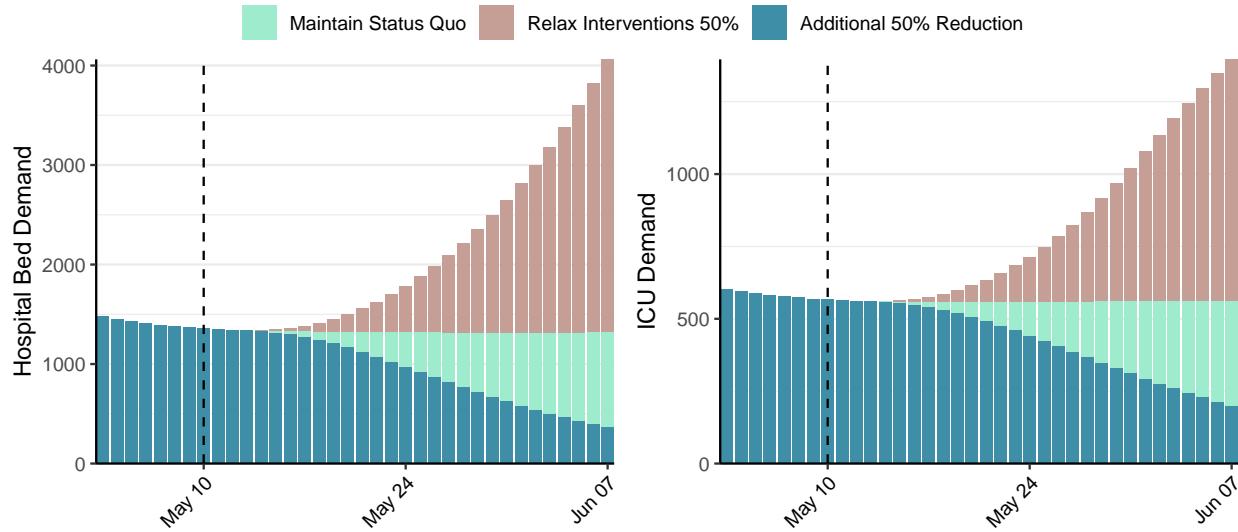


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 15,410 (95% CI: 14,657-16,164) at the current date to 1,360 (95% CI: 1,260-1,460) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 15,410 (95% CI: 14,657-16,164) at the current date to 100,944 (95% CI: 93,092-108,795) by 2021-06-07.

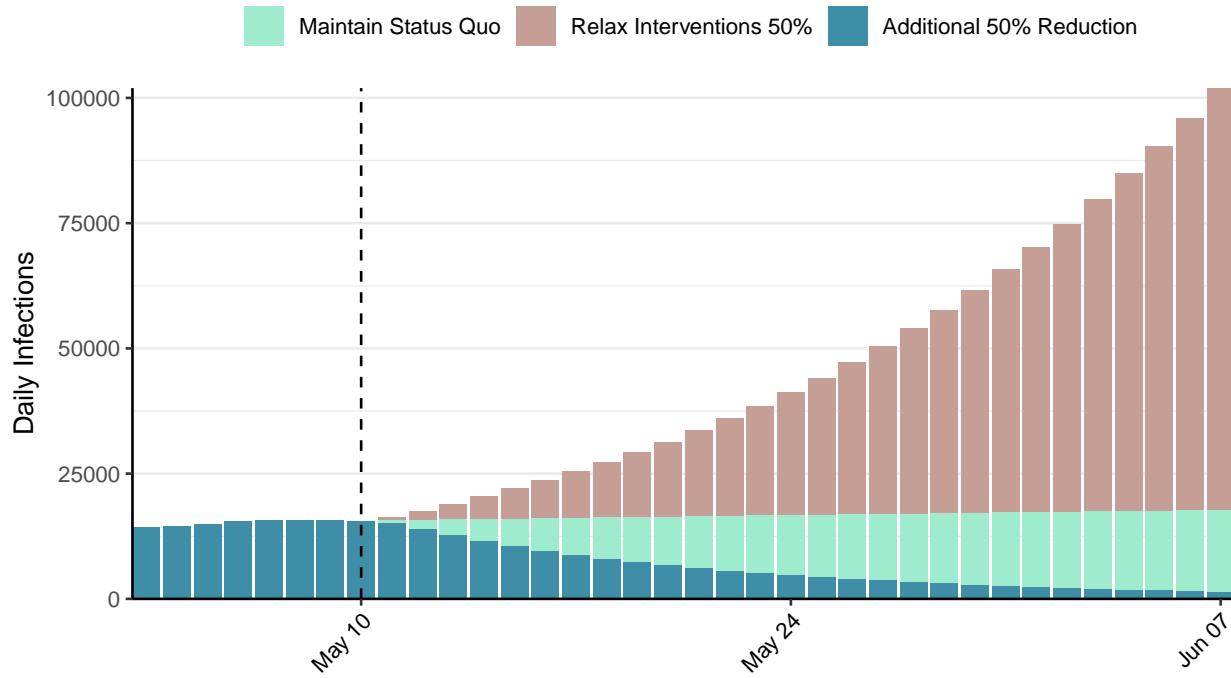


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Jamaica, 2021-05-10

[Download the report for Jamaica, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
46,782	74	809	3	0.74 (95% CI: 0.68-0.82)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

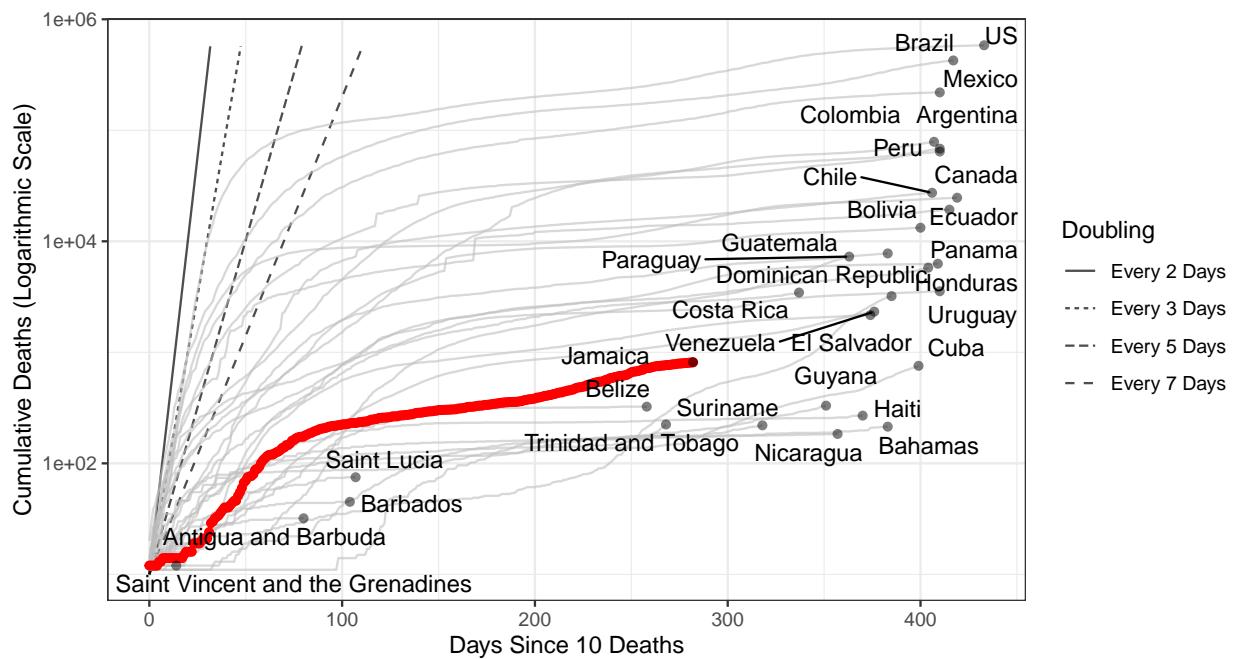


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 35,050 (95% CI: 33,757-36,343) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

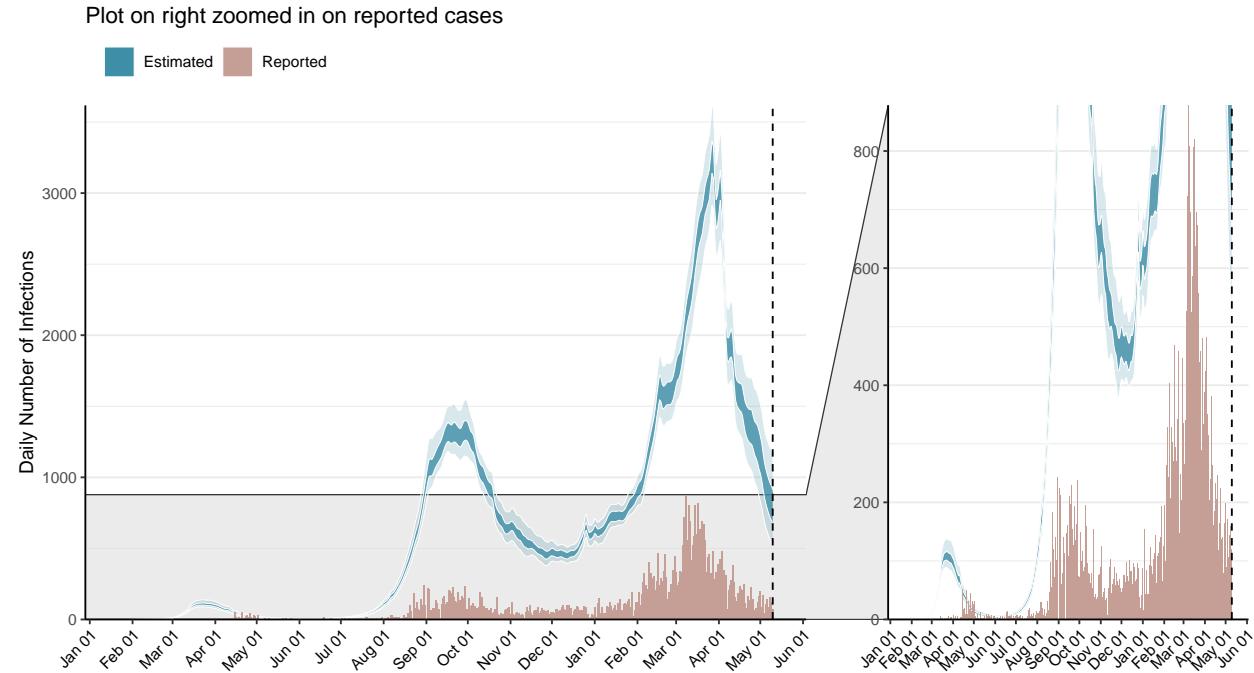
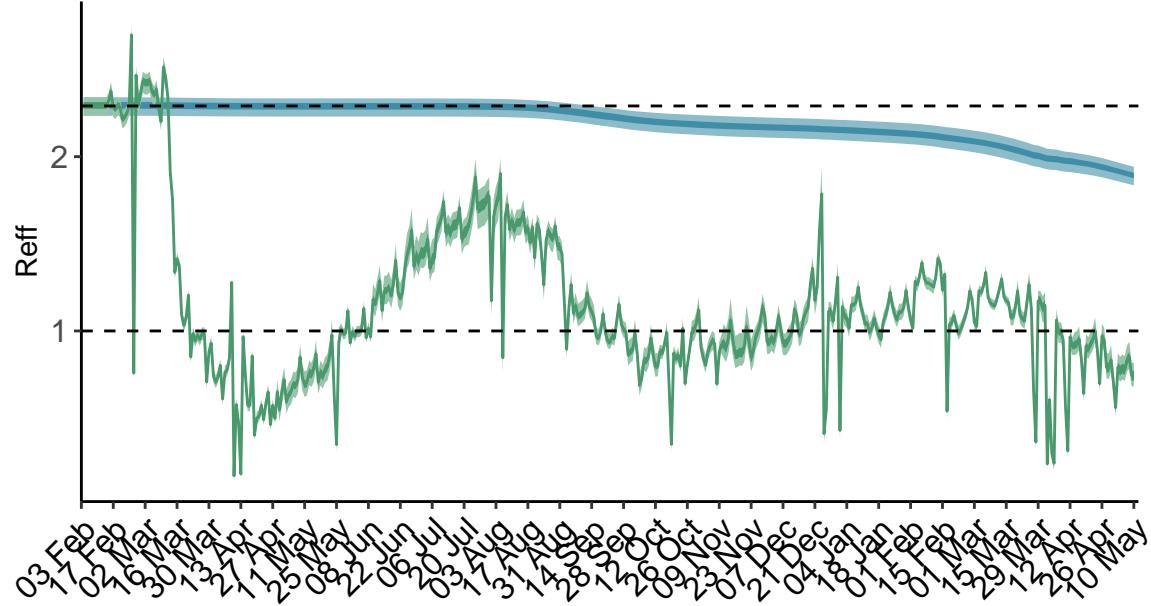


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

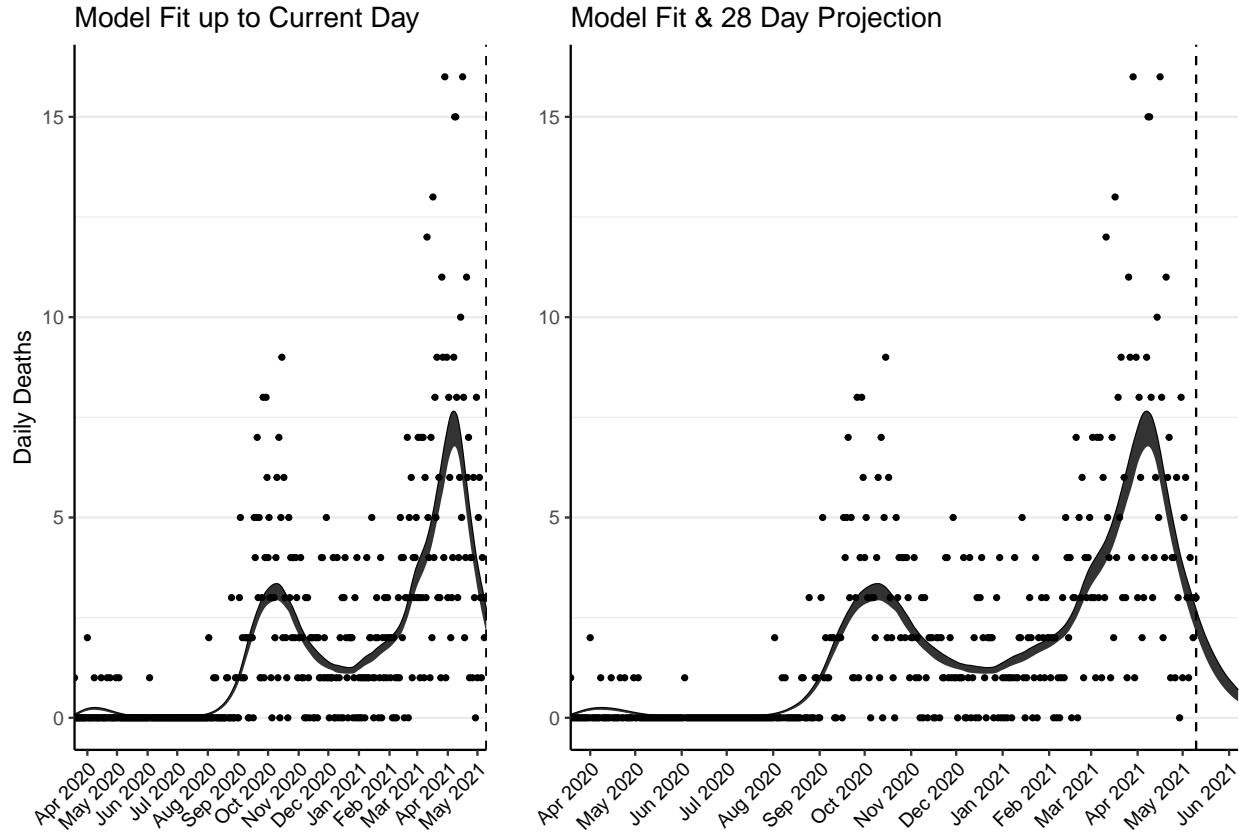


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 94 (95% CI: 90-97) patients requiring treatment with high-pressure oxygen at the current date to 25 (95% CI: 23-28) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 43 (95% CI: 41-44) patients requiring treatment with mechanical ventilation at the current date to 12 (95% CI: 11-13) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

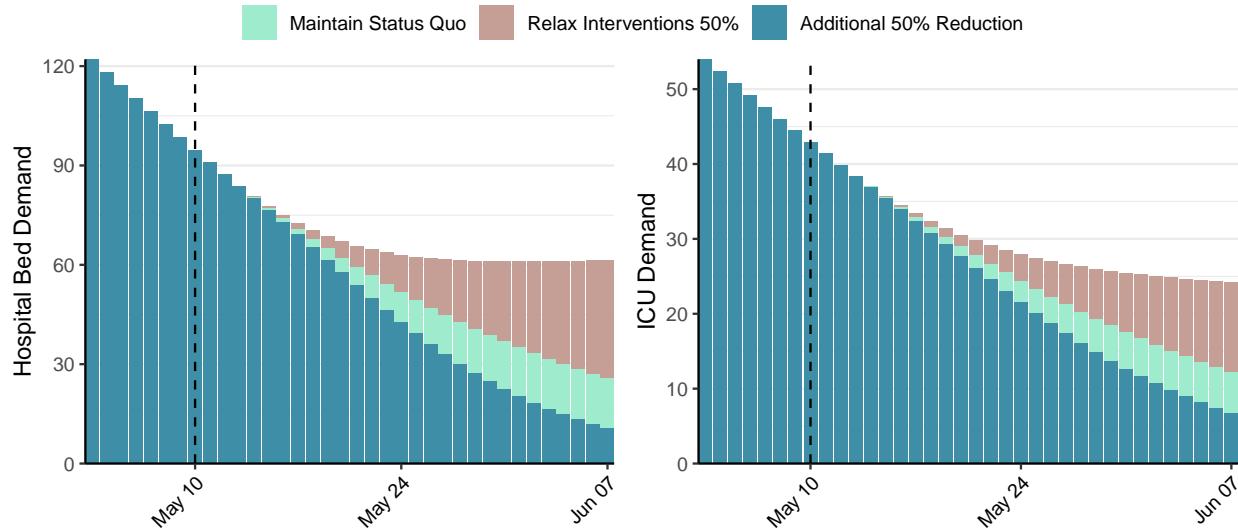


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 820 (95% CI: 772-867) at the current date to 24 (95% CI: 21-26) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 820 (95% CI: 772-867) at the current date to 1,178 (95% CI: 1,040-1,315) by 2021-06-07.

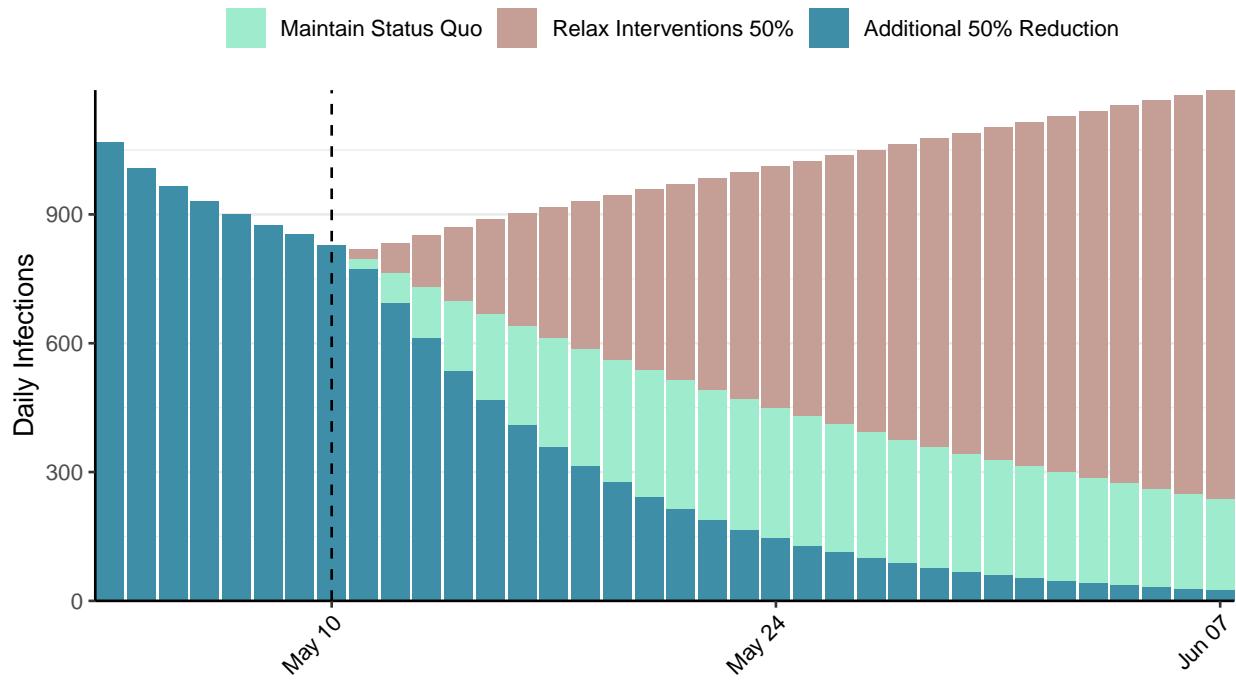


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Jordan, 2021-05-10

[Download the report for Jordan, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
720,998	1,765	9,125	49	0.66 (95% CI: 0.62-0.7)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

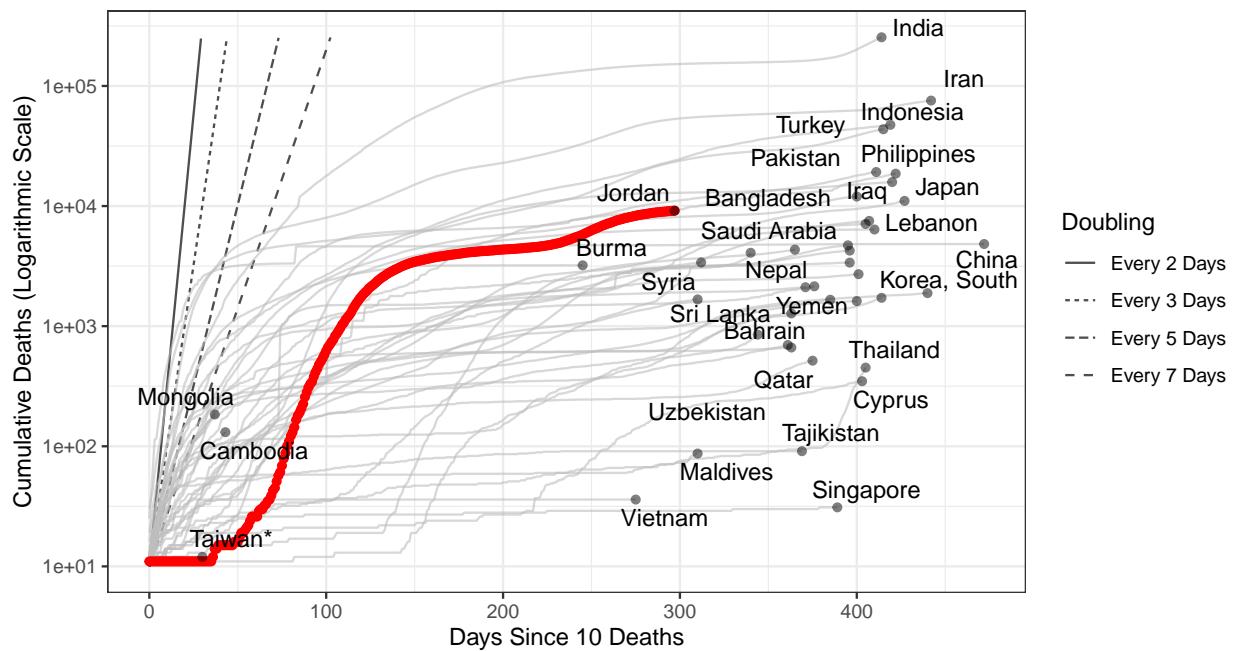


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 442,742 (95% CI: 430,093-455,391) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Jordan has revised their historic reported cases and thus have reported negative cases.**

Plot on right zoomed in on reported cases

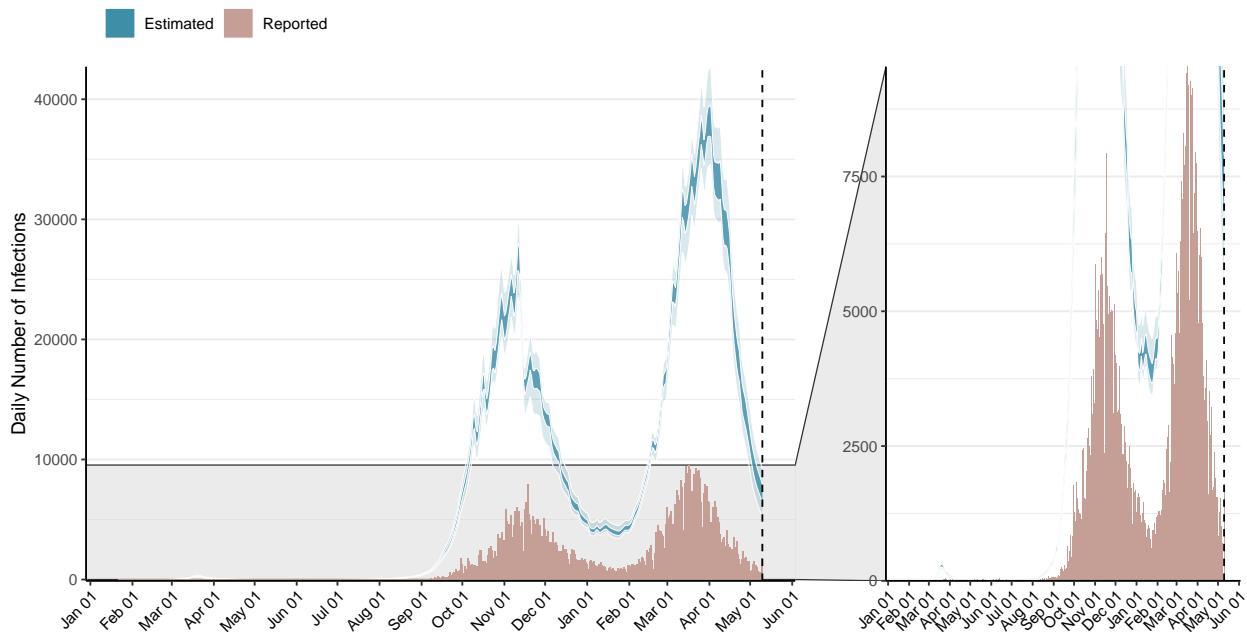
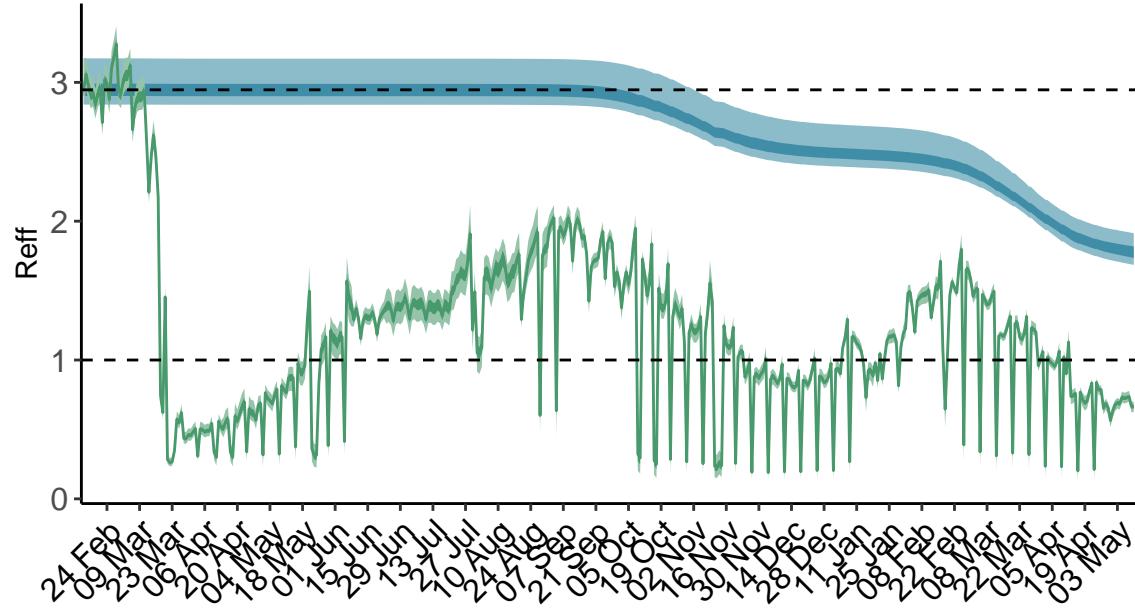


Figure 2: Daily number of infections estimated by fitting to the current total of deaths. Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Jordan is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

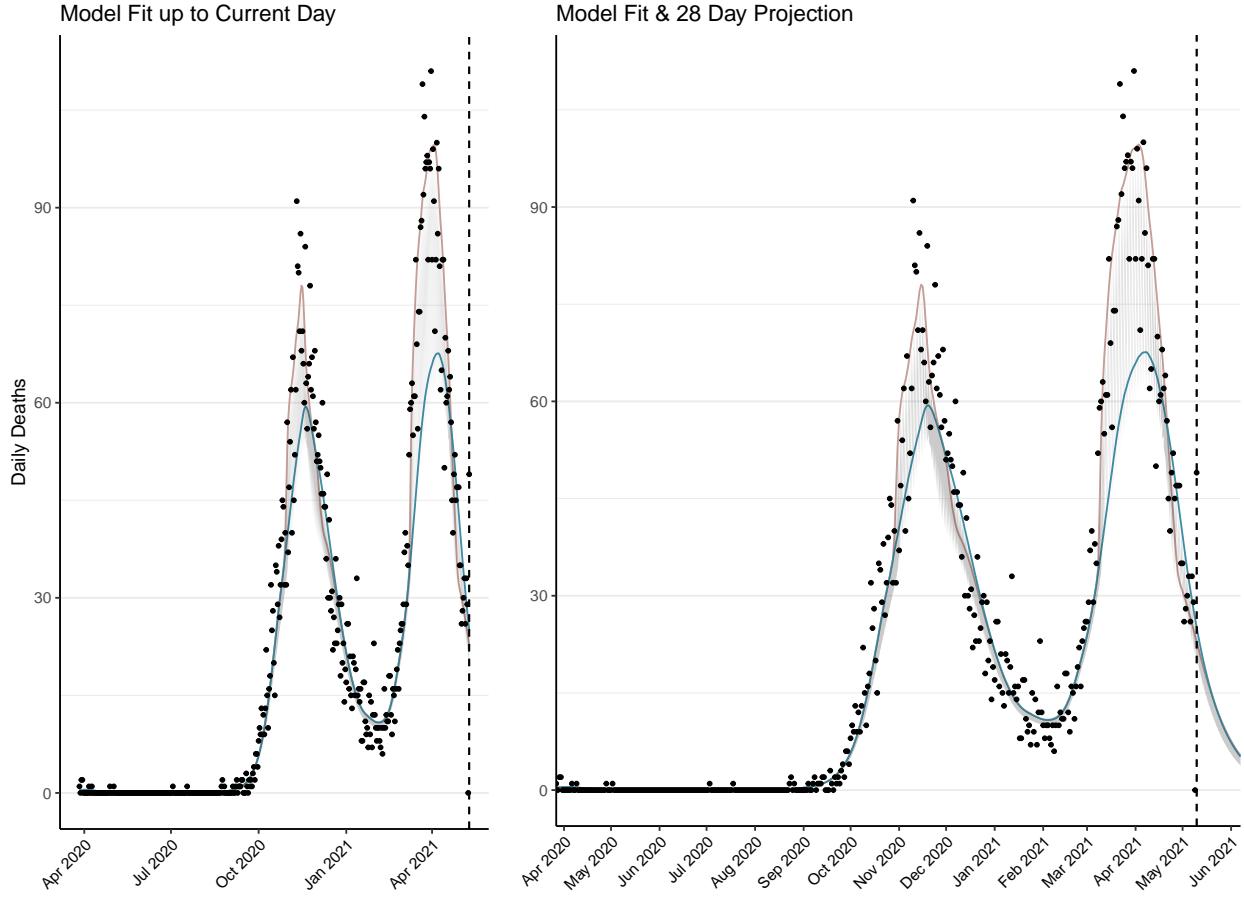


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 959 (95% CI: 931-987) patients requiring treatment with high-pressure oxygen at the current date to 201 (95% CI: 193-210) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 411 (95% CI: 401-421) patients requiring treatment with mechanical ventilation at the current date to 105 (95% CI: 100-109) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

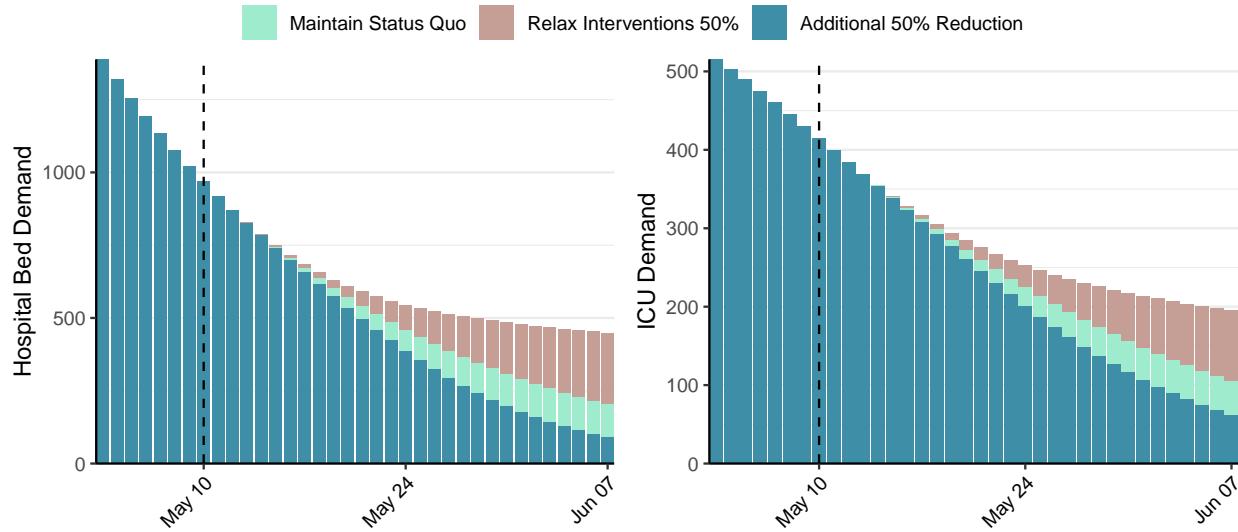
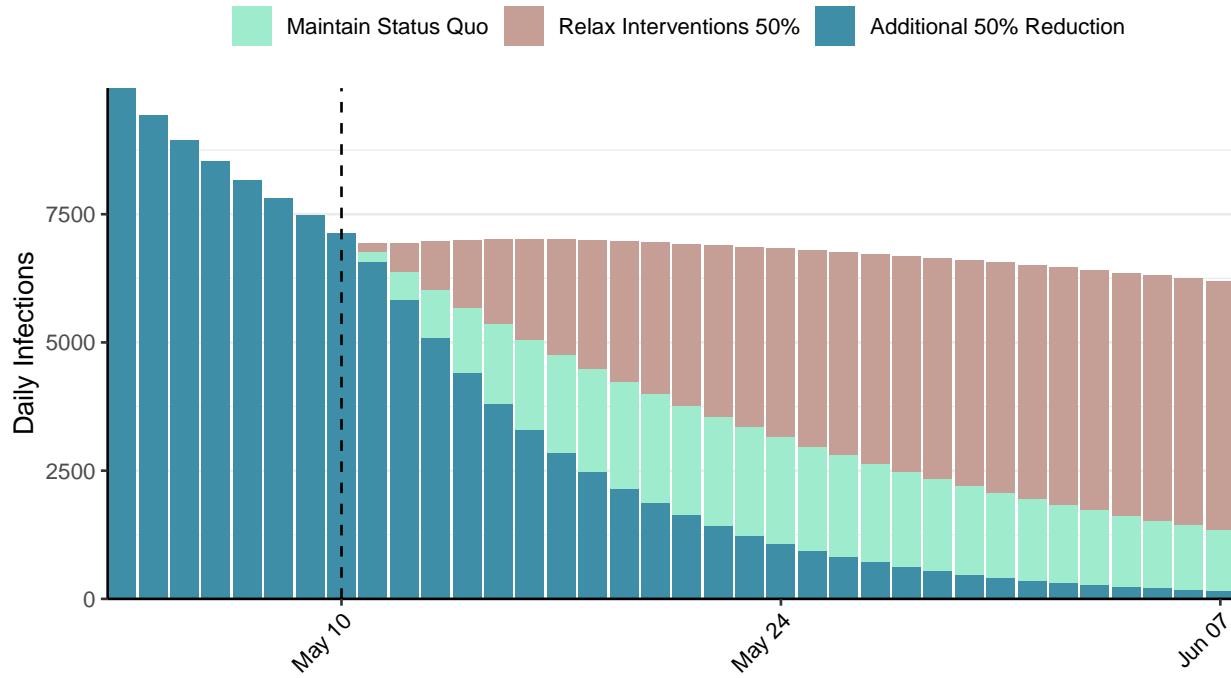


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 7,063 (95% CI: 6,800-7,327) at the current date to 150 (95% CI: 142-157) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 7,063 (95% CI: 6,800-7,327) at the current date to 6,130 (95% CI: 5,798-6,462) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Kazakhstan, 2021-05-10

[Download the report for Kazakhstan, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
398,295	23	3,373	1	0.83 (95% CI: 0.72-0.93)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

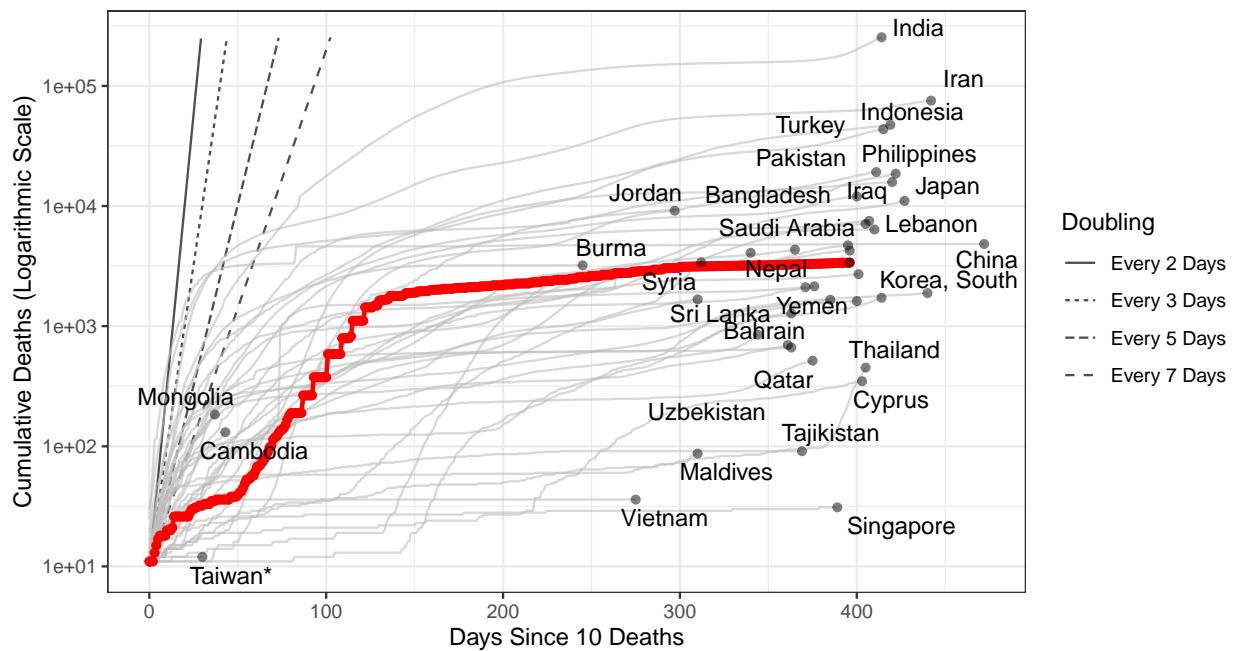


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 61,976 (95% CI: 59,275-64,677) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

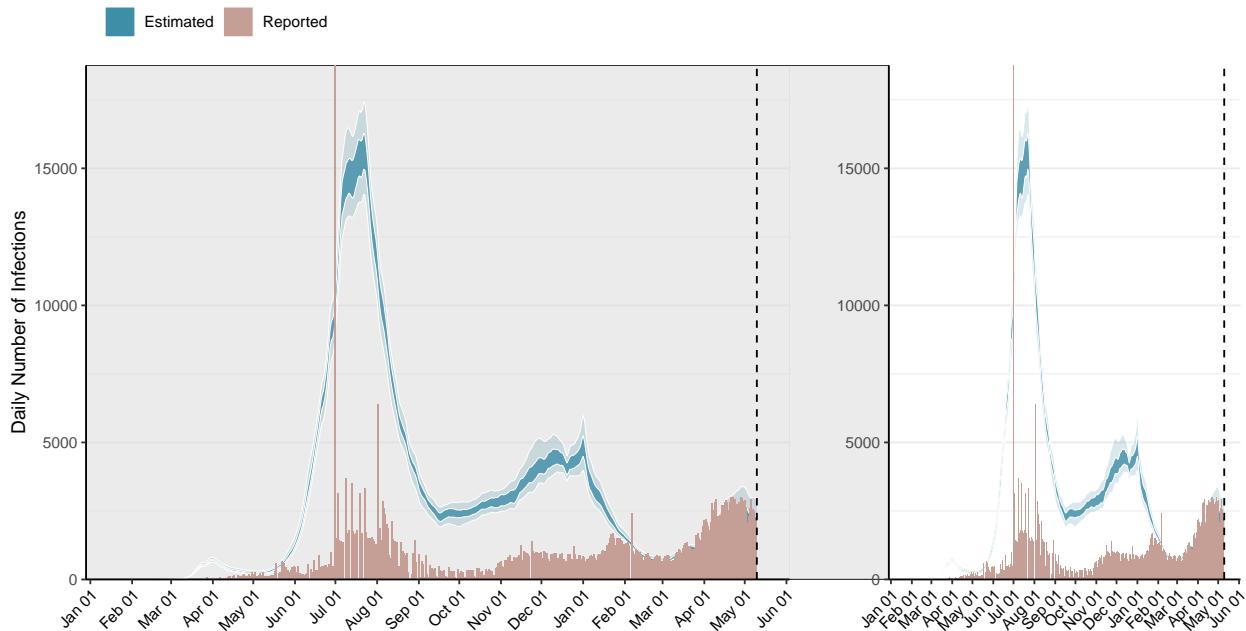
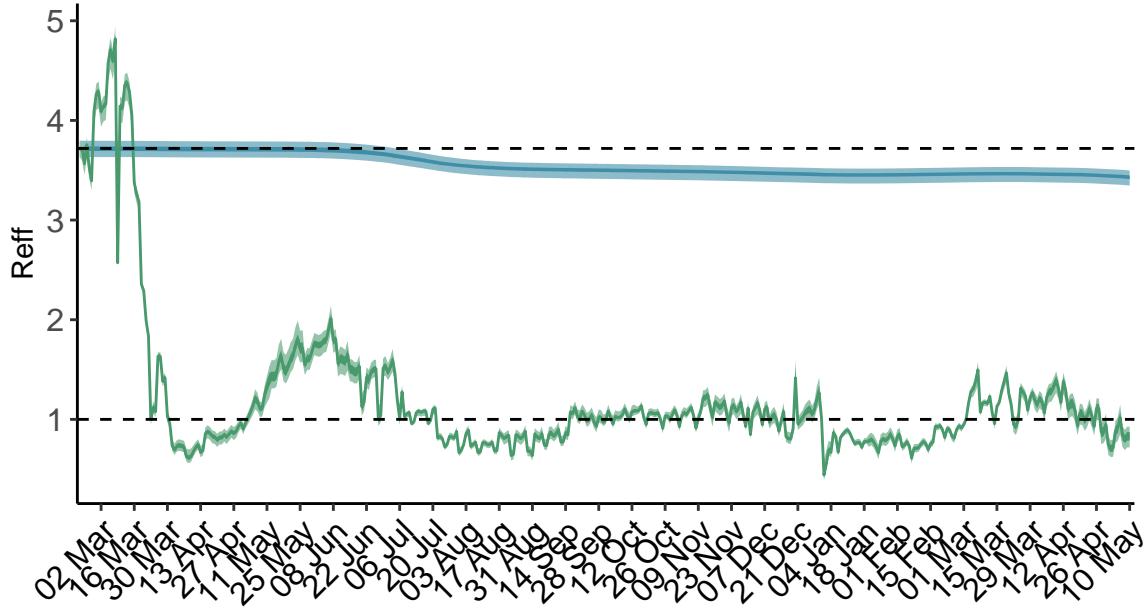


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

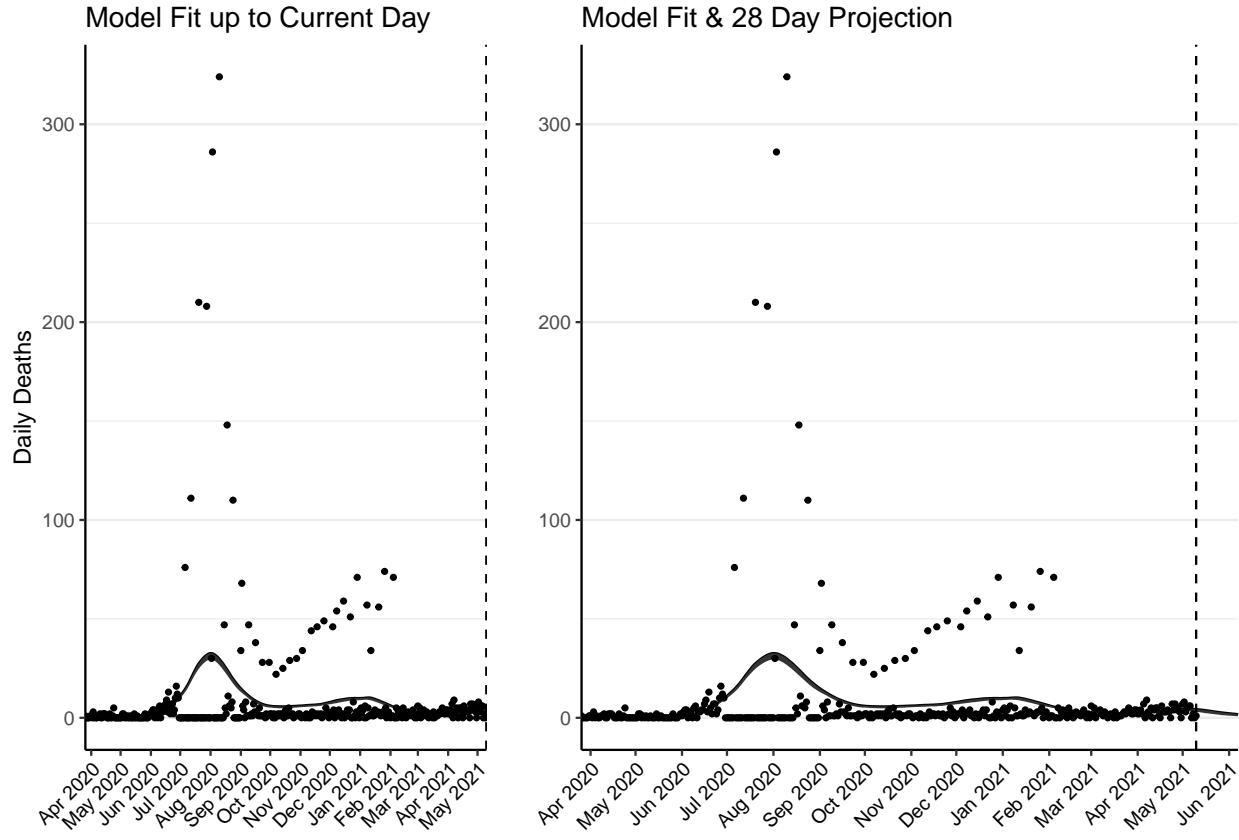


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 176 (95% CI: 168-184) patients requiring treatment with high-pressure oxygen at the current date to 81 (95% CI: 74-88) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 73 (95% CI: 70-76) patients requiring treatment with mechanical ventilation at the current date to 38 (95% CI: 34-41) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

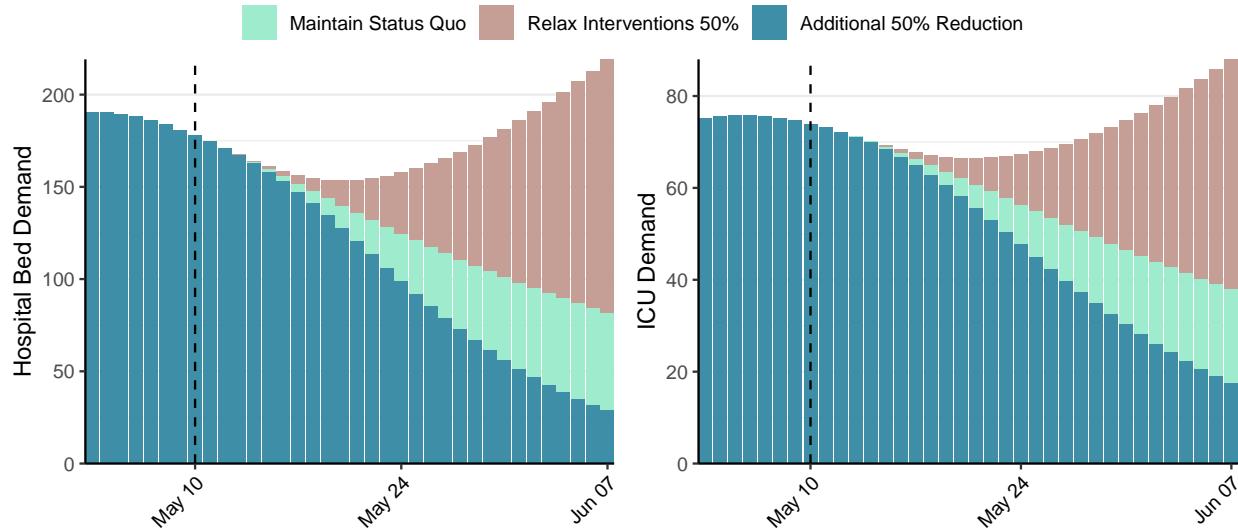


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,856 (95% CI: 1,737-1,976) at the current date to 80 (95% CI: 72-88) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,856 (95% CI: 1,737-1,976) at the current date to 4,803 (95% CI: 4,234-5,371) by 2021-06-07.

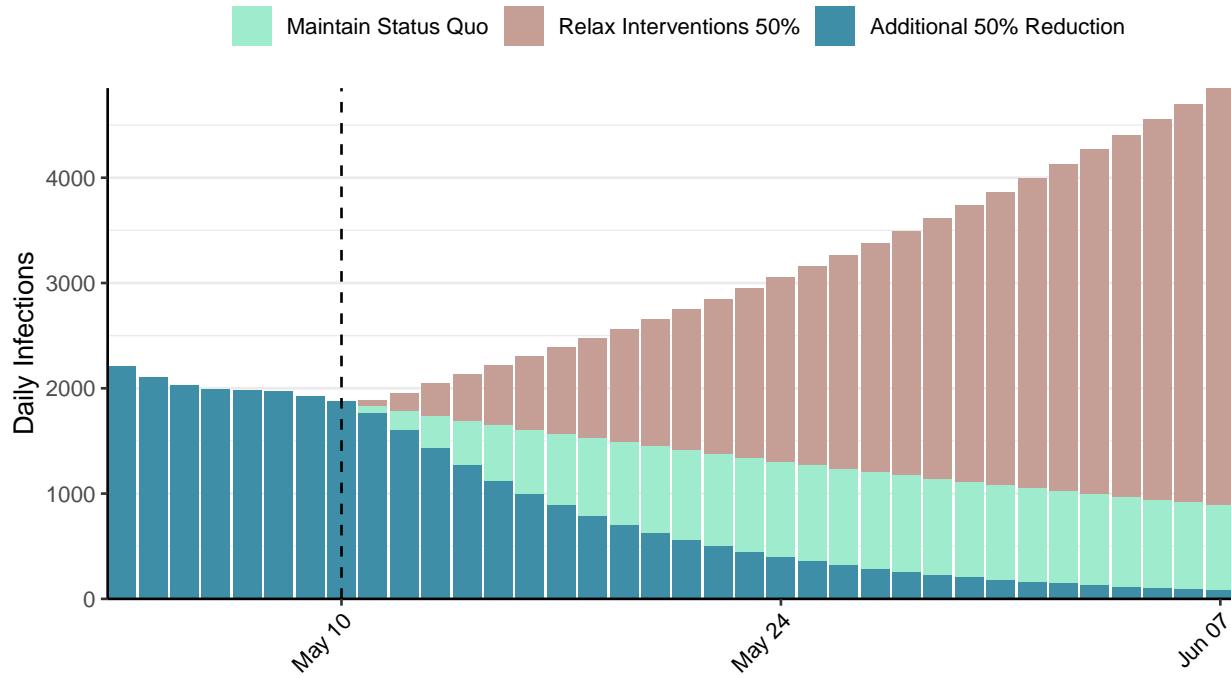


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Kenya, 2021-05-10

[Download the report for Kenya, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
163,620	66	2,907	12	0.87 (95% CI: 0.78-0.98)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

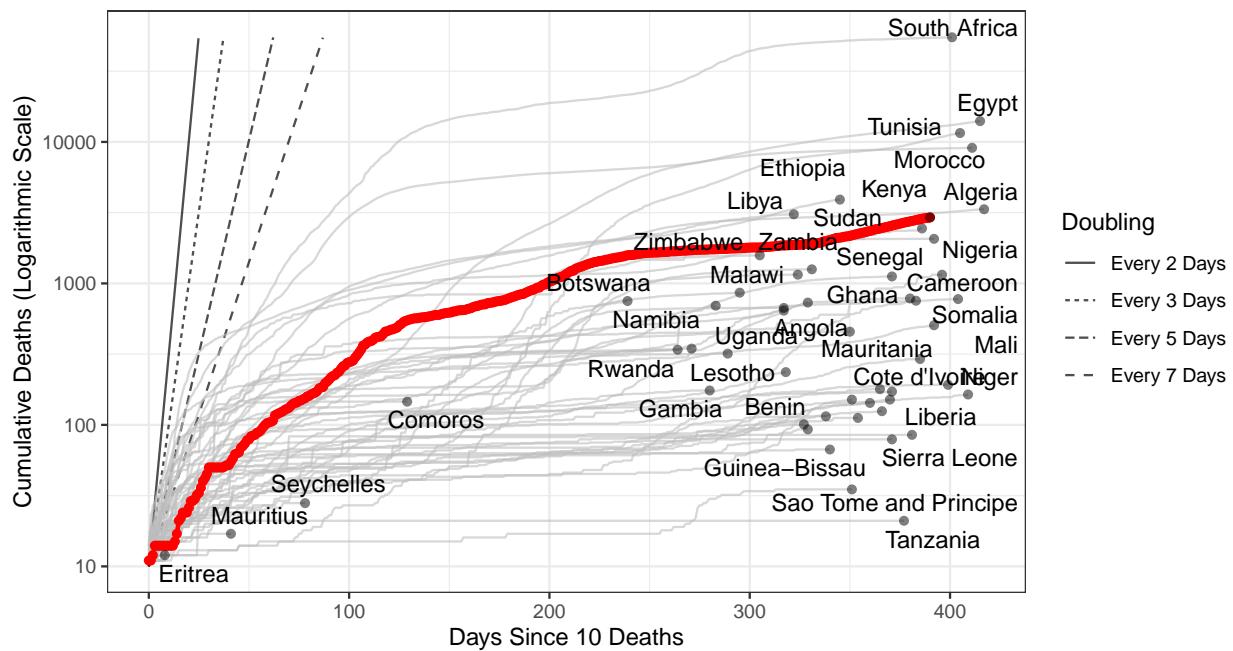


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 211,535 (95% CI: 204,309–218,761) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

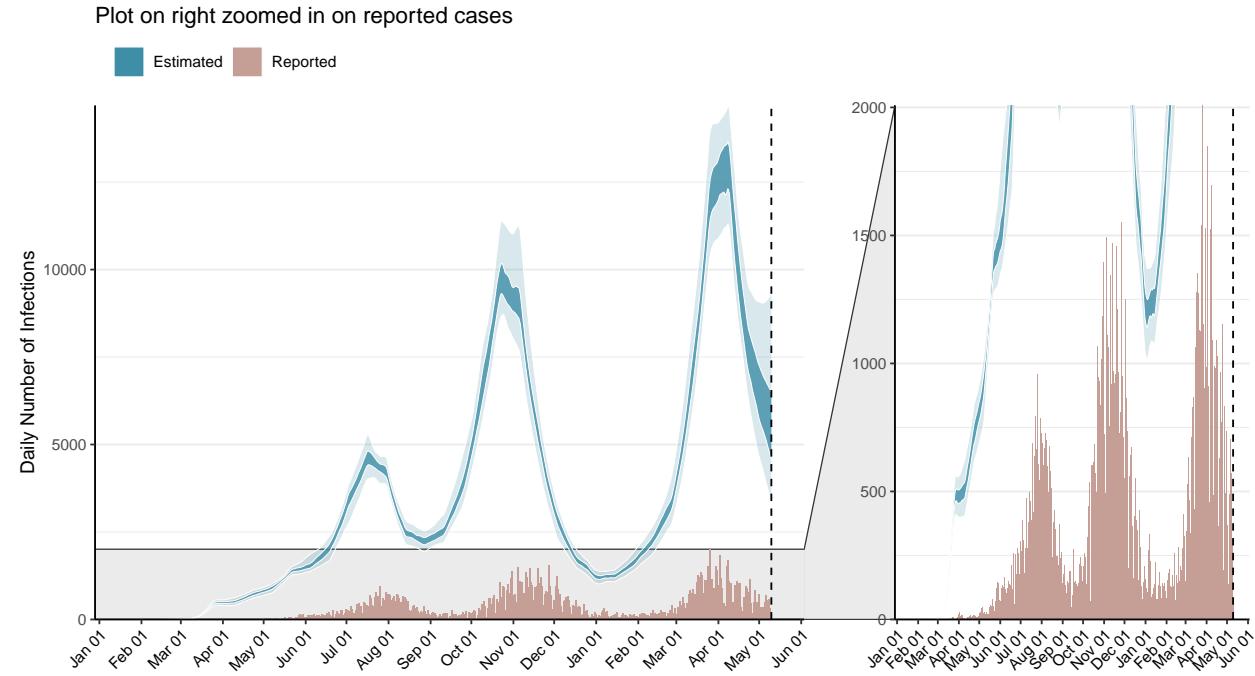
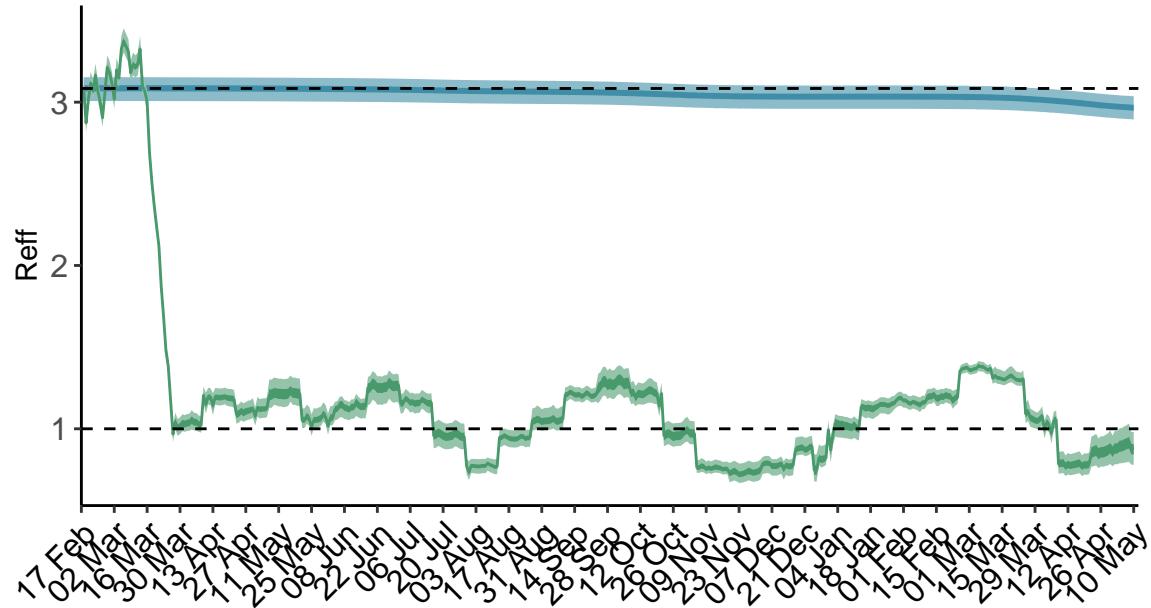


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

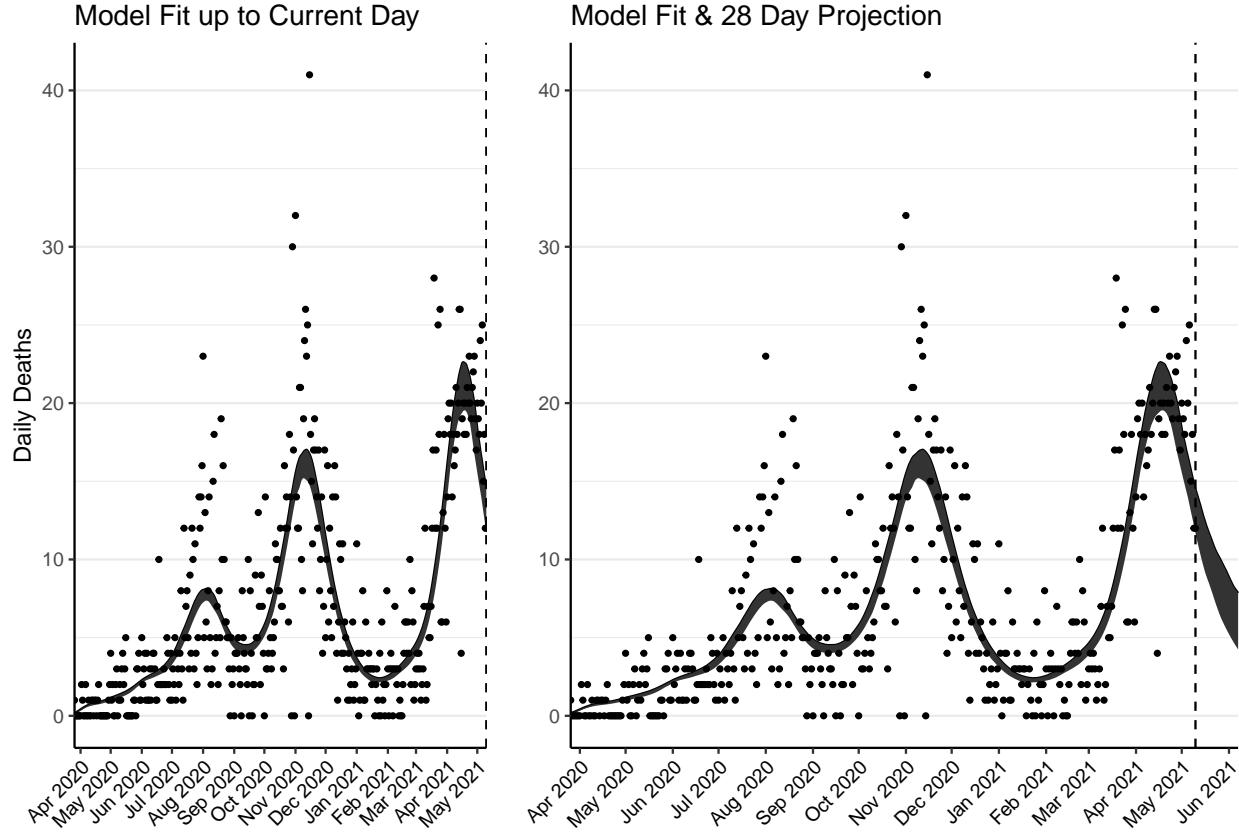


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 540 (95% CI: 521-560) patients requiring treatment with high-pressure oxygen at the current date to 322 (95% CI: 296-347) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 230 (95% CI: 222-237) patients requiring treatment with mechanical ventilation at the current date to 135 (95% CI: 125-145) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

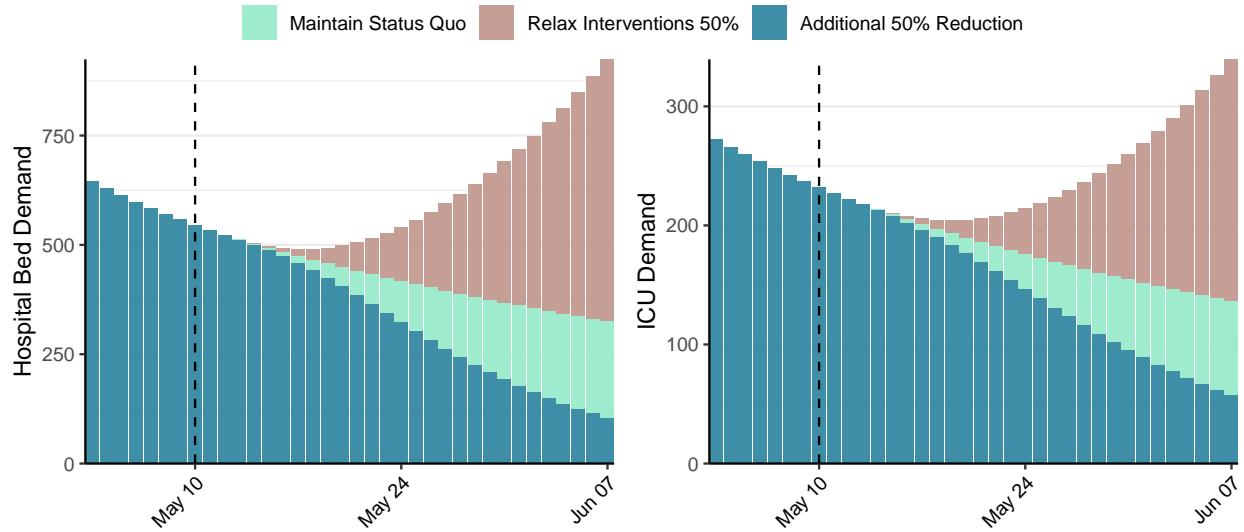


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 5,666 (95% CI: 5,357-5,975) at the current date to 302 (95% CI: 274-329) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 5,666 (95% CI: 5,357-5,975) at the current date to 19,518 (95% CI: 17,395-21,641) by 2021-06-07.

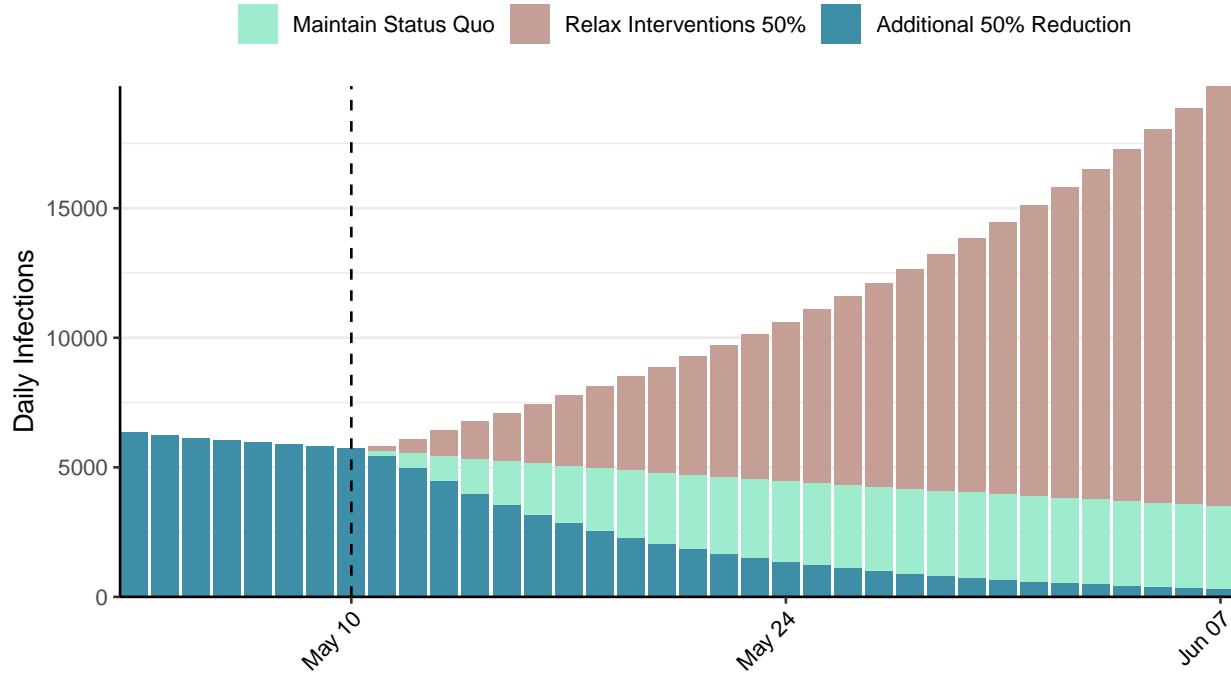


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Kyrgyz Republic, 2021-05-10

[Download the report for Kyrgyz Republic, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
99,028	379	1,667	7	1.23 (95% CI: 1.09-1.34)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

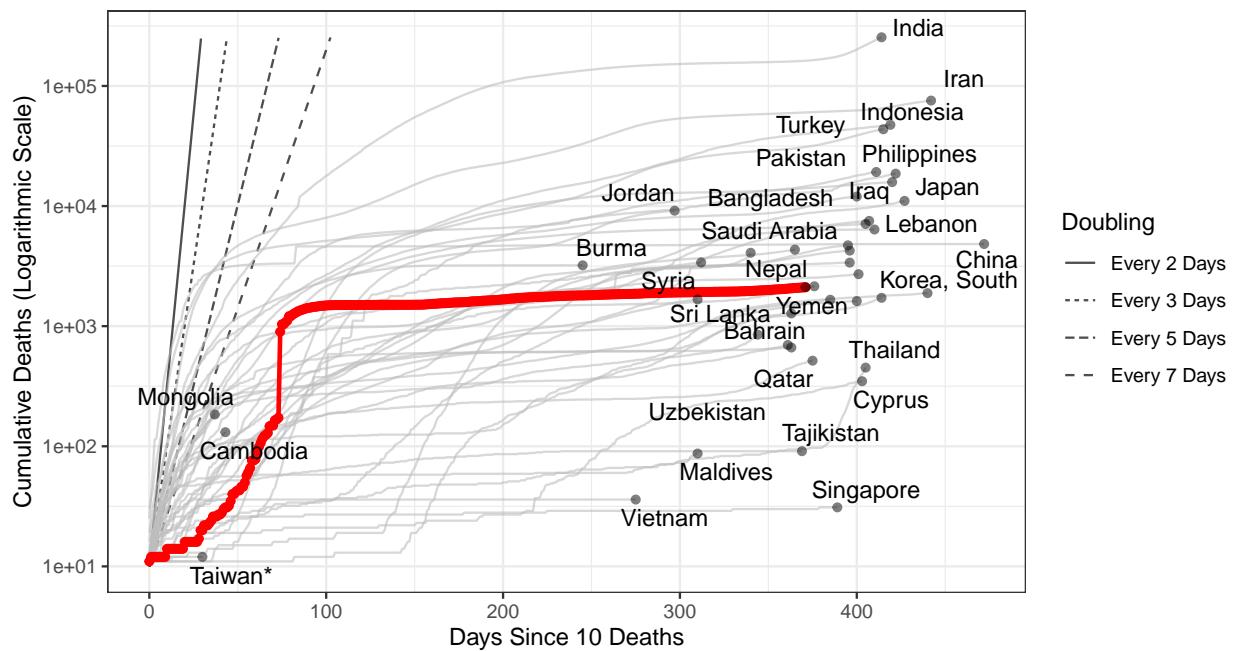


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 94,191 (95% CI: 91,160-97,223) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

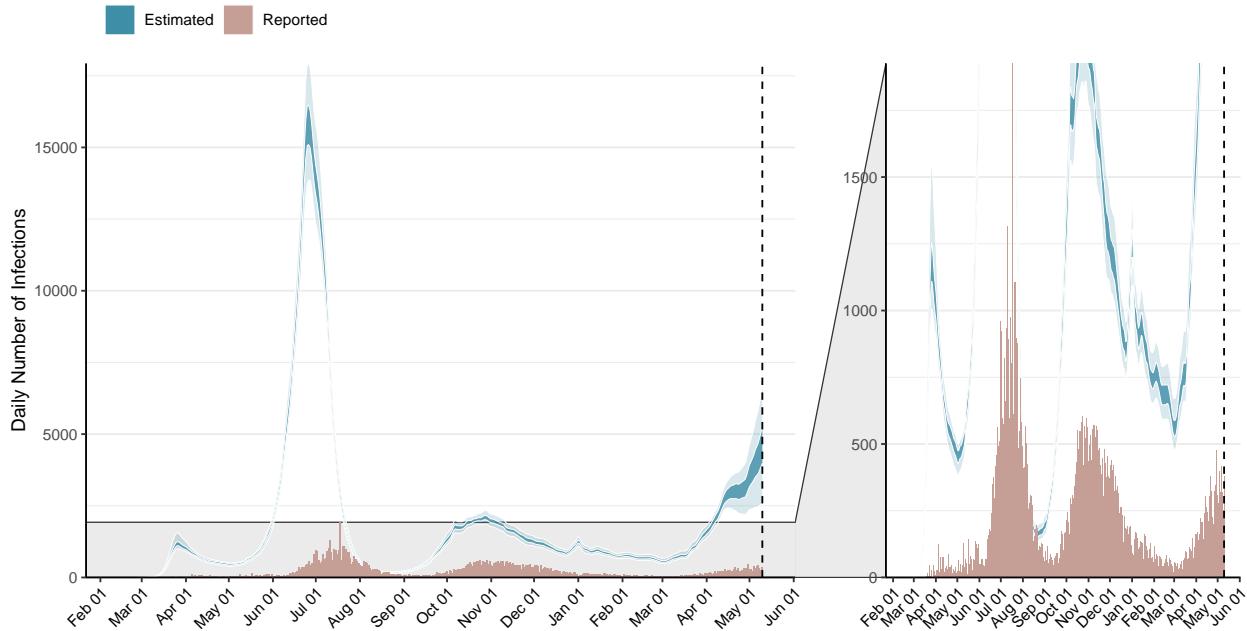
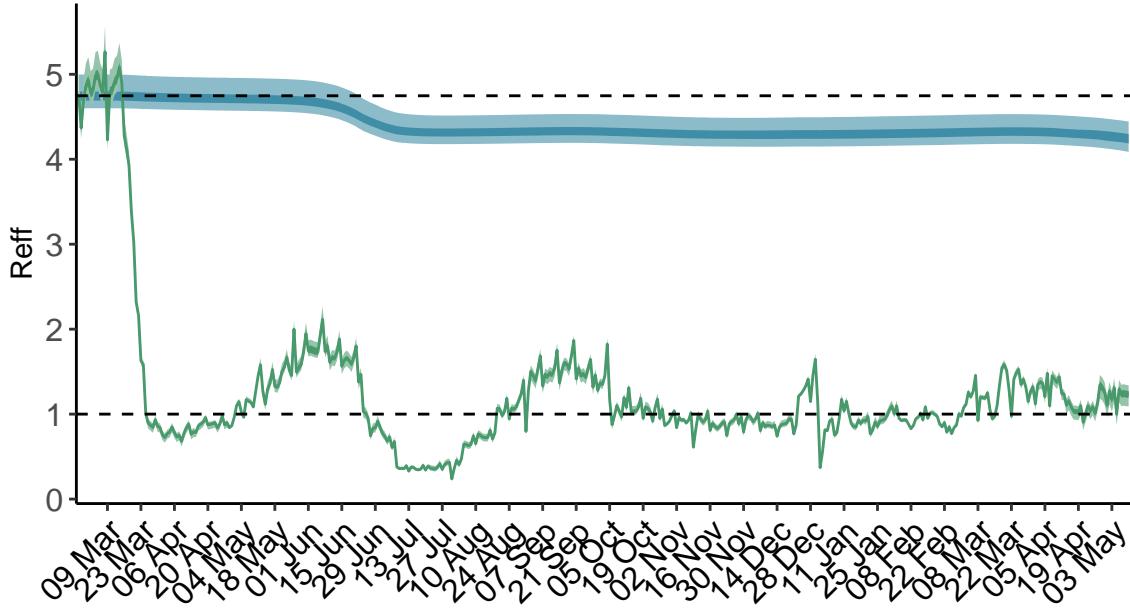


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

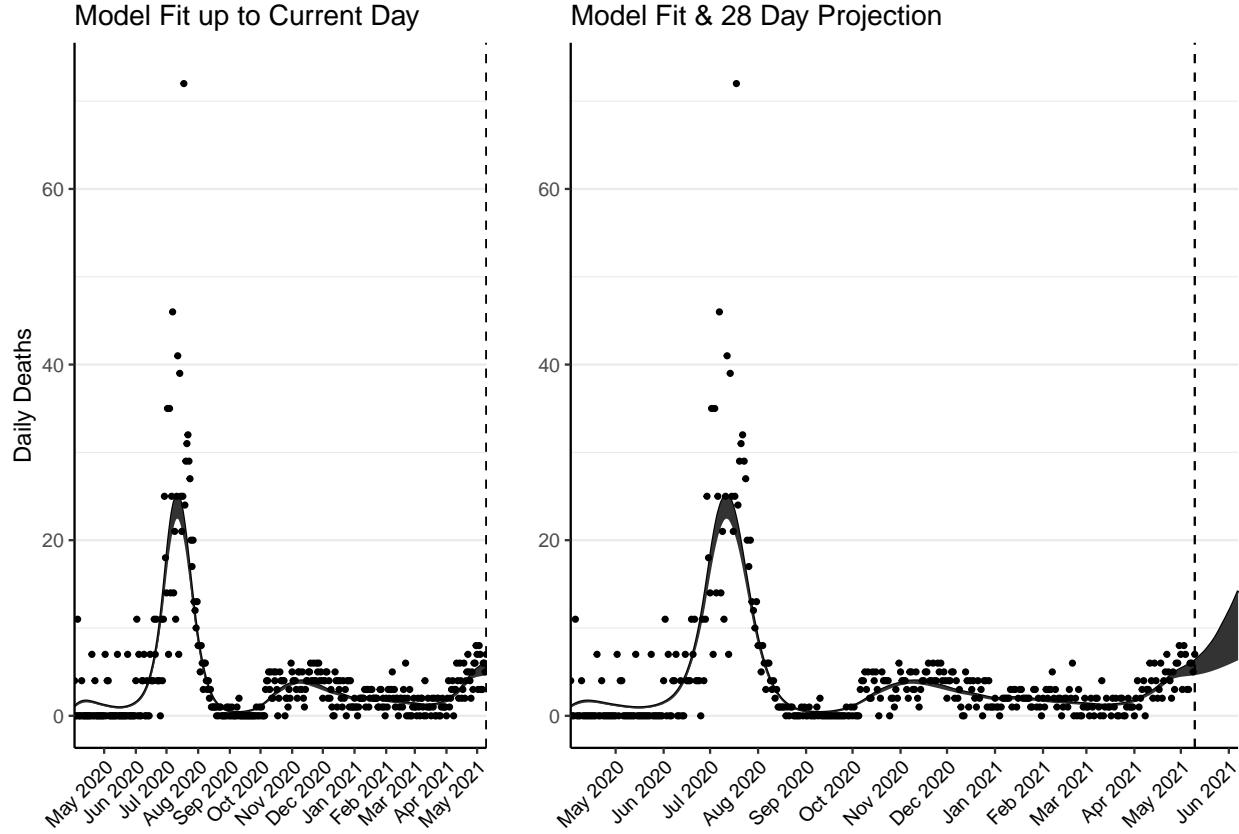


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 280 (95% CI: 270-290) patients requiring treatment with high-pressure oxygen at the current date to 661 (95% CI: 612-710) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 104 (95% CI: 101-107) patients requiring treatment with mechanical ventilation at the current date to 241 (95% CI: 224-258) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

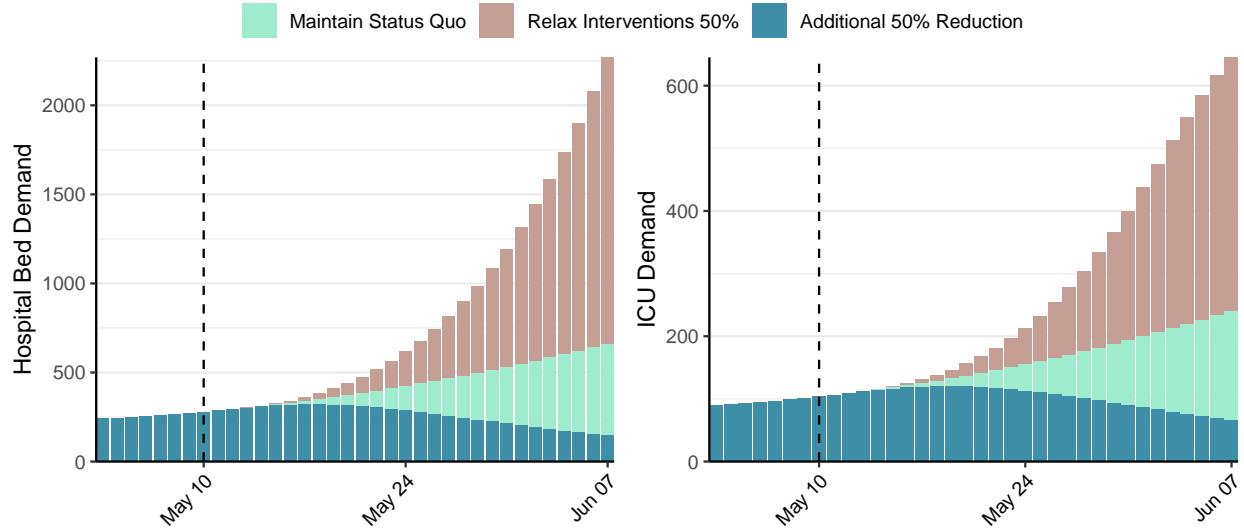


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 4,614 (95% CI: 4,387-4,842) at the current date to 765 (95% CI: 703-828) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 4,614 (95% CI: 4,387-4,842) at the current date to 60,476 (95% CI: 56,075-64,877) by 2021-06-07.

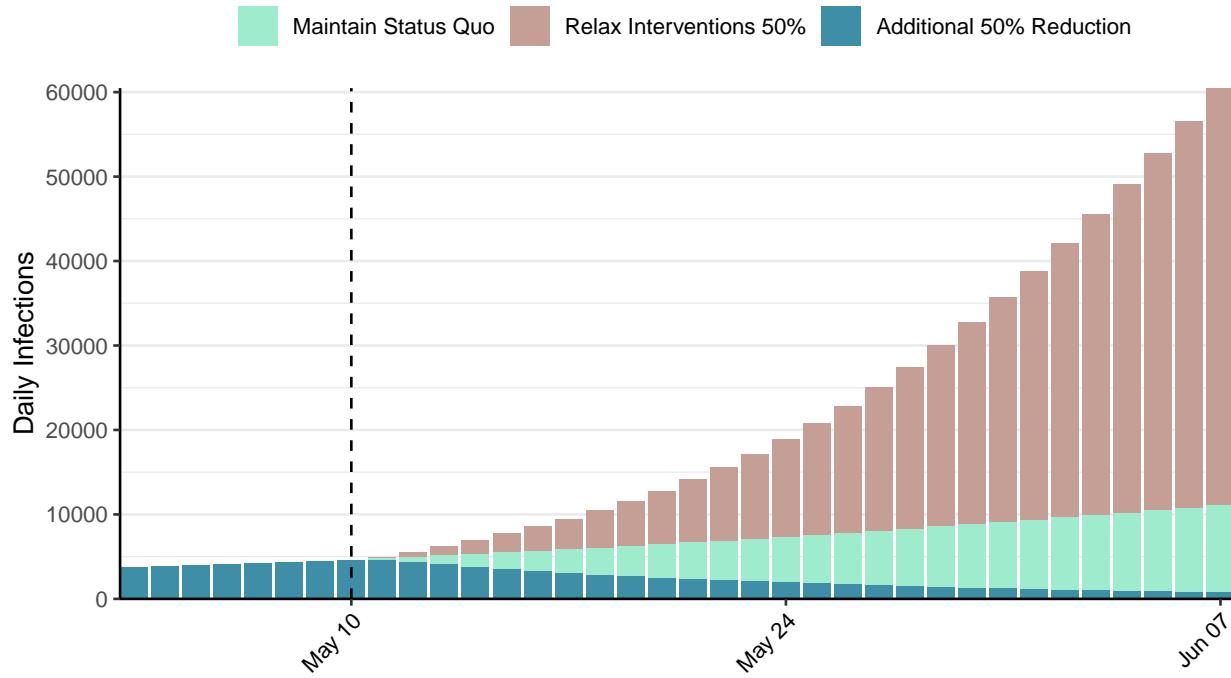


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Cambodia, 2021-05-10

[Download the report for Cambodia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
19,743	506	126	6	0.98 (95% CI: 0.69-1.25)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

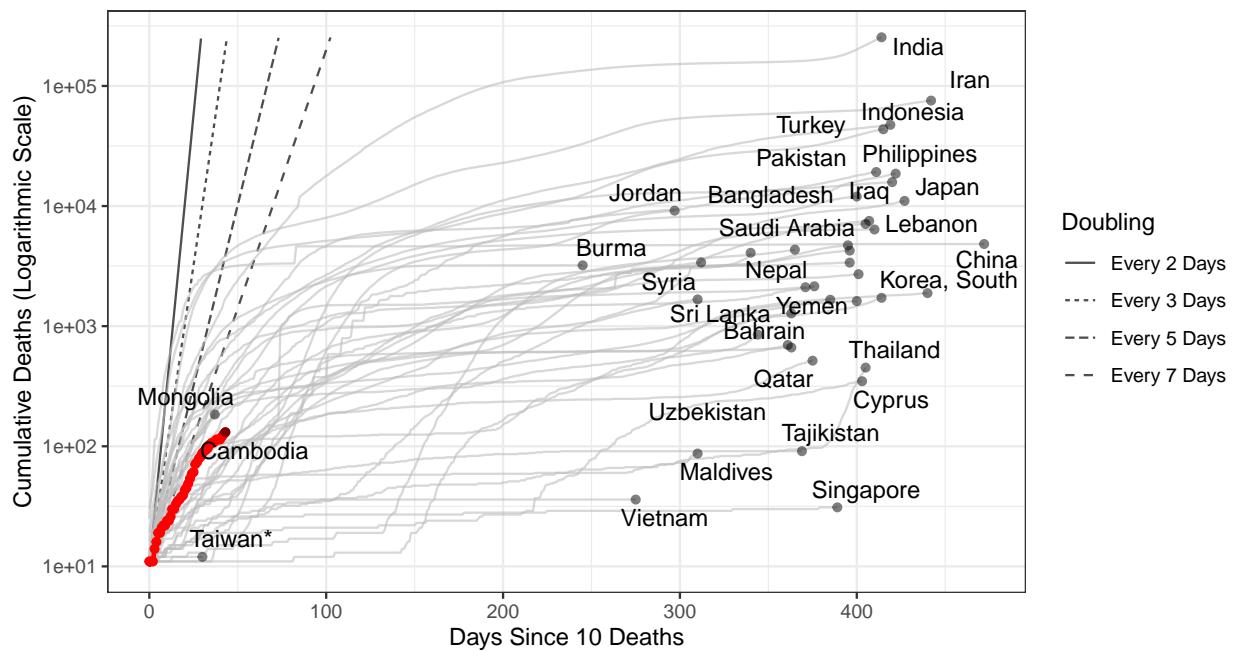


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 38,356 (95% CI: 36,099-40,614) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

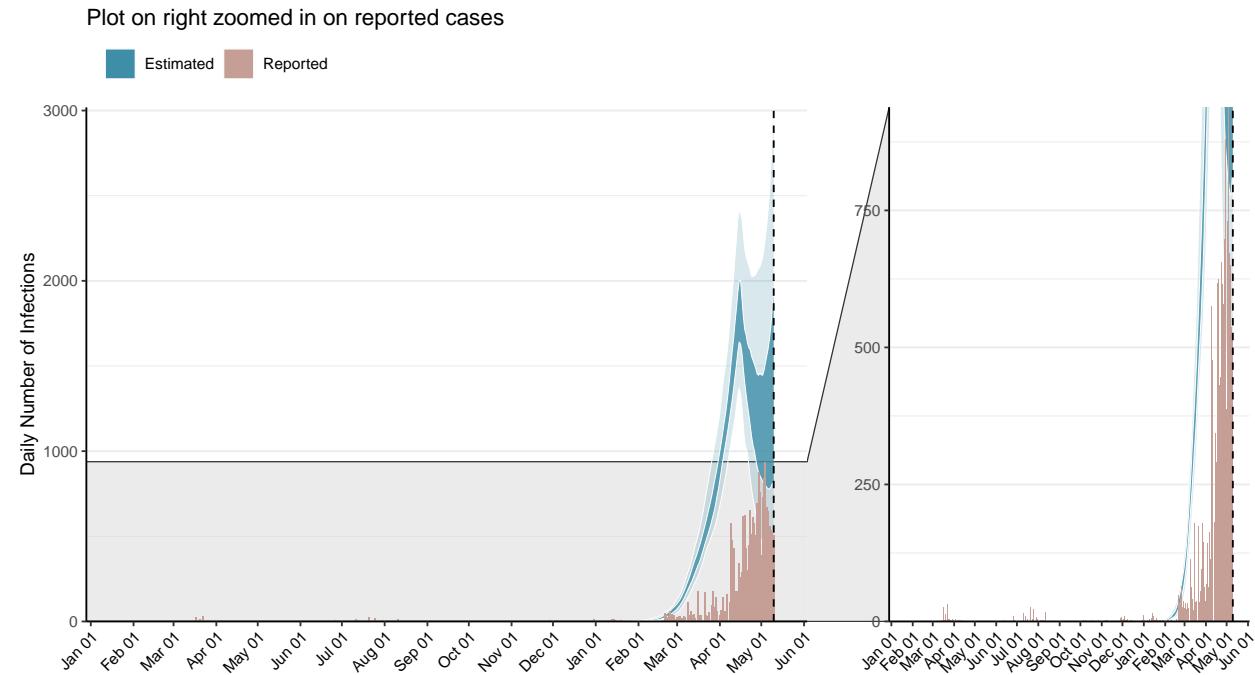
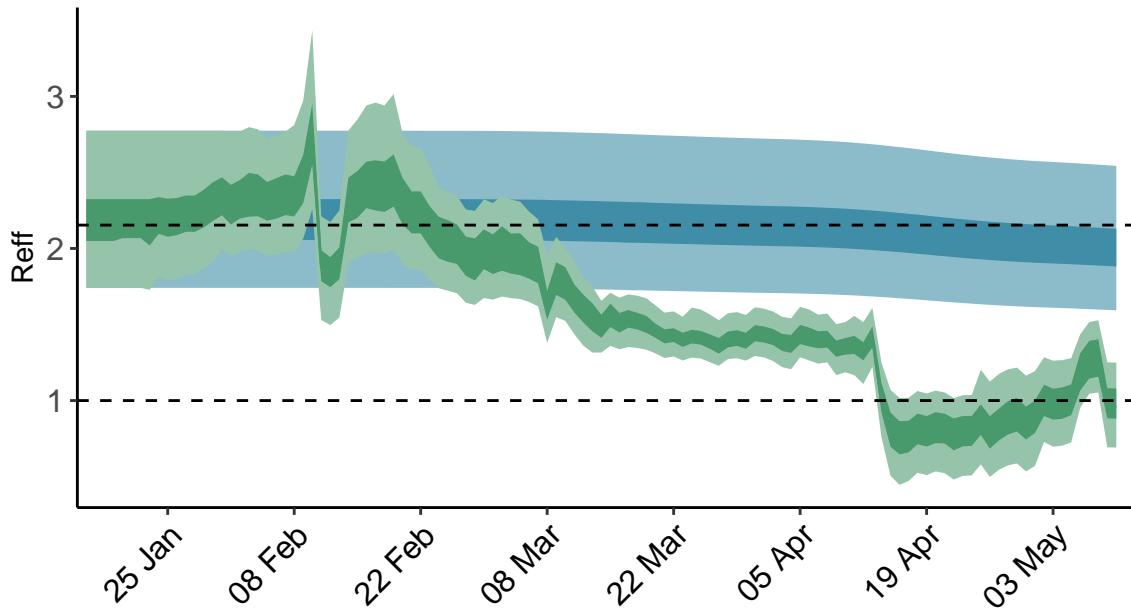


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

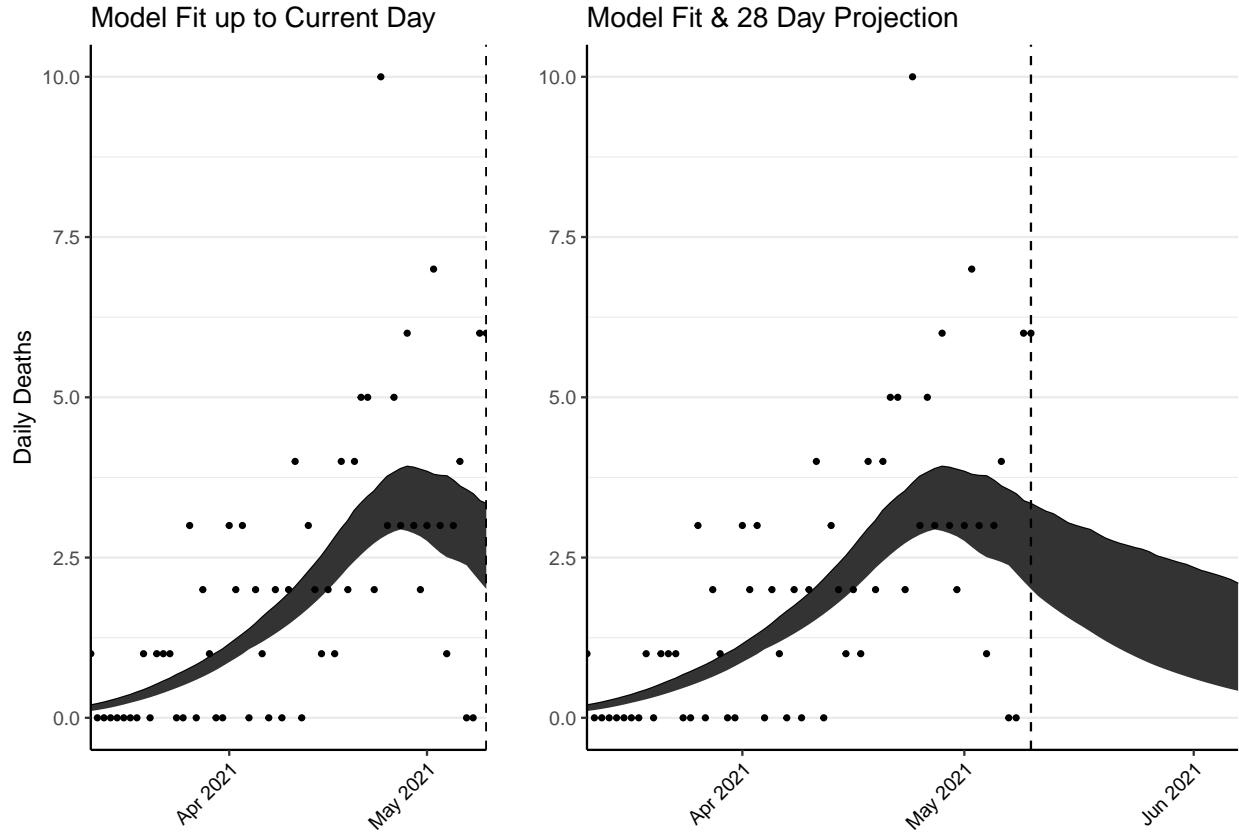


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 127 (95% CI: 119-136) patients requiring treatment with high-pressure oxygen at the current date to 125 (95% CI: 101-149) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 52 (95% CI: 49-55) patients requiring treatment with mechanical ventilation at the current date to 49 (95% CI: 40-58) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

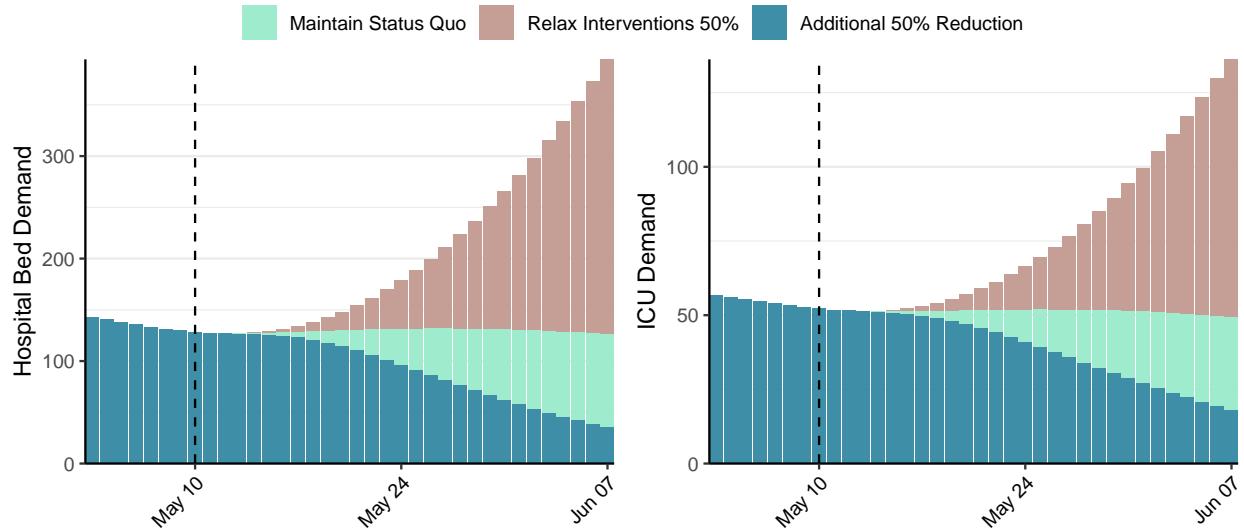


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,348 (95% CI: 1,187-1,509) at the current date to 116 (95% CI: 91-142) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,348 (95% CI: 1,187-1,509) at the current date to 9,584 (95% CI: 7,118-12,050) by 2021-06-07.

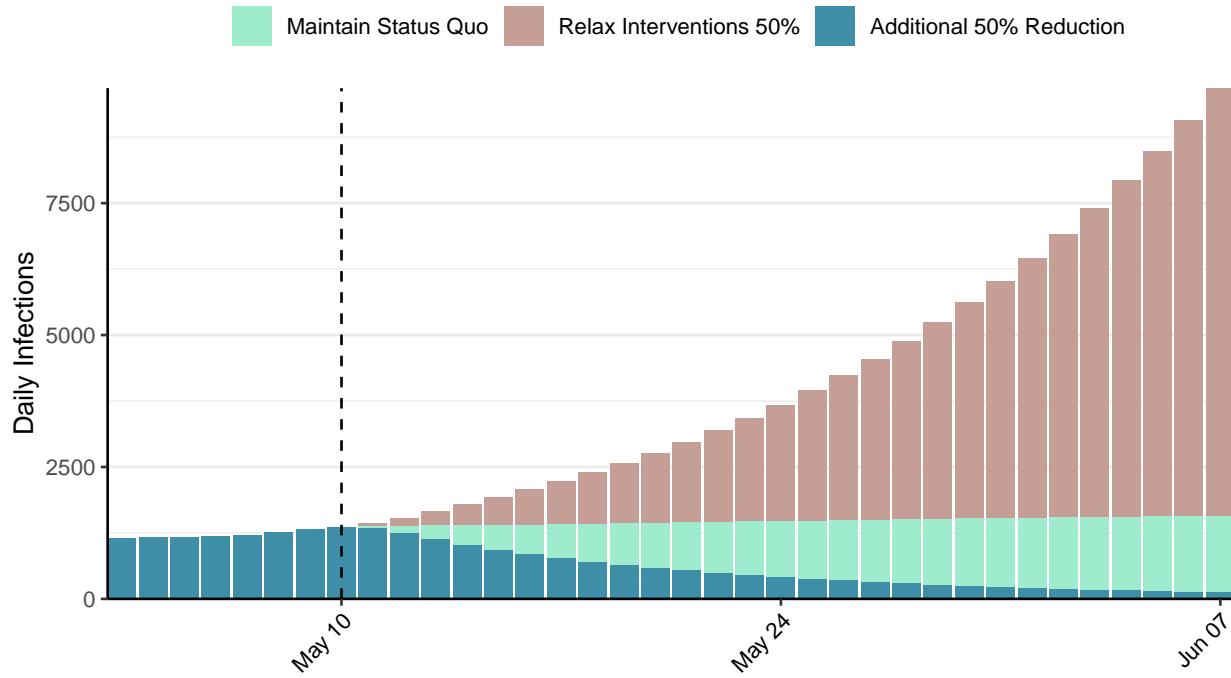


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: South Korea, 2021-05-10

[Download the report for South Korea, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
128,282	511	1,879	4	0.88 (95% CI: 0.84-0.92)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

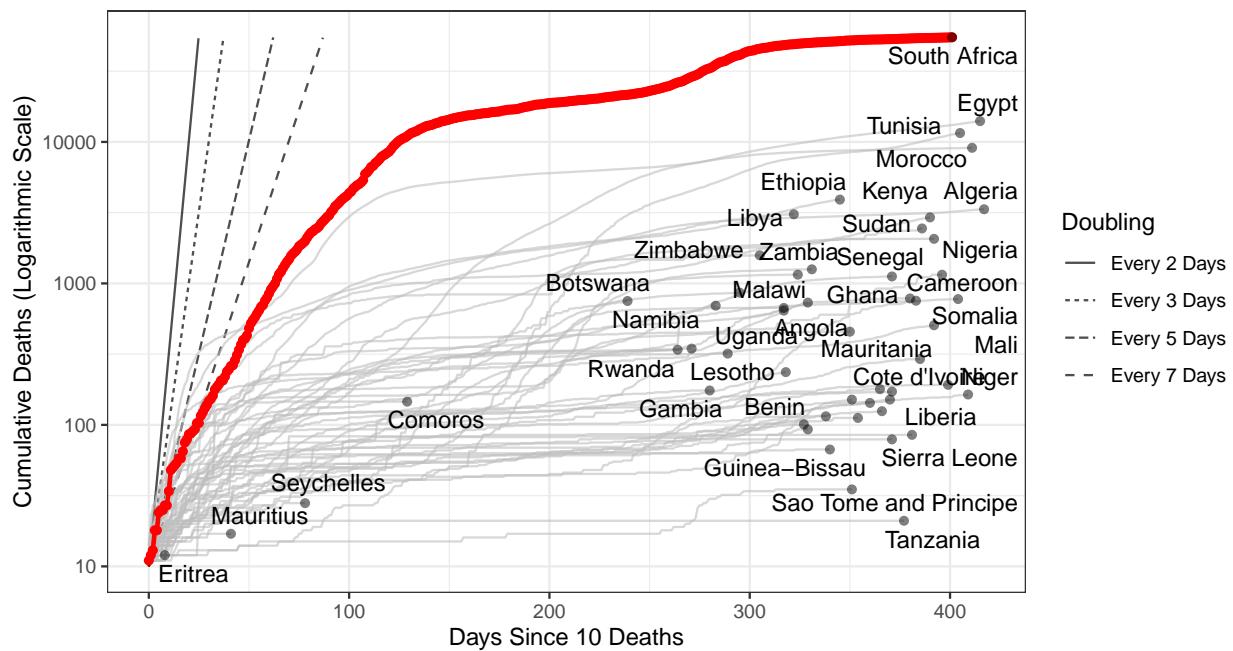


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 36,329 (95% CI: 35,527-37,130) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

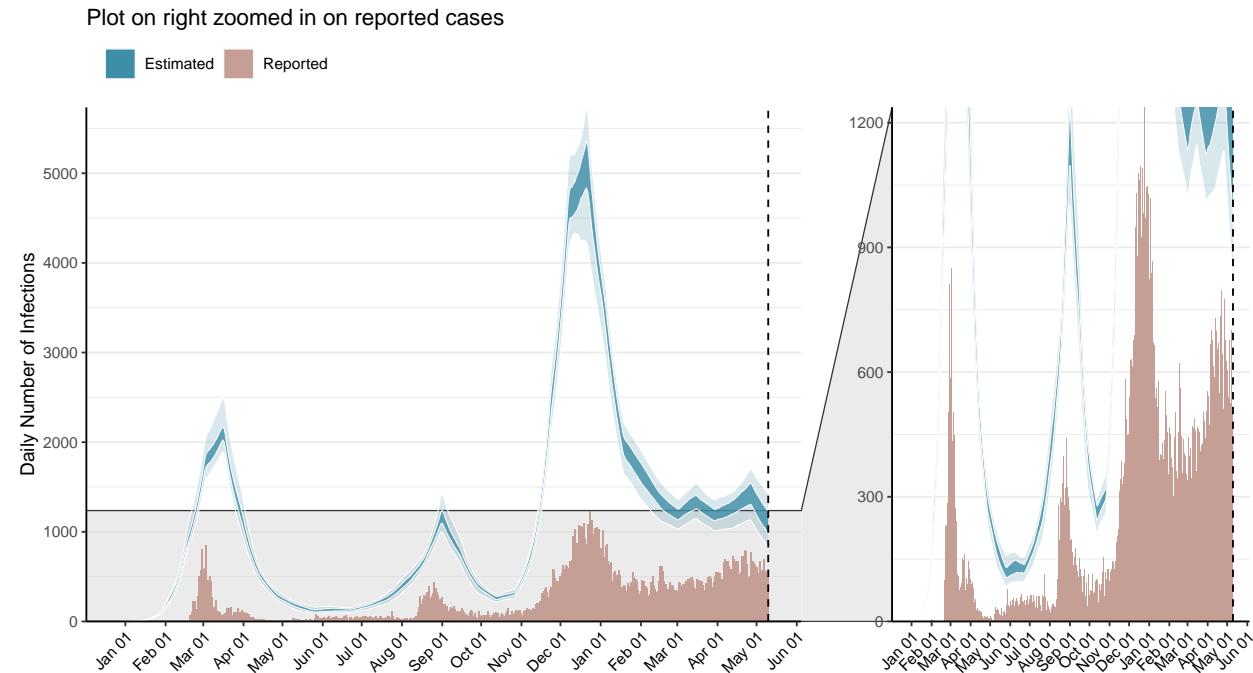
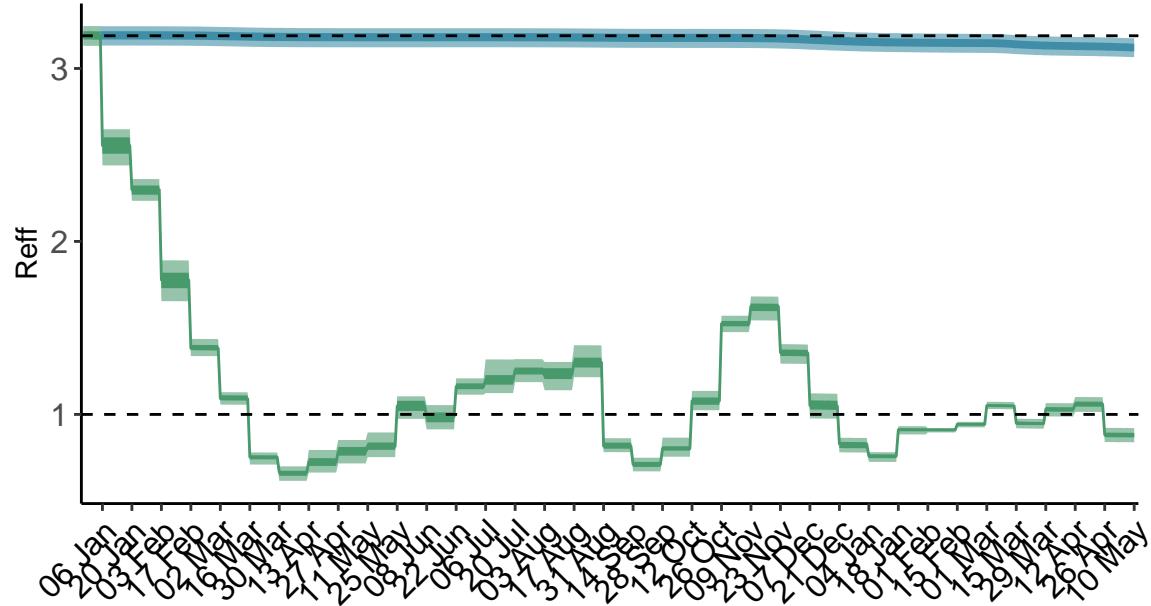


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

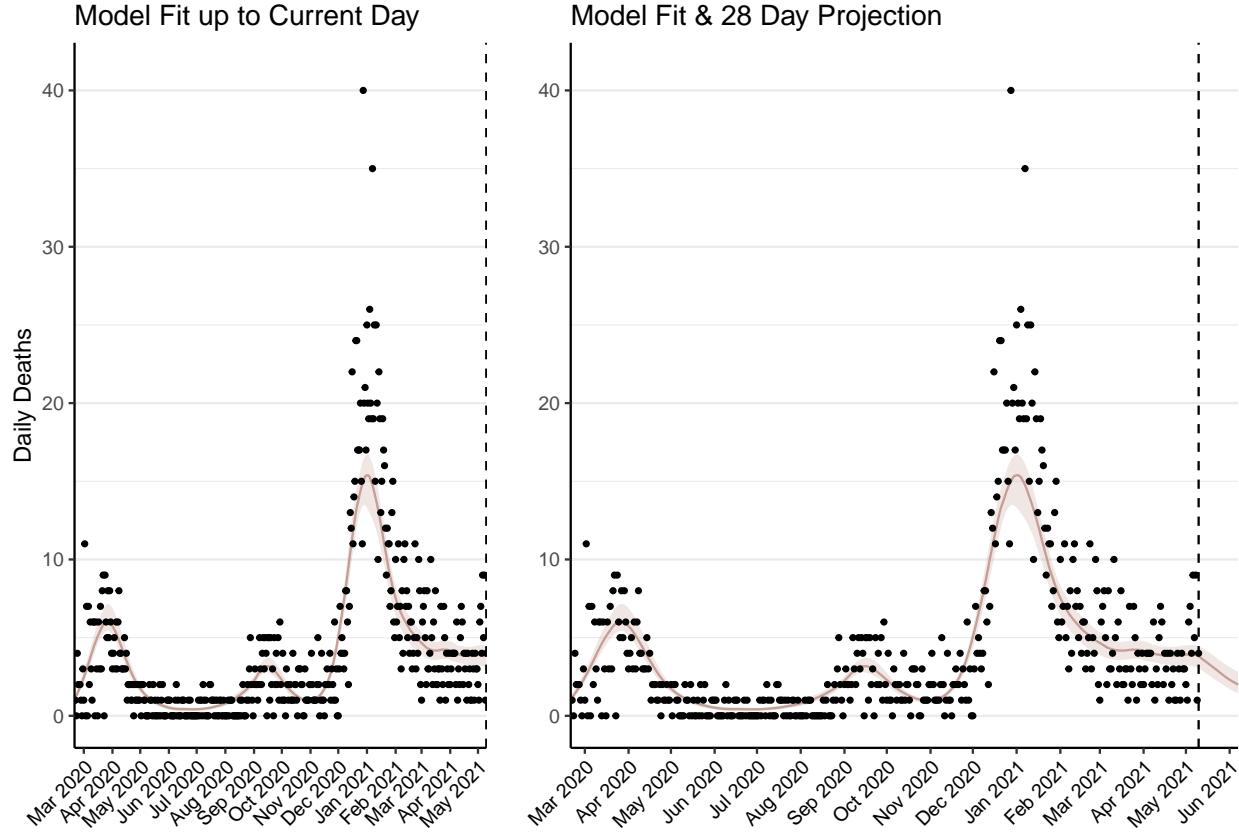


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 142 (95% CI: 139-145) patients requiring treatment with high-pressure oxygen at the current date to 79 (95% CI: 76-82) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 59 (95% CI: 58-60) patients requiring treatment with mechanical ventilation at the current date to 37 (95% CI: 35-38) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

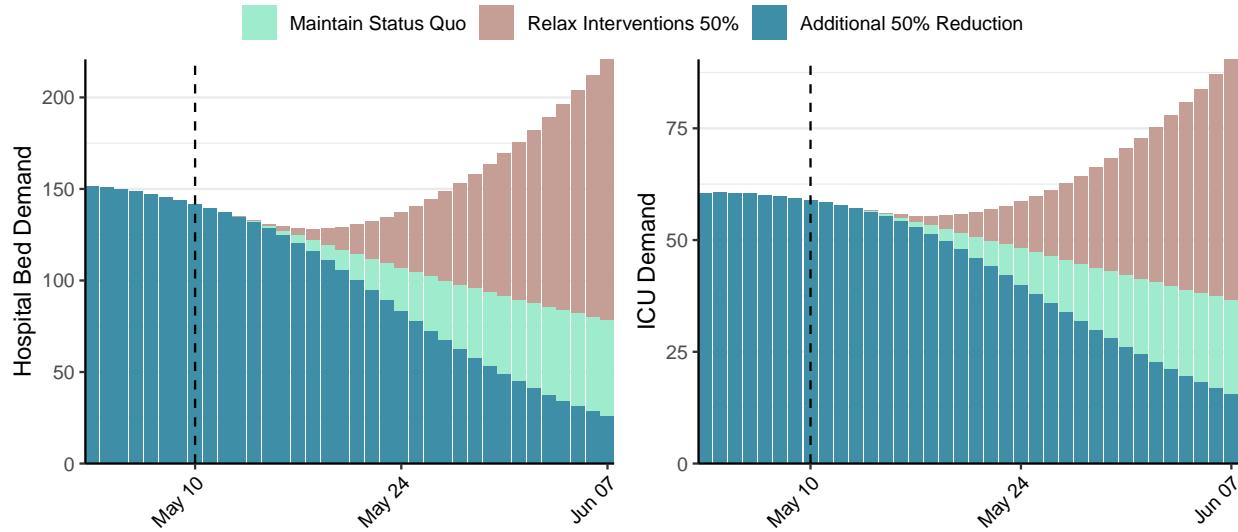


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,104 (95% CI: 1,071-1,136) at the current date to 57 (95% CI: 55-60) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,104 (95% CI: 1,071-1,136) at the current date to 3,714 (95% CI: 3,533-3,895) by 2021-06-07.

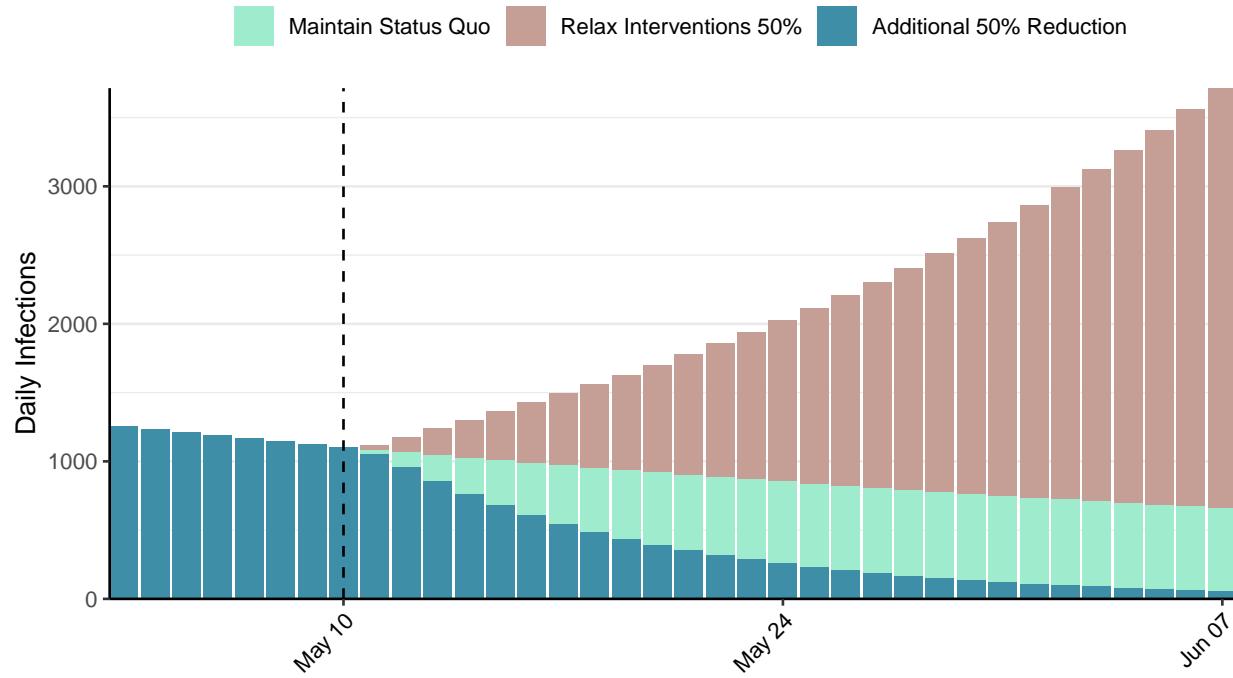


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool - https://covid19sim.org/](https://covid19sim.org/), which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Lao PDR, 2021-05-10

[Download the report for Lao PDR, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
1,327	25	1	0	1.74 (95% CI: 0.69-3.46)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease. **N.B.** Lao PDR is not shown in the following plot as only 1 deaths have been reported to date

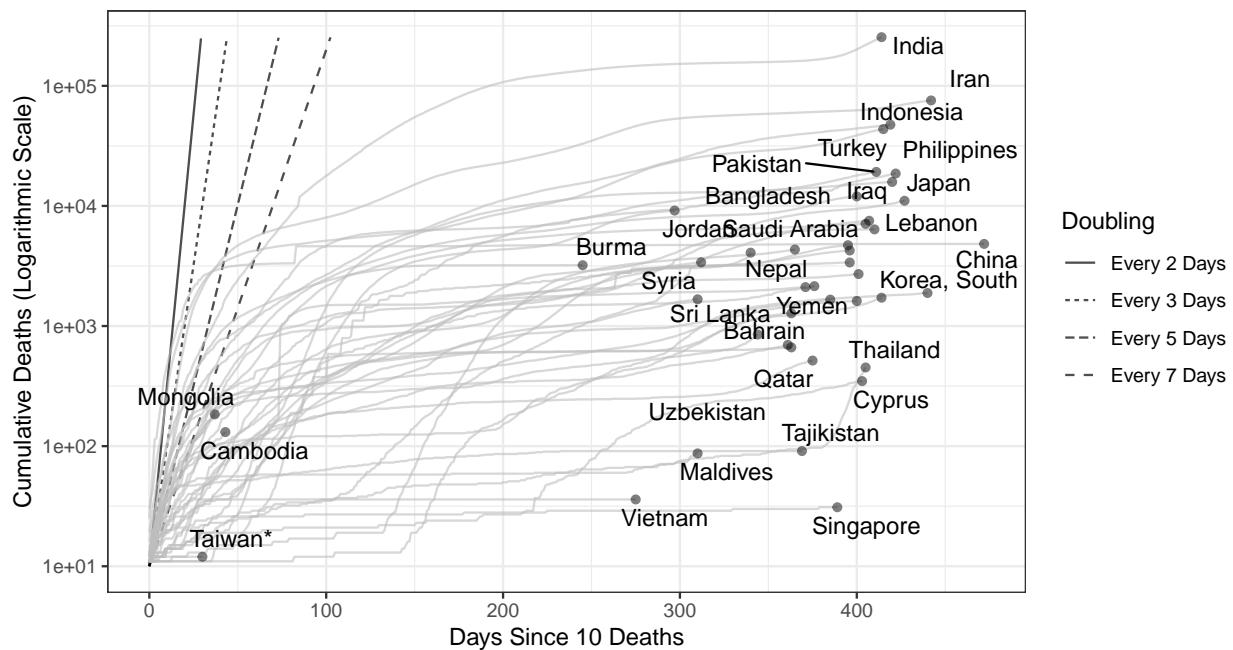


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 5,186 (95% CI: 3,947-6,424) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

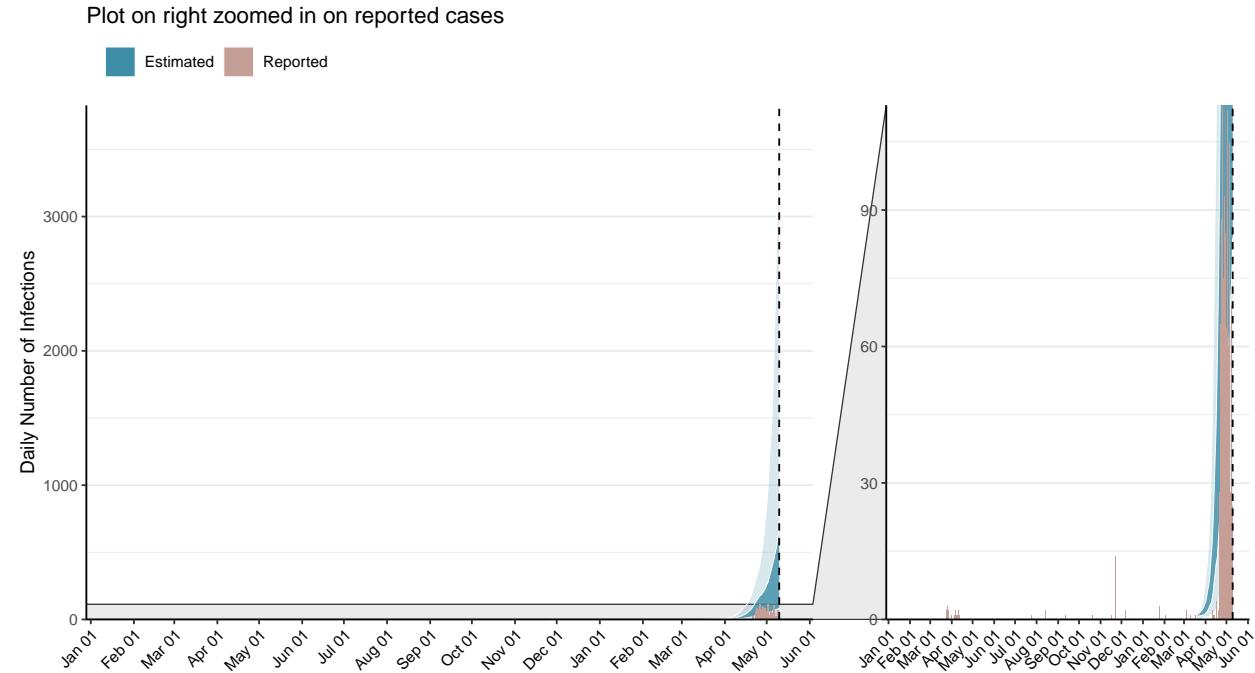
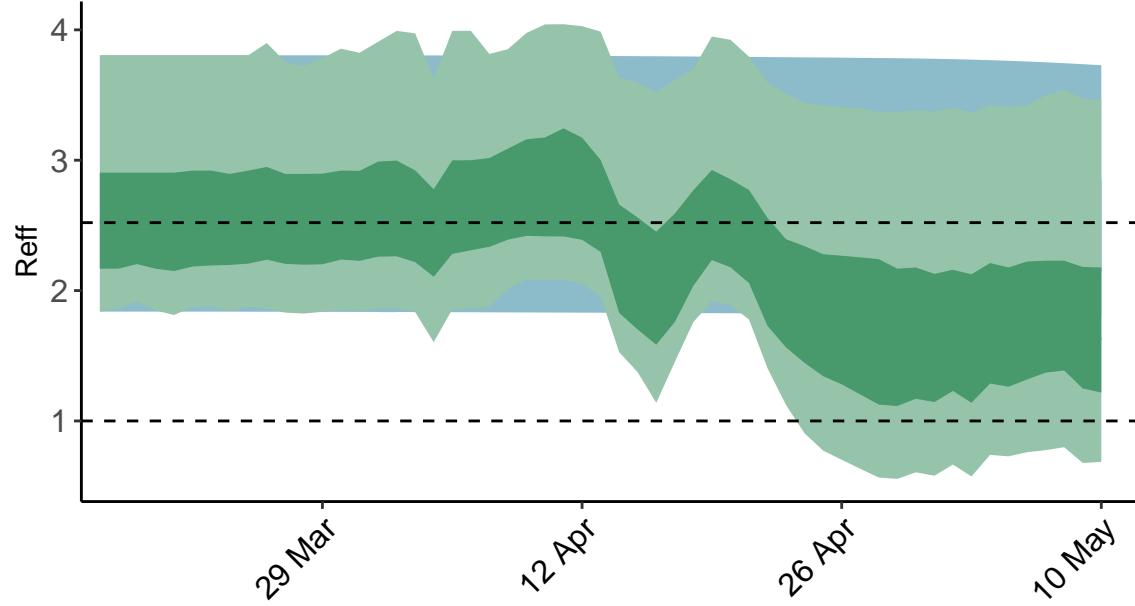


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

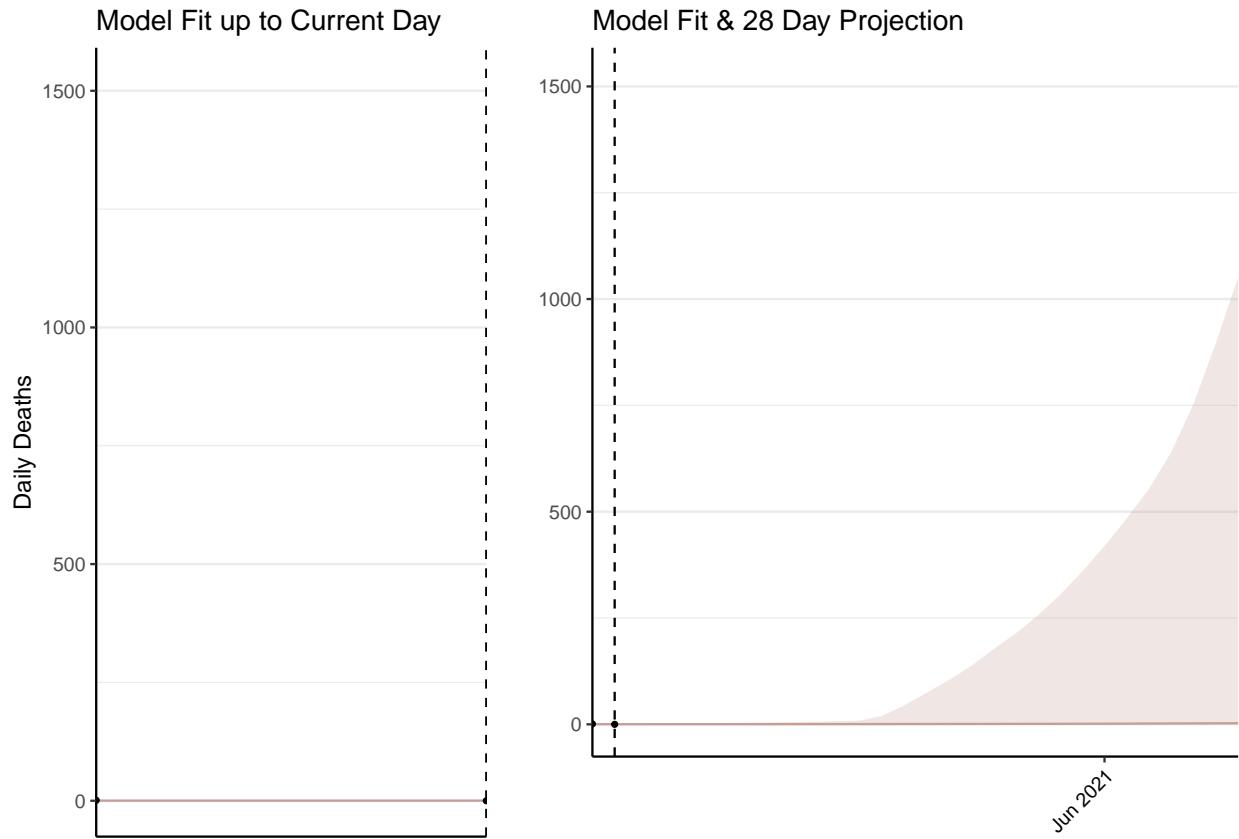


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 20 (95% CI: 16-25) patients requiring treatment with high-pressure oxygen at the current date to 1,120 (95% CI: 448-1,793) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 7 (95% CI: 5-8) patients requiring treatment with mechanical ventilation at the current date to 141 (95% CI: 89-193) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

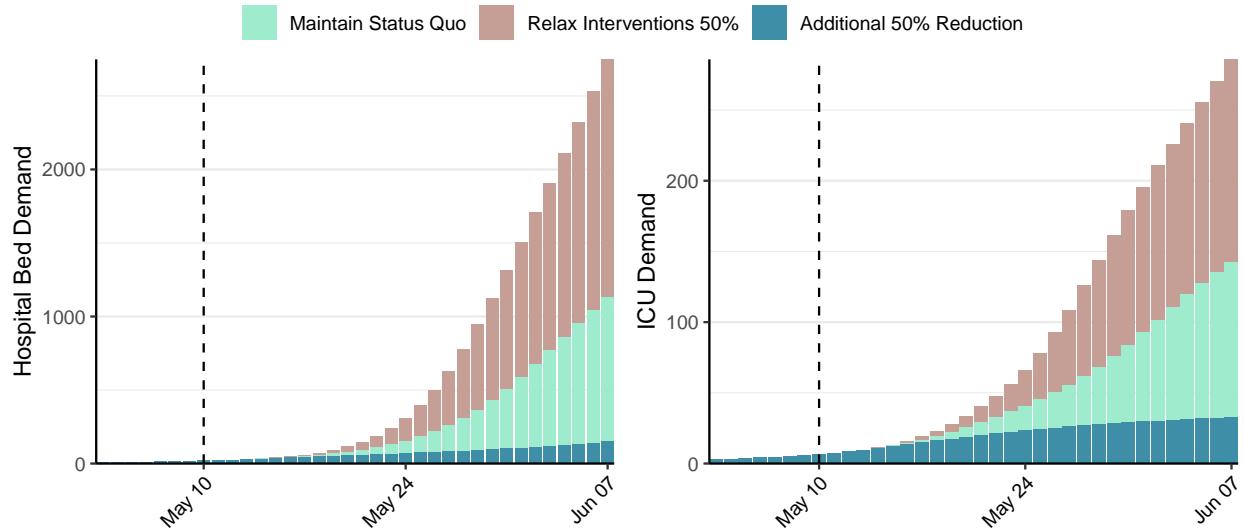


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 645 (95% CI: 435-854) at the current date to 2,928 (95% CI: 473-5,382) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 645 (95% CI: 435-854) at the current date to 73,931 (95% CI: 53,318-94,545) by 2021-06-07.

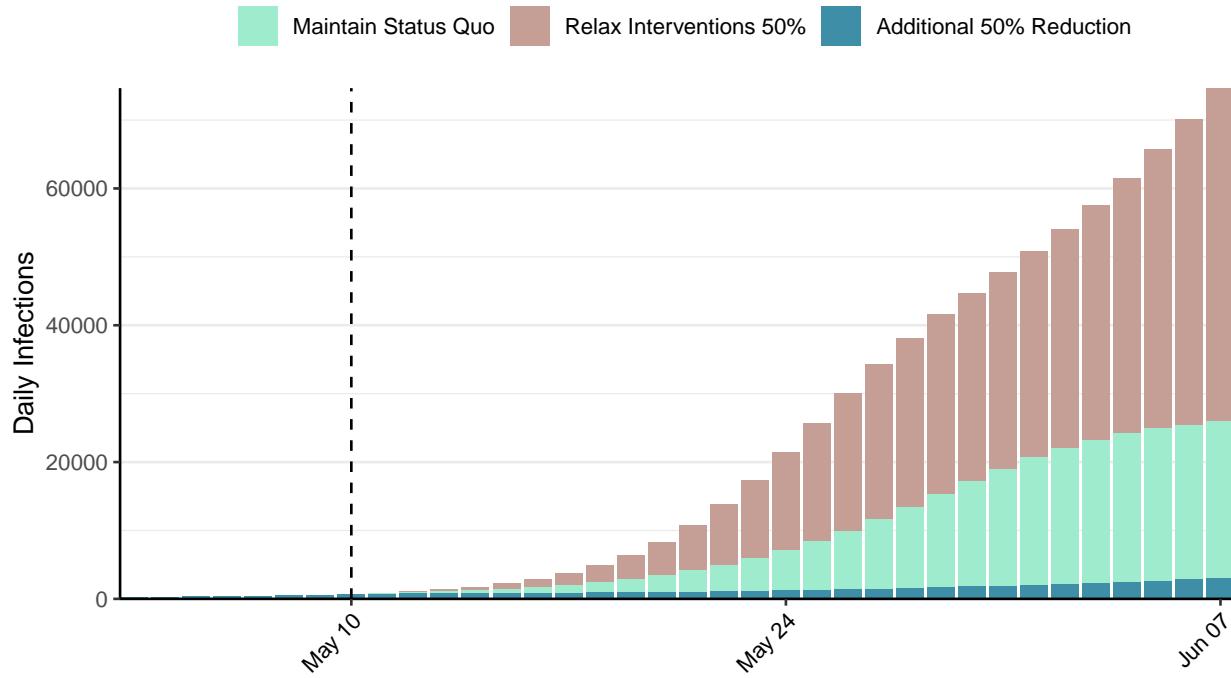


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Lebanon, 2021-05-10

[Download the report for Lebanon, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
533,141	302	7,507	21	0.74 (95% CI: 0.68-0.78)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

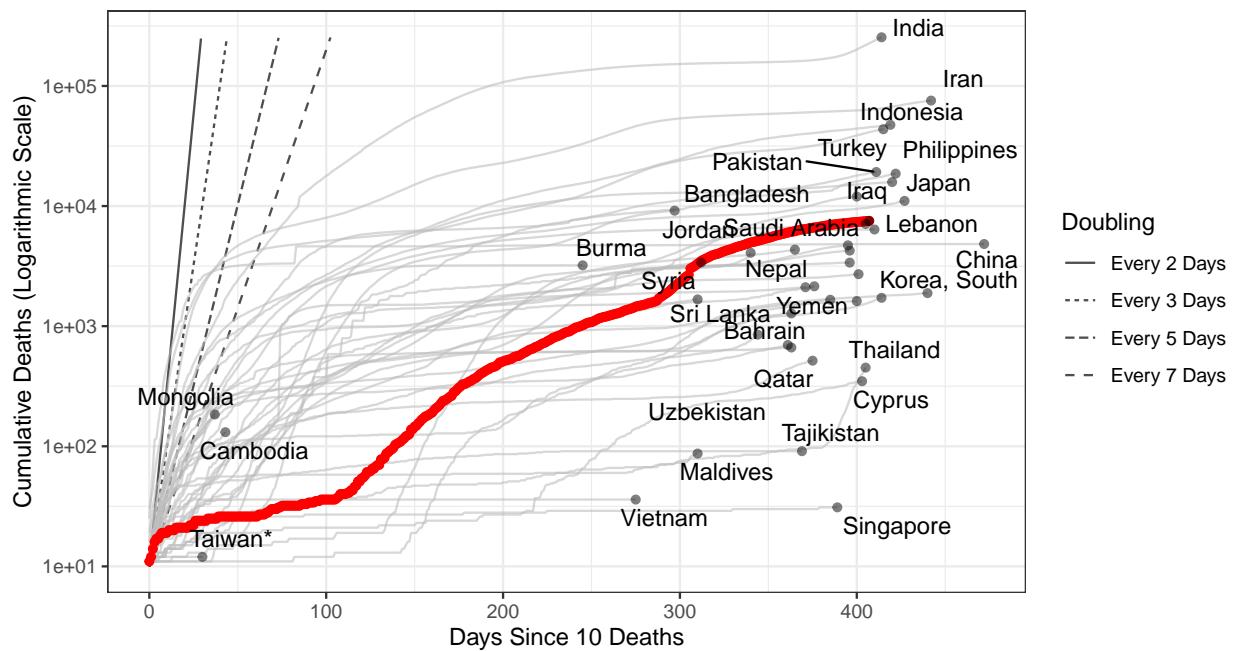


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 235,368 (95% CI: 228,233-242,503) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

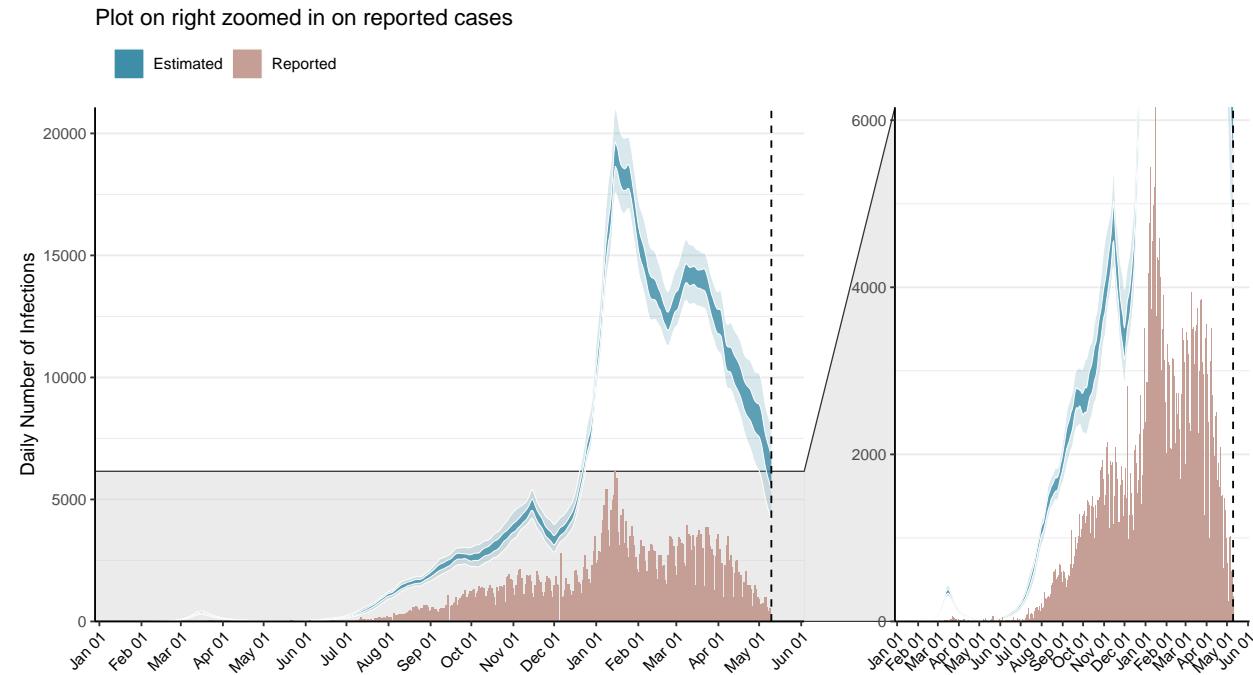
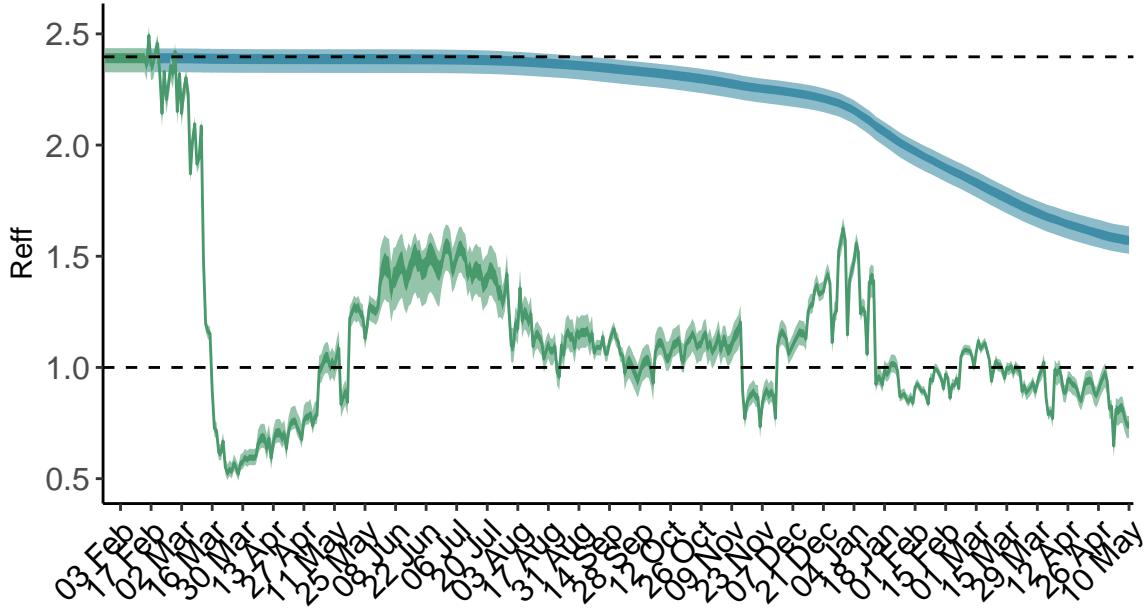


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Lebanon is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

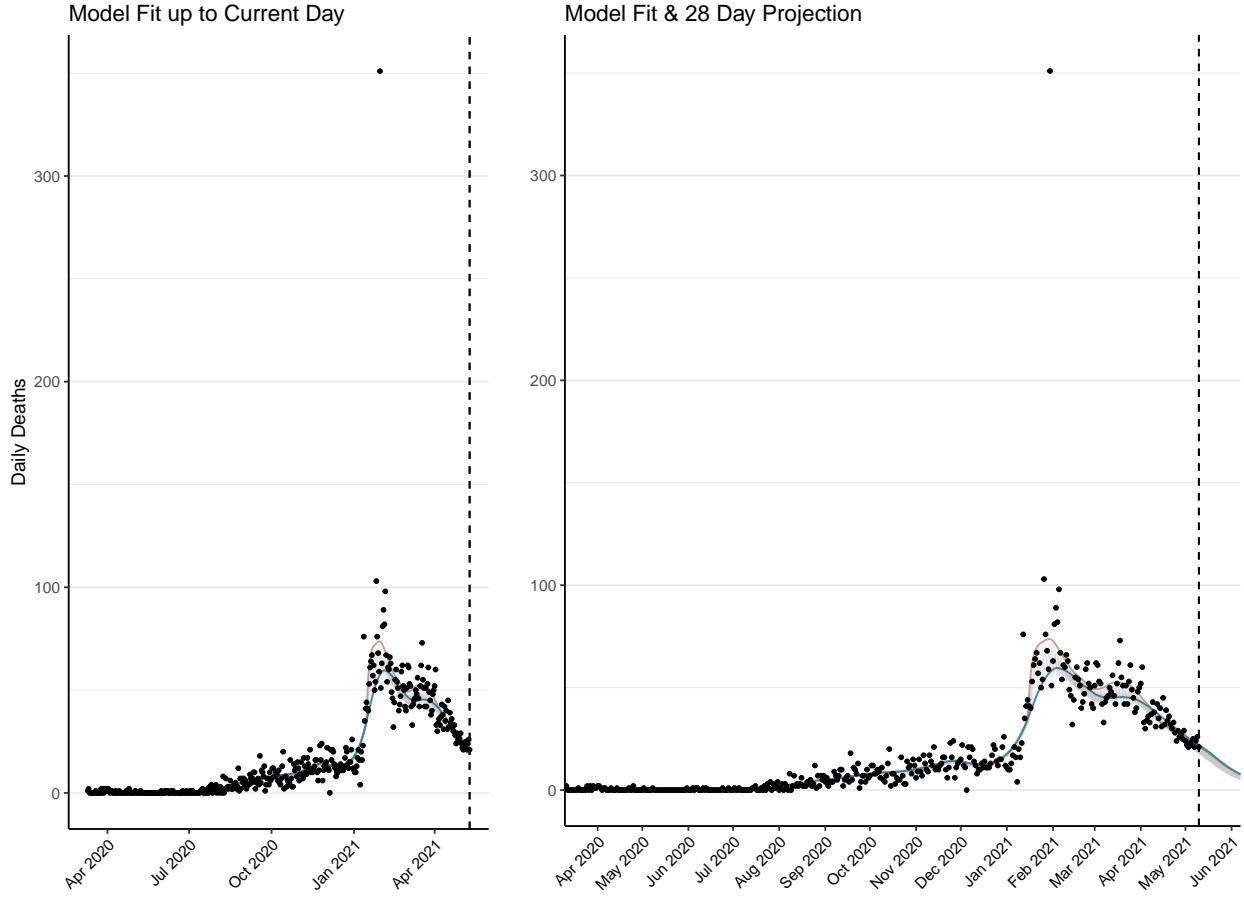


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 830 (95% CI: 805-856) patients requiring treatment with high-pressure oxygen at the current date to 278 (95% CI: 265-291) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 387 (95% CI: 376-399) patients requiring treatment with mechanical ventilation at the current date to 143 (95% CI: 137-150) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

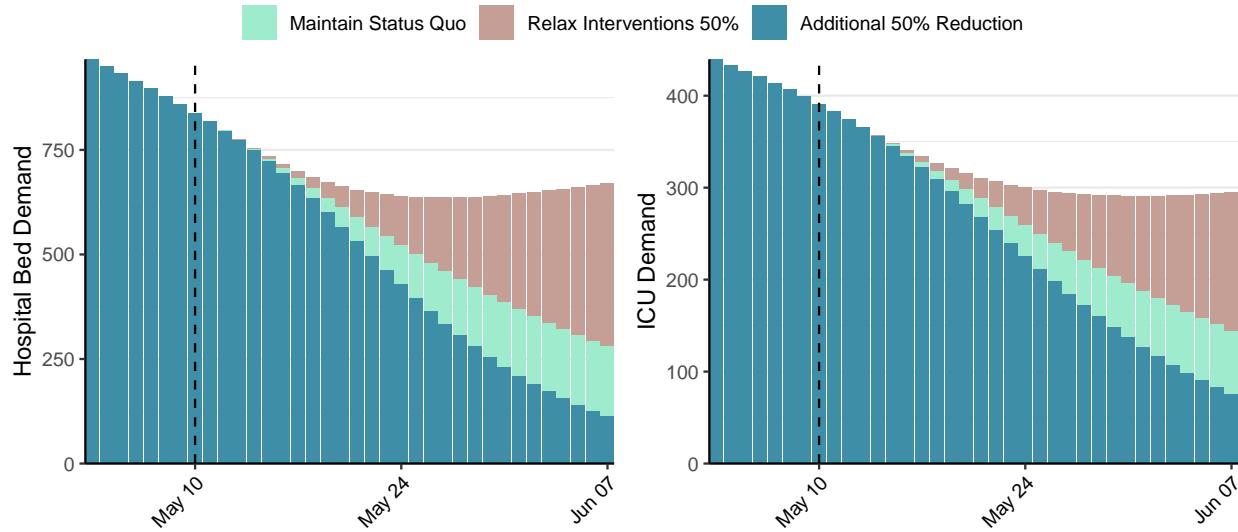
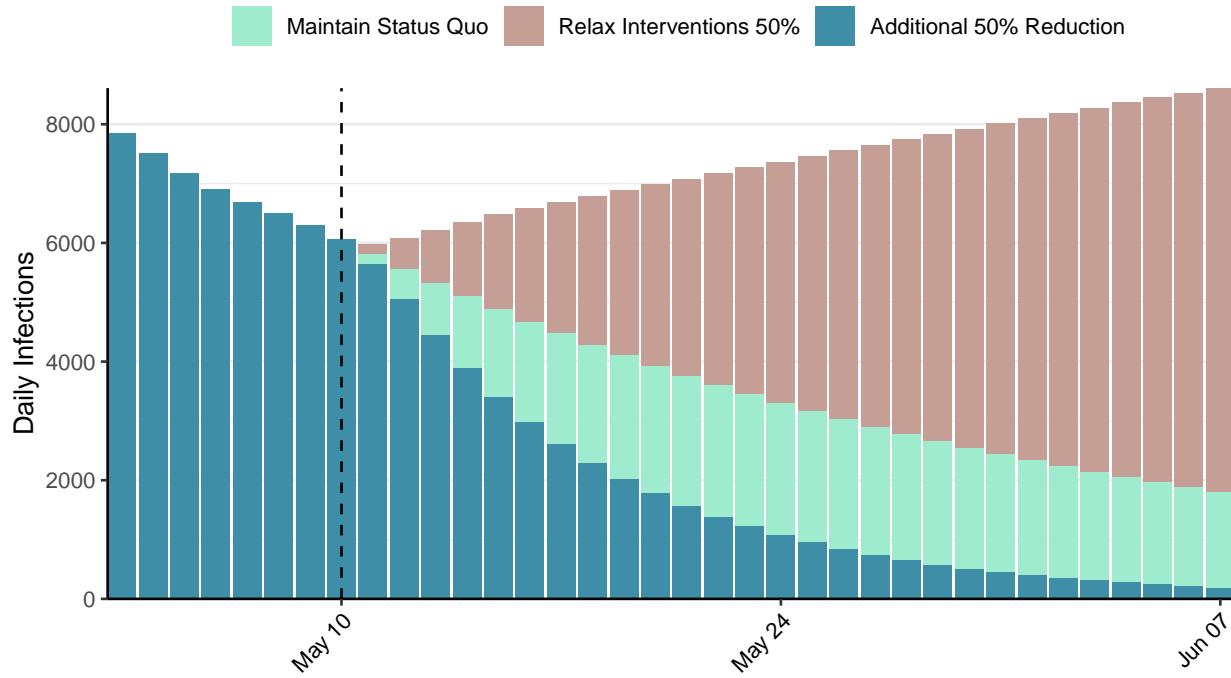


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 6,001 (95% CI: 5,768-6,234) at the current date to 184 (95% CI: 174-194) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 6,001 (95% CI: 5,768-6,234) at the current date to 8,524 (95% CI: 8,035-9,013) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Liberia, 2021-05-10

[Download the report for Liberia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
2,114	0	85	0	0.89 (95% CI: 0.6-1.26)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

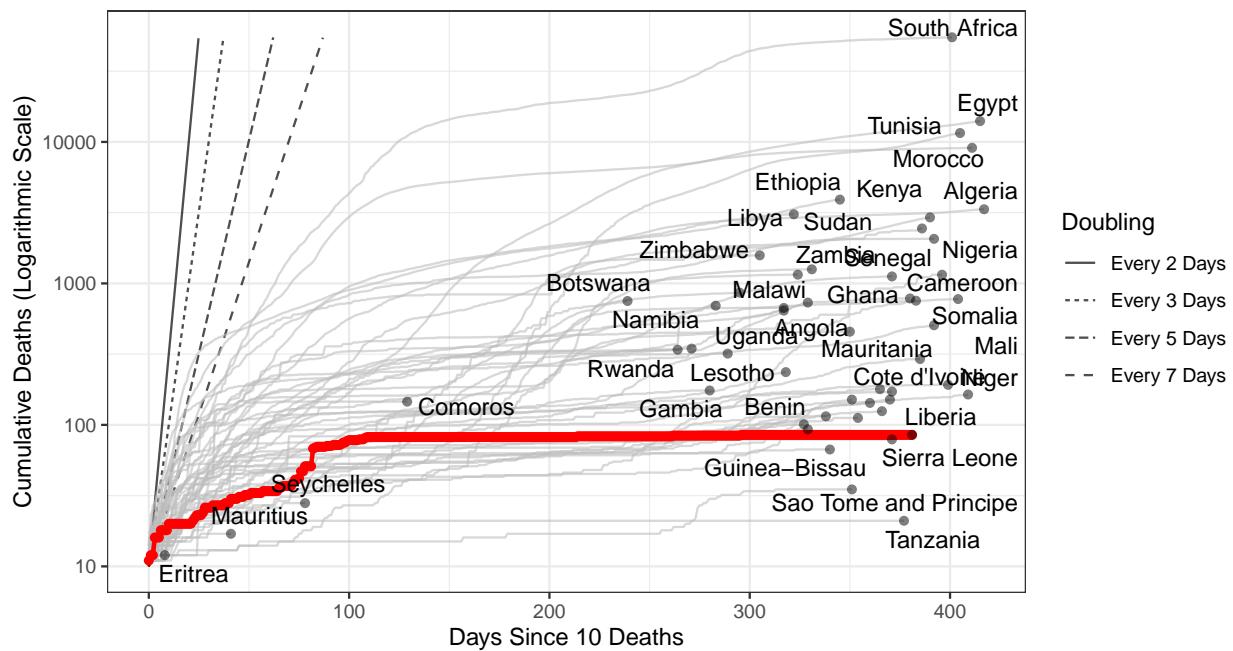


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 29 (95% CI: 17-40) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

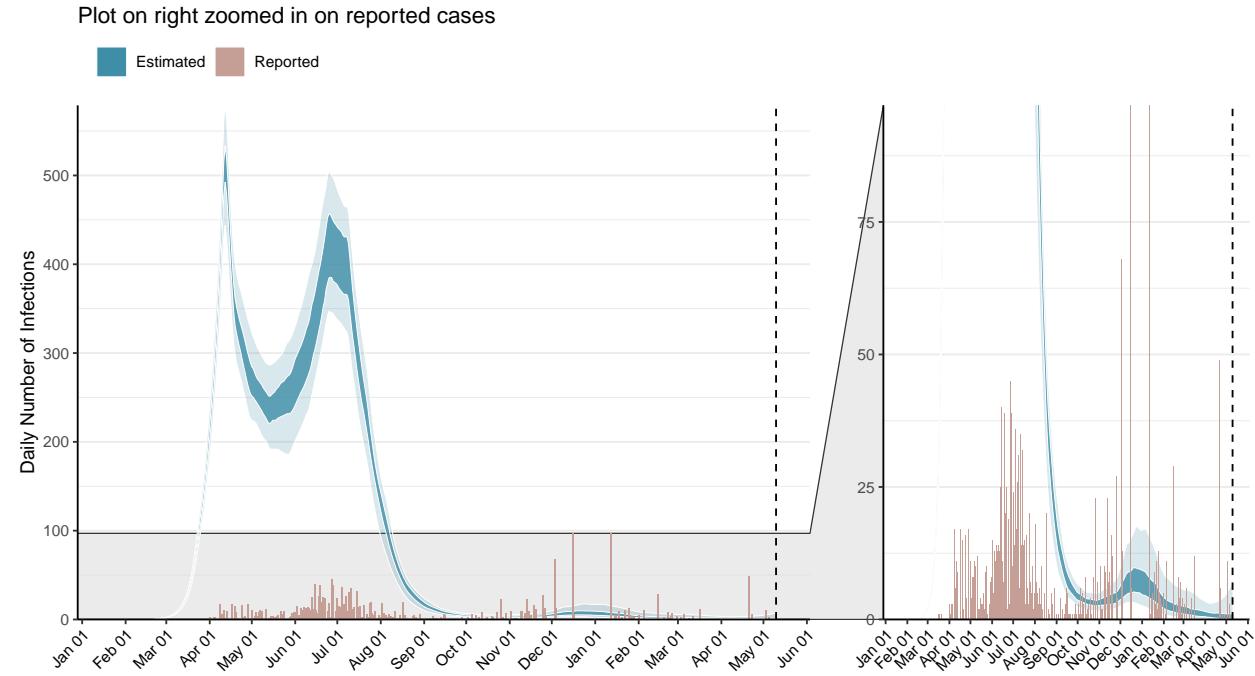
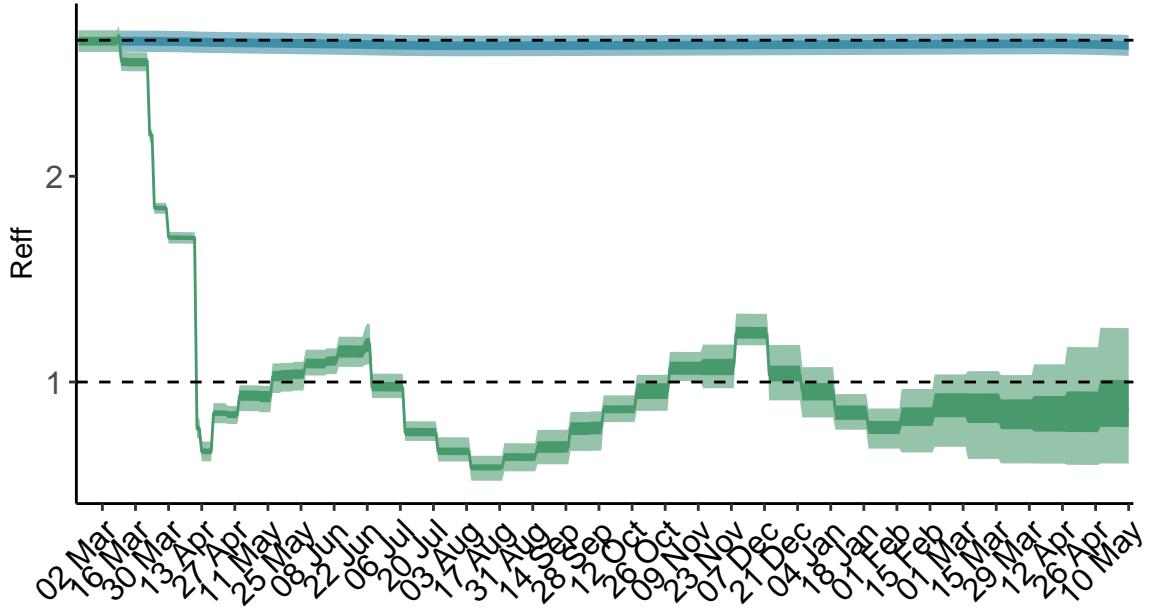


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

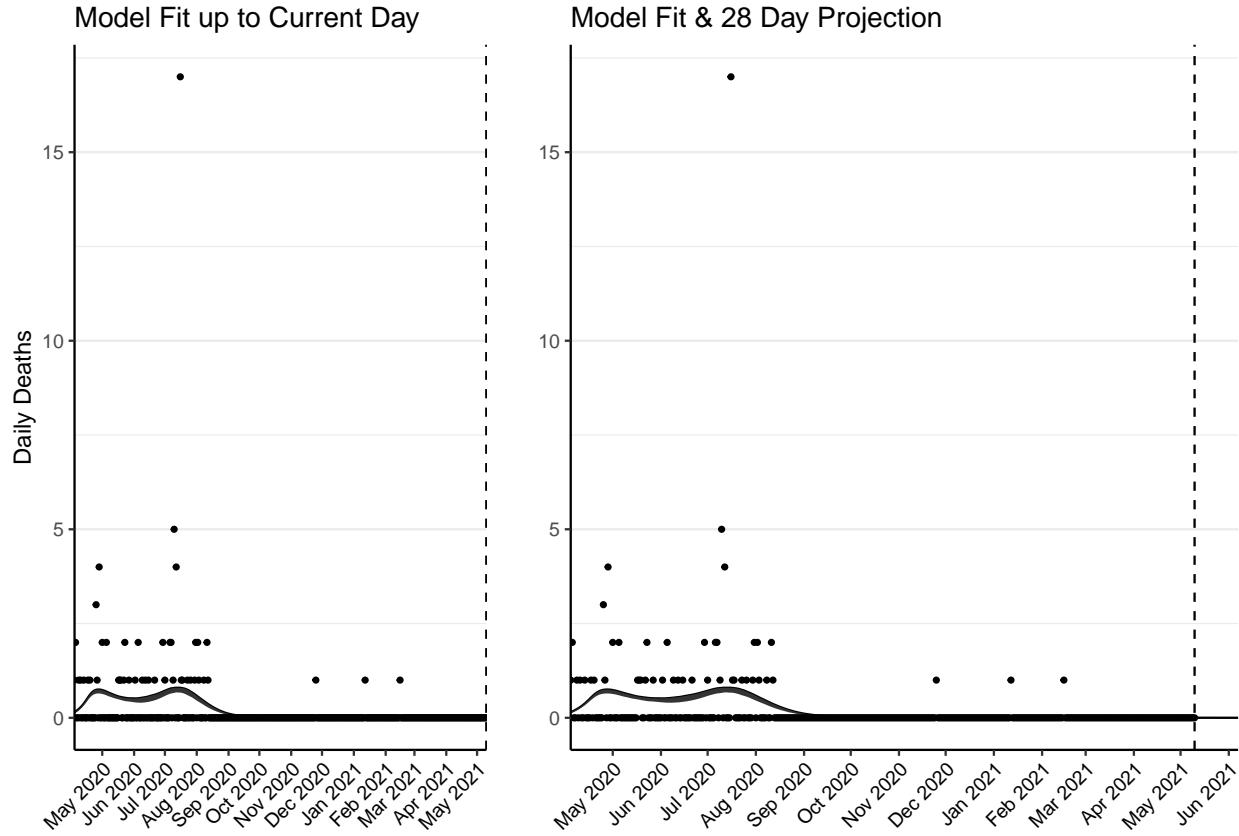


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 0 (95% CI: 0-0) patients requiring treatment with high-pressure oxygen at the current date to 0 (95% CI: 0-0) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 0 (95% CI: 0-0) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

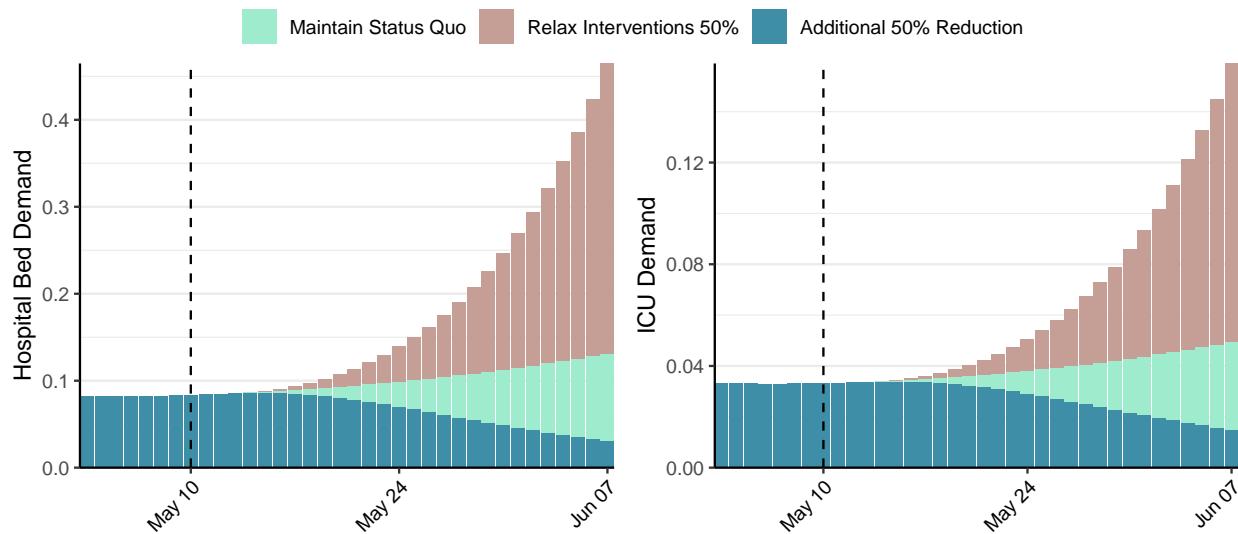


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1 (95% CI: 1-2) at the current date to 0 (95% CI: 0-0) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1 (95% CI: 1-2) at the current date to 14 (95% CI: 1-27) by 2021-06-07.

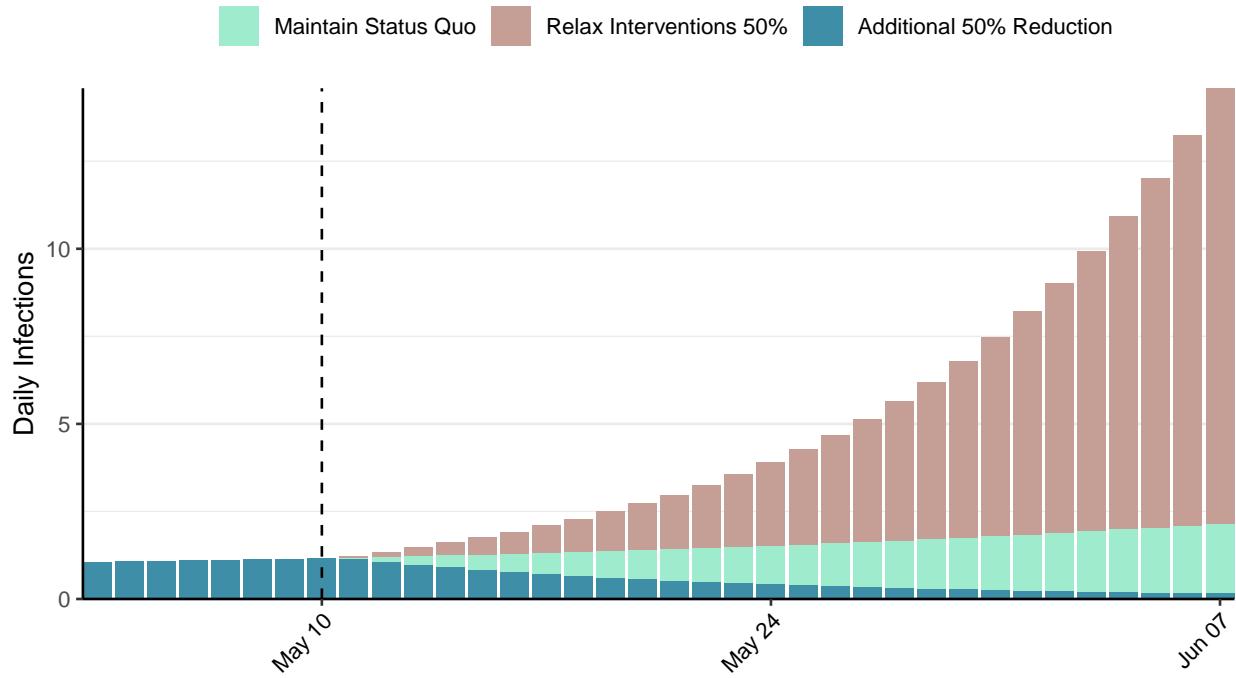


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Libya, 2021-05-10

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### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
180,226	256	3,075	2	0.77 (95% CI: 0.66-0.89)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

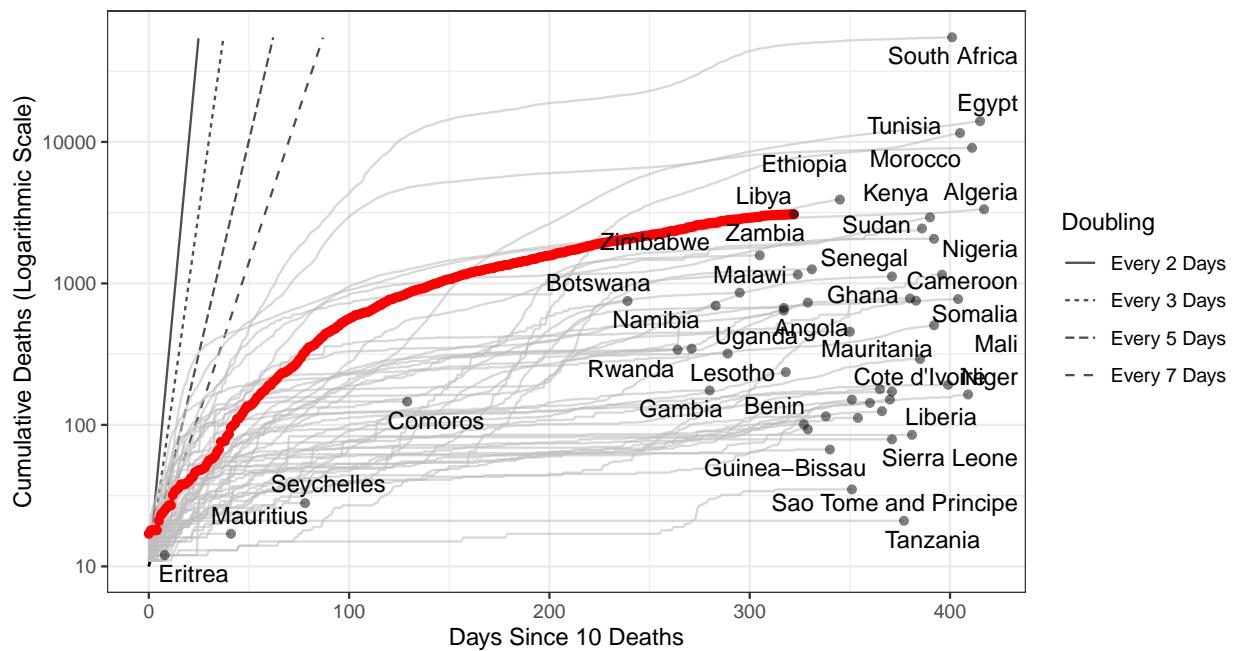


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 45,375 (95% CI: 43,460-47,290) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

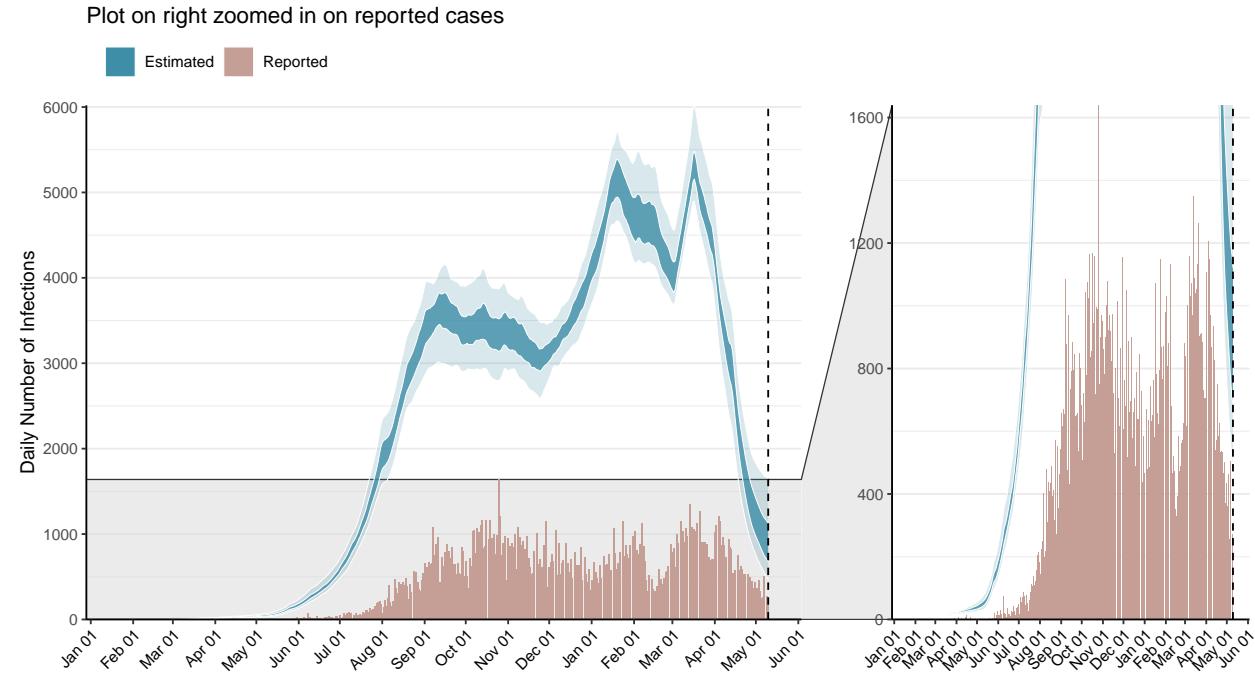
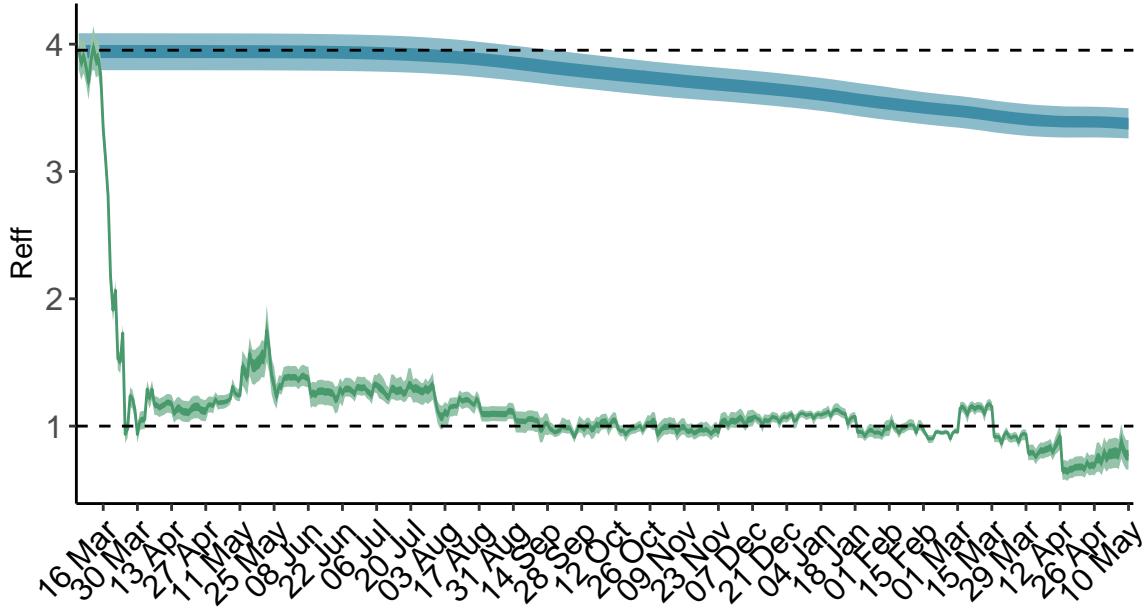


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

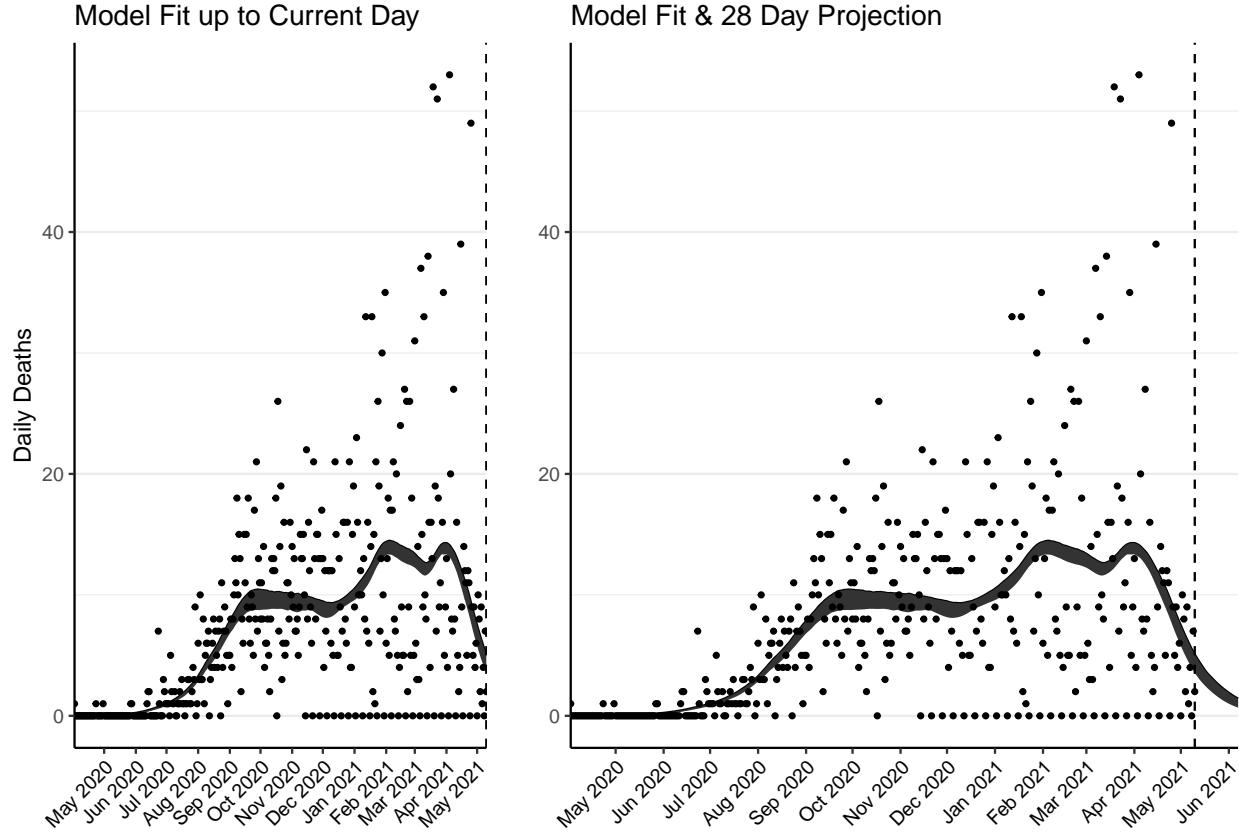


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 165 (95% CI: 158-173) patients requiring treatment with high-pressure oxygen at the current date to 56 (95% CI: 50-61) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 75 (95% CI: 72-78) patients requiring treatment with mechanical ventilation at the current date to 27 (95% CI: 24-29) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

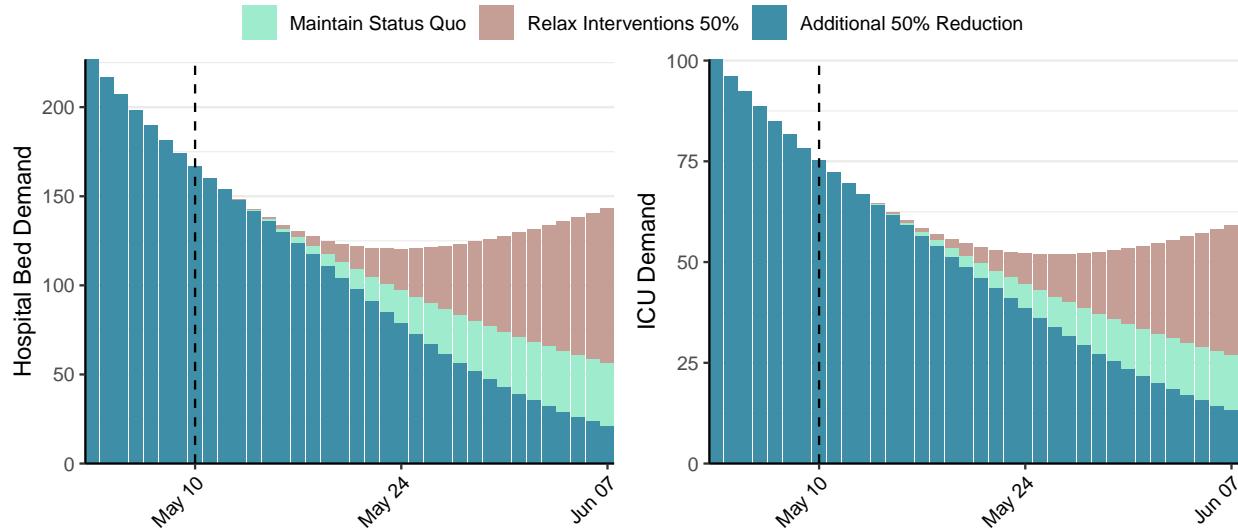
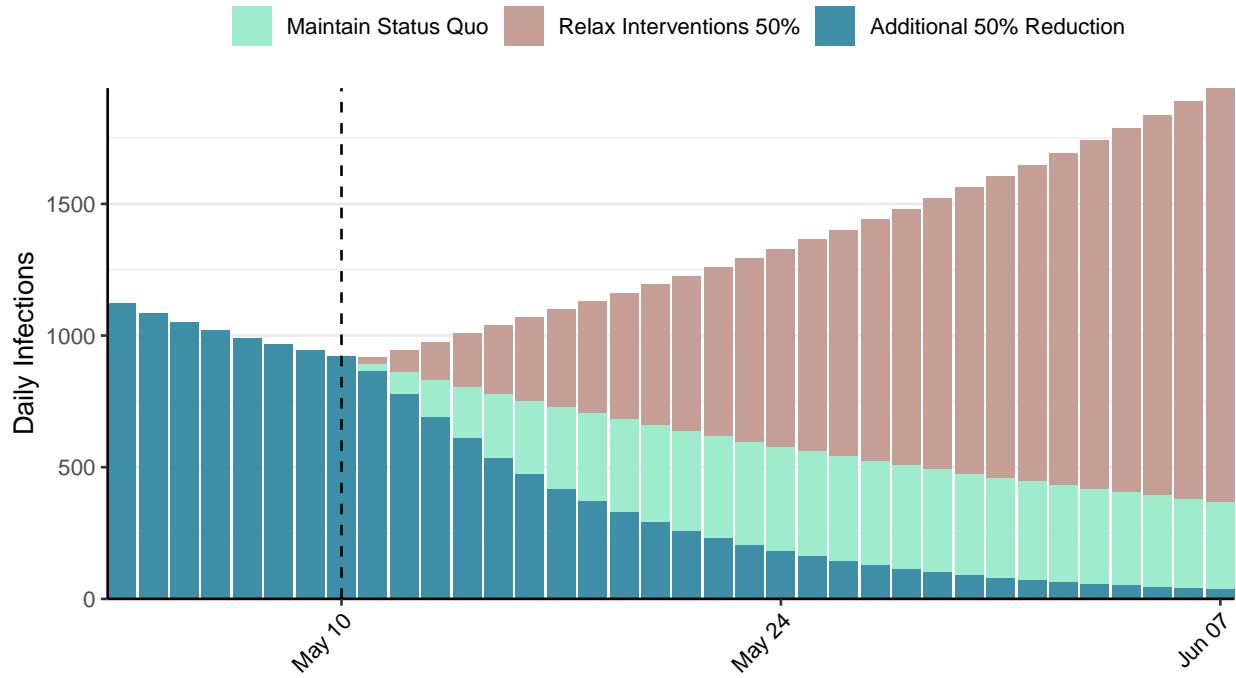


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 910 (95% CI: 846-974) at the current date to 35 (95% CI: 31-39) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 910 (95% CI: 846-974) at the current date to 1,920 (95% CI: 1,659-2,182) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: St. Lucia, 2021-05-10

[Download the report for St. Lucia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
4,690	36	75	0	0.89 (95% CI: 0.74-1.11)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

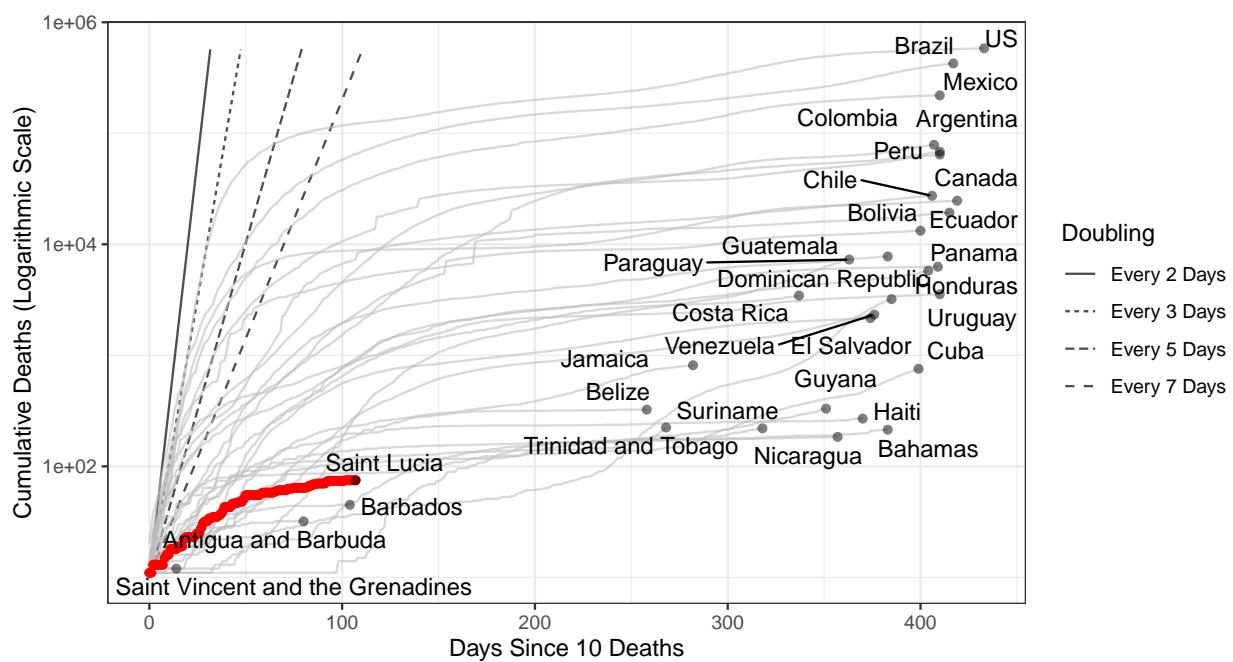


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 1,814 (95% CI: 1,685-1,943) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

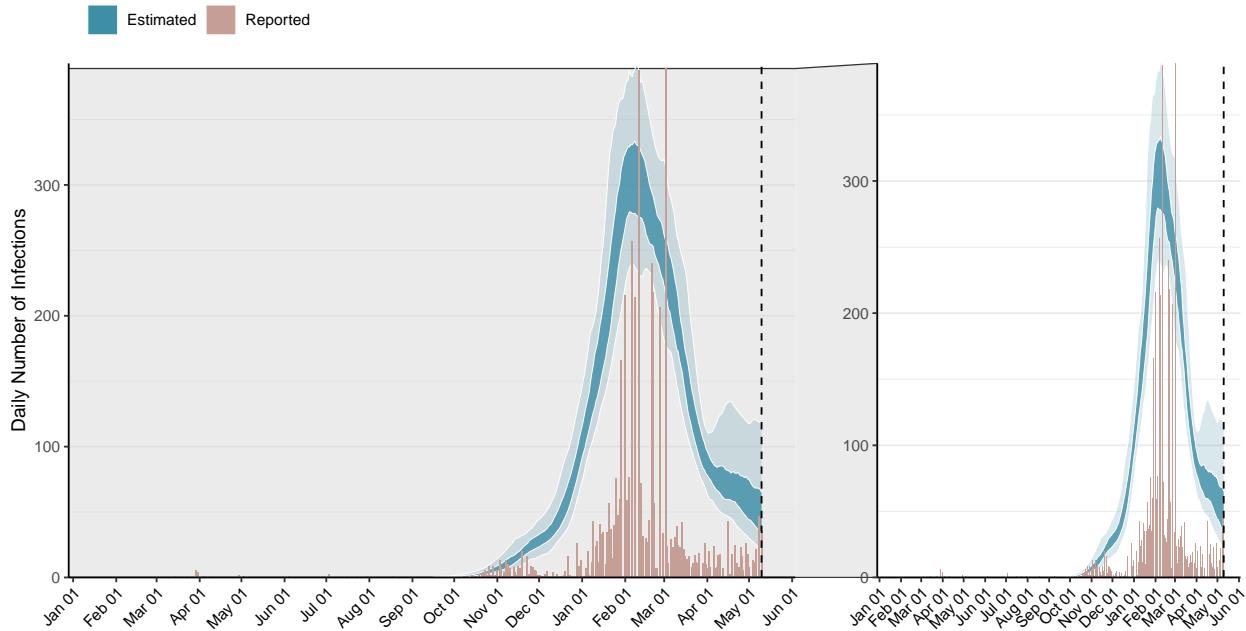
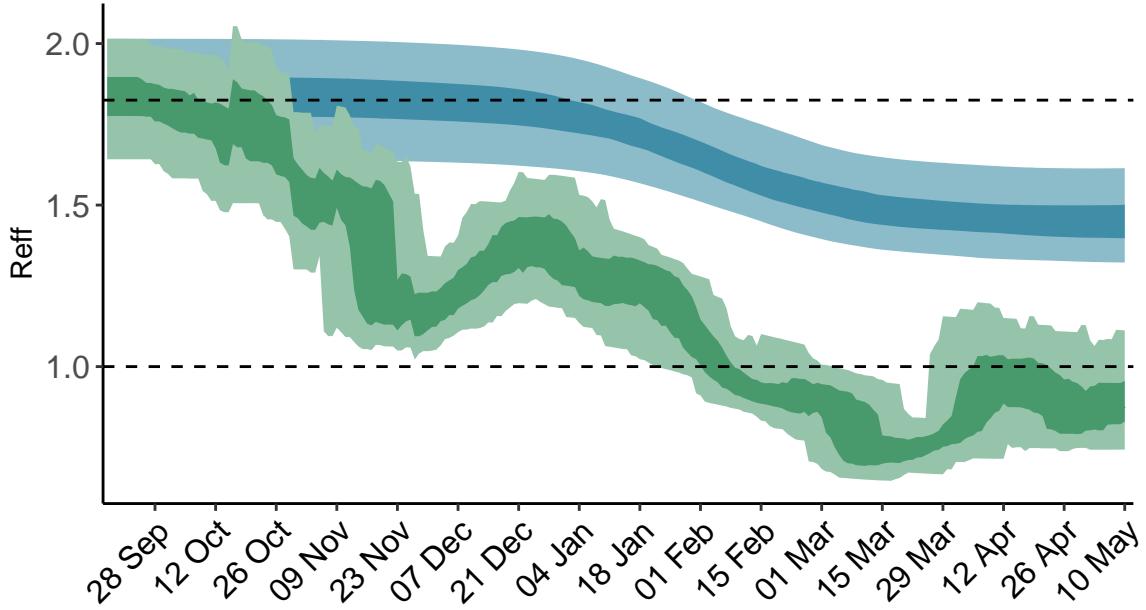


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

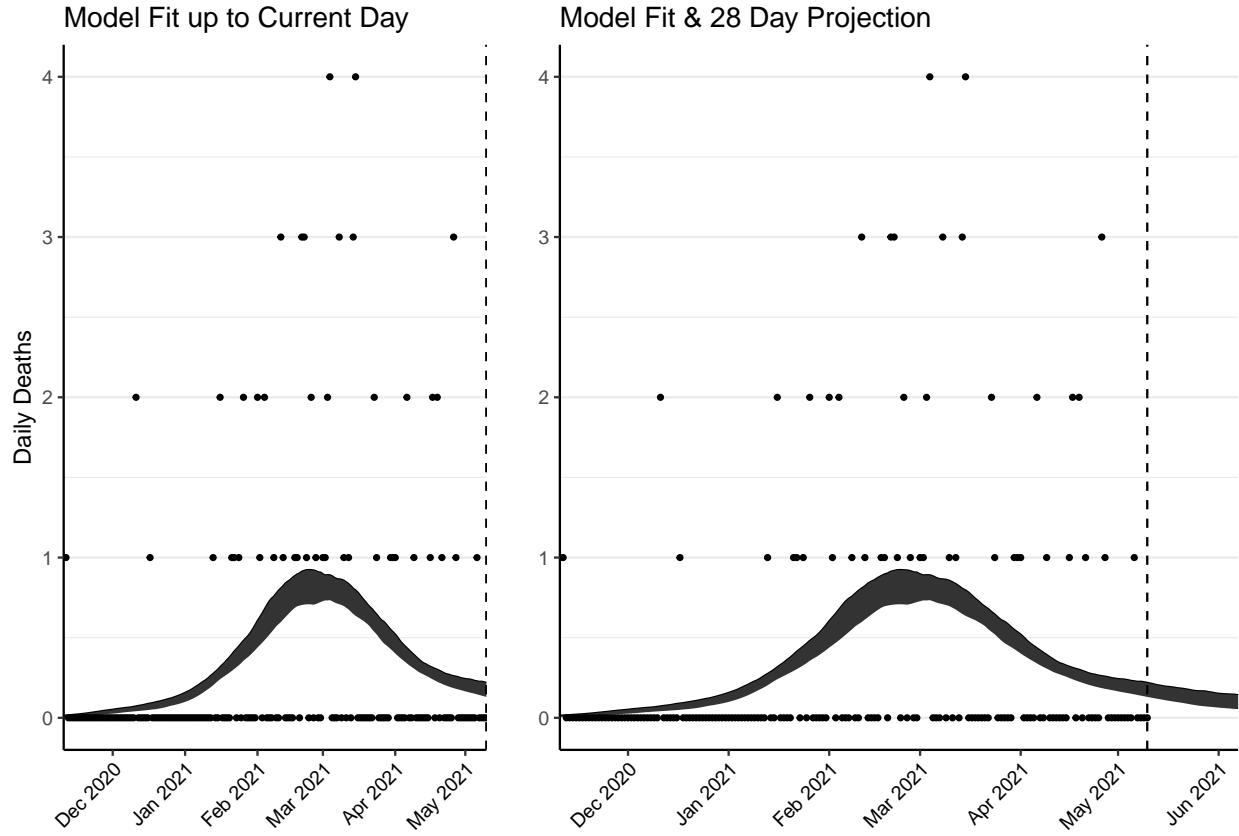


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 8 (95% CI: 7-8) patients requiring treatment with high-pressure oxygen at the current date to 6 (95% CI: 5-7) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 3 (95% CI: 3-3) patients requiring treatment with mechanical ventilation at the current date to 2 (95% CI: 2-2) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

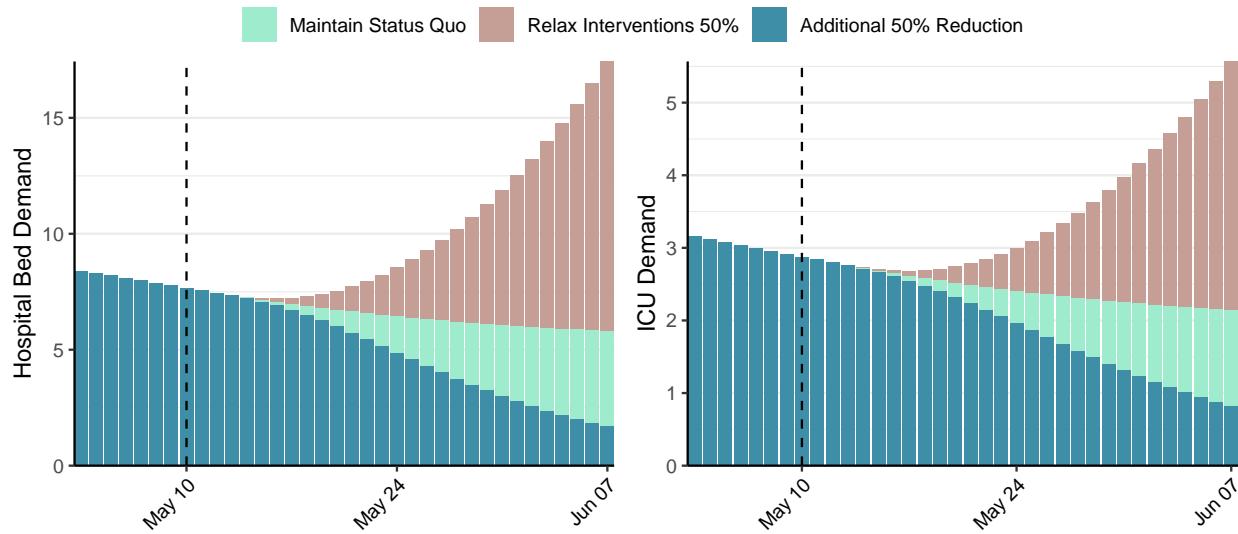


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 53 (95% CI: 48-59) at the current date to 4 (95% CI: 3-4) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 53 (95% CI: 48-59) at the current date to 249 (95% CI: 196-302) by 2021-06-07.

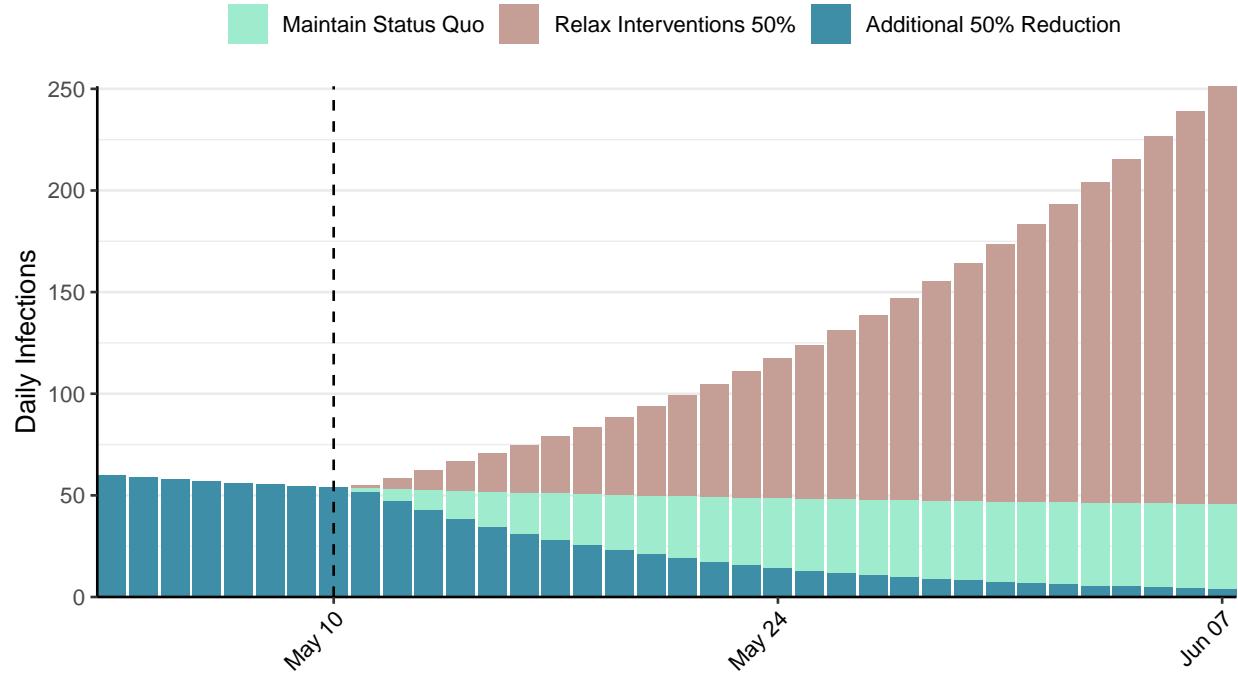


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Sri Lanka, 2021-05-10

[Download the report for Sri Lanka, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
128,530	2,624	827	26	1.29 (95% CI: 1.19-1.42)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

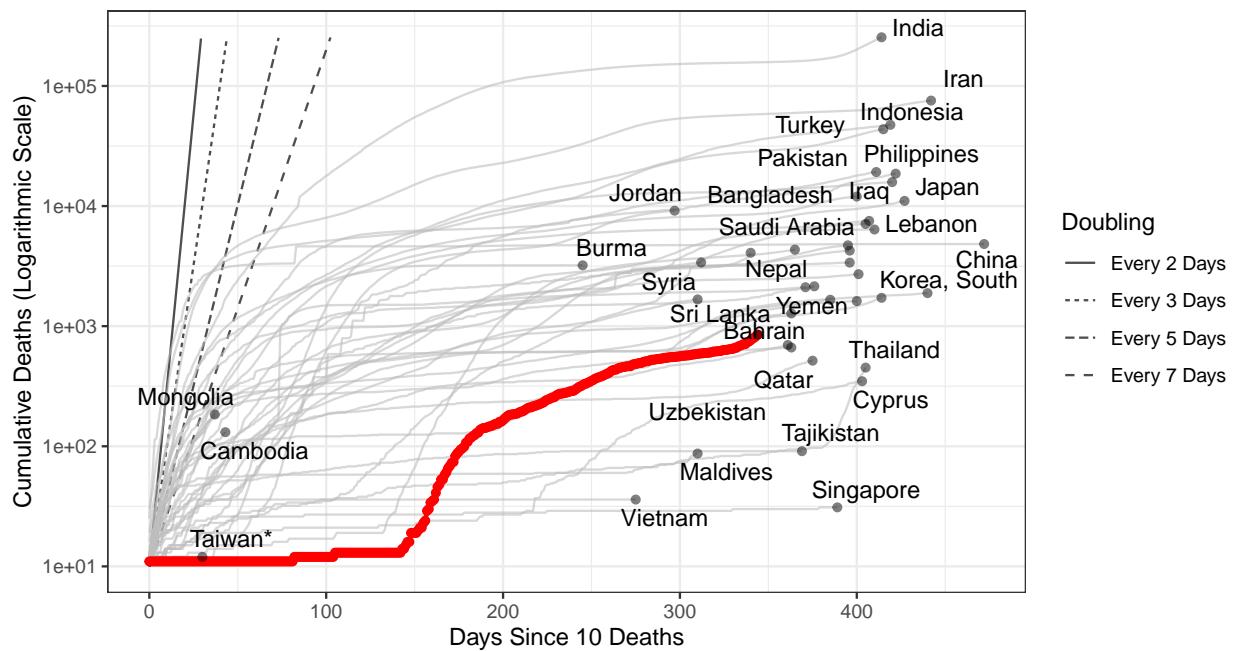


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 88,529 (95% CI: 85,477-91,581) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

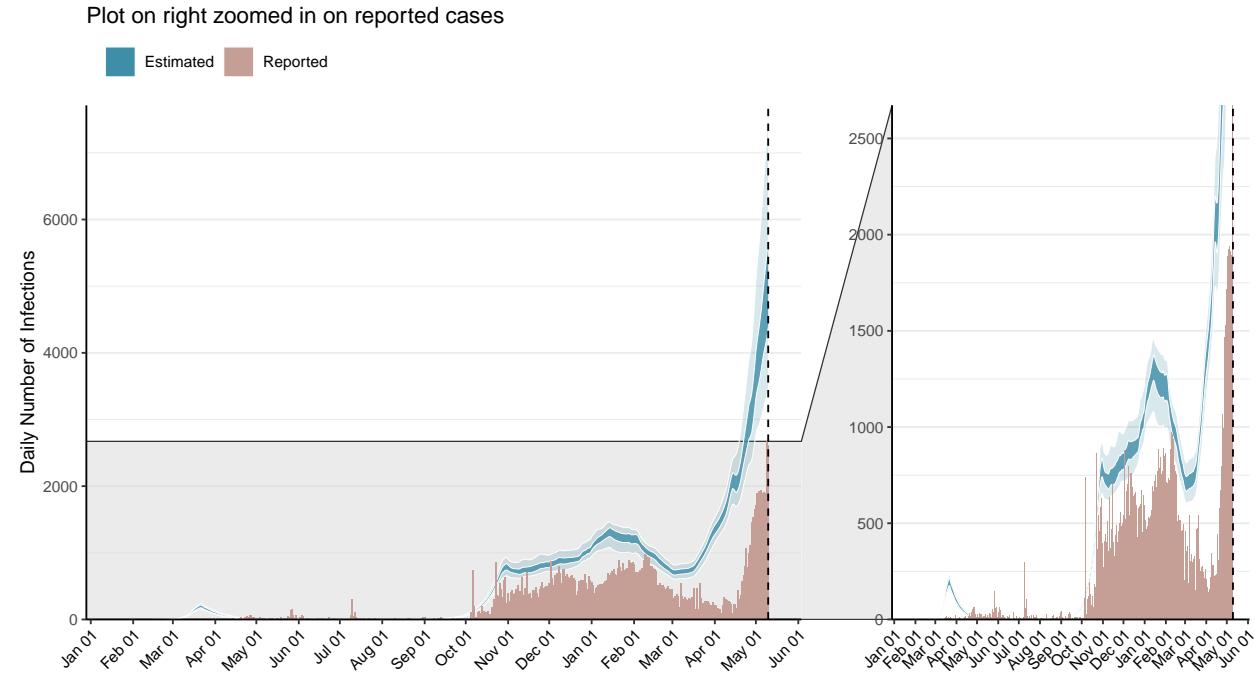
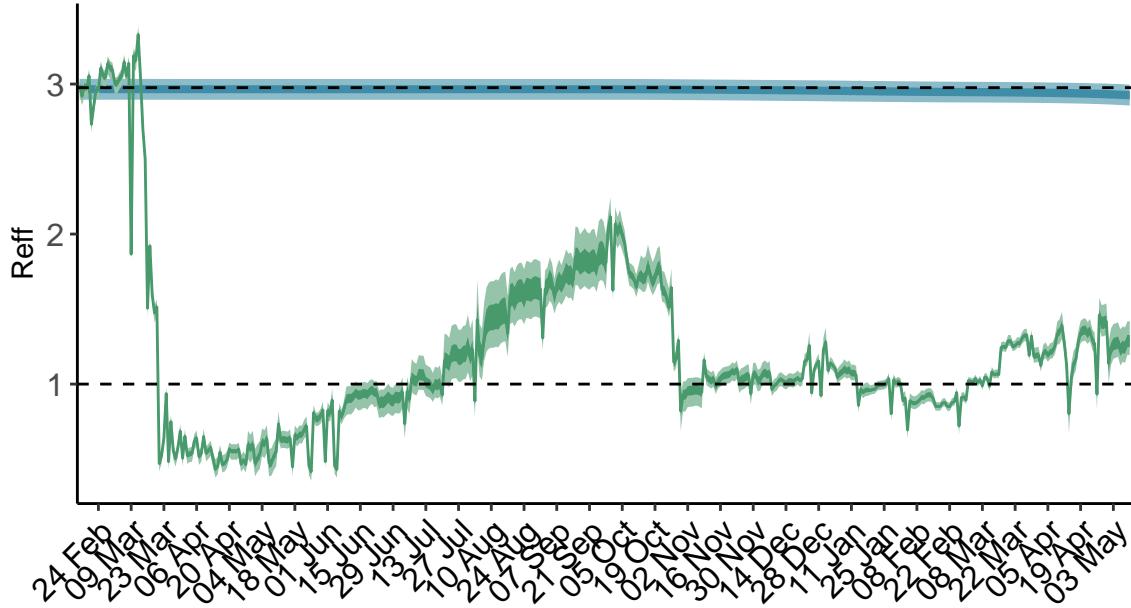


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Sri Lanka is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

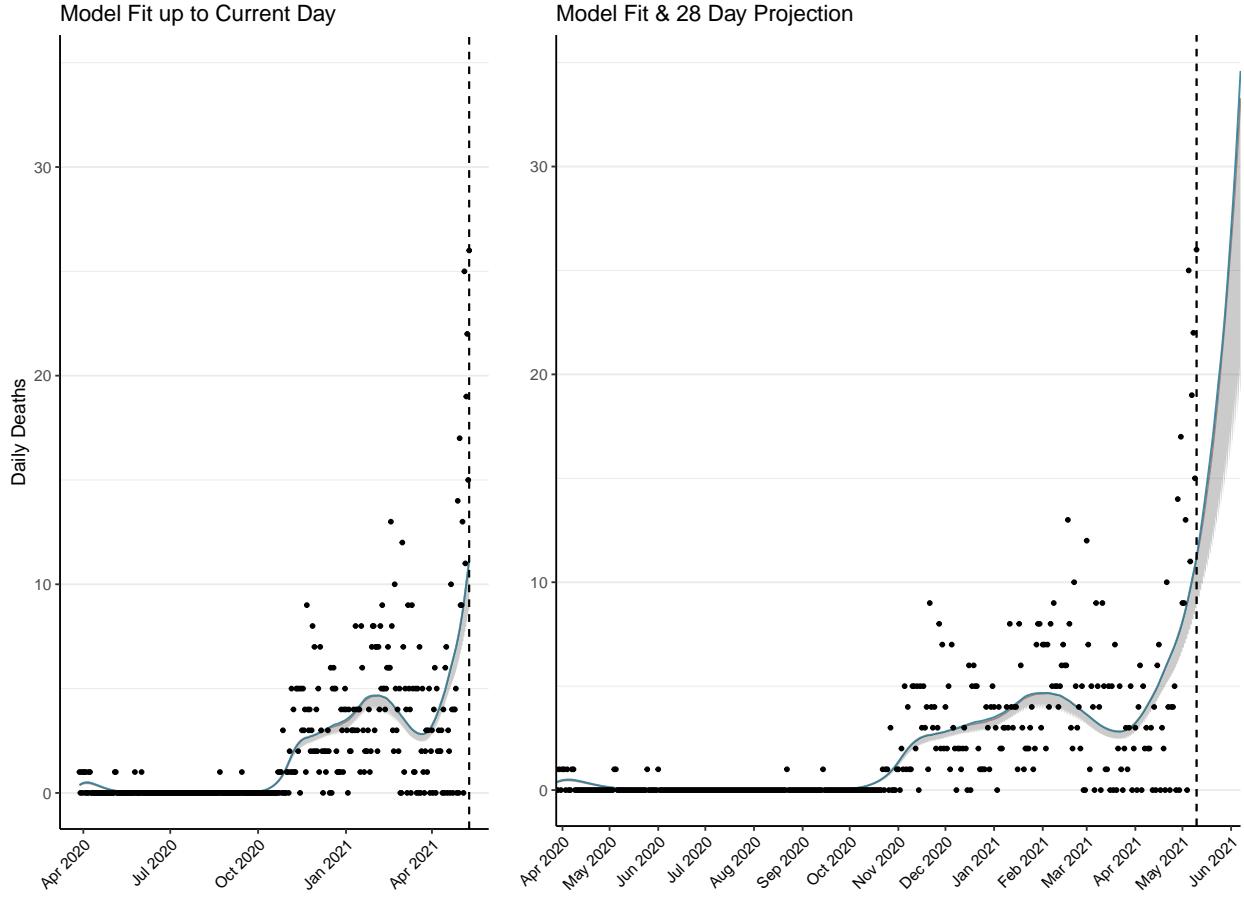


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 445 (95% CI: 429-461) patients requiring treatment with high-pressure oxygen at the current date to 1,362 (95% CI: 1,267-1,458) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 163 (95% CI: 157-168) patients requiring treatment with mechanical ventilation at the current date to 496 (95% CI: 462-529) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

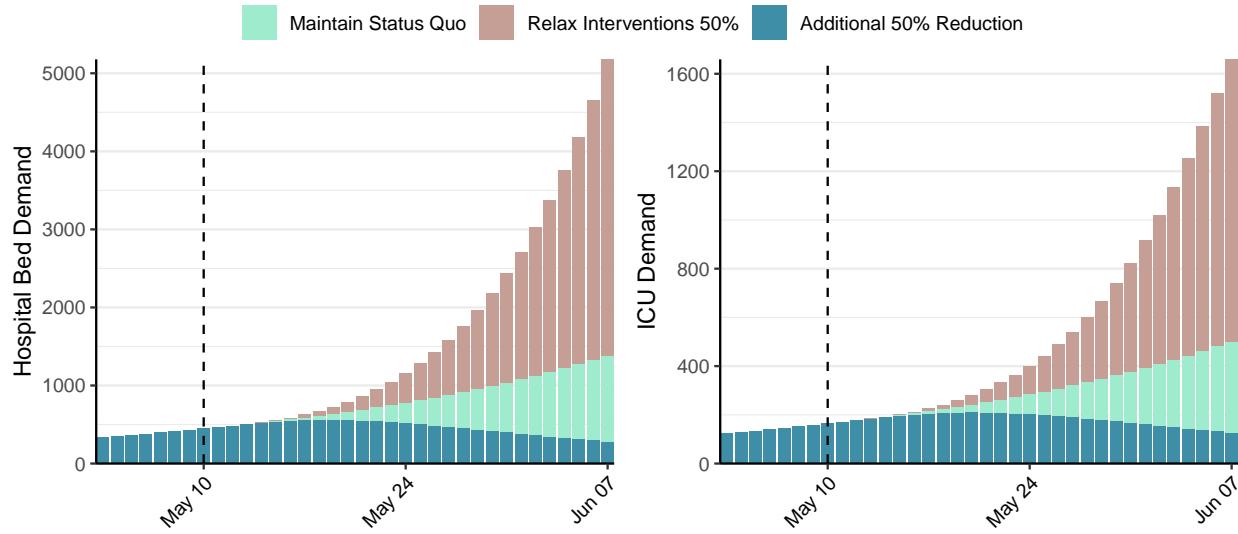


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 5,056 (95% CI: 4,824-5,288) at the current date to 997 (95% CI: 921-1,073) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 5,056 (95% CI: 4,824-5,288) at the current date to 103,928 (95% CI: 95,372-112,484) by 2021-06-07.

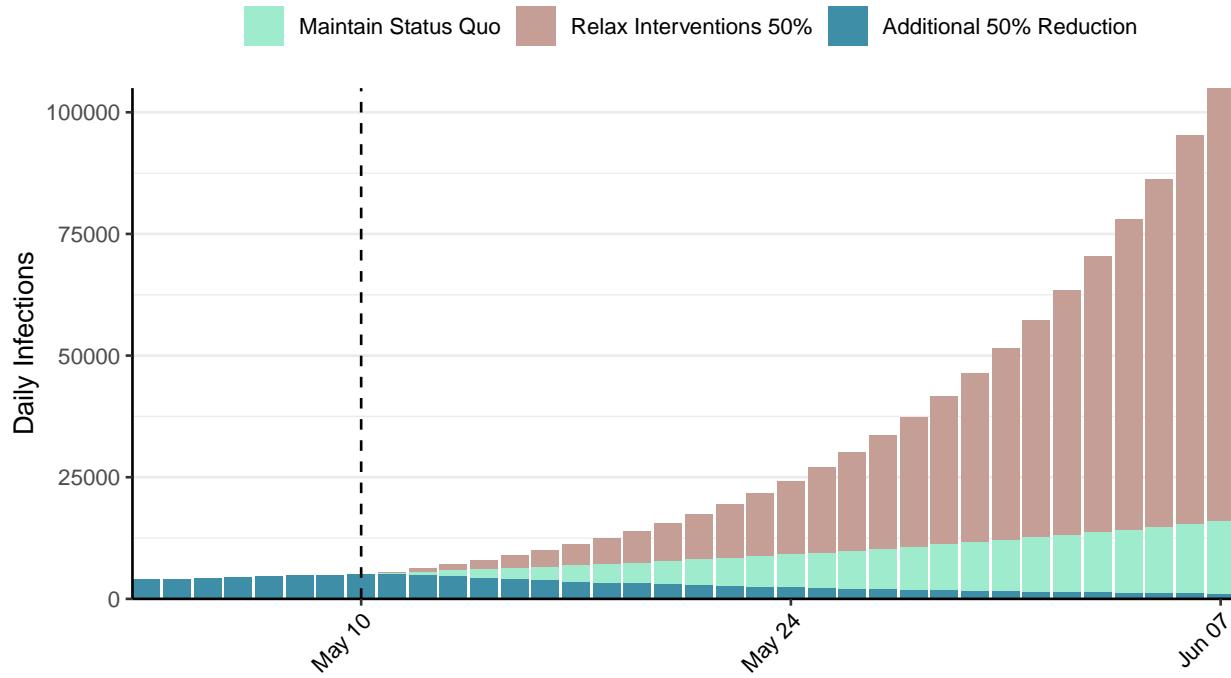


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Lesotho, 2021-05-10

[Download the report for Lesotho, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
10,773	0	319	0	0.66 (95% CI: 0.55-0.8)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

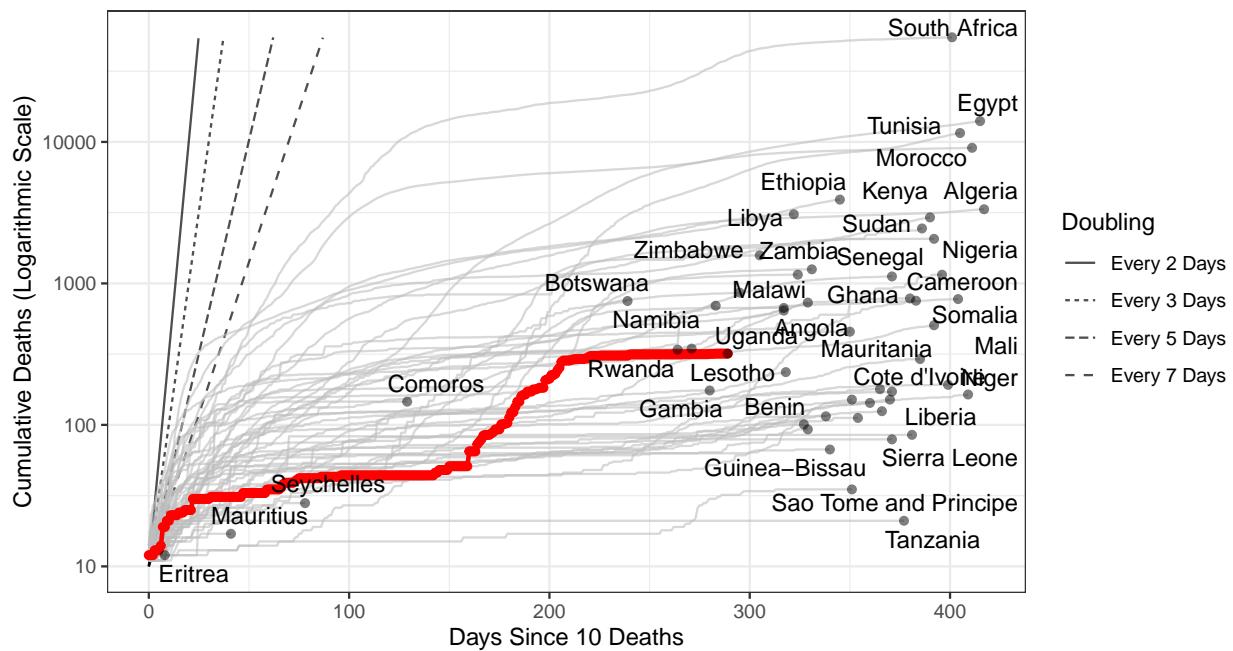


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 28 (95% CI: 26-30) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

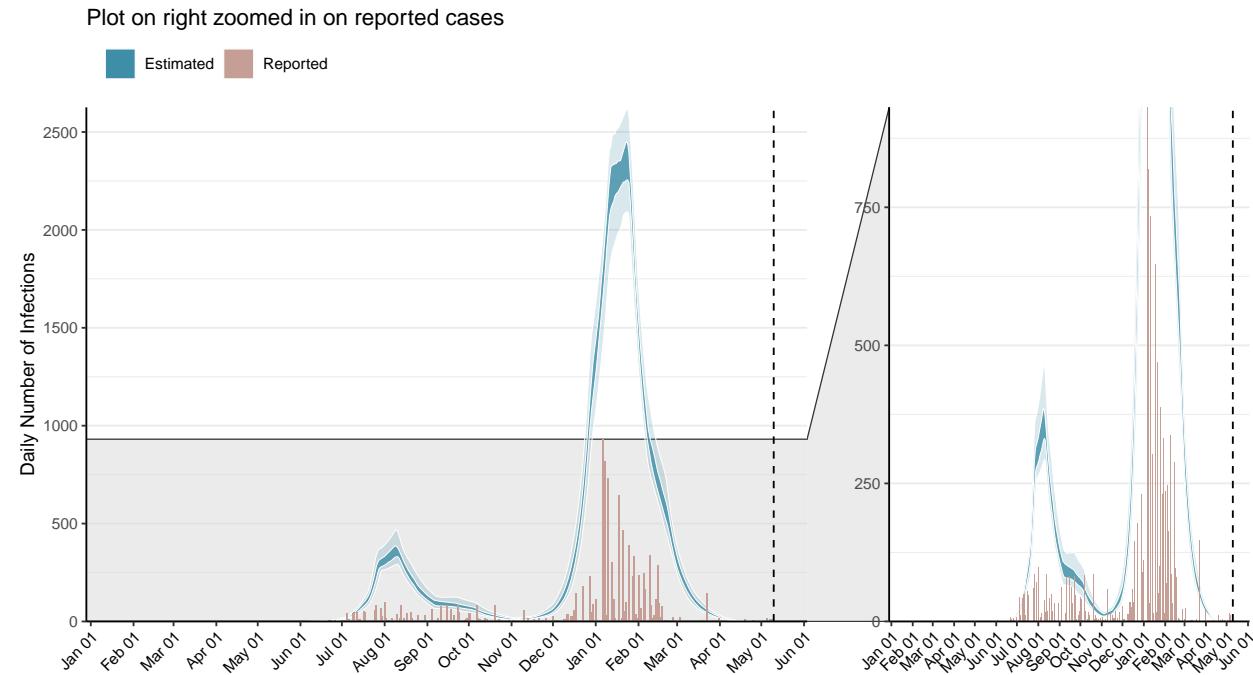
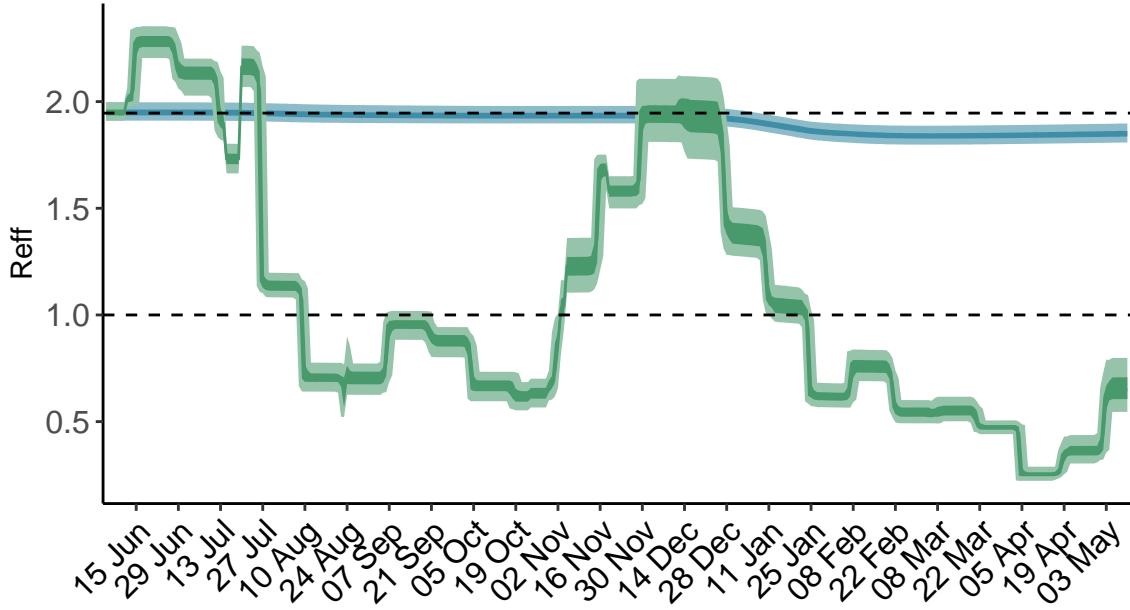


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Lesotho is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

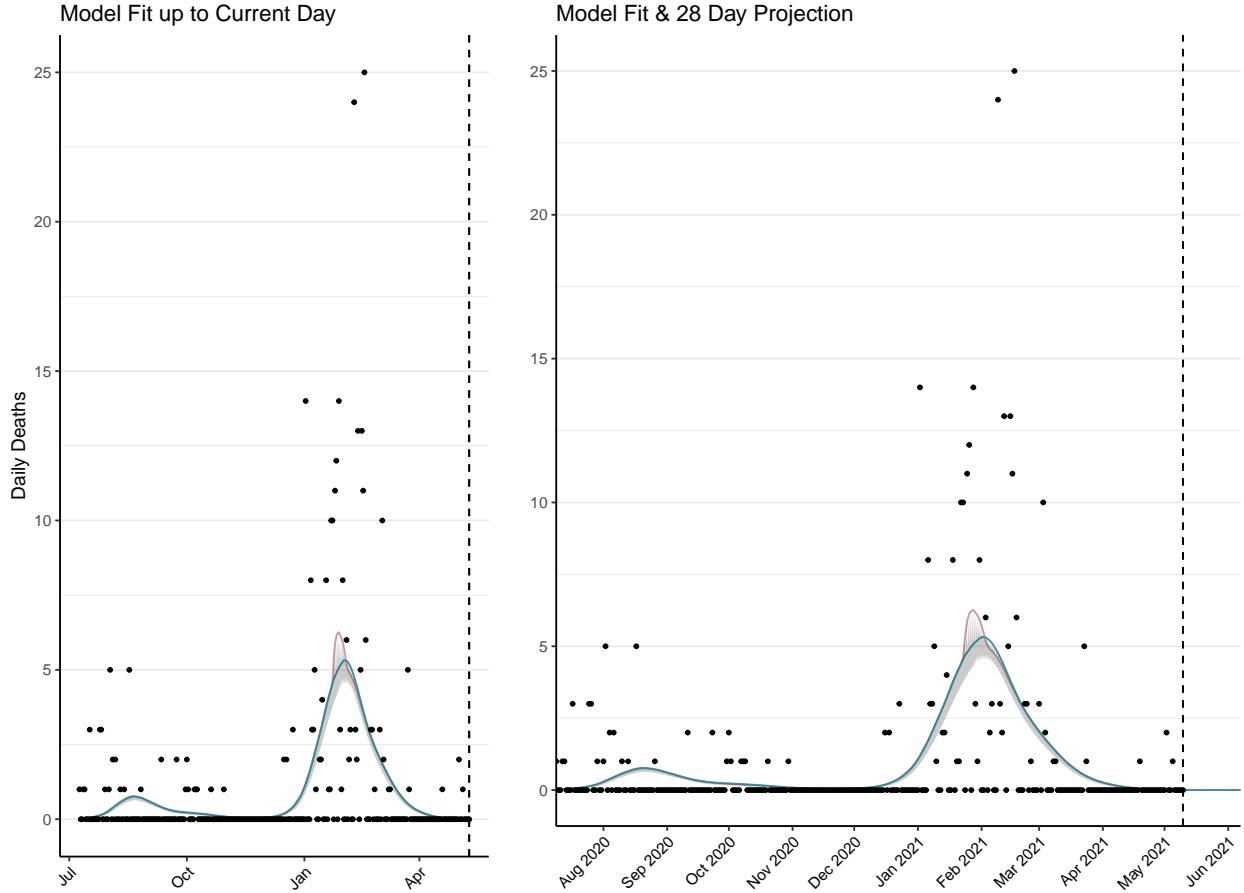


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 0 (95% CI: 0-0) patients requiring treatment with high-pressure oxygen at the current date to 0 (95% CI: 0-0) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 0 (95% CI: 0-0) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

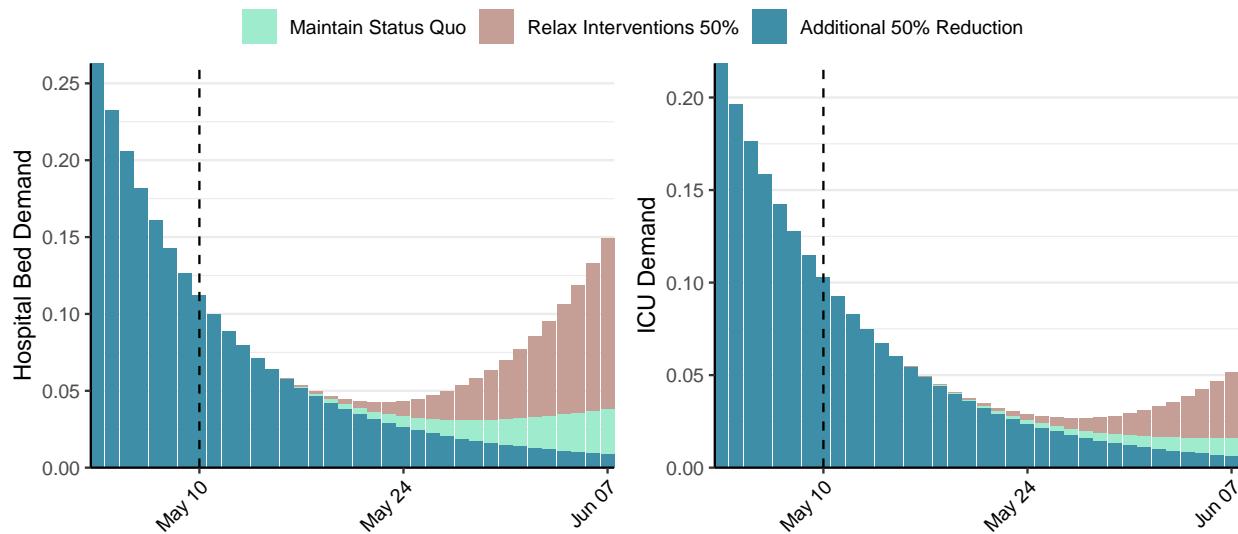


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 0 (95% CI: 0-0) at the current date to 0 (95% CI: 0-0) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 0 (95% CI: 0-0) at the current date to 5 (95% CI: 4-6) by 2021-06-07.

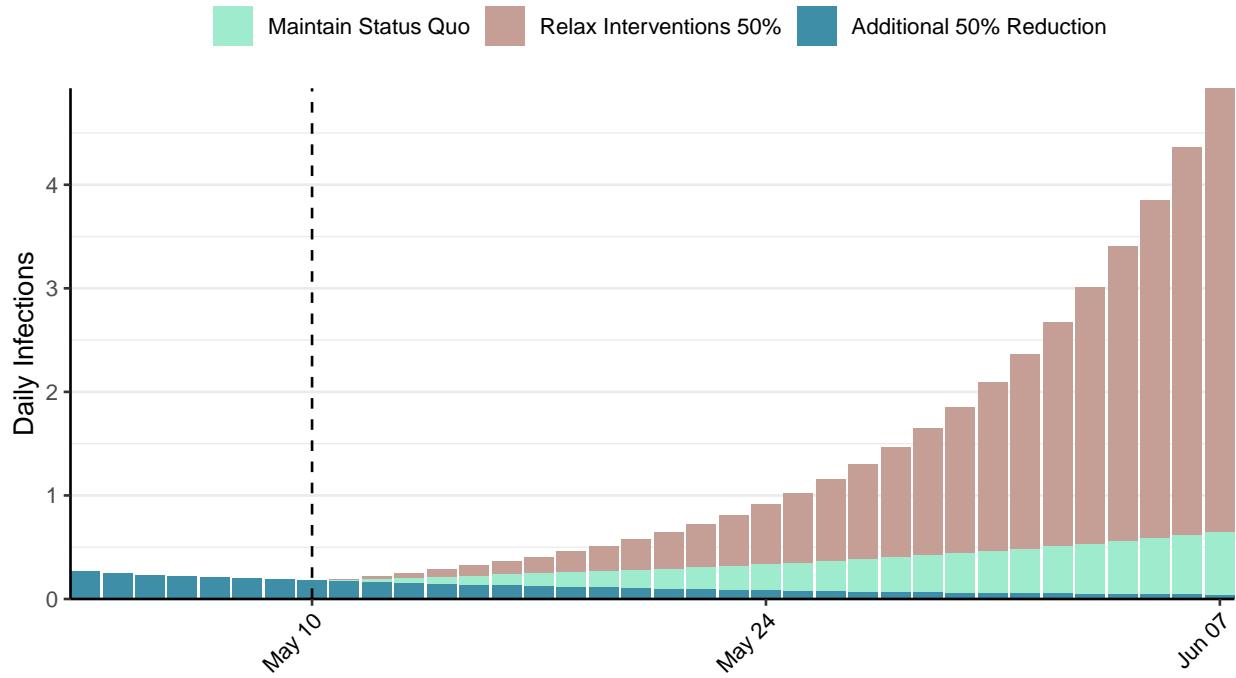


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Morocco, 2021-05-10

[Download the report for Morocco, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
513,922	58	9,077	5	0.66 (95% CI: 0.58-0.75)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

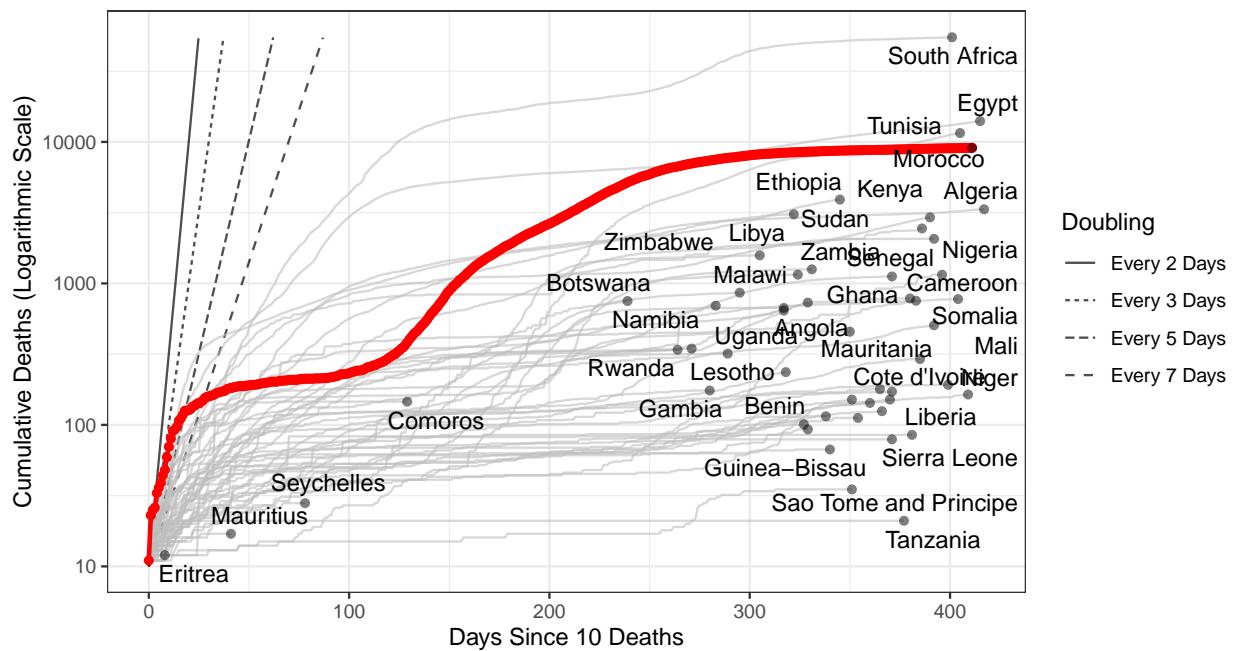


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 42,388 (95% CI: 40,622-44,153) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

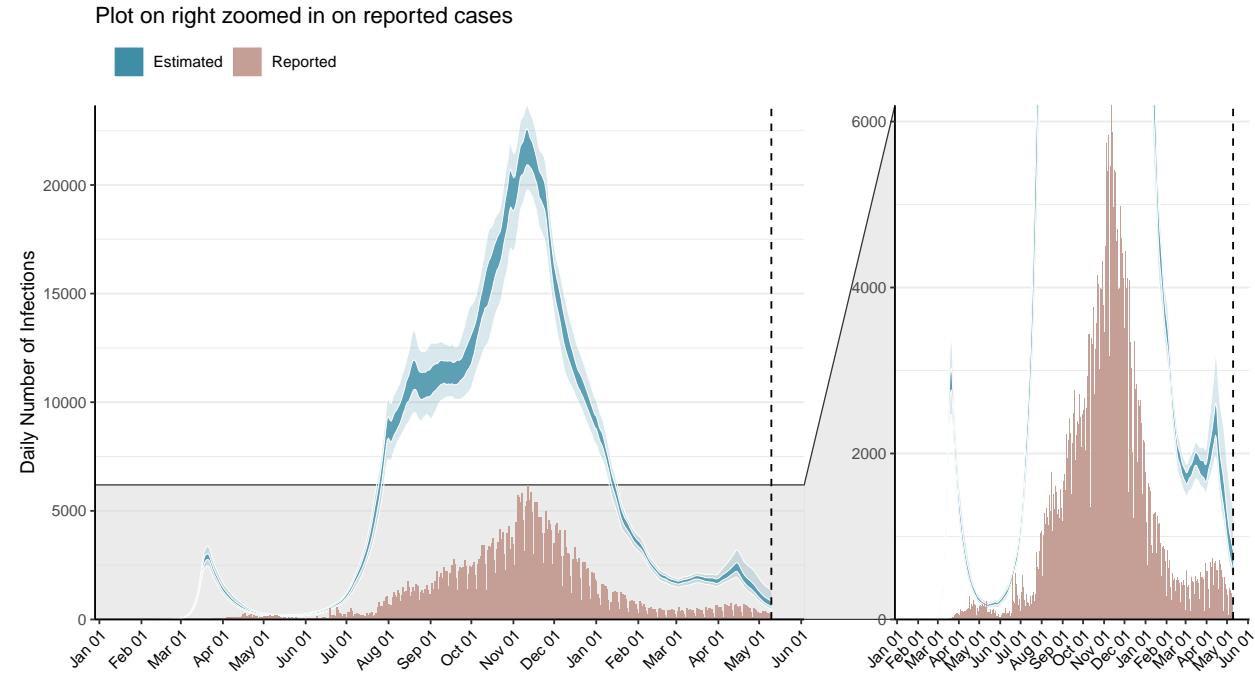
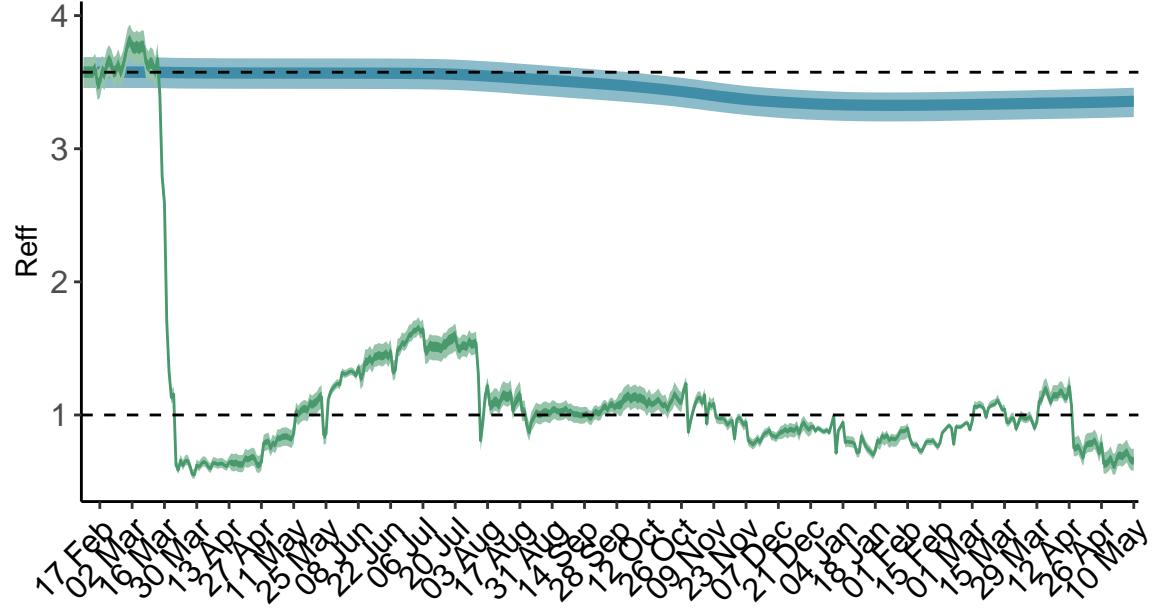


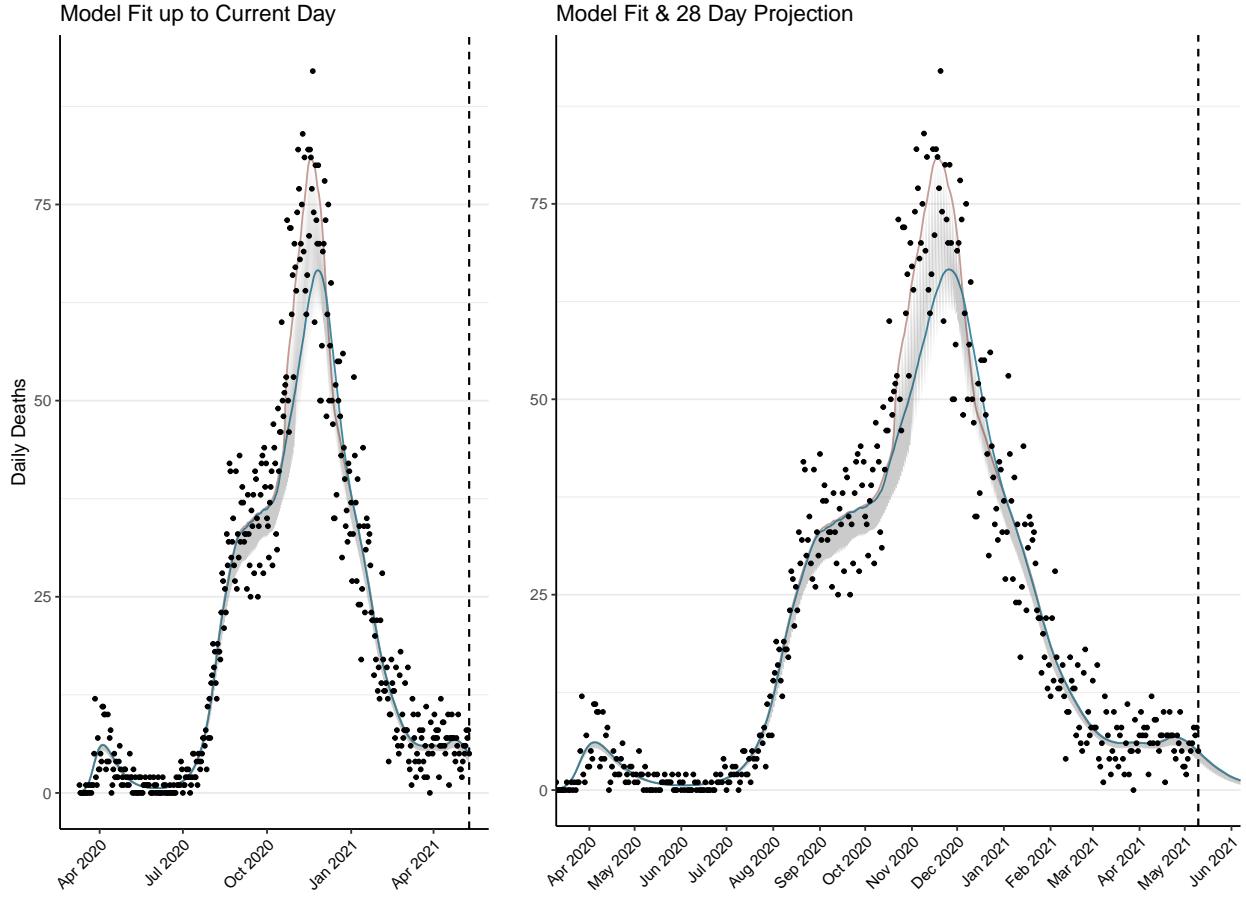
Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Morocco is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)



**Figure 4: Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 165 (95% CI: 158-173) patients requiring treatment with high-pressure oxygen at the current date to 41 (95% CI: 37-45) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 71 (95% CI: 68-74) patients requiring treatment with mechanical ventilation at the current date to 20 (95% CI: 18-21) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

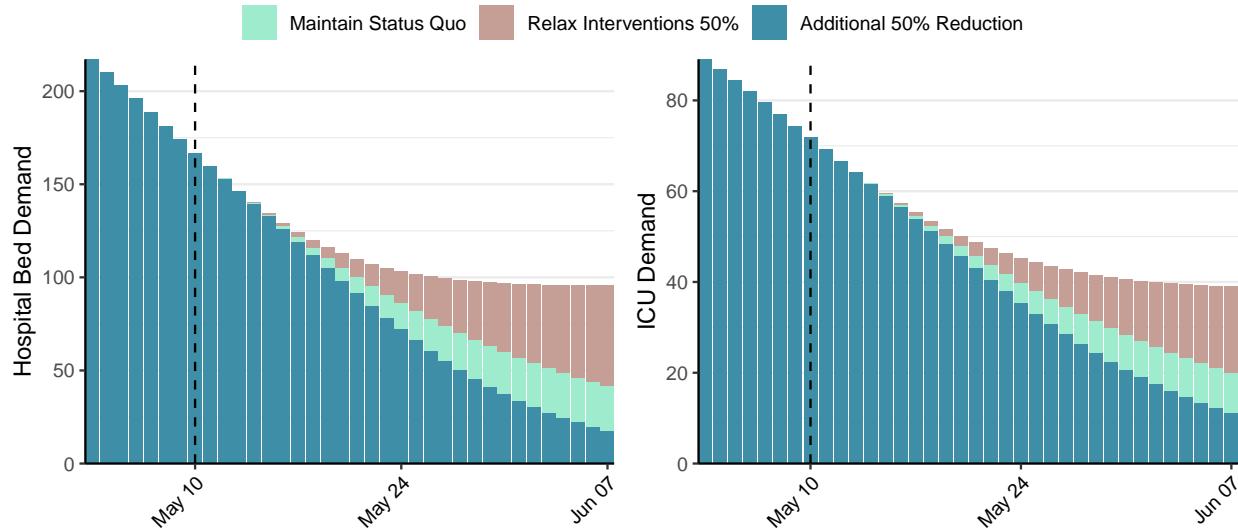


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 739 (95% CI: 689-789) at the current date to 18 (95% CI: 16-20) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 739 (95% CI: 689-789) at the current date to 803 (95% CI: 689-917) by 2021-06-07.

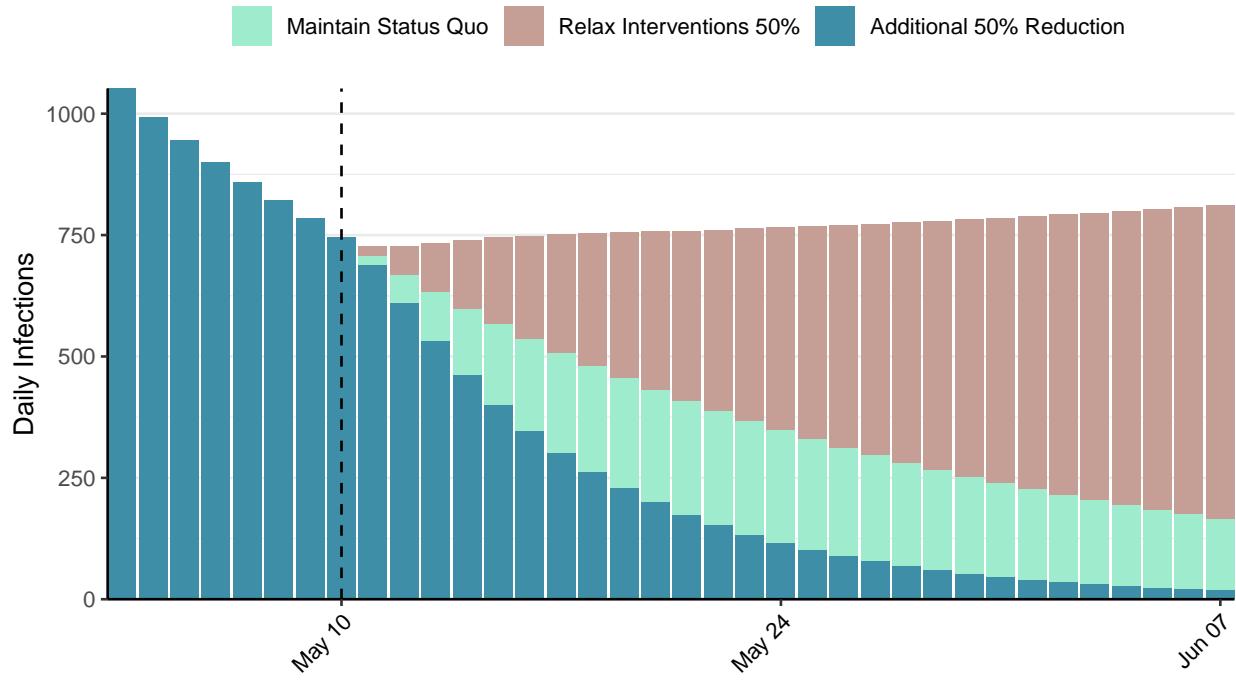


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Moldova, 2021-05-10

[Download the report for Moldova, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
252,798	49	5,958	6	0.55 (95% CI: 0.51-0.59)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

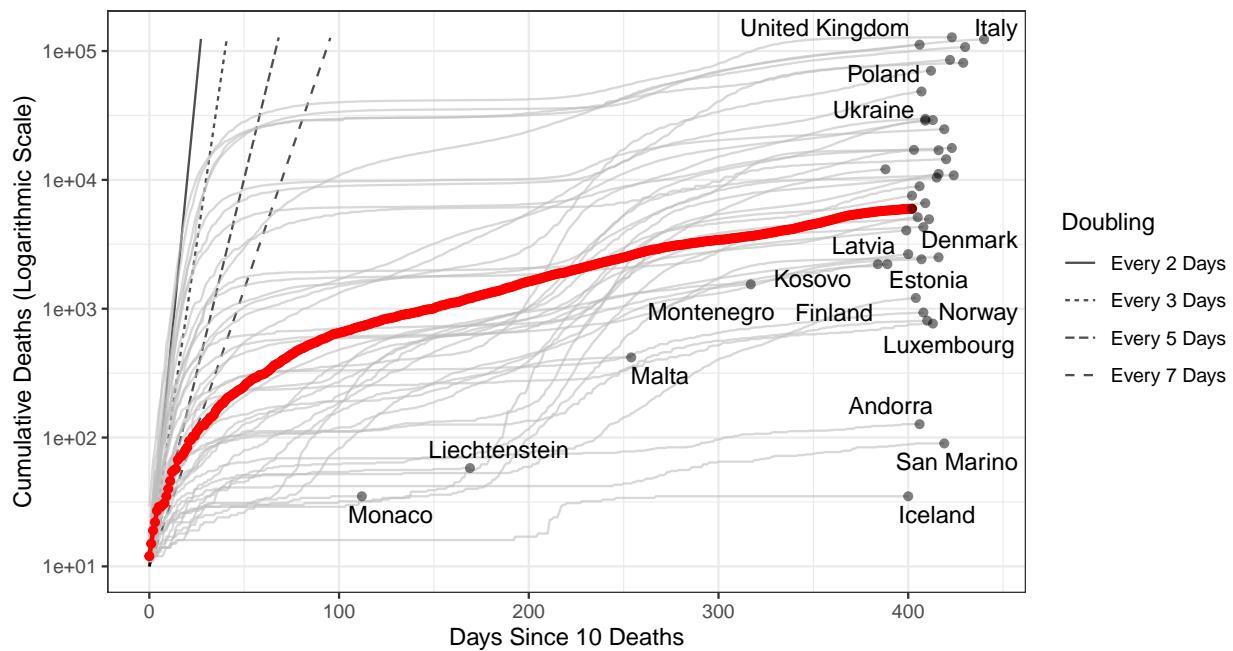


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 72,465 (95% CI: 70,075-74,854) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

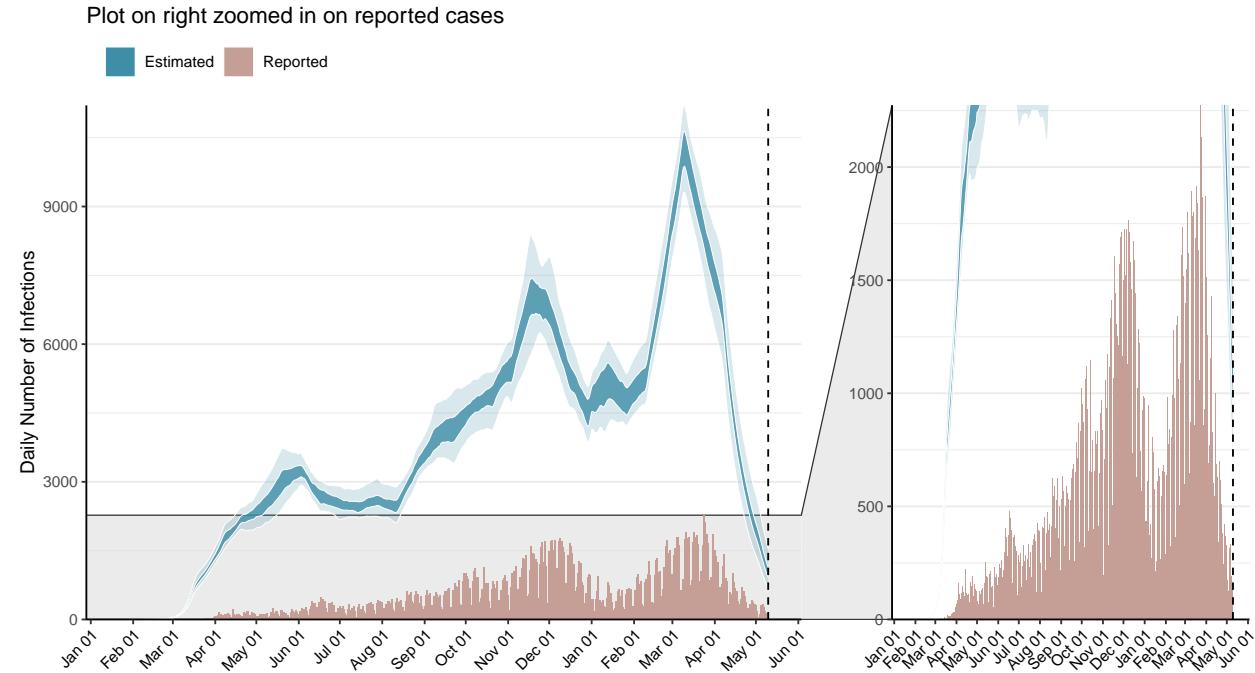
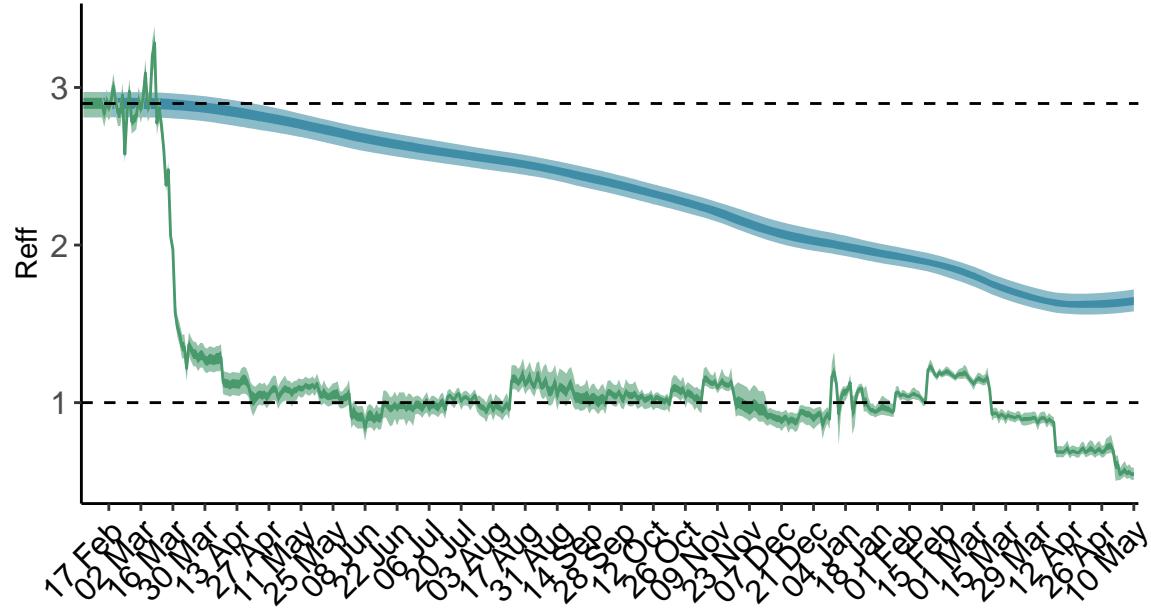


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

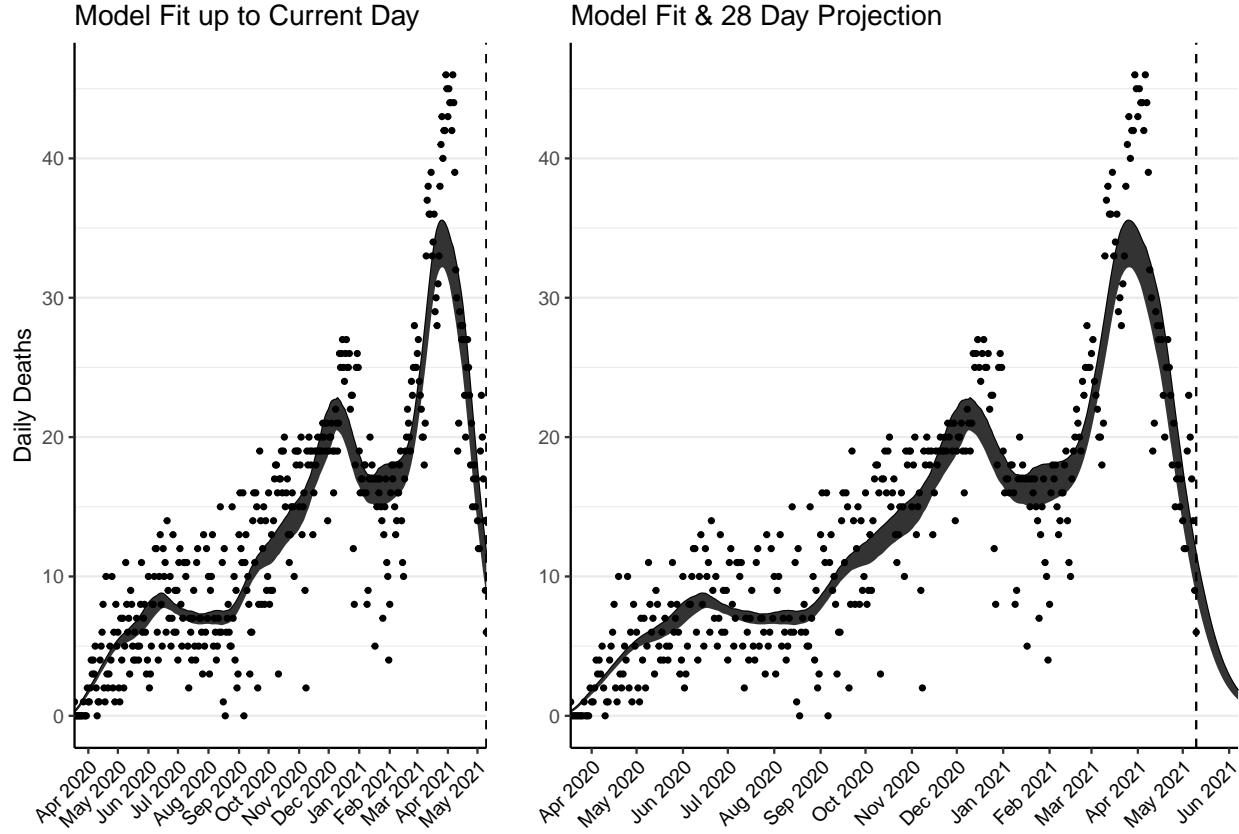


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 340 (95% CI: 329-352) patients requiring treatment with high-pressure oxygen at the current date to 50 (95% CI: 47-52) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 158 (95% CI: 153-163) patients requiring treatment with mechanical ventilation at the current date to 27 (95% CI: 26-29) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

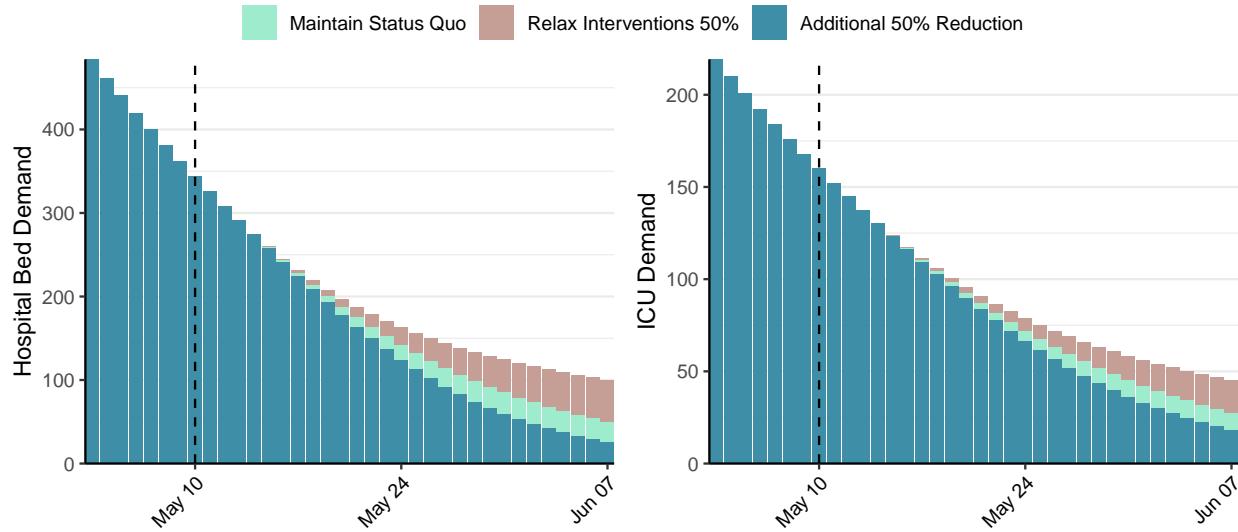
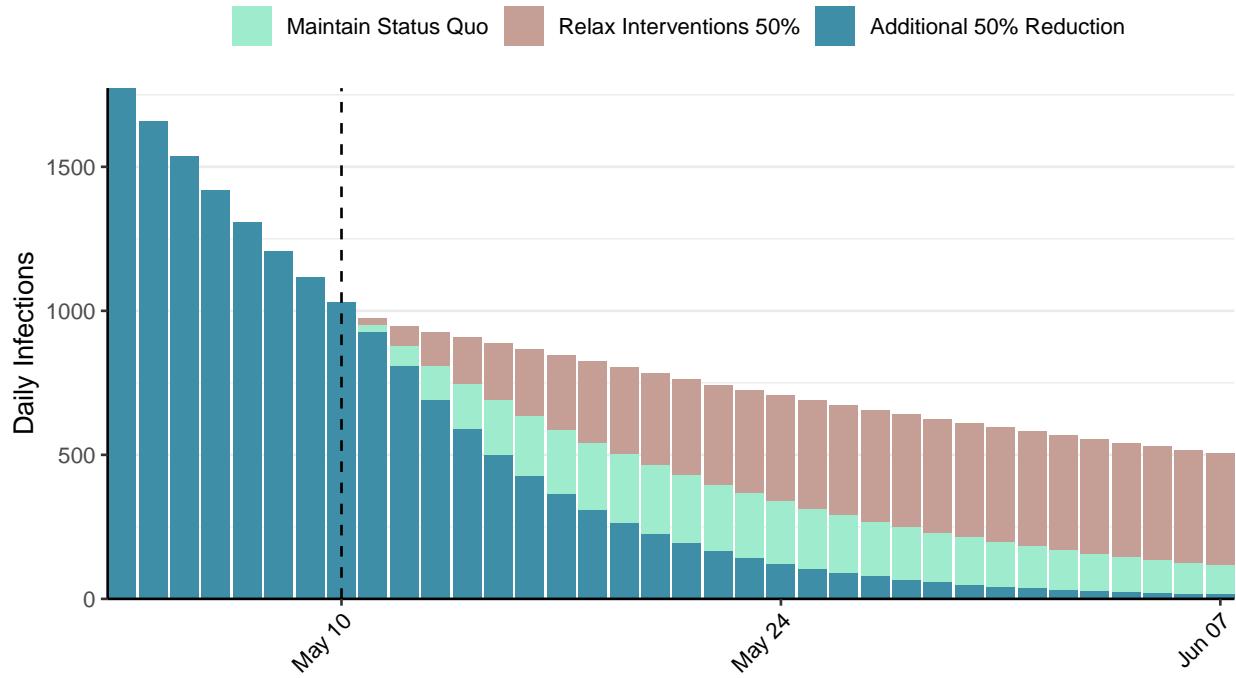


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,019 (95% CI: 973-1,065) at the current date to 14 (95% CI: 13-15) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,019 (95% CI: 973-1,065) at the current date to 501 (95% CI: 461-540) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Madagascar, 2021-05-10

[Download the report for Madagascar, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
39,162	150	729	7	0.81 (95% CI: 0.74-0.9)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

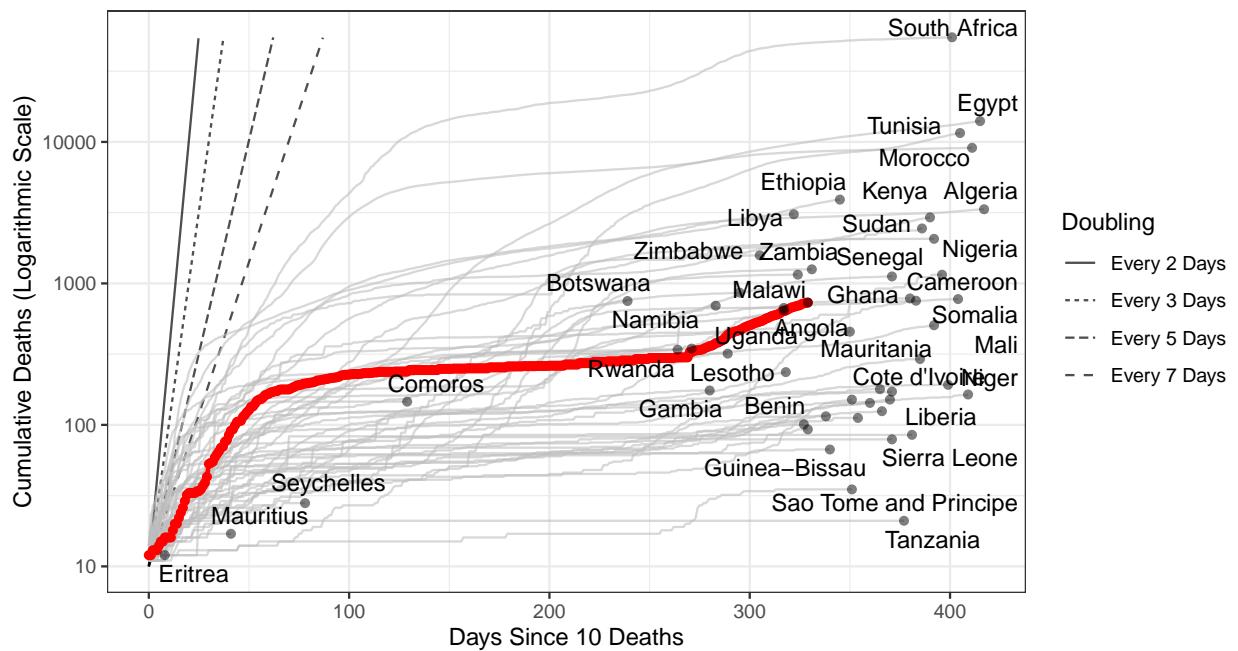


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 162,689 (95% CI: 156,253-169,124) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Madagascar has revised their historic reported cases and thus have reported negative cases.**

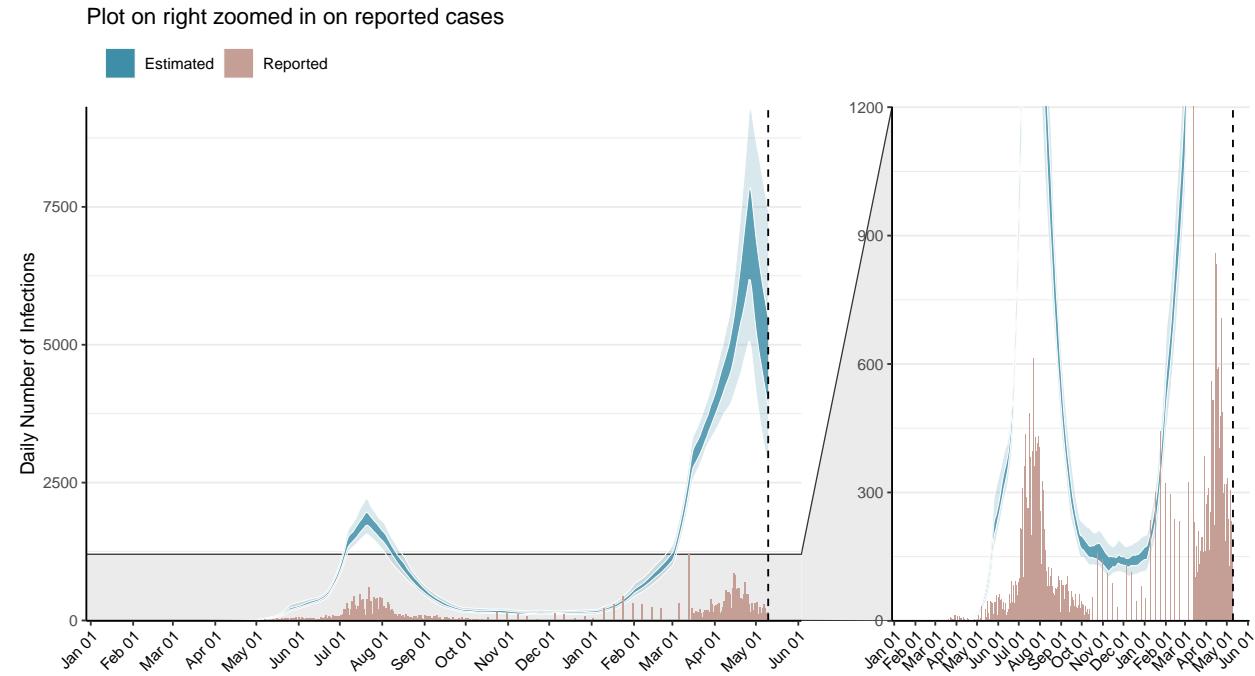
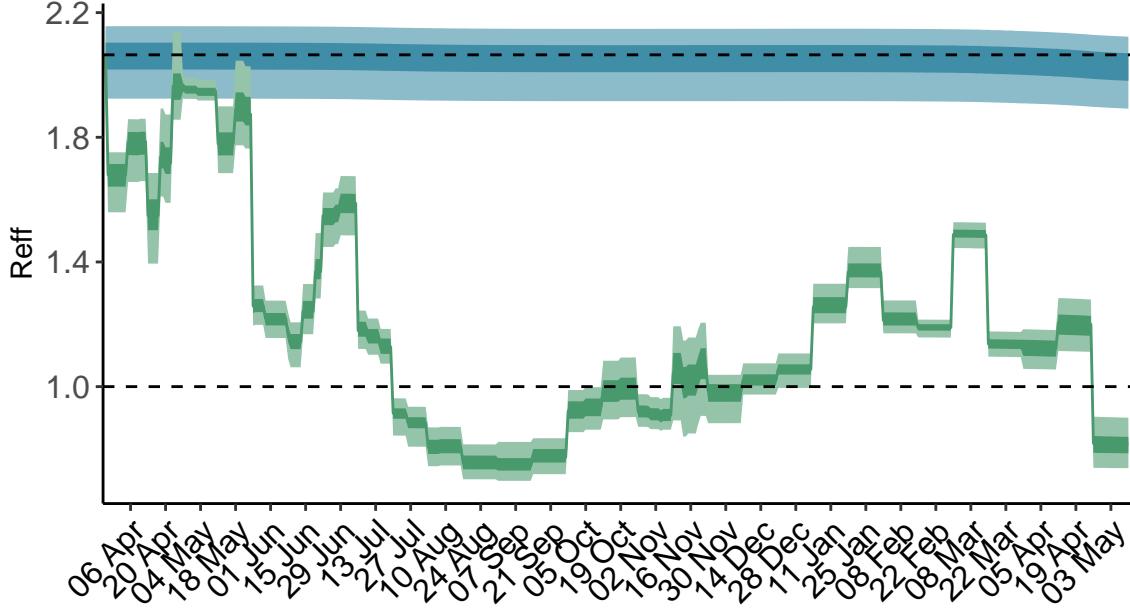


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

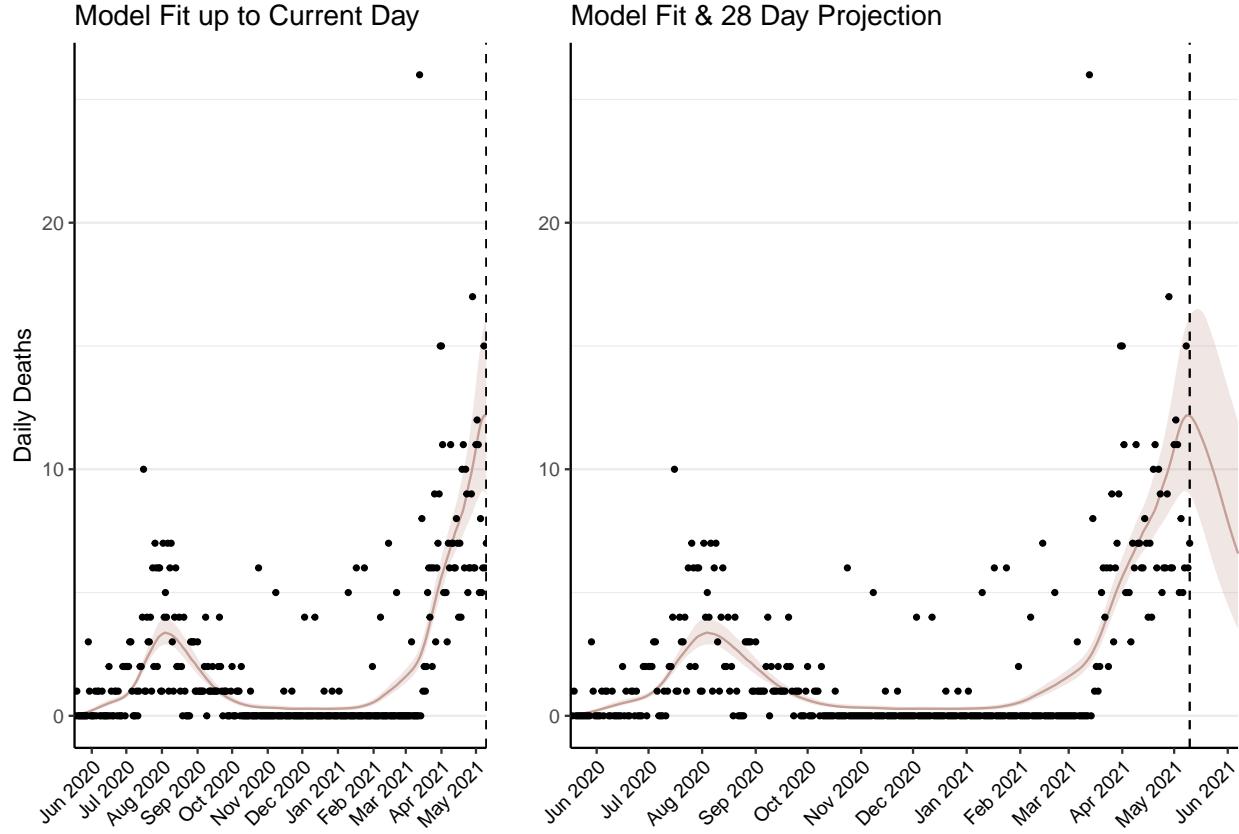


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 481 (95% CI: 461-501) patients requiring treatment with high-pressure oxygen at the current date to 248 (95% CI: 229-267) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 186 (95% CI: 179-193) patients requiring treatment with mechanical ventilation at the current date to 106 (95% CI: 98-113) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

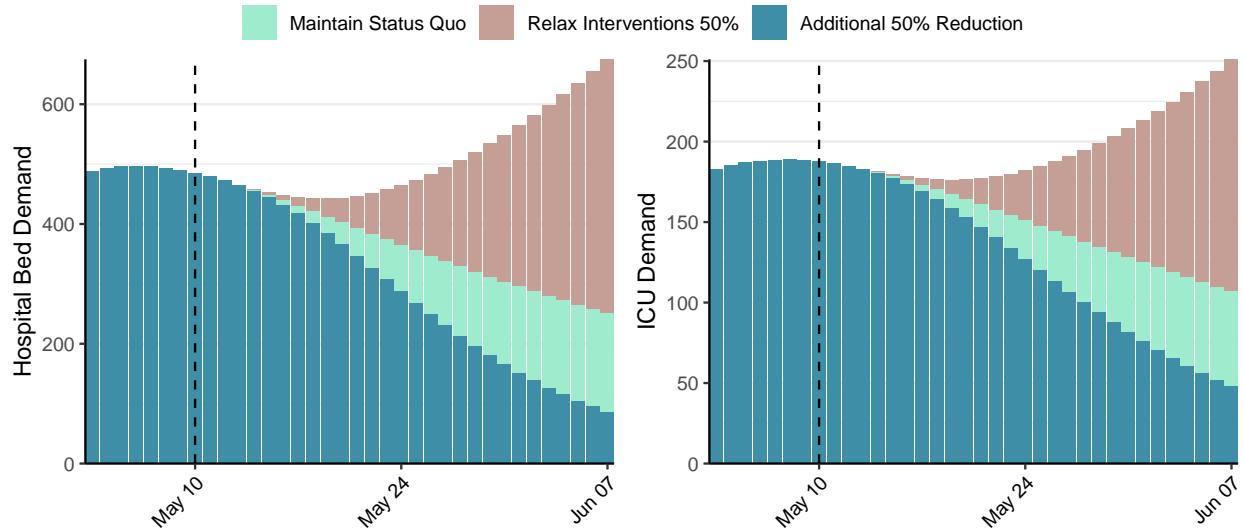


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 4,771 (95% CI: 4,503-5,038) at the current date to 203 (95% CI: 185-221) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 4,771 (95% CI: 4,503-5,038) at the current date to 11,794 (95% CI: 10,601-12,987) by 2021-06-07.

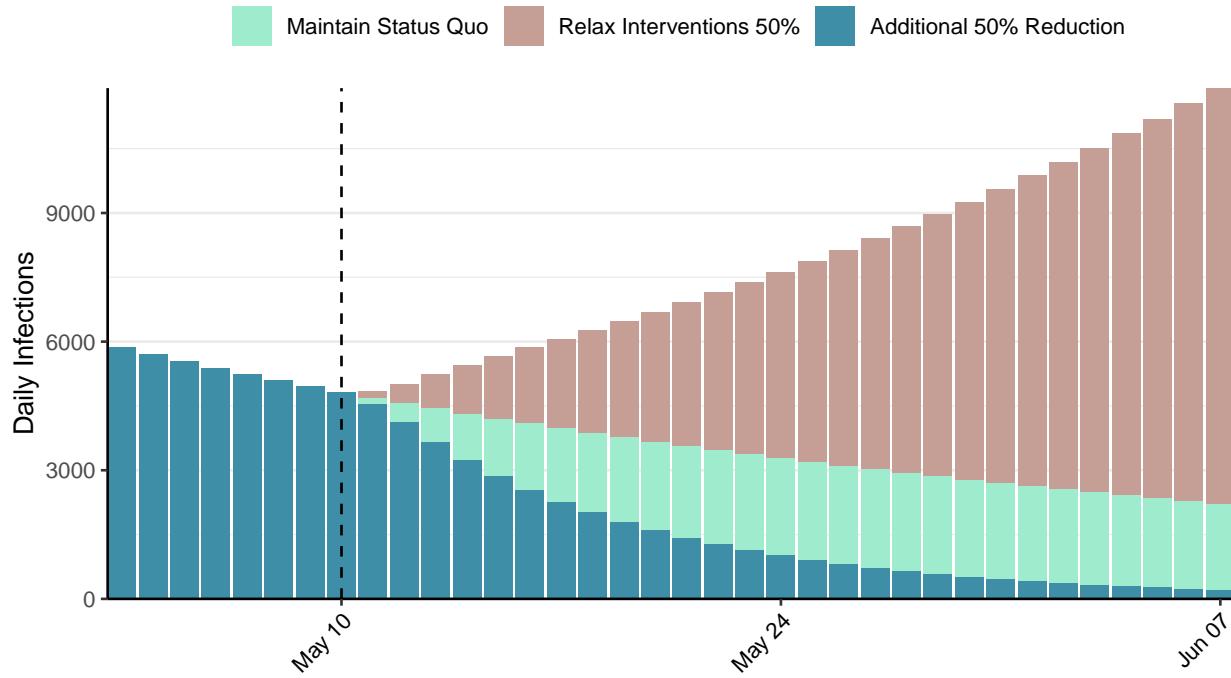


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Maldives, 2021-05-10

[Download the report for Maldives, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
37,019	1,204	87	3	1.4 (95% CI: 1.31-1.54)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

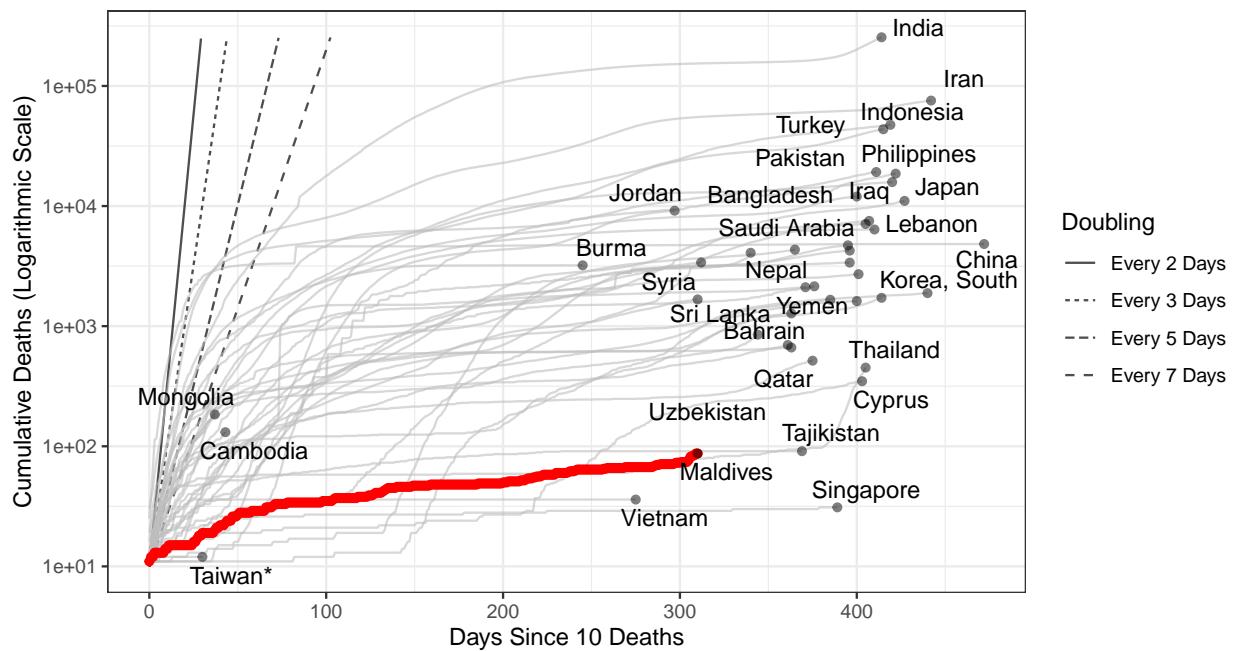


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 34,800 (95% CI: 33,157-36,443) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

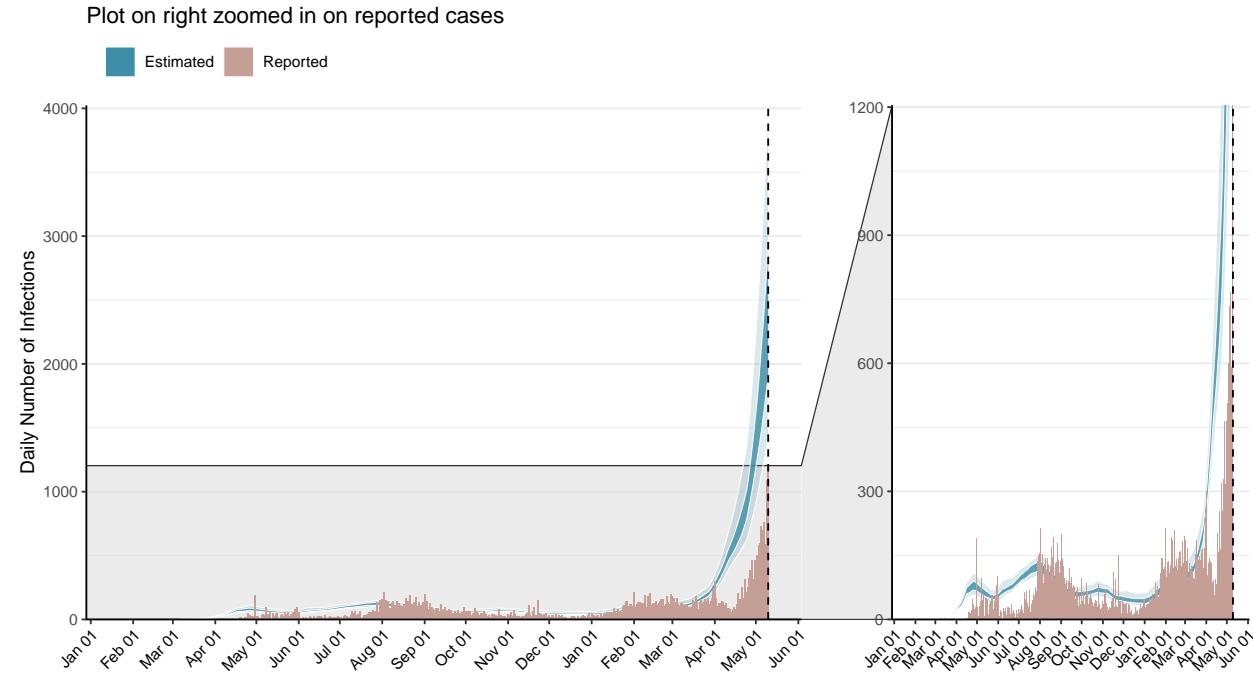
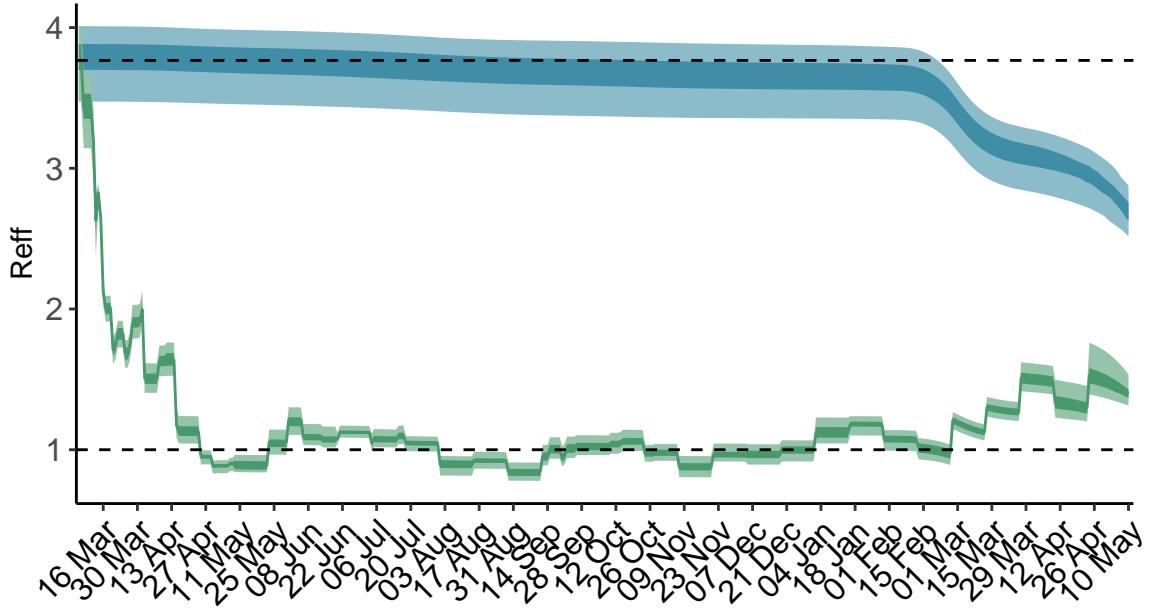


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Maldives is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

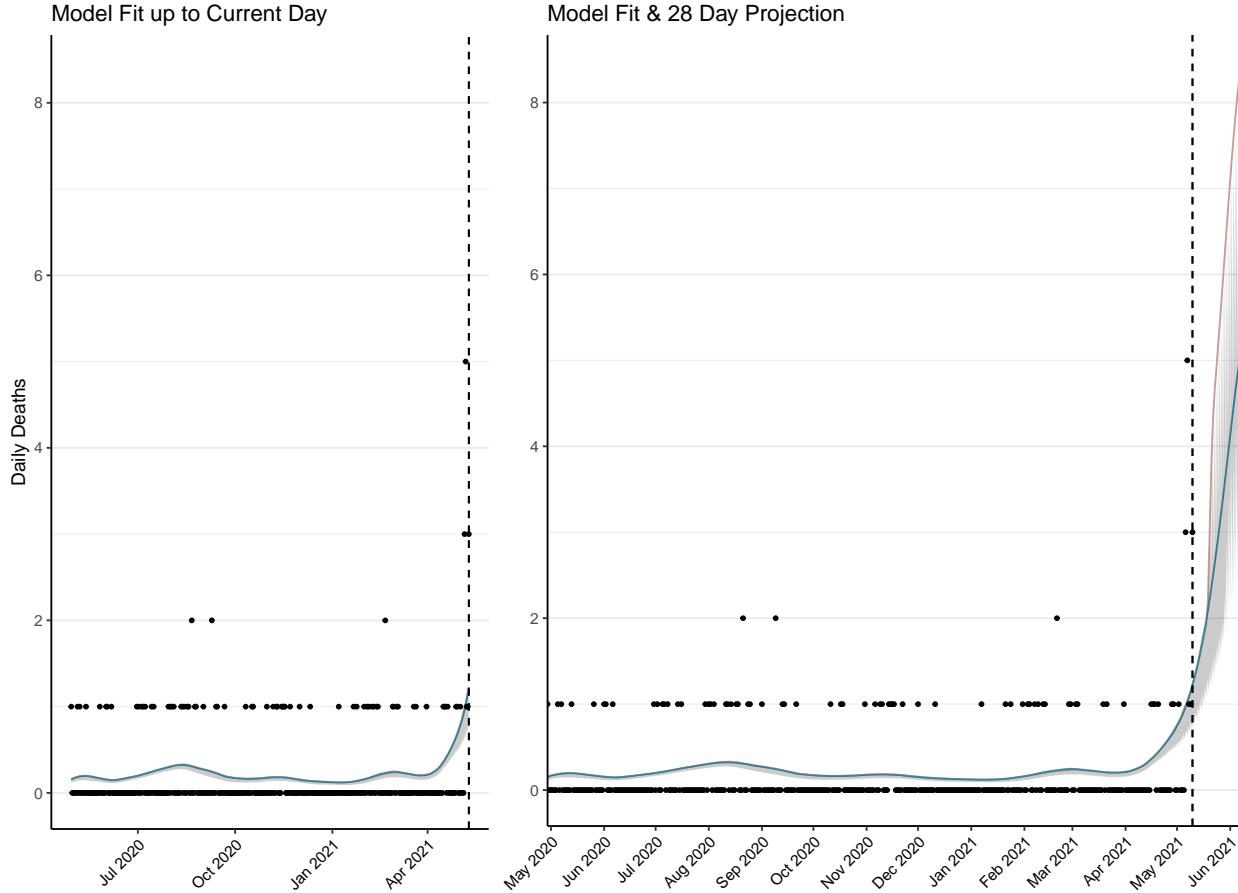


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 74 (95% CI: 71-78) patients requiring treatment with high-pressure oxygen at the current date to 265 (95% CI: 251-279) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 23 (95% CI: 22-24) patients requiring treatment with mechanical ventilation at the current date to 43 (95% CI: 42-43) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

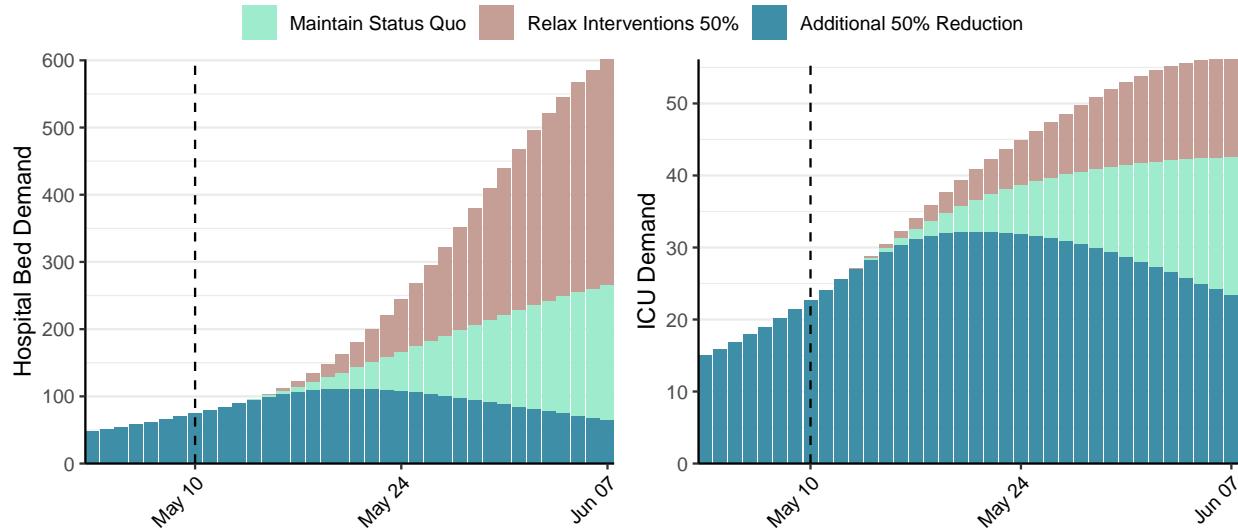
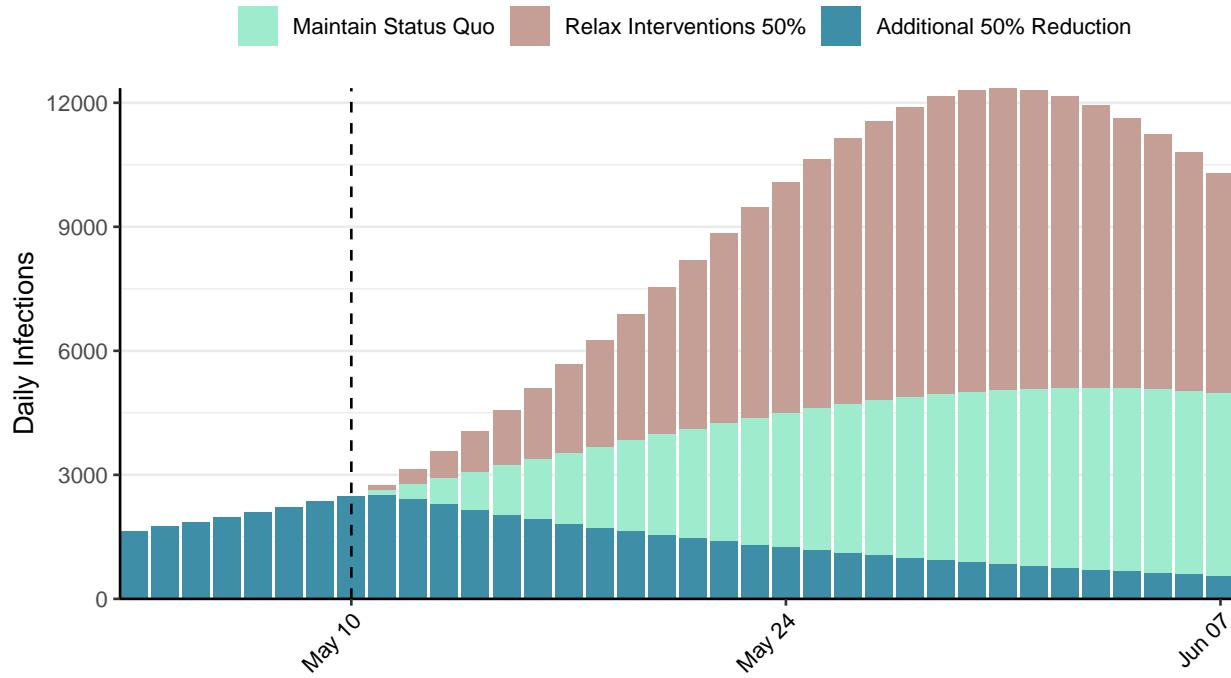


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 2,483 (95% CI: 2,337-2,628) at the current date to 553 (95% CI: 516-590) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 2,483 (95% CI: 2,337-2,628) at the current date to 10,298 (95% CI: 10,086-10,511) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Mexico, 2021-05-10

[Download the report for Mexico, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
2,366,496	704	219,089	104	0.91 (95% CI: 0.88-0.94)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

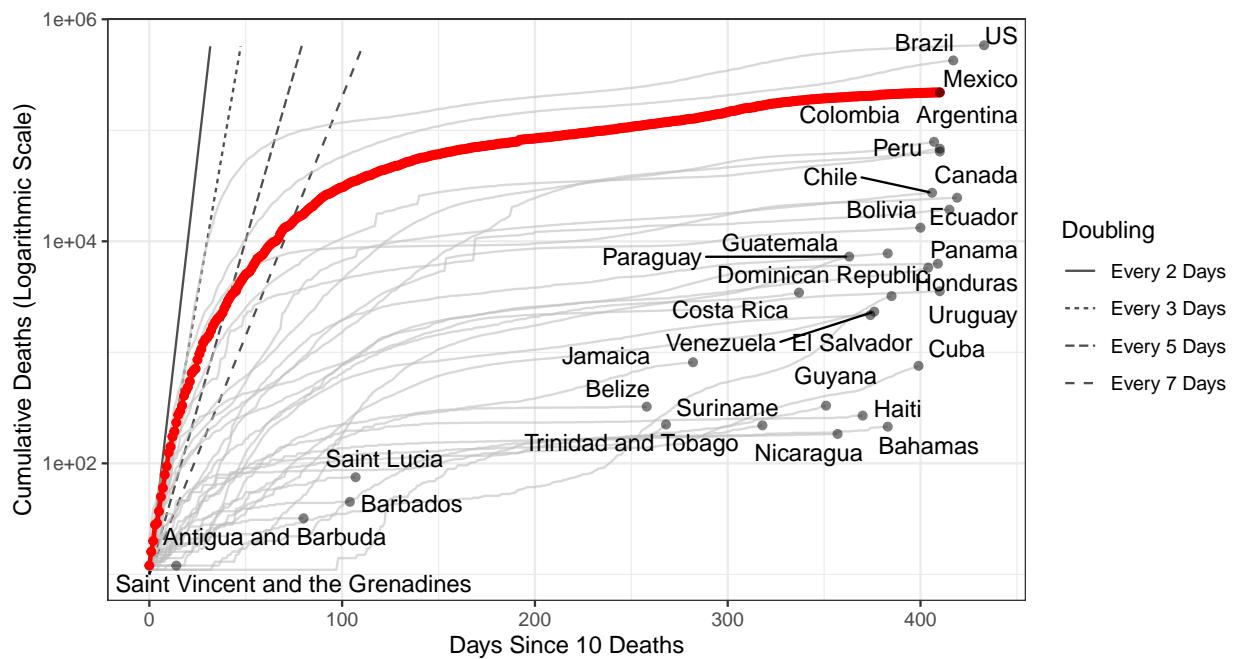


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 3,405,595 (95% CI: 3,328,510–3,482,681) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

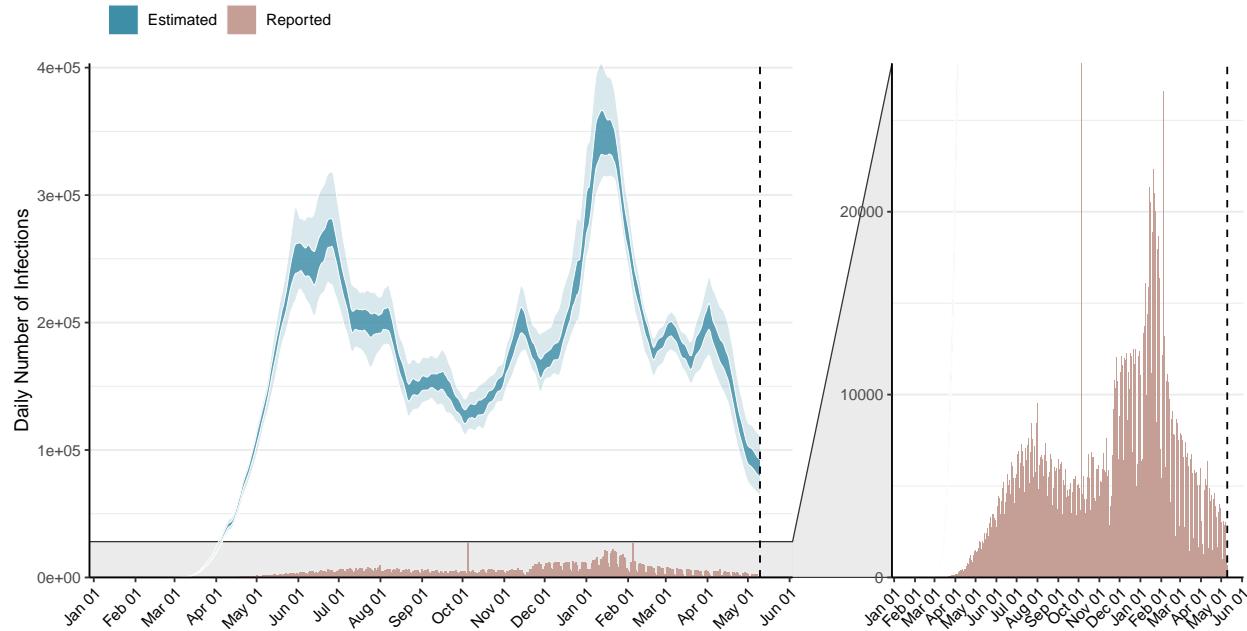
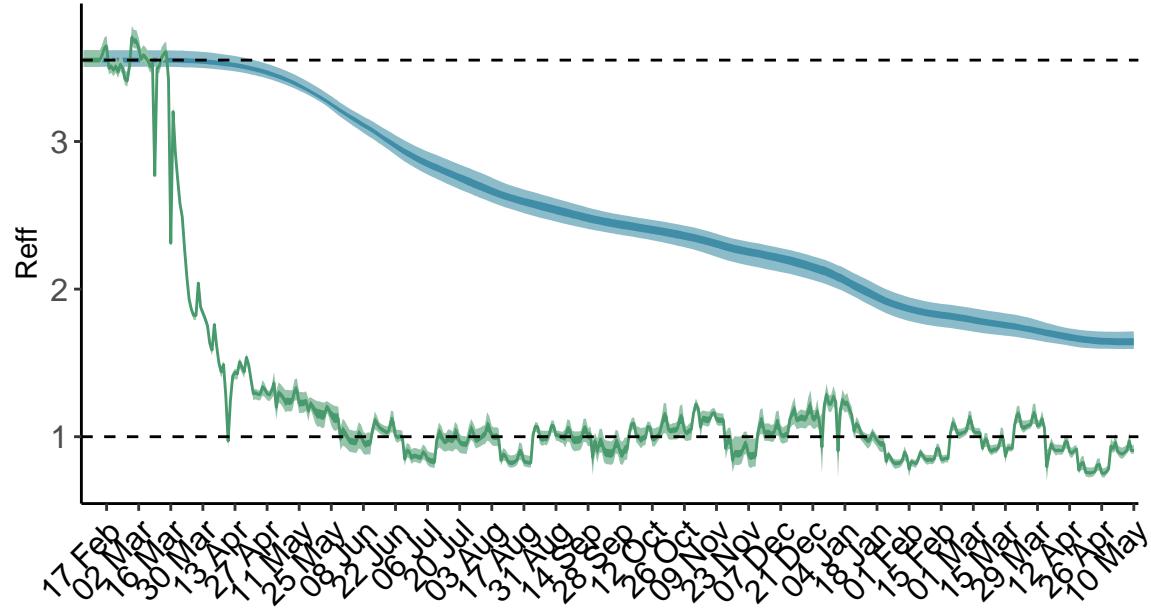


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Mexico is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

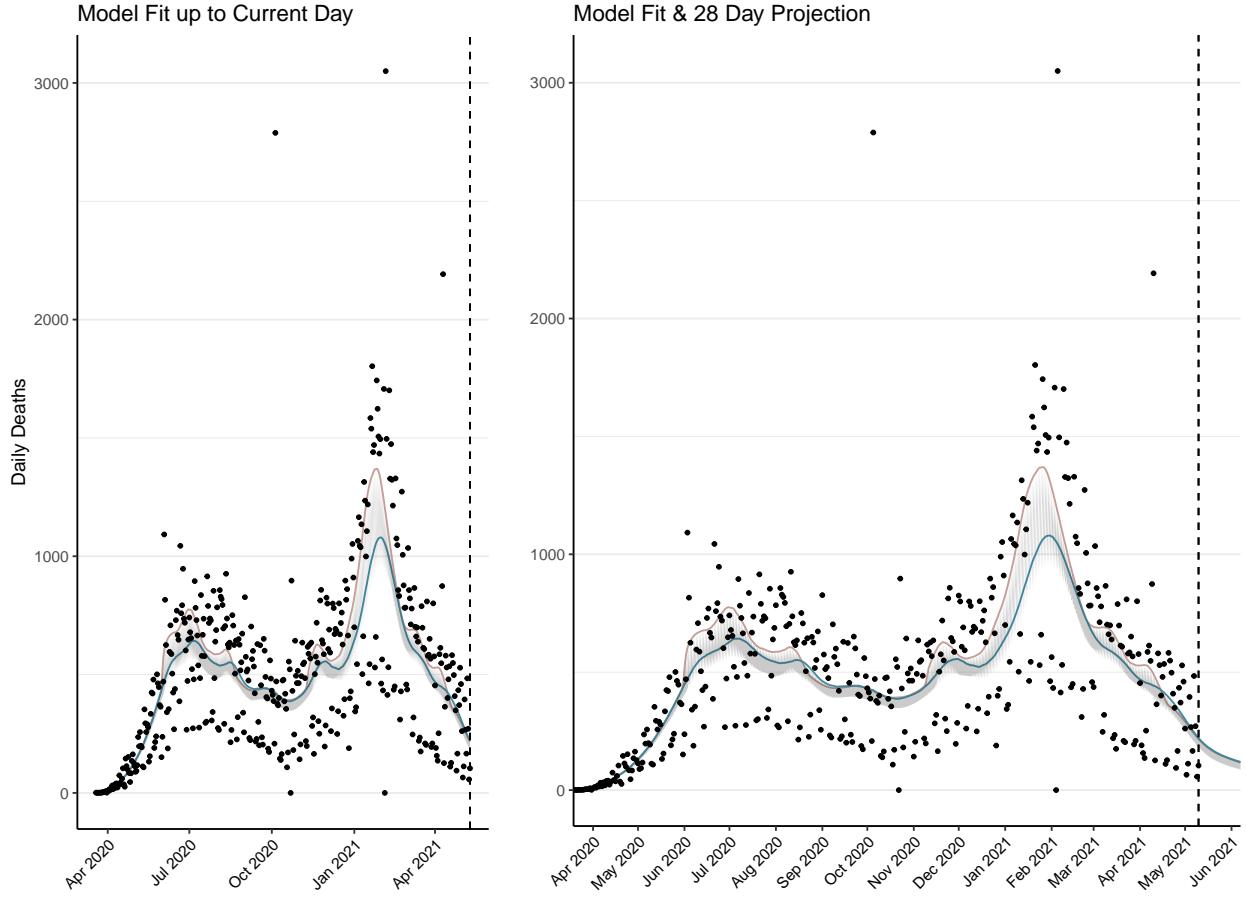


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 8,547 (95% CI: 8,348-8,747) patients requiring treatment with high-pressure oxygen at the current date to 4,991 (95% CI: 4,816-5,165) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 3,898 (95% CI: 3,821-3,975) patients requiring treatment with mechanical ventilation at the current date to 2,181 (95% CI: 2,108-2,254) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

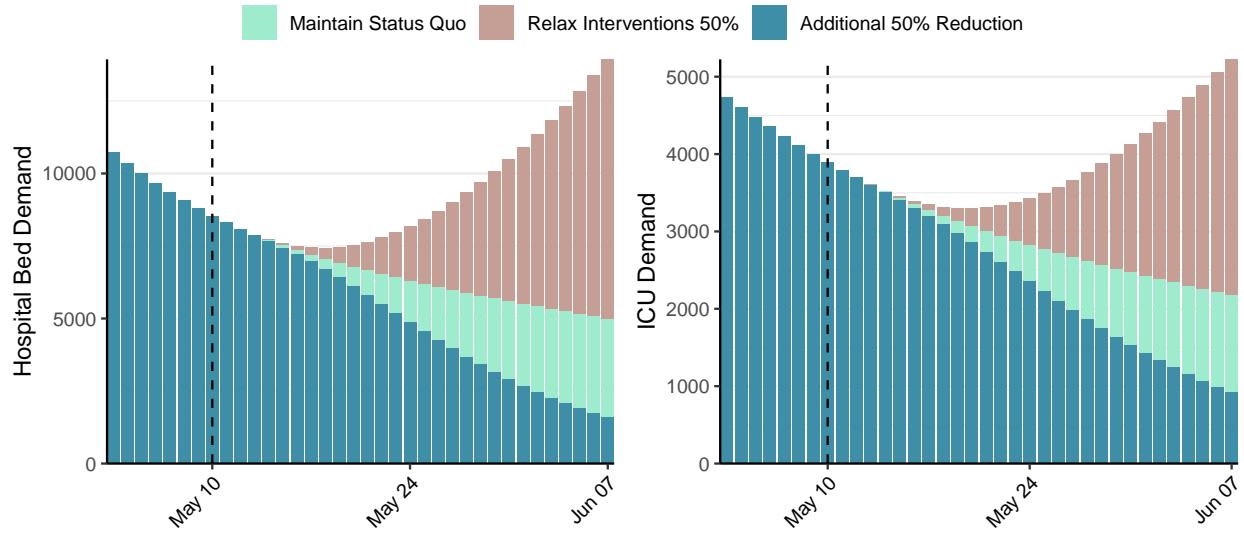
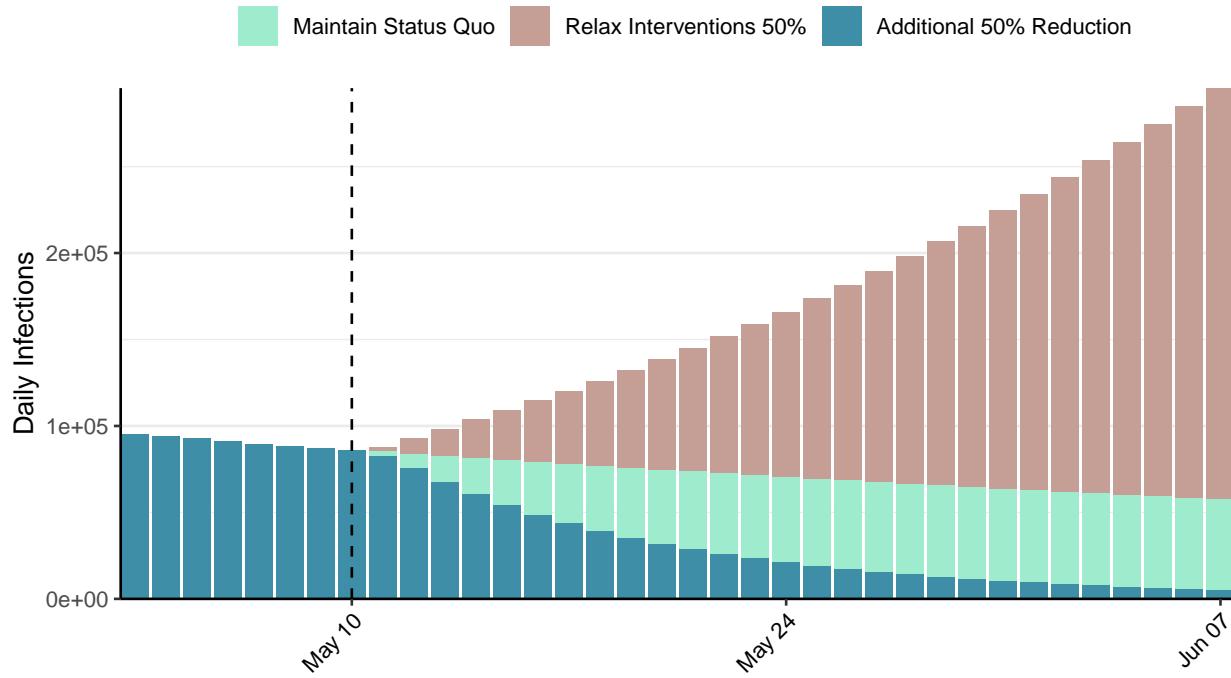


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 86,168 (95% CI: 83,692-88,644) at the current date to 5,076 (95% CI: 4,886-5,267) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 86,168 (95% CI: 83,692-88,644) at the current date to 295,381 (95% CI: 285,095-305,667) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: North Macedonia, 2021-05-10

[Download the report for North Macedonia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
154,051	25	5,109	16	0.66 (95% CI: 0.62-0.68)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

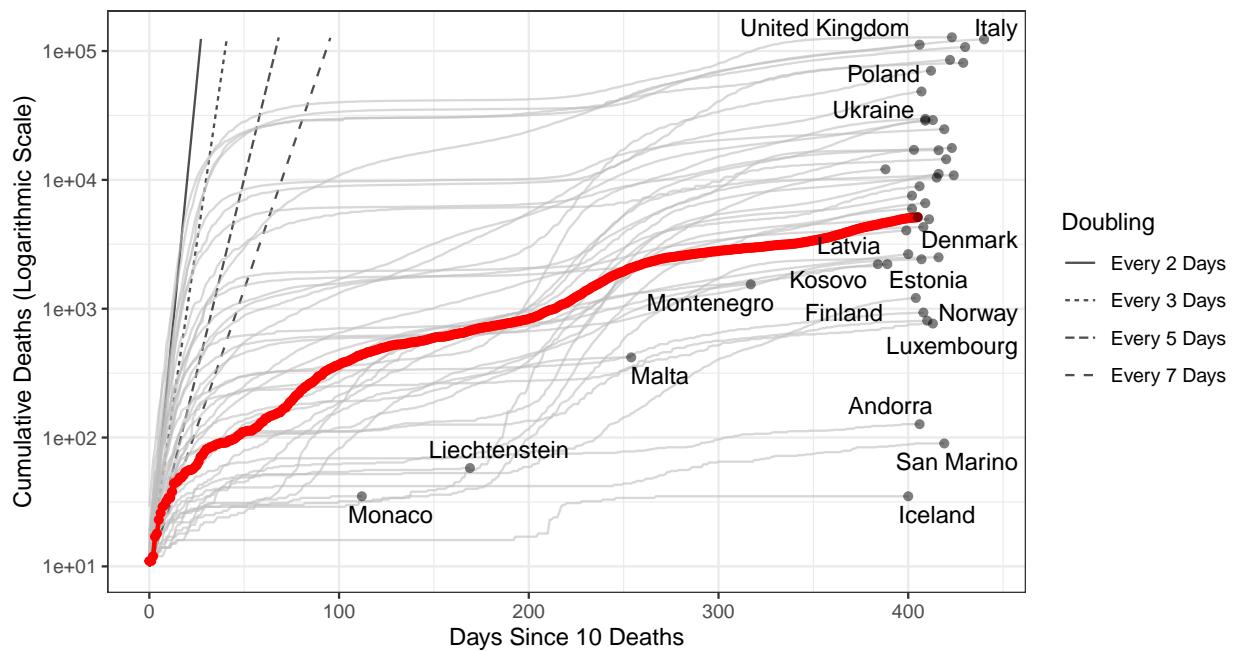


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 120,642 (95% CI: 117,430-123,854) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

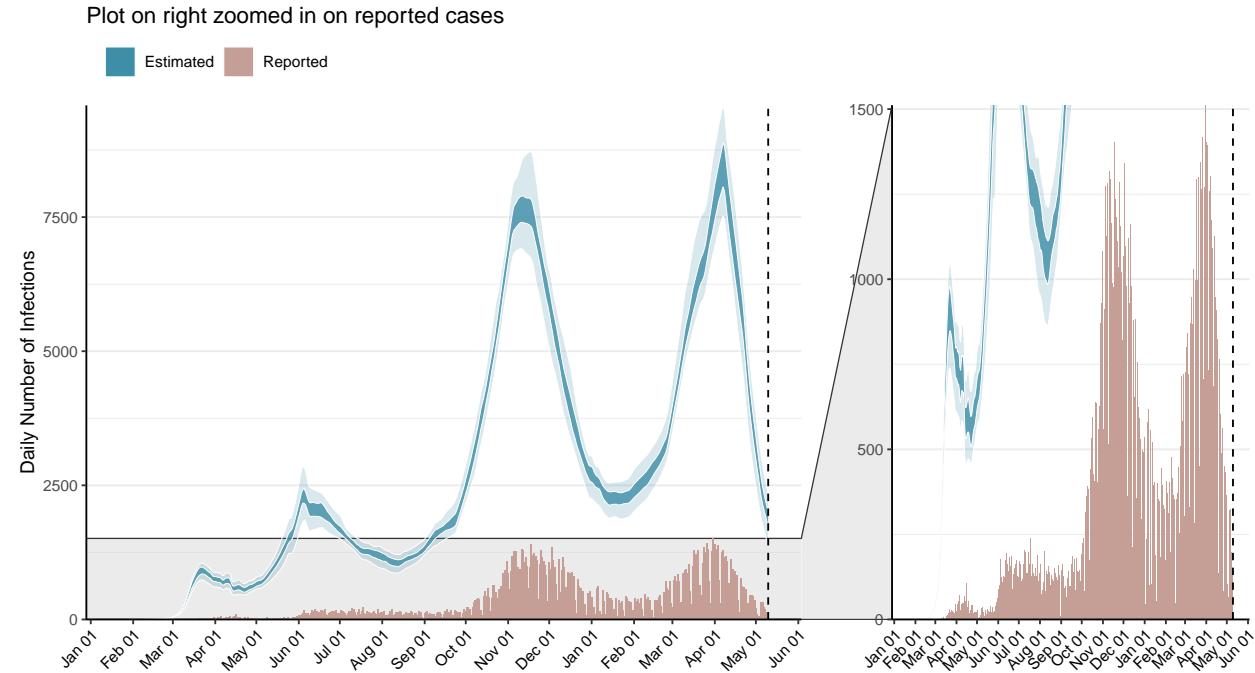
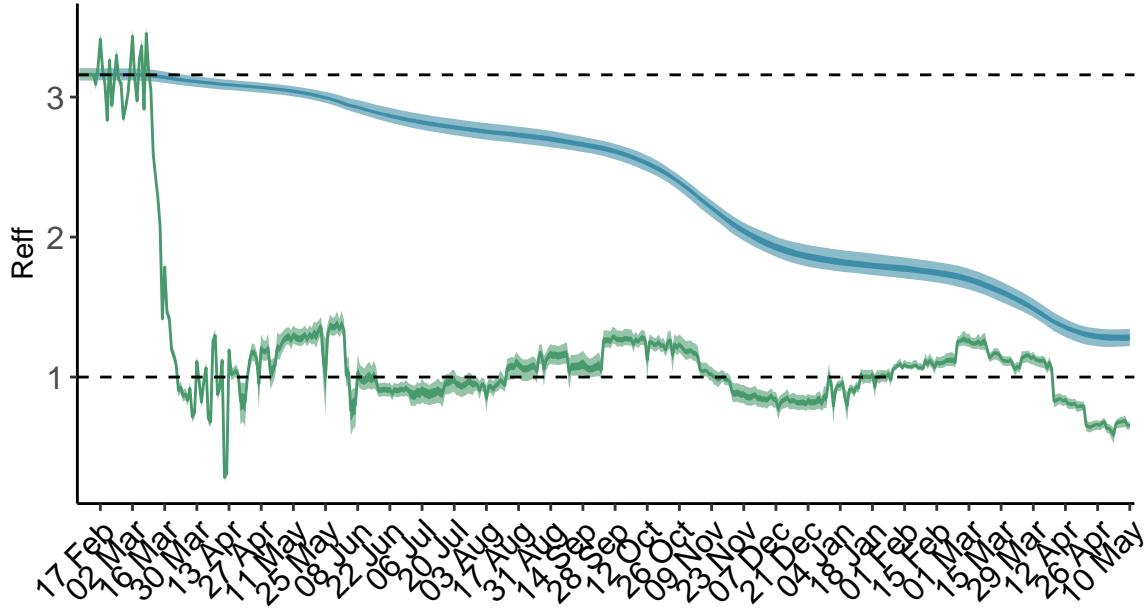


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. North Macedonia is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

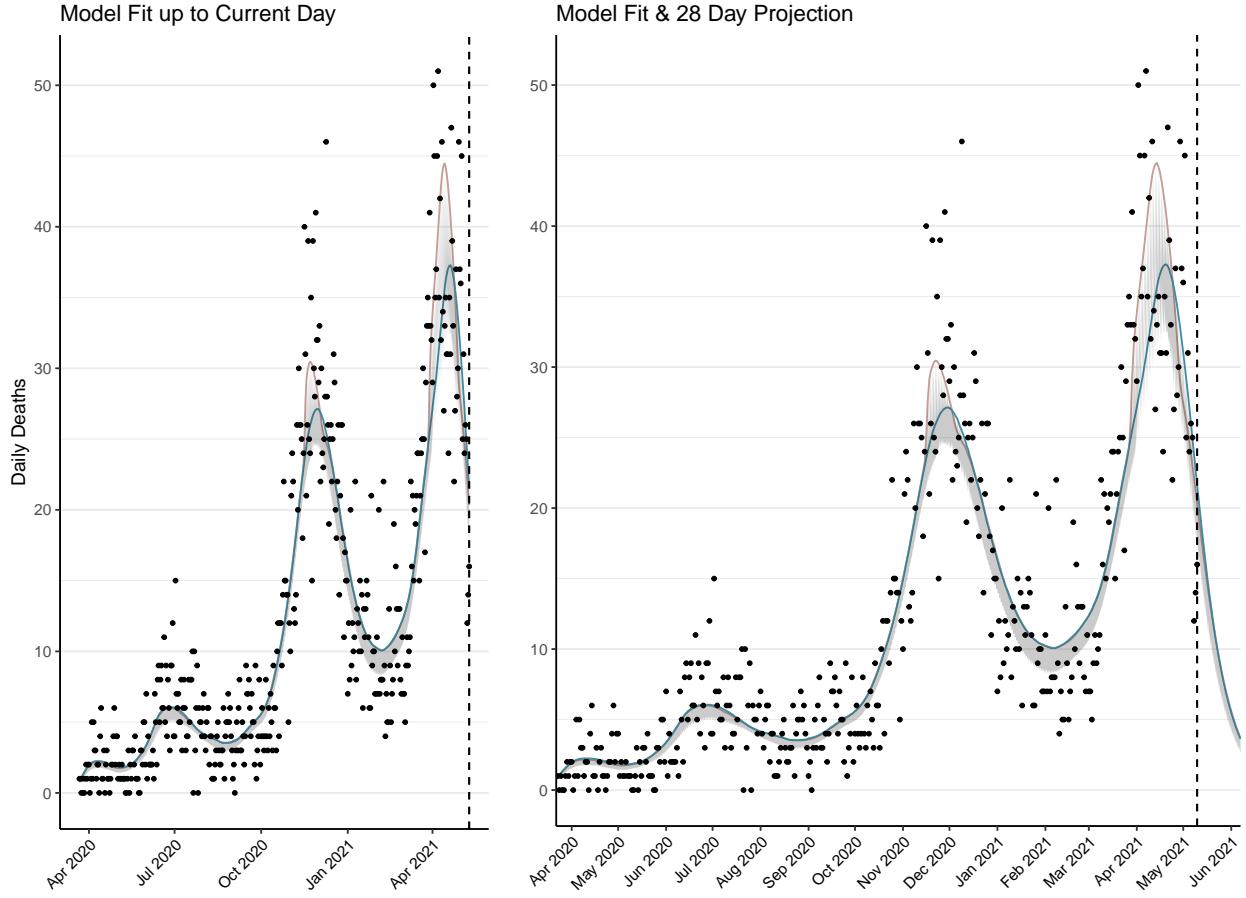


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 616 (95% CI: 599-633) patients requiring treatment with high-pressure oxygen at the current date to 107 (95% CI: 103-110) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 261 (95% CI: 255-267) patients requiring treatment with mechanical ventilation at the current date to 62 (95% CI: 59-64) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

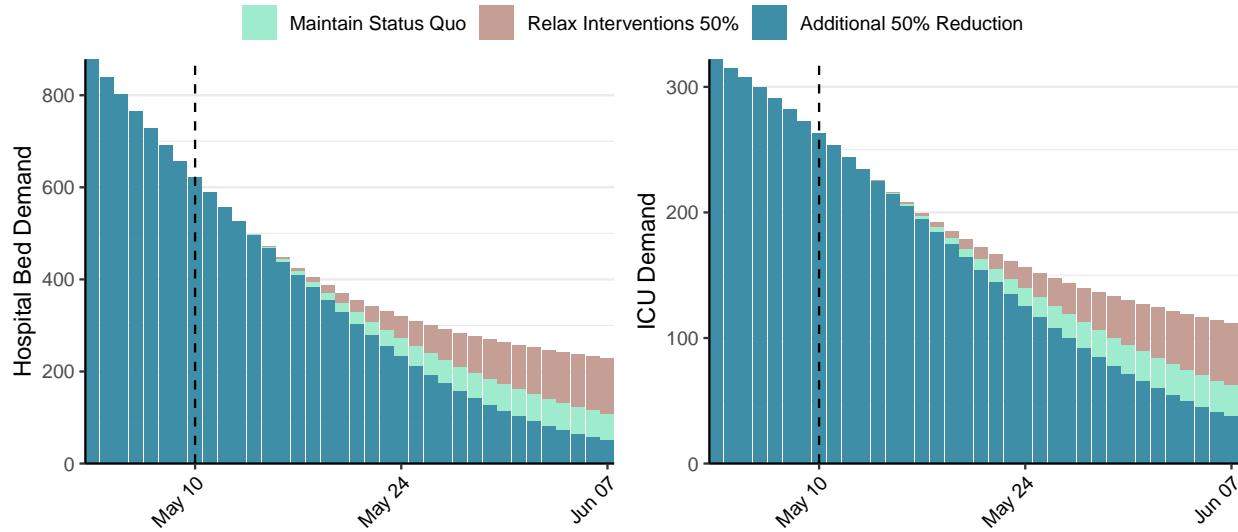
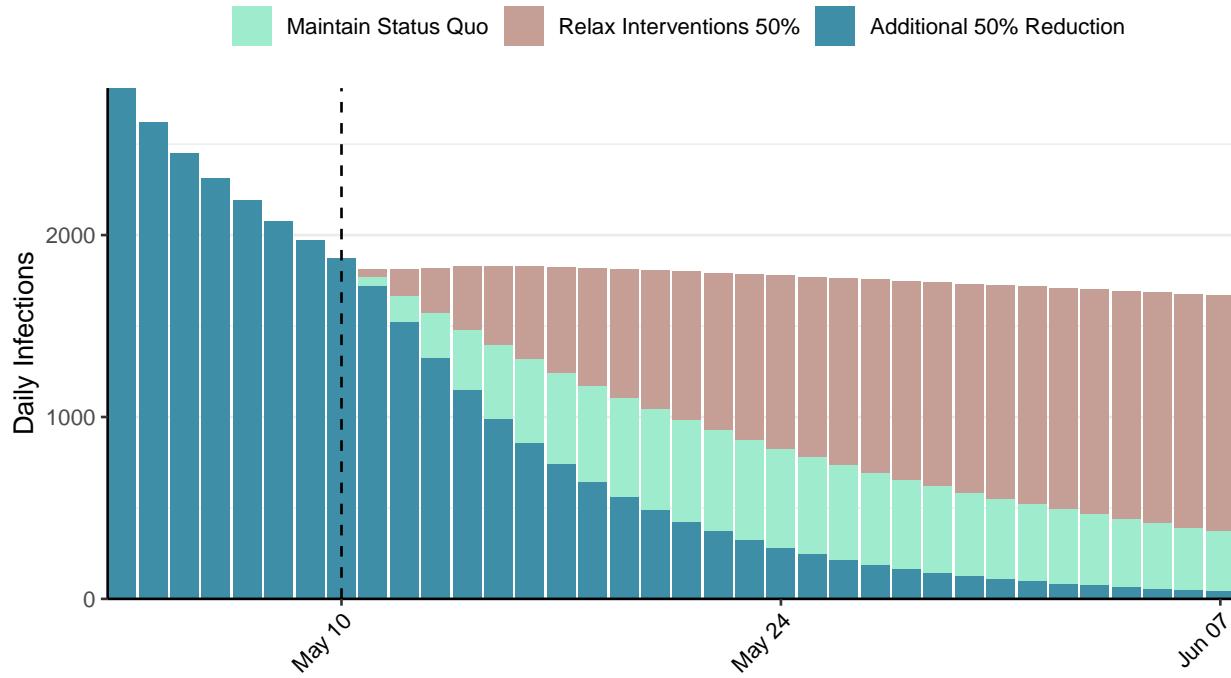


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,851 (95% CI: 1,791-1,911) at the current date to 41 (95% CI: 39-43) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,851 (95% CI: 1,791-1,911) at the current date to 1,649 (95% CI: 1,580-1,718) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Mali, 2021-05-10

[Download the report for Mali, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
14,115	7	502	2	0.69 (95% CI: 0.59-0.77)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

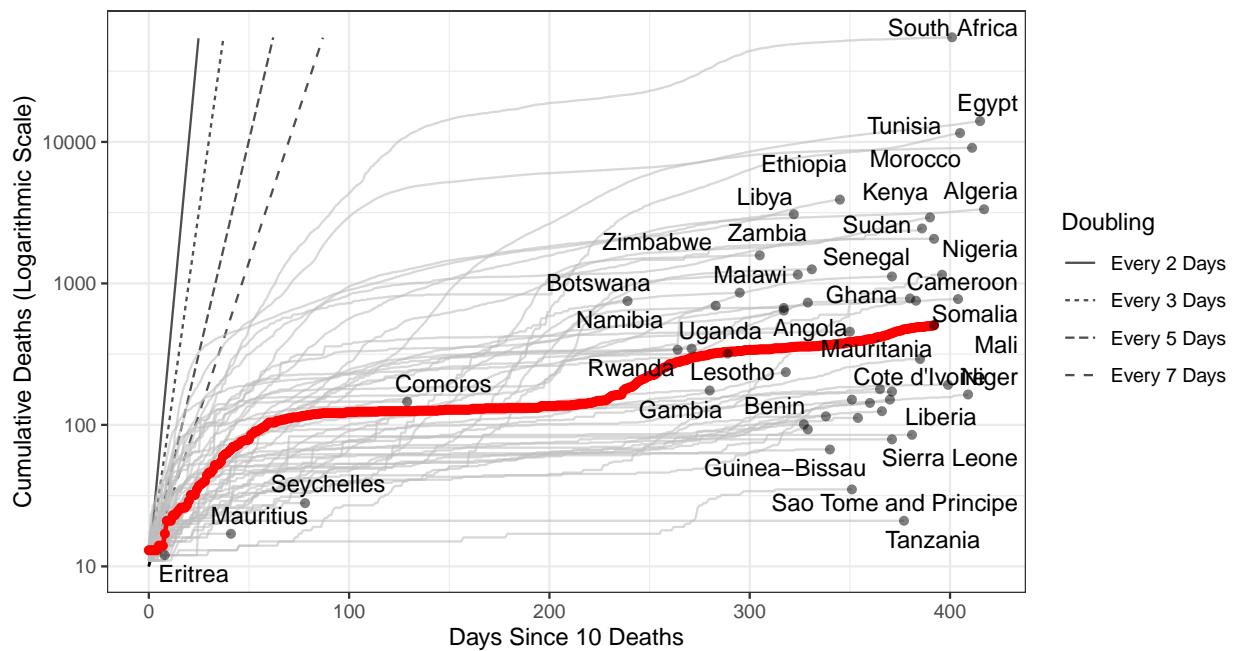


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 45,594 (95% CI: 43,846-47,342) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

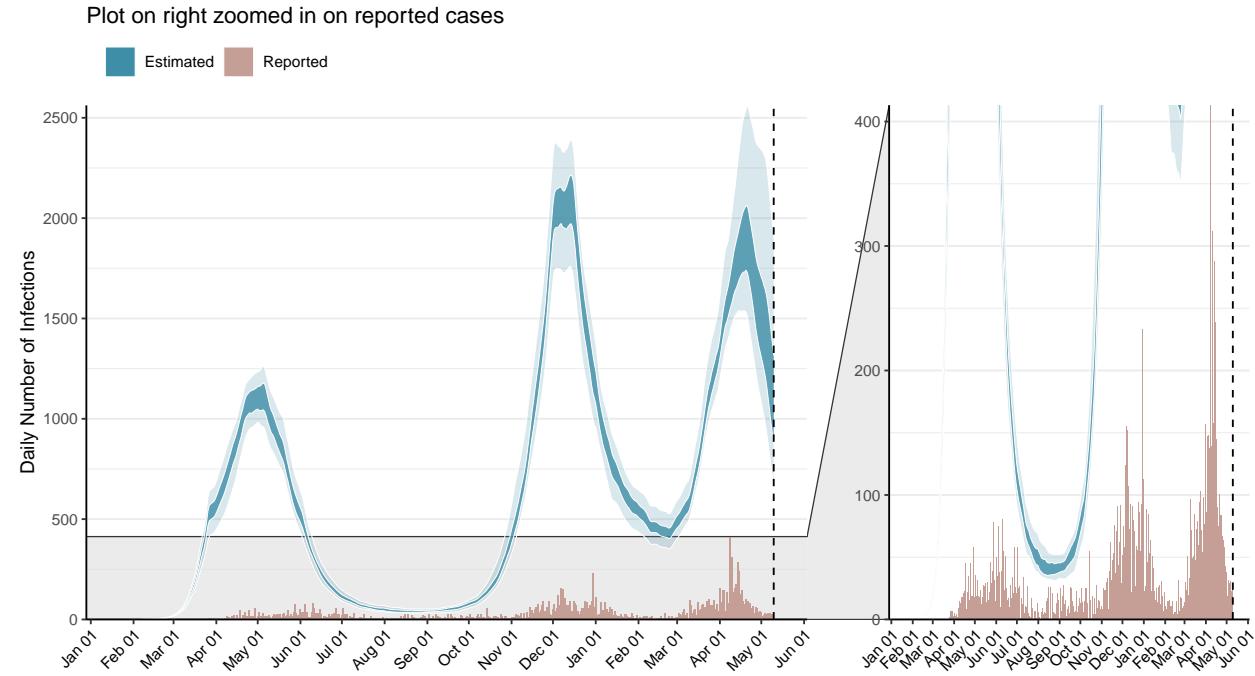
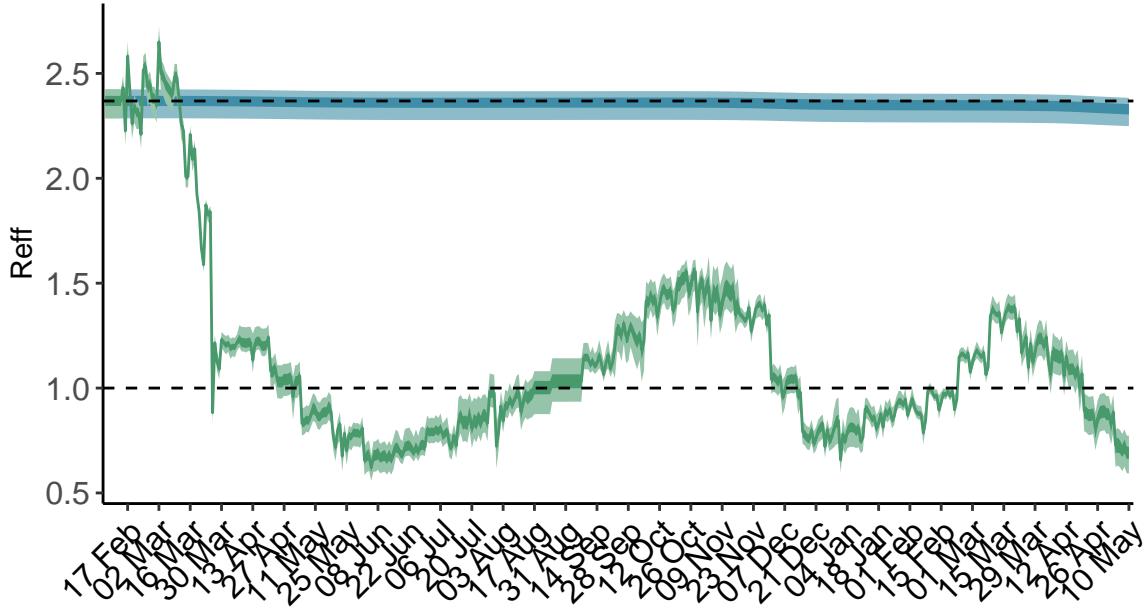


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

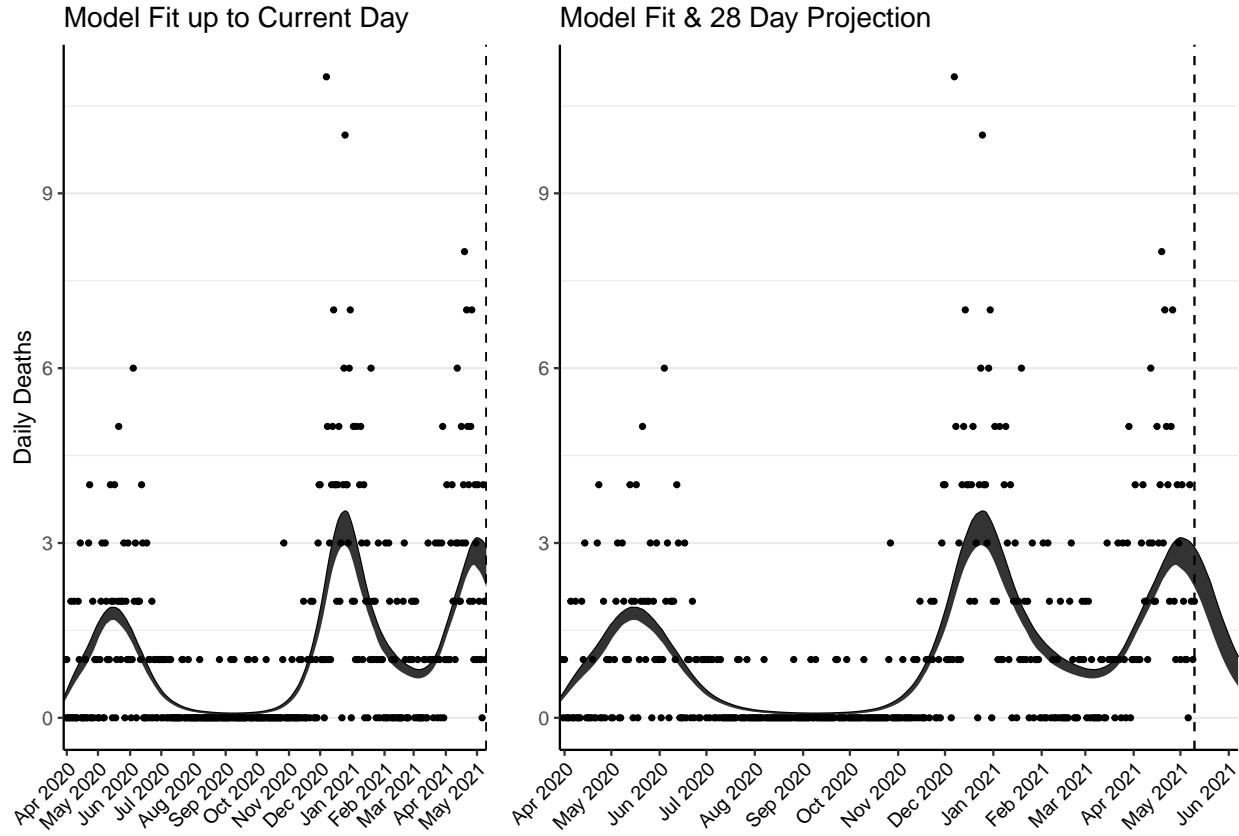


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 114 (95% CI: 109-118) patients requiring treatment with high-pressure oxygen at the current date to 37 (95% CI: 34-40) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 46 (95% CI: 44-48) patients requiring treatment with mechanical ventilation at the current date to 17 (95% CI: 16-18) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

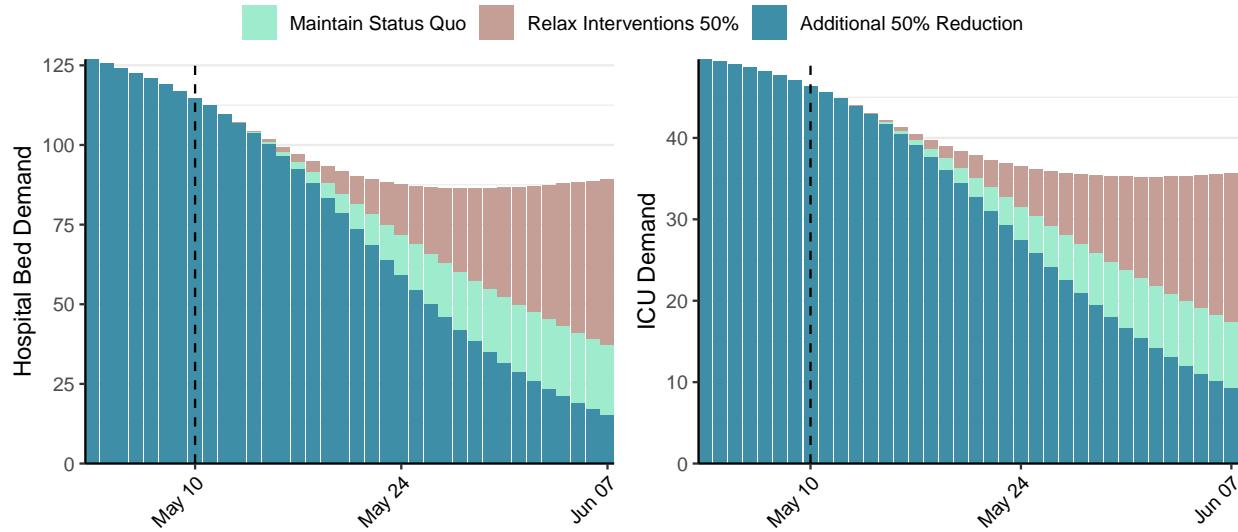
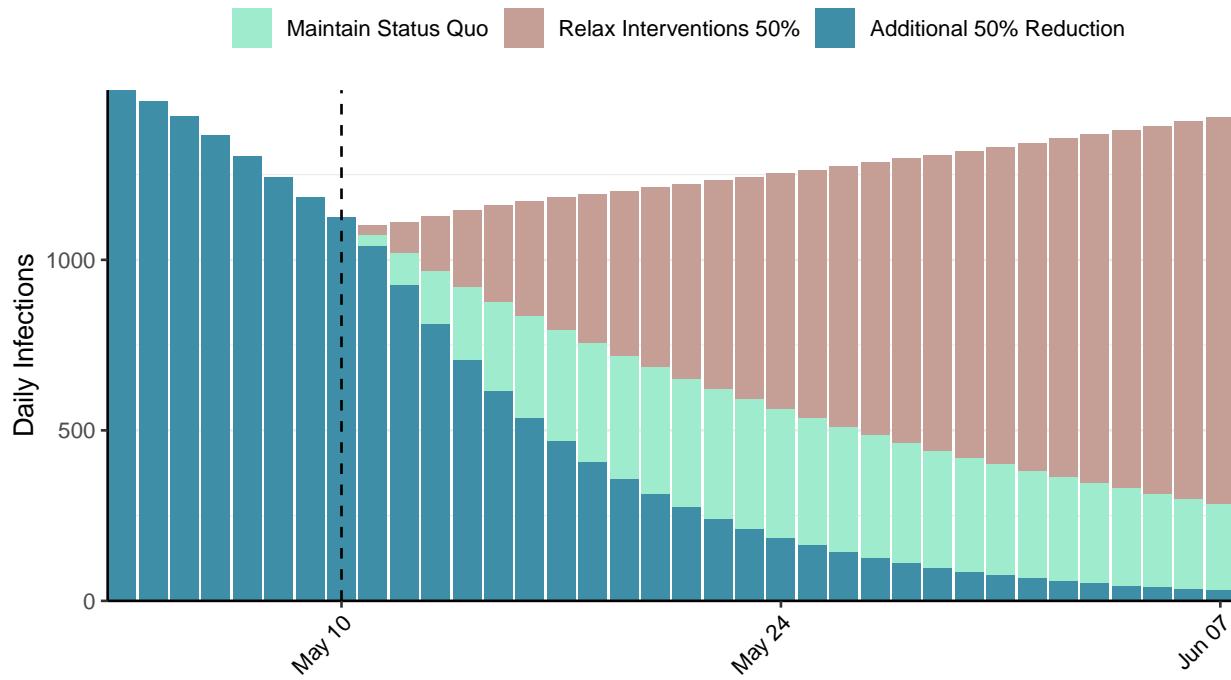


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,115 (95% CI: 1,050-1,179) at the current date to 29 (95% CI: 27-32) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,115 (95% CI: 1,050-1,179) at the current date to 1,404 (95% CI: 1,247-1,561) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Myanmar, 2021-05-10

[Download the report for Myanmar, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
142,963	16	3,211	0	1.11 (95% CI: 0.87-1.4)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

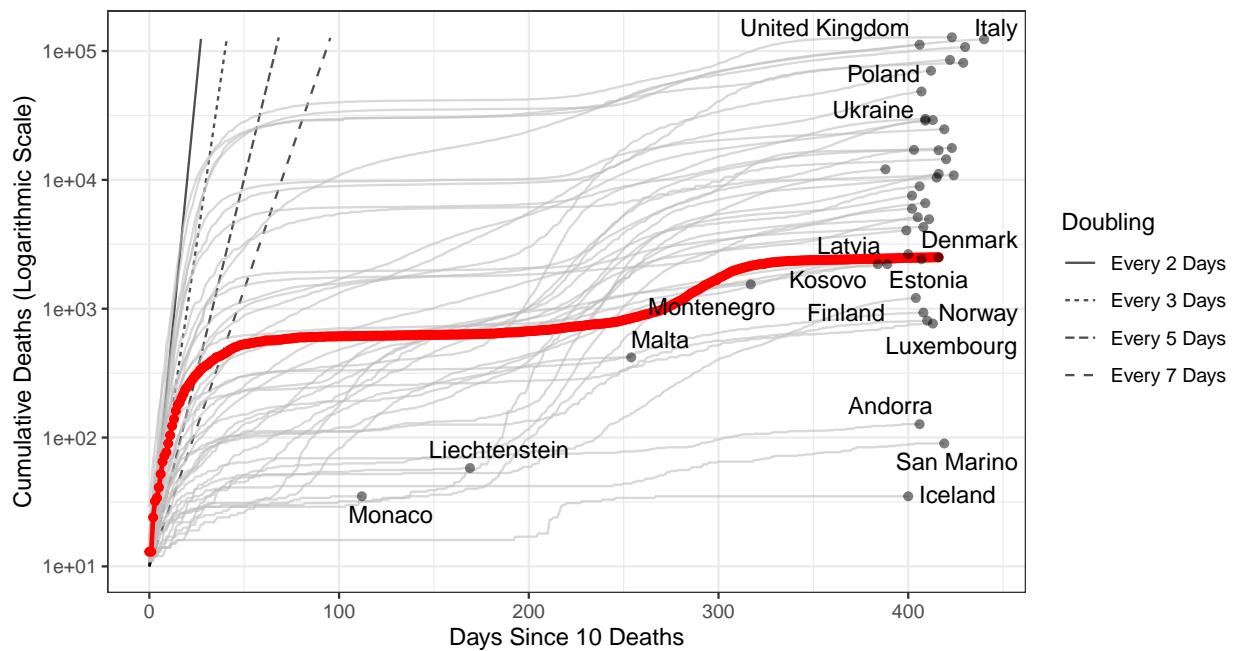


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 175 (95% CI: 149-201) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

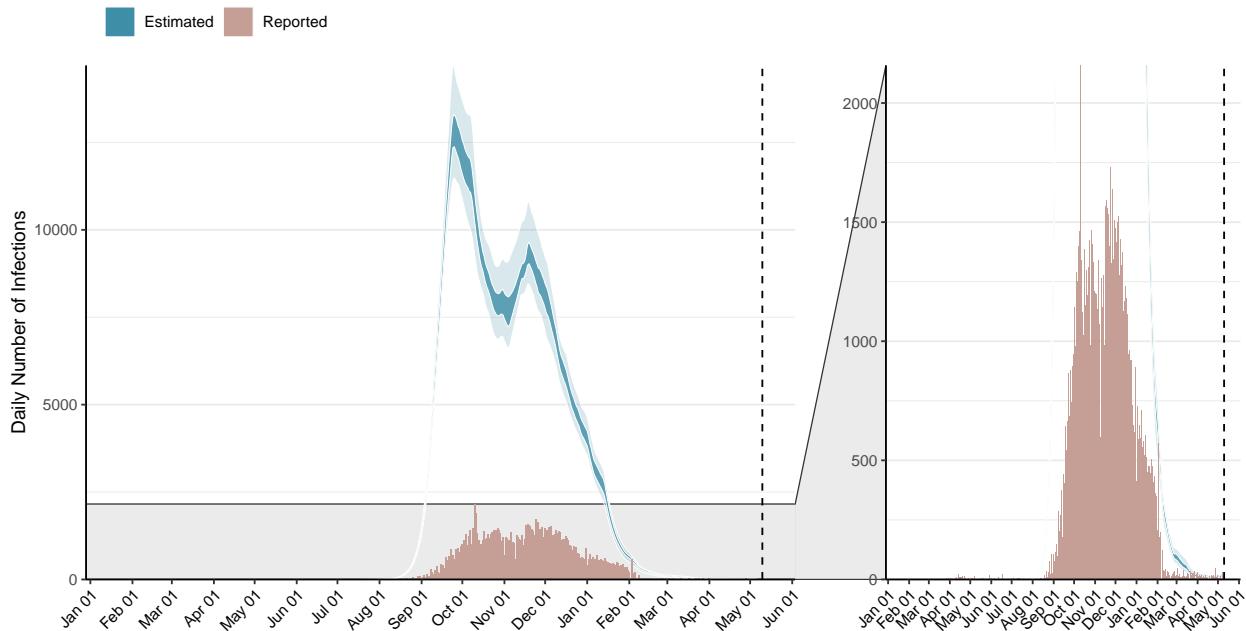
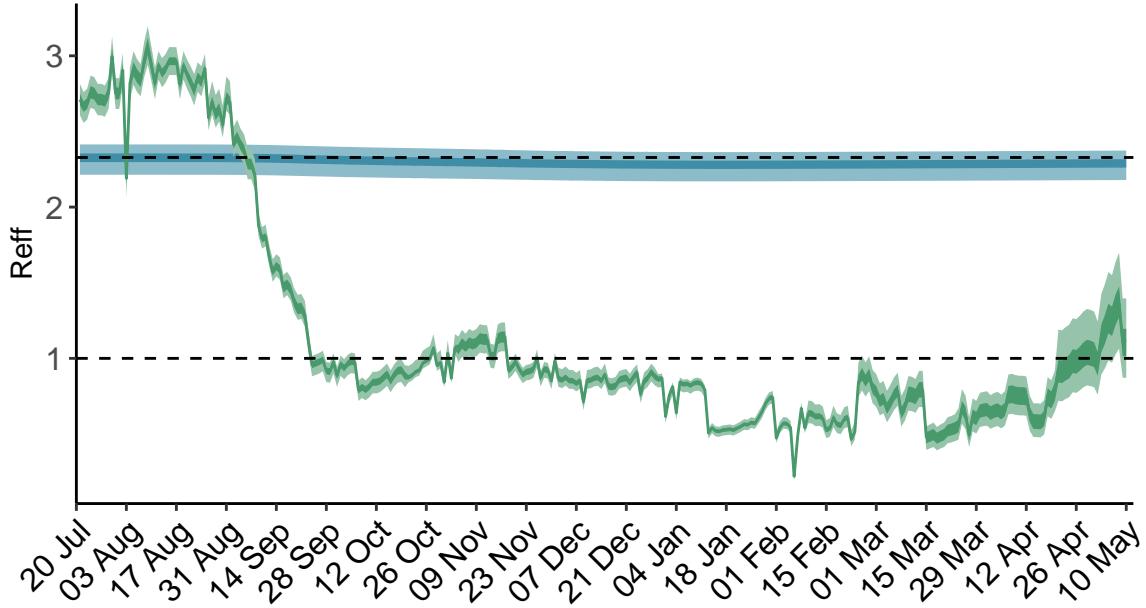


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

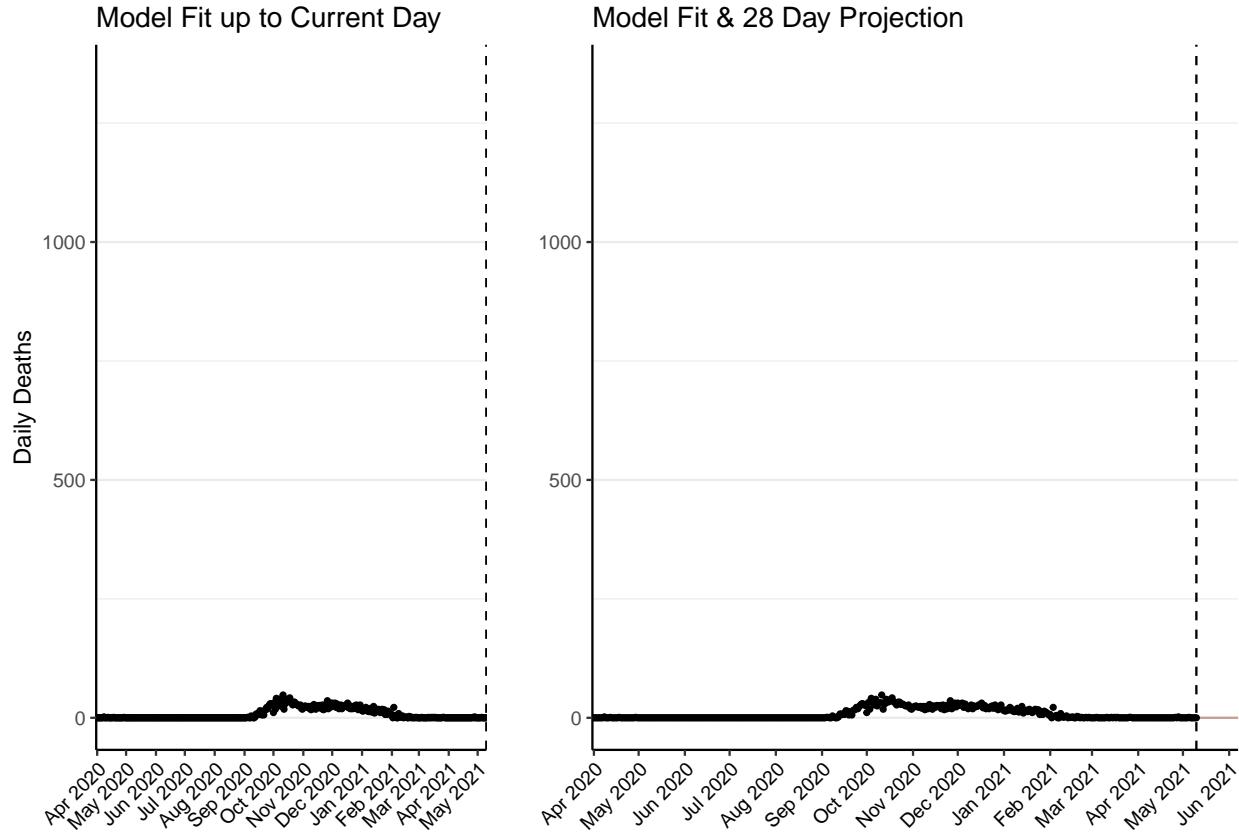


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 1 (95% CI: 1-1) patients requiring treatment with high-pressure oxygen at the current date to 2 (95% CI: 1-2) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 0 (95% CI: 0-0) patients requiring treatment with mechanical ventilation at the current date to 1 (95% CI: 0-1) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

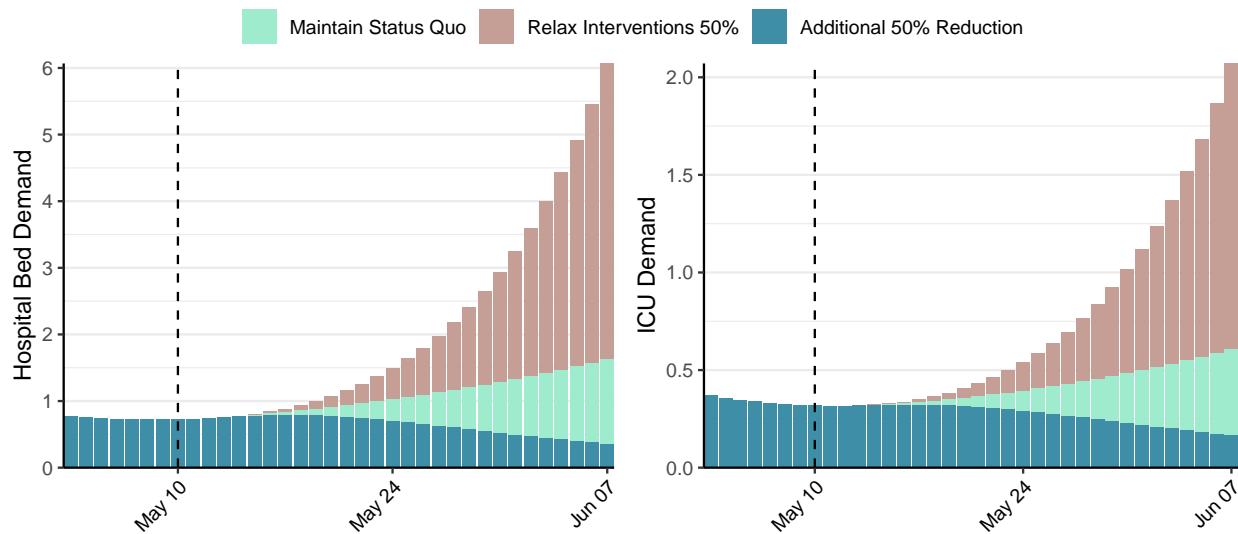


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 8 (95% CI: 6-10) at the current date to 1 (95% CI: 1-2) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 8 (95% CI: 6-10) at the current date to 145 (95% CI: 93-198) by 2021-06-07.

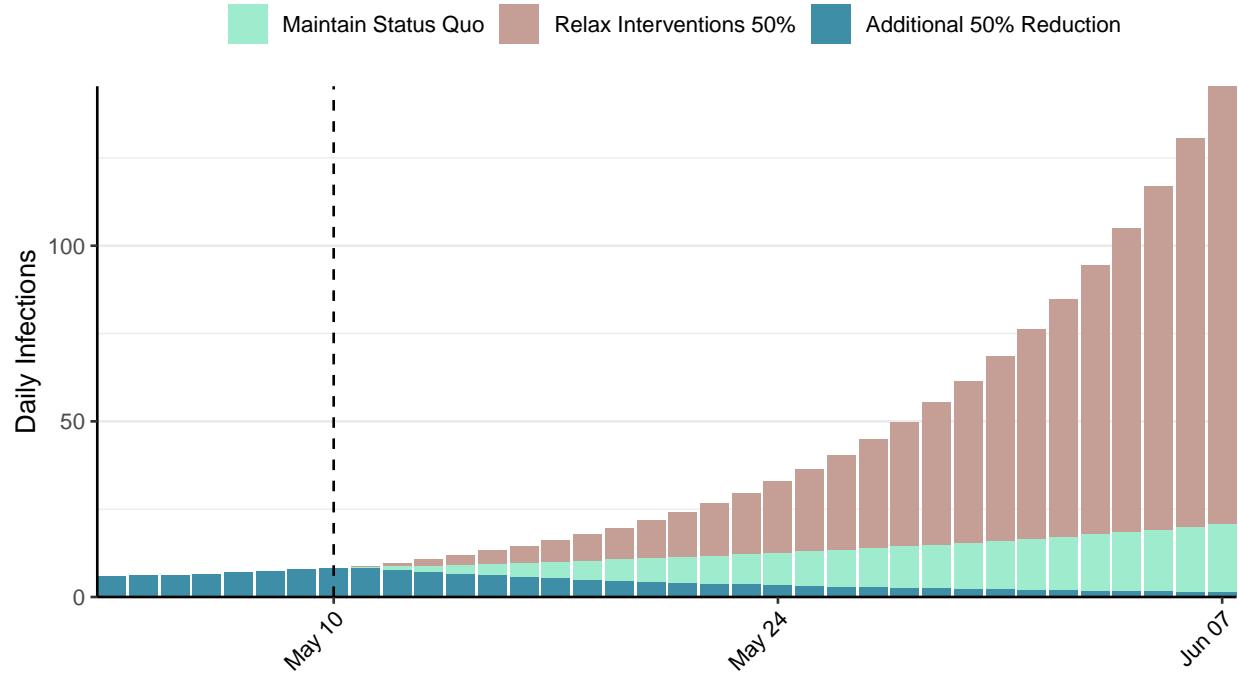


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Montenegro, 2021-05-10

[Download the report for Montenegro, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
98,365	62	1,544	4	0.82 (95% CI: 0.77-0.85)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

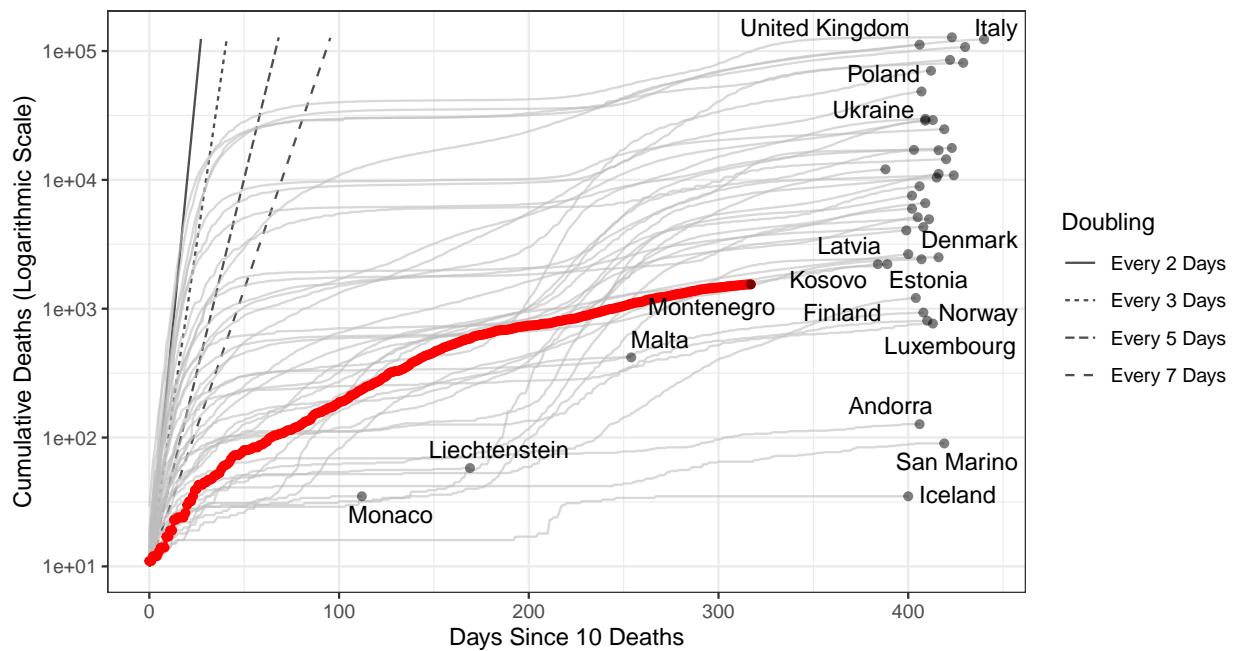


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 26,595 (95% CI: 26,168-27,022) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

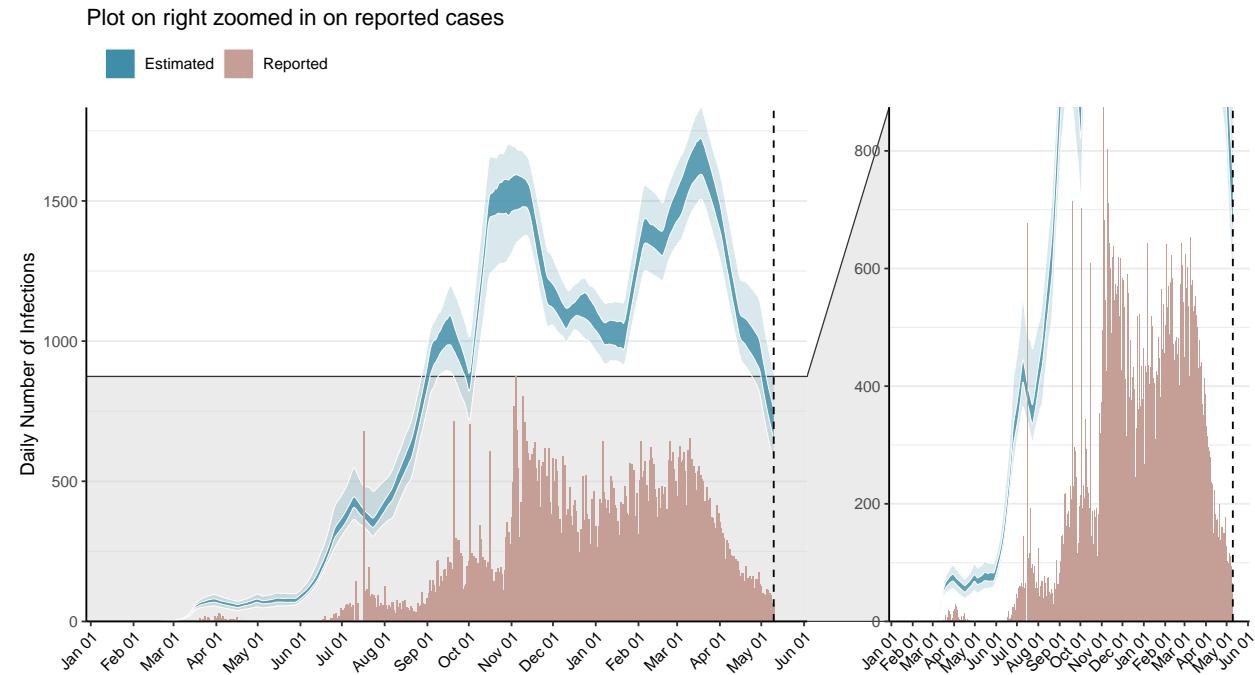
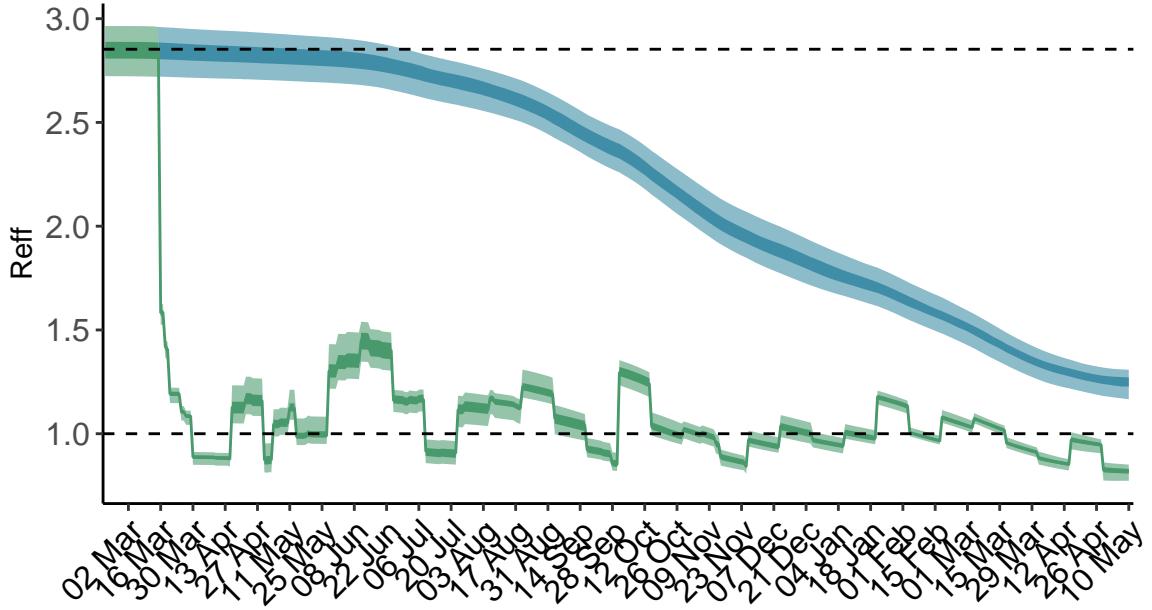


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Montenegro is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

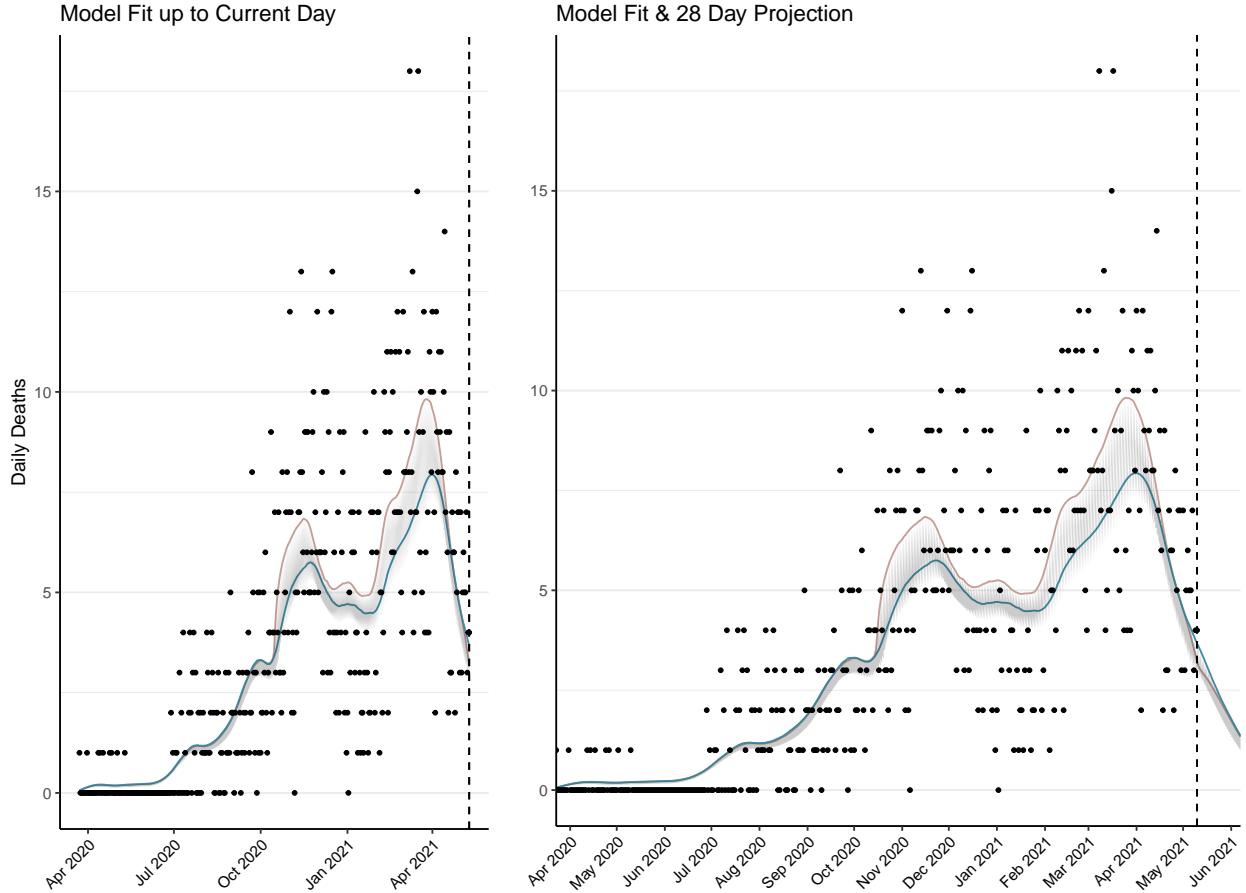


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 124 (95% CI: 122-126) patients requiring treatment with high-pressure oxygen at the current date to 45 (95% CI: 44-46) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 48 (95% CI: 48-48) patients requiring treatment with mechanical ventilation at the current date to 23 (95% CI: 23-24) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

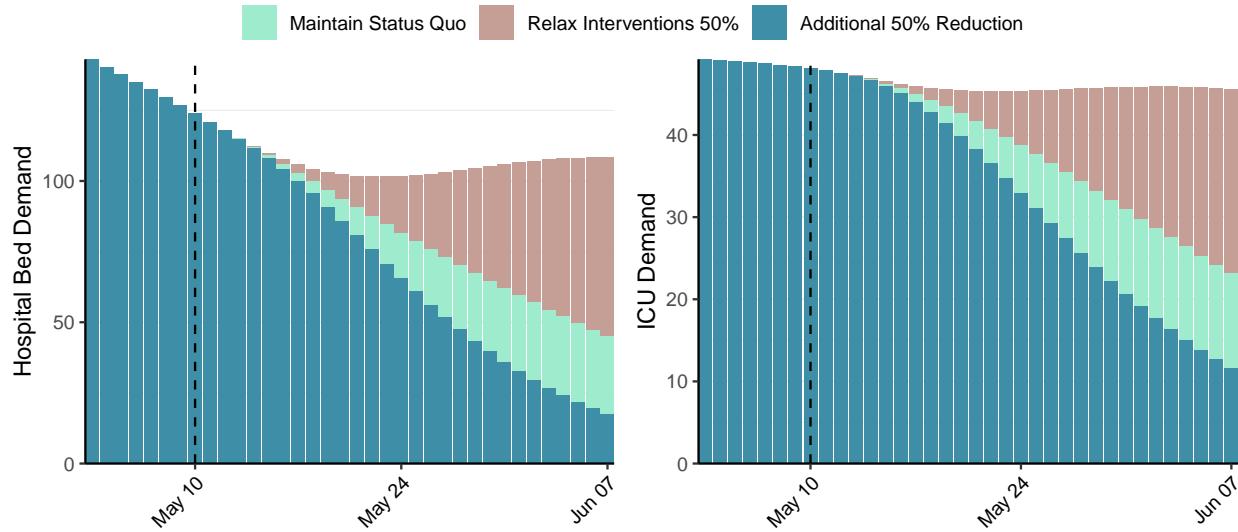


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 709 (95% CI: 692-725) at the current date to 26 (95% CI: 25-27) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 709 (95% CI: 692-725) at the current date to 1,182 (95% CI: 1,143-1,221) by 2021-06-07.

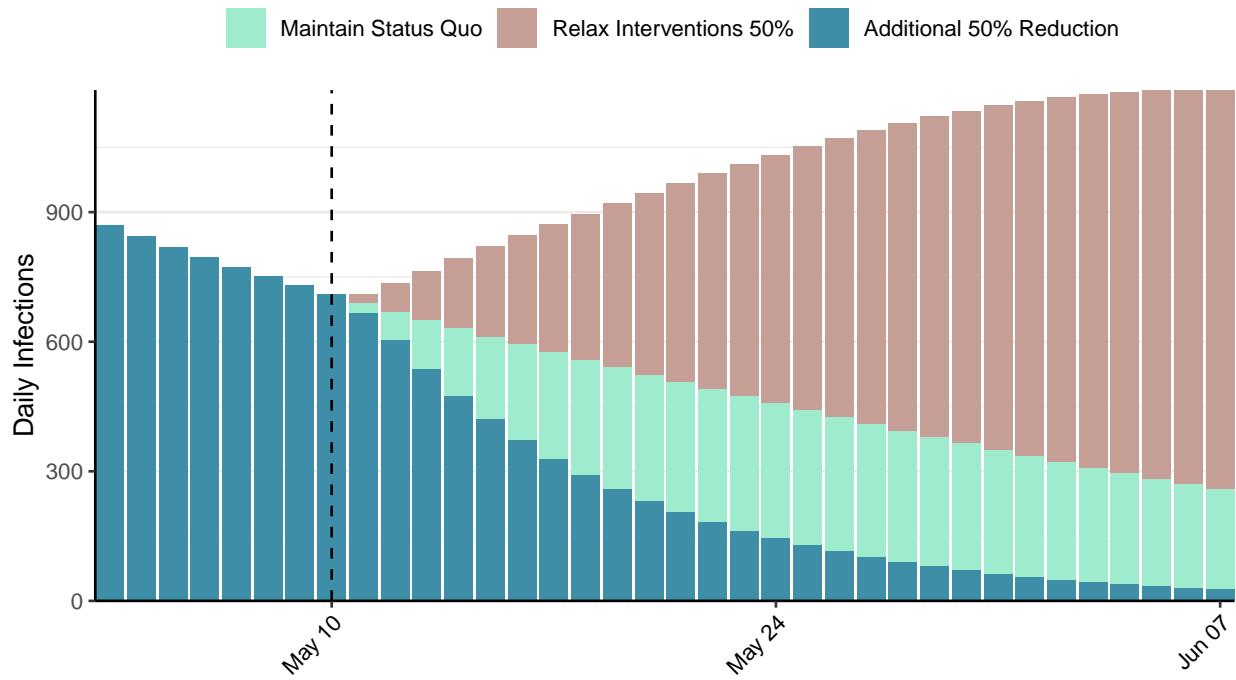


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Mongolia, 2021-05-10

[Download the report for Mongolia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
45,936	477	179	9	1.03 (95% CI: 0.76-1.34)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

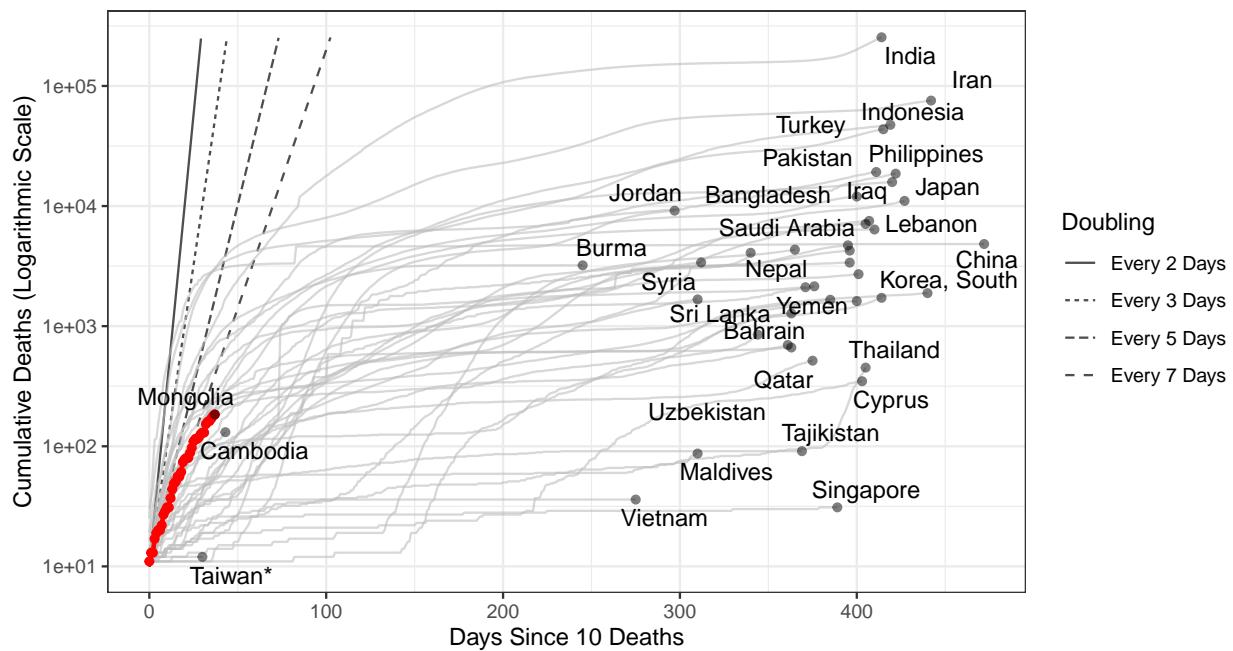


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 117,014 (95% CI: 111,058-122,970) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

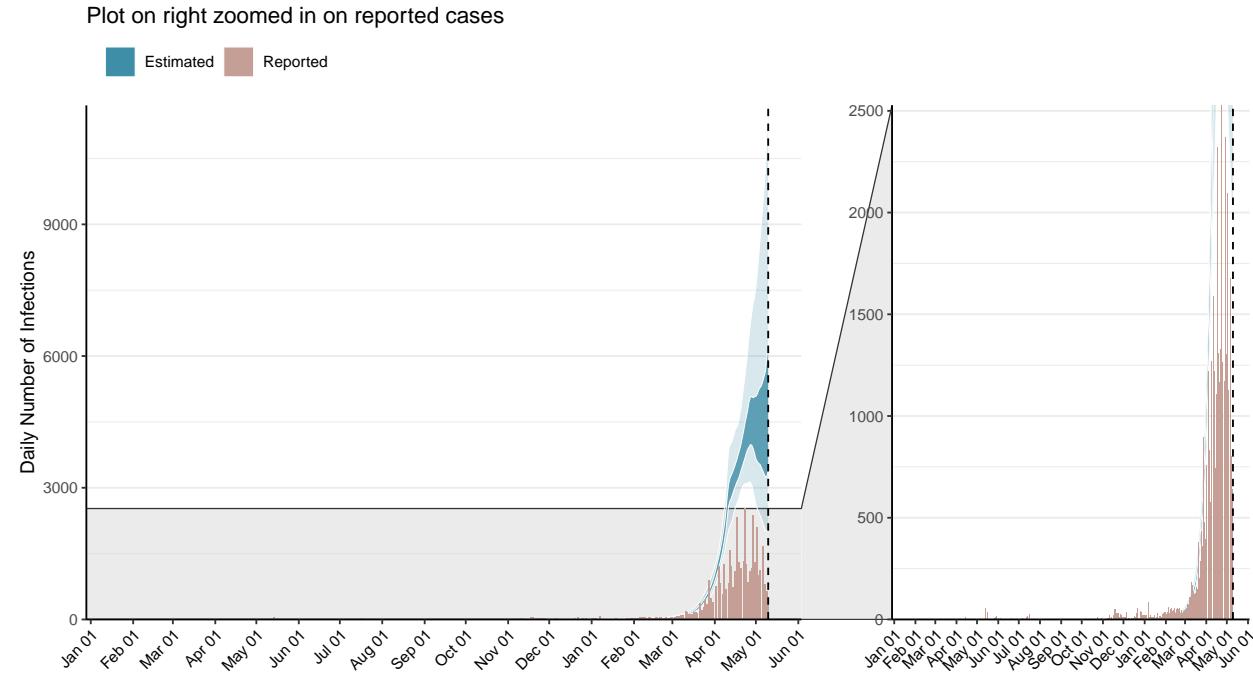
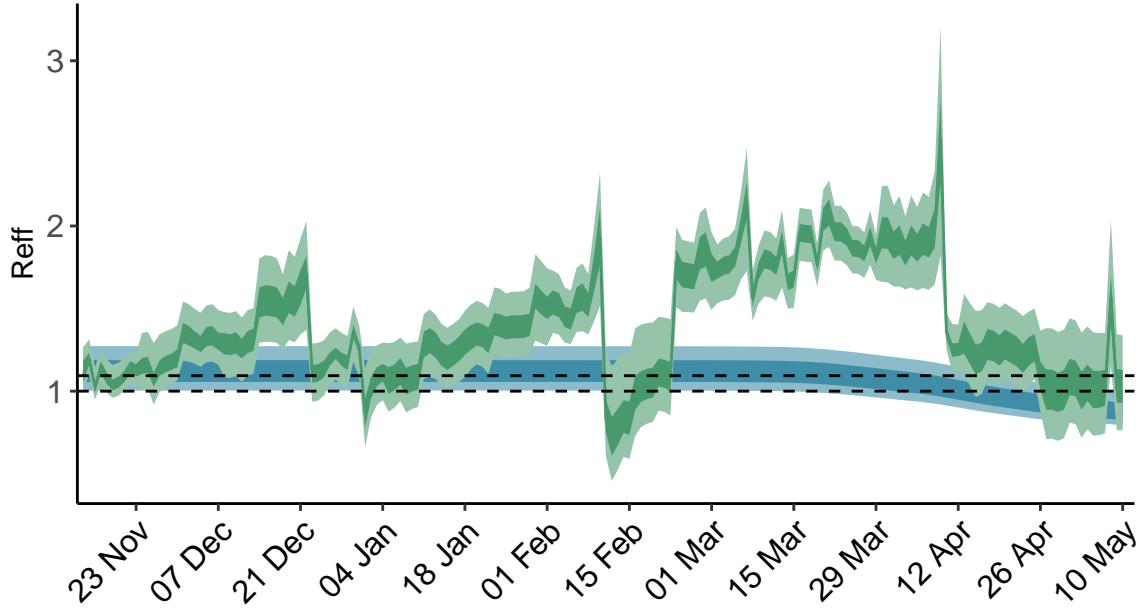


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

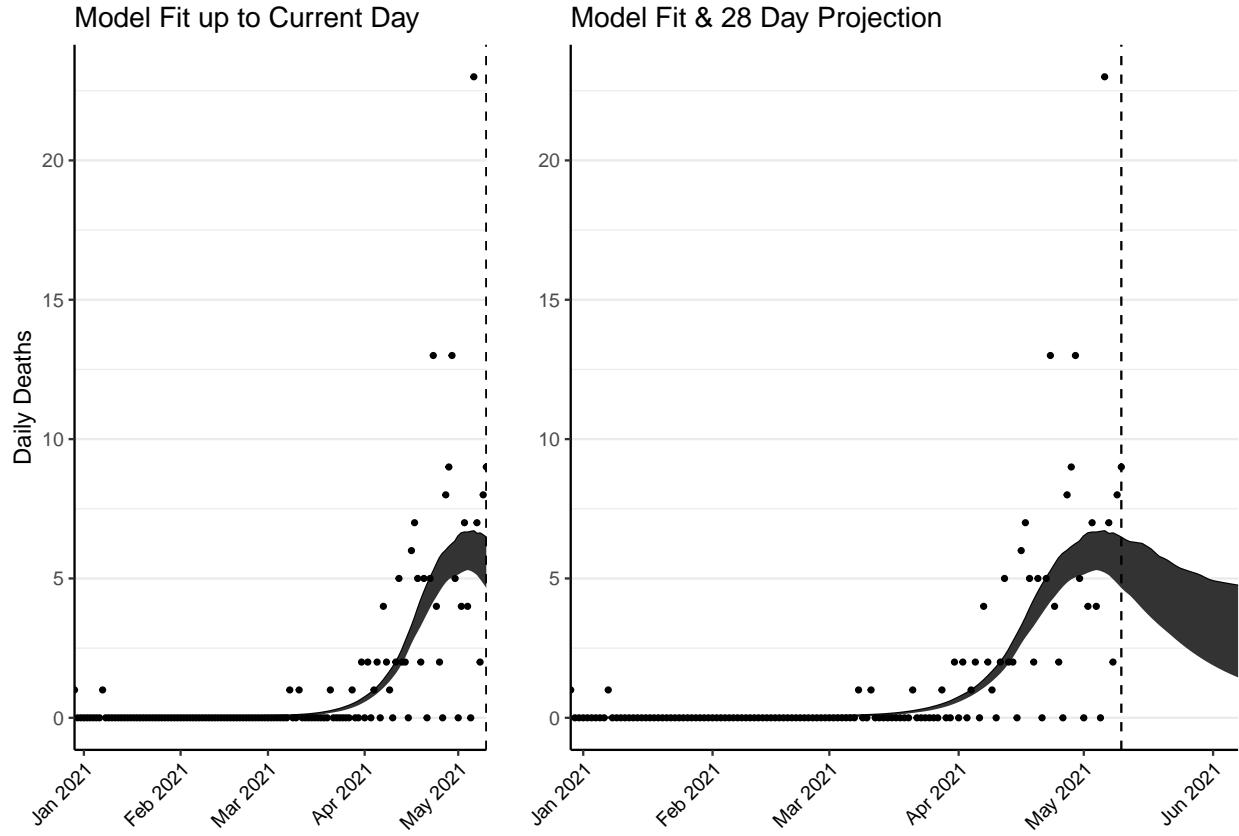


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 290 (95% CI: 275-306) patients requiring treatment with high-pressure oxygen at the current date to 346 (95% CI: 287-404) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 107 (95% CI: 102-112) patients requiring treatment with mechanical ventilation at the current date to 121 (95% CI: 102-139) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

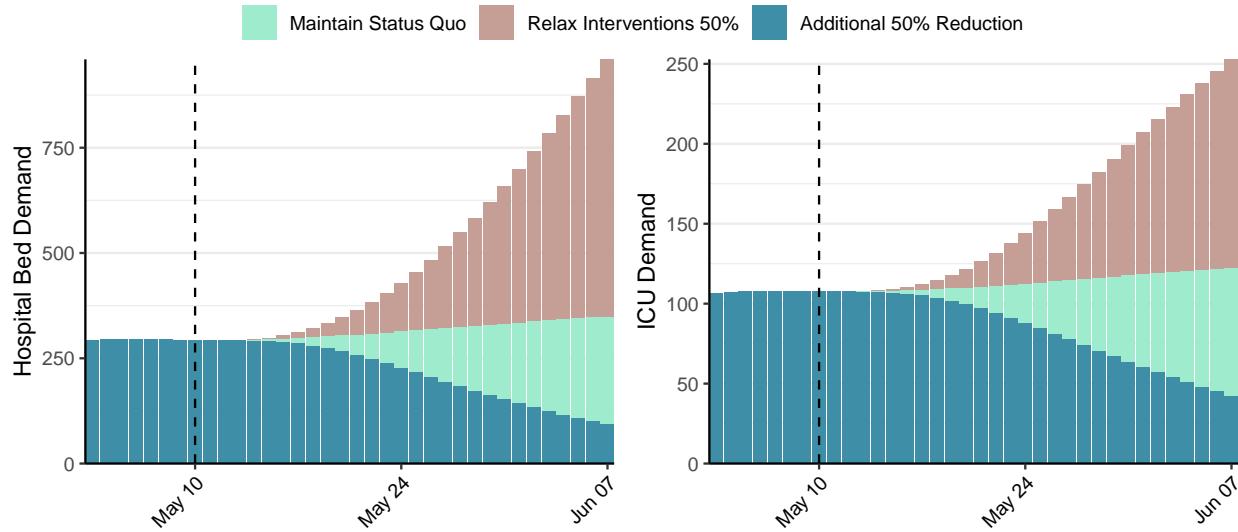


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 5,282 (95% CI: 4,740-5,824) at the current date to 584 (95% CI: 464-704) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 5,282 (95% CI: 4,740-5,824) at the current date to 25,403 (95% CI: 21,899-28,907) by 2021-06-07.

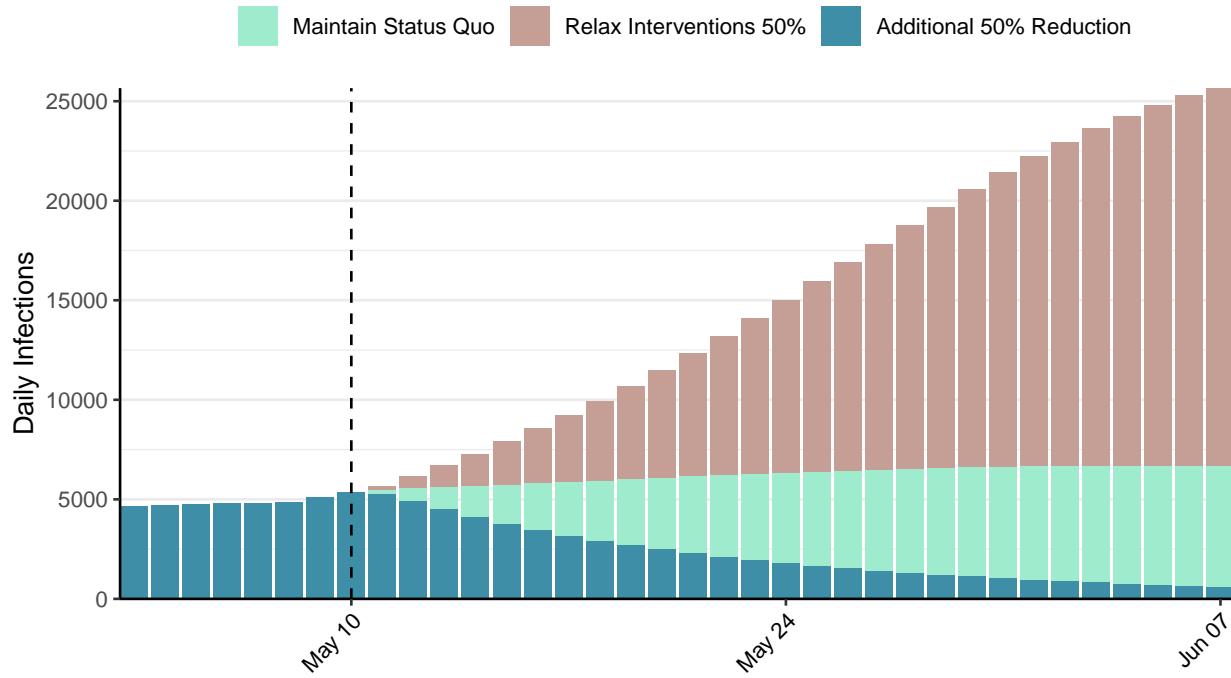


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Mozambique, 2021-05-10

[Download the report for Mozambique, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
70,283	71	859	2	0.8 (95% CI: 0.73-0.87)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

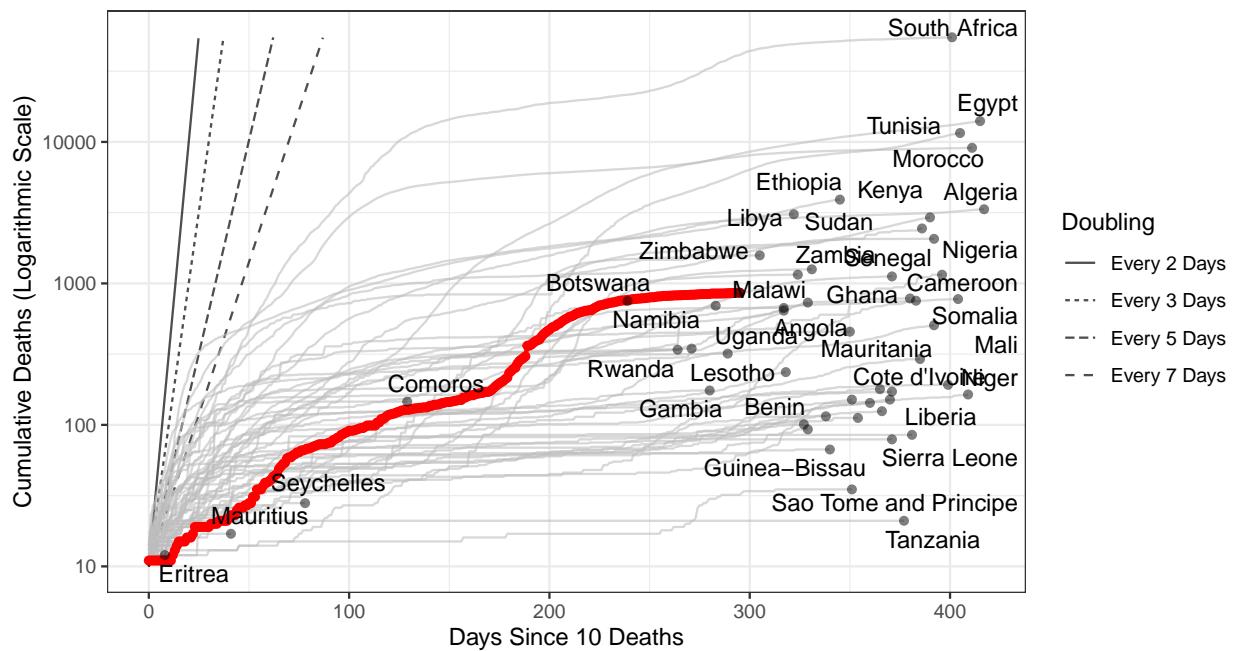


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 11,851 (95% CI: 11,405-12,296) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

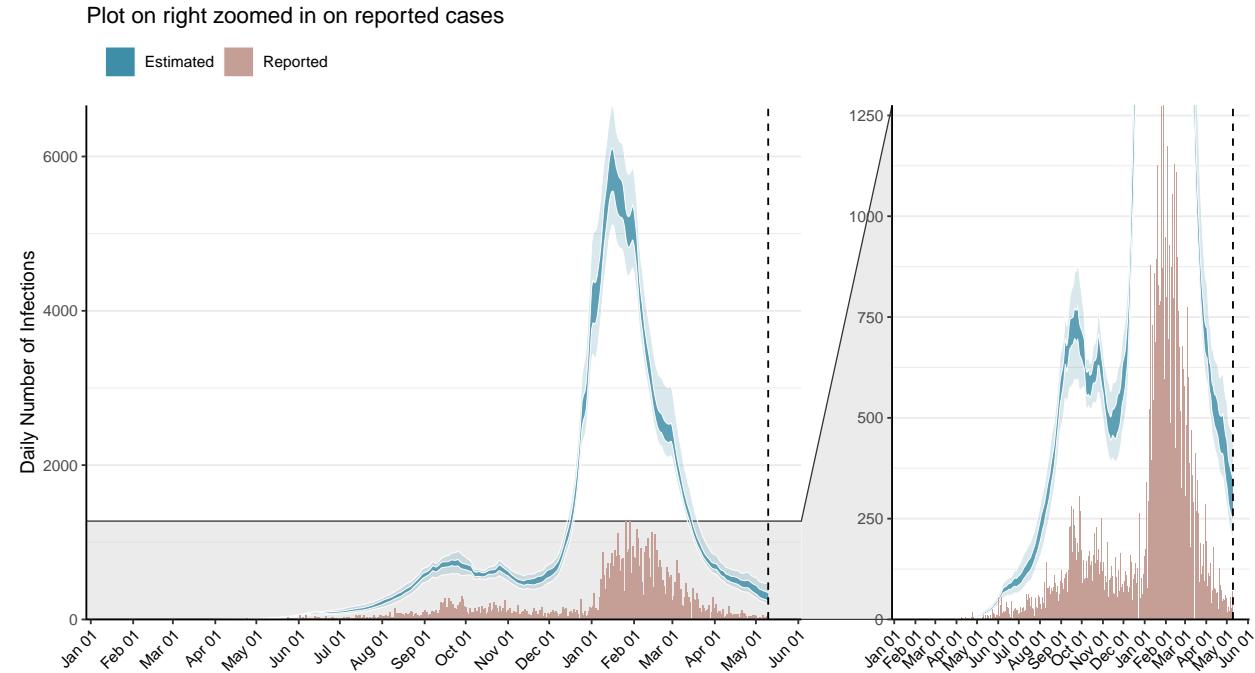
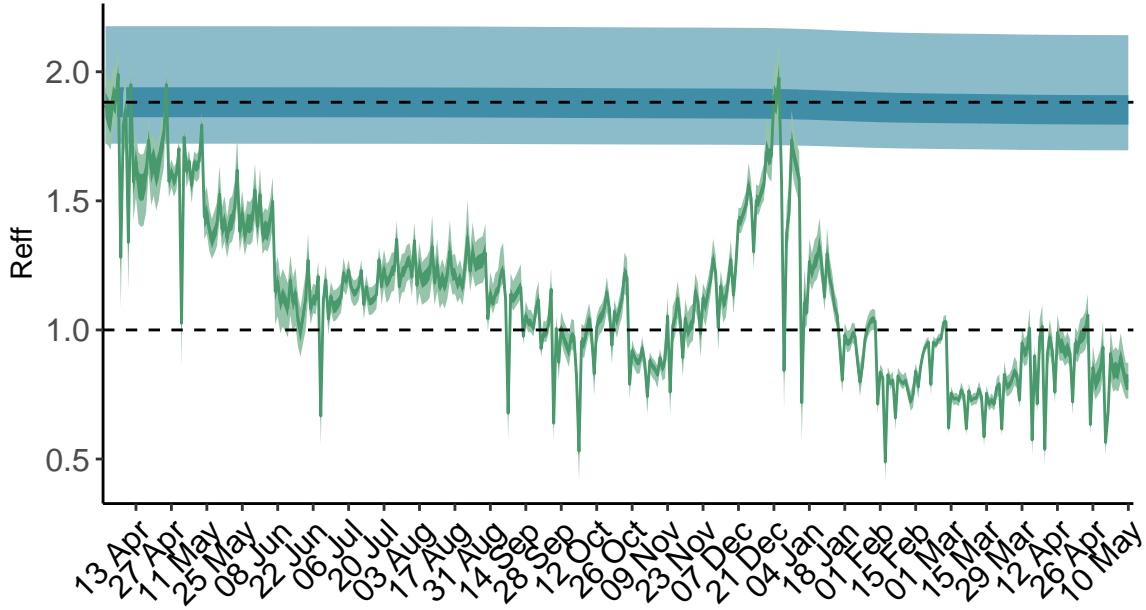


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

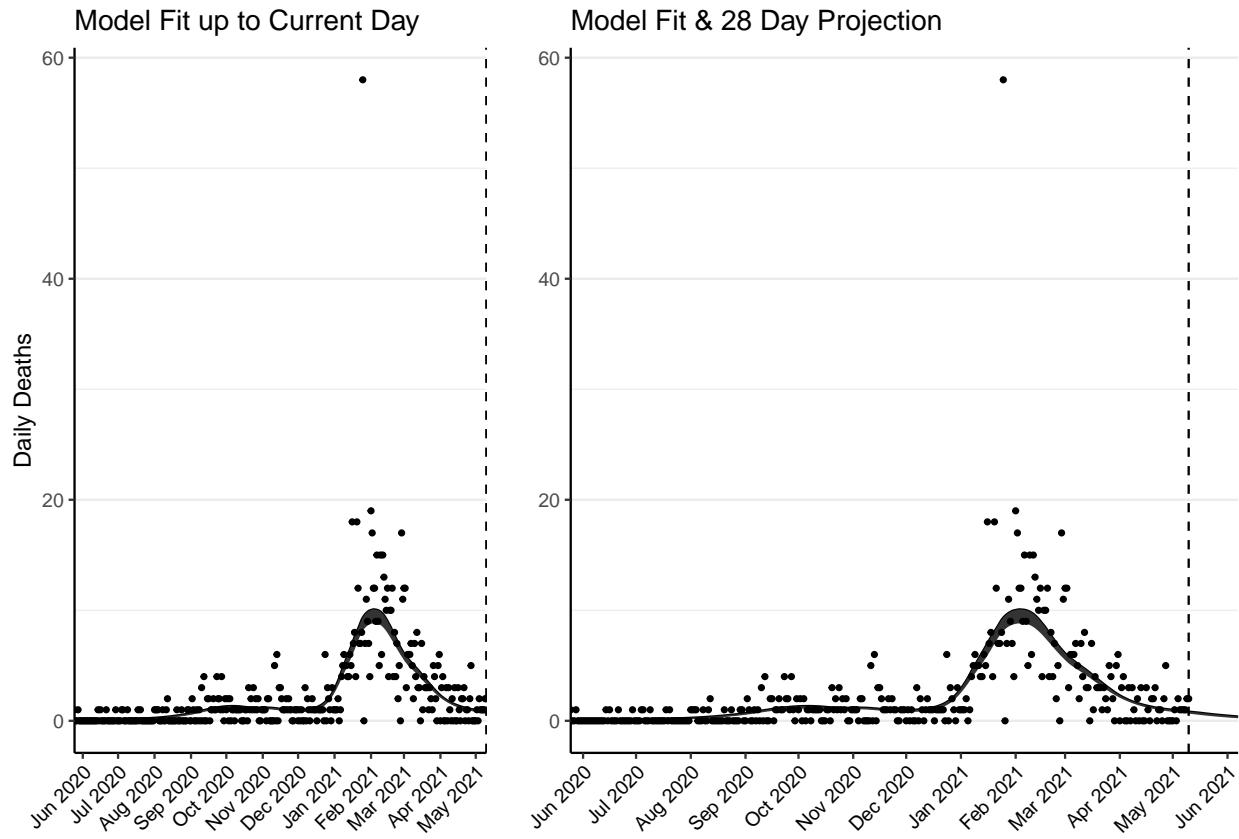


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 31 (95% CI: 30-32) patients requiring treatment with high-pressure oxygen at the current date to 14 (95% CI: 13-15) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 13 (95% CI: 13-14) patients requiring treatment with mechanical ventilation at the current date to 6 (95% CI: 6-7) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

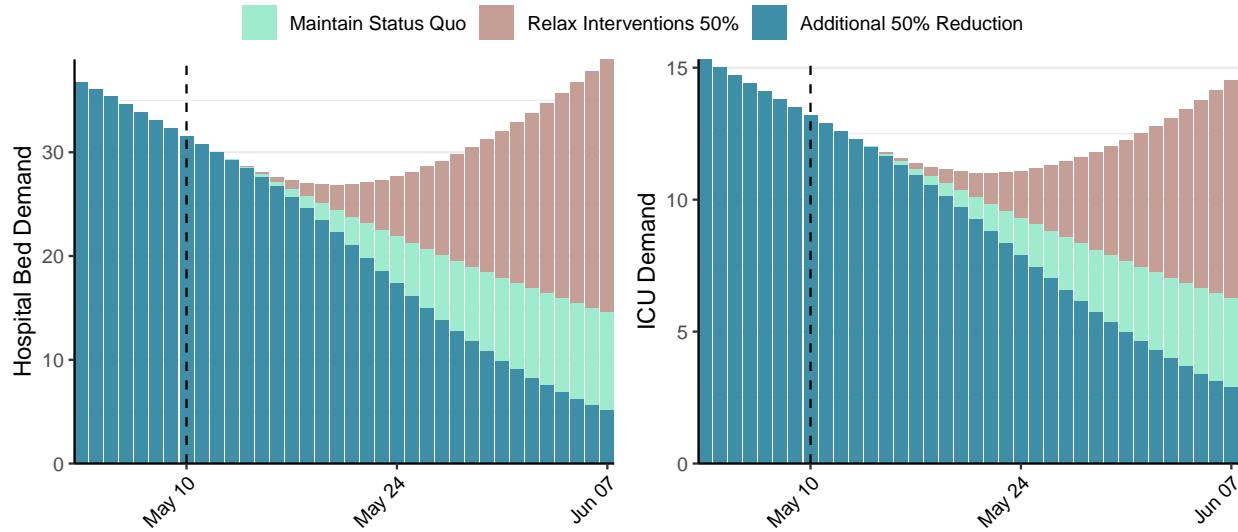


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 303 (95% CI: 286-319) at the current date to 12 (95% CI: 11-13) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 303 (95% CI: 286-319) at the current date to 708 (95% CI: 640-775) by 2021-06-07.

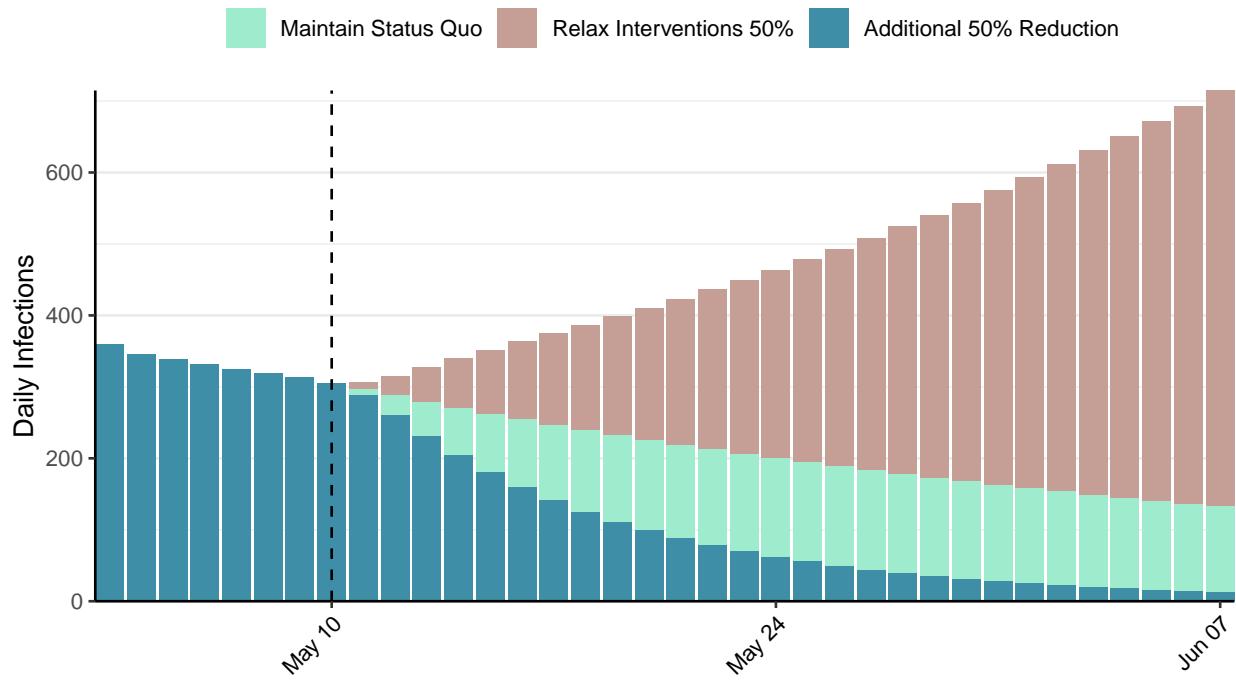


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Mauritania, 2021-05-10

[Download the report for Mauritania, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
18,691	24	456	0	0.91 (95% CI: 0.73-1.09)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

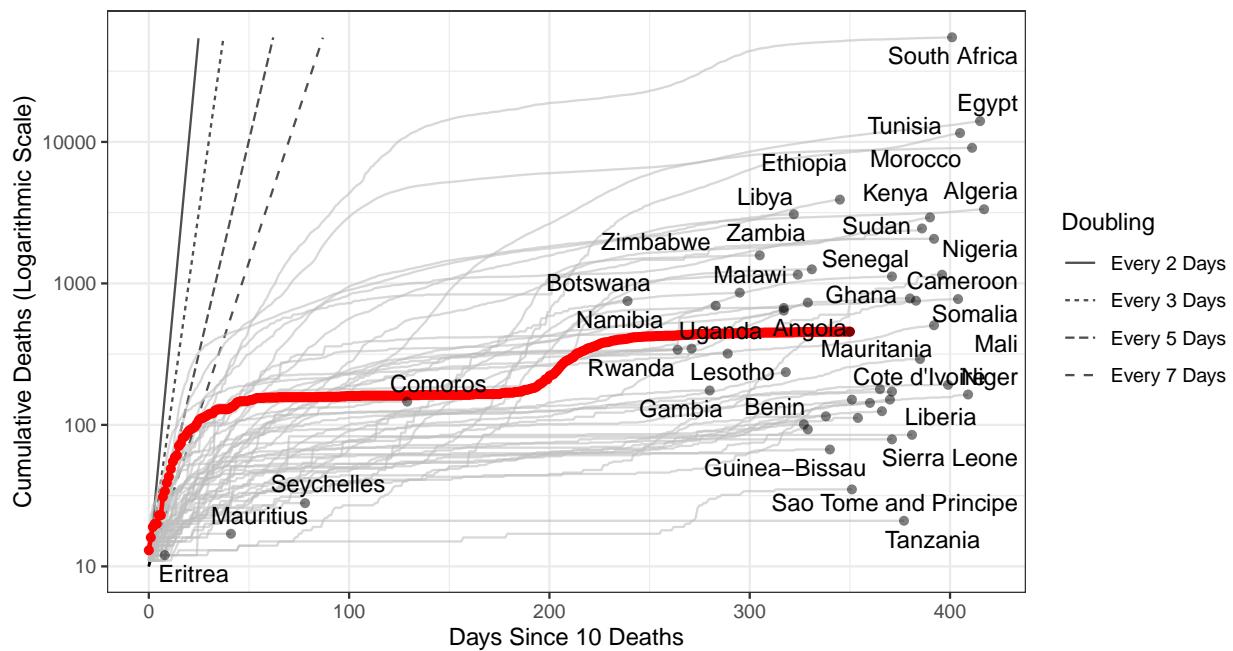


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 1,403 (95% CI: 1,288-1,518) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

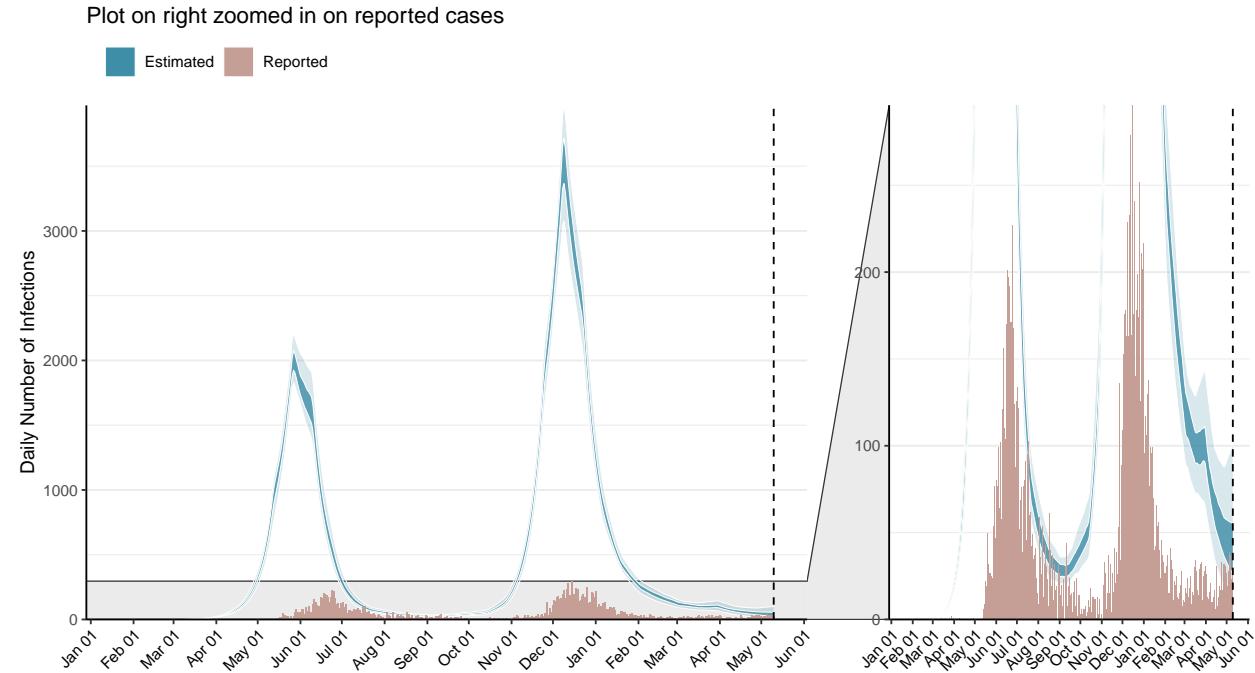
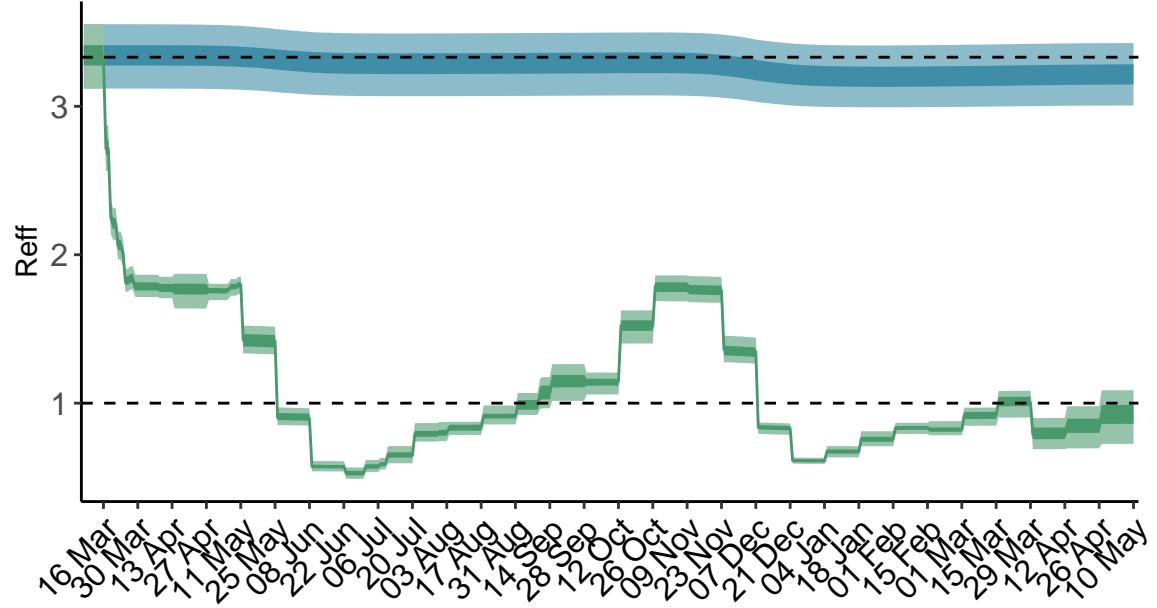


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Mauritania is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

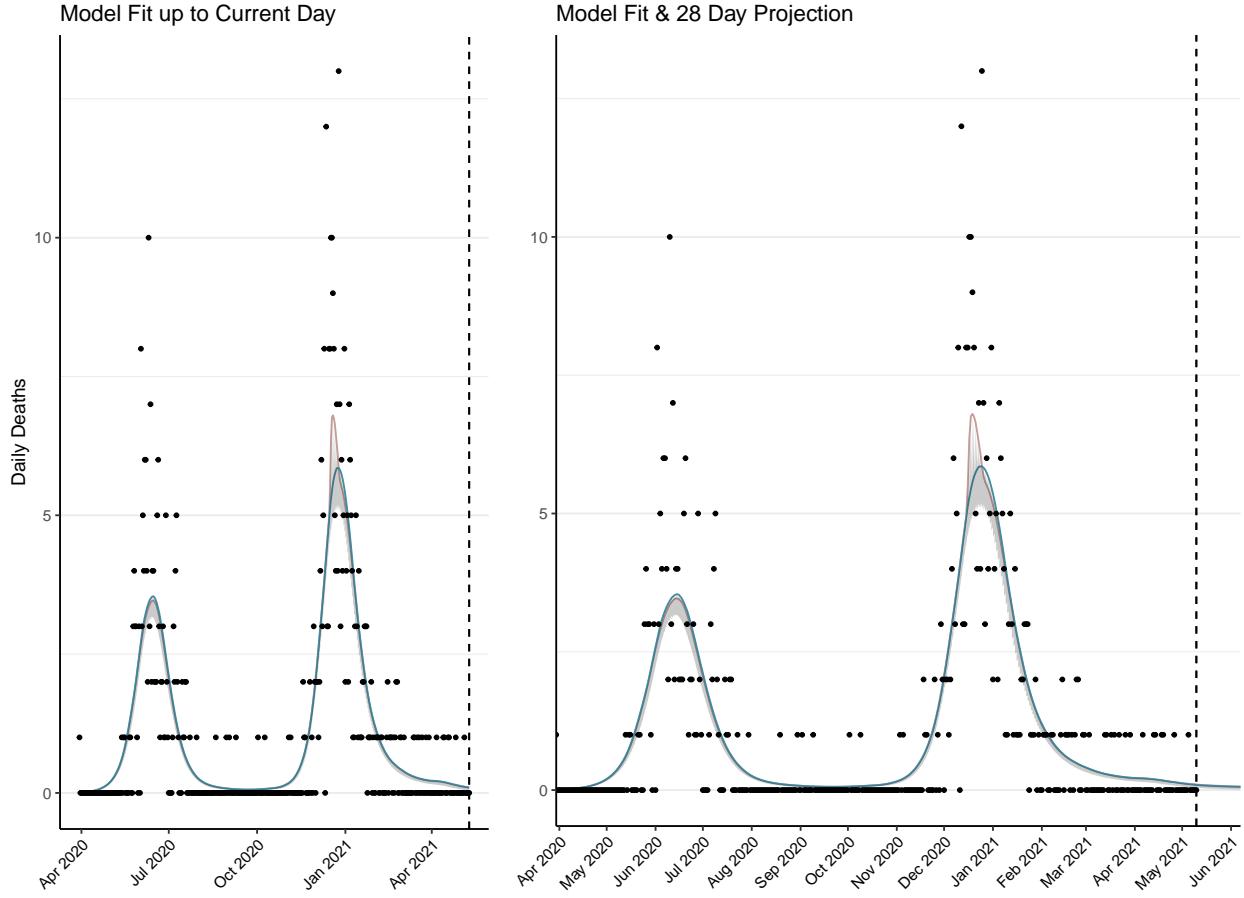


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 4 (95% CI: 4-4) patients requiring treatment with high-pressure oxygen at the current date to 3 (95% CI: 3-4) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 2 (95% CI: 2-2) patients requiring treatment with mechanical ventilation at the current date to 1 (95% CI: 1-2) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

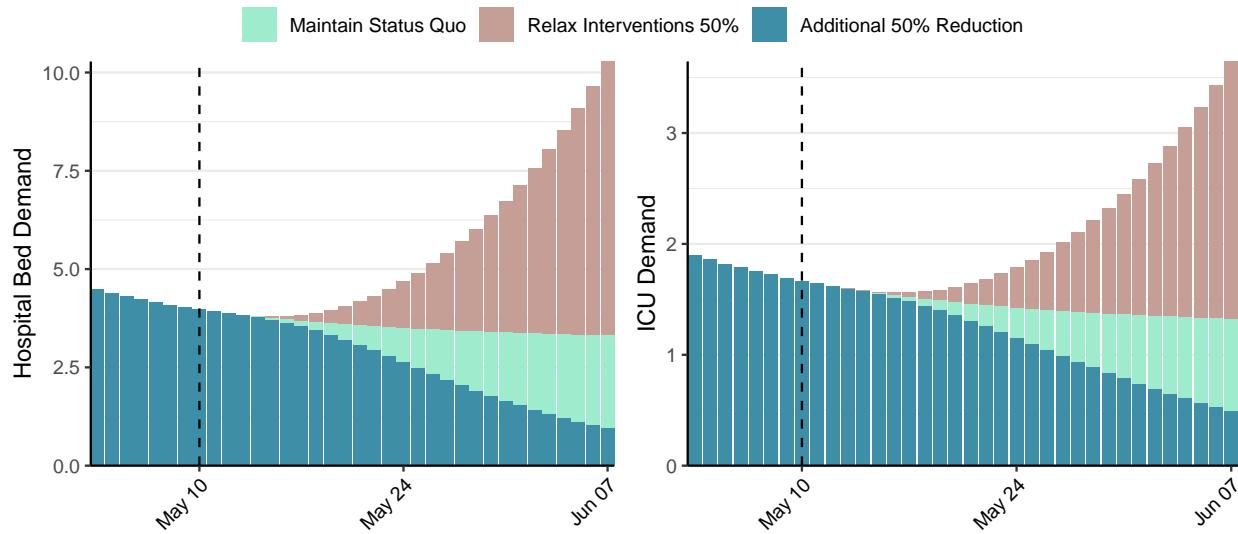


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 43 (95% CI: 38-48) at the current date to 3 (95% CI: 2-4) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 43 (95% CI: 38-48) at the current date to 243 (95% CI: 181-305) by 2021-06-07.

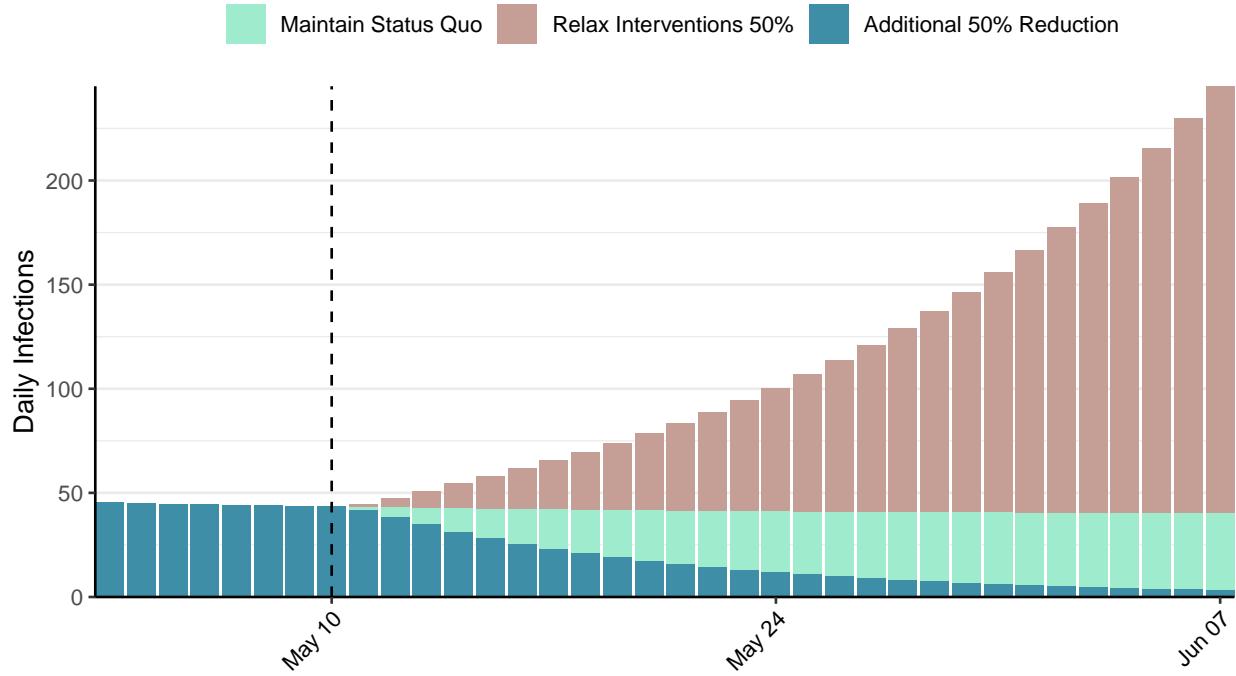


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Mauritius, 2021-05-10

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### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
1,256	10	17	0	1.34 (95% CI: 1.01-1.65)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

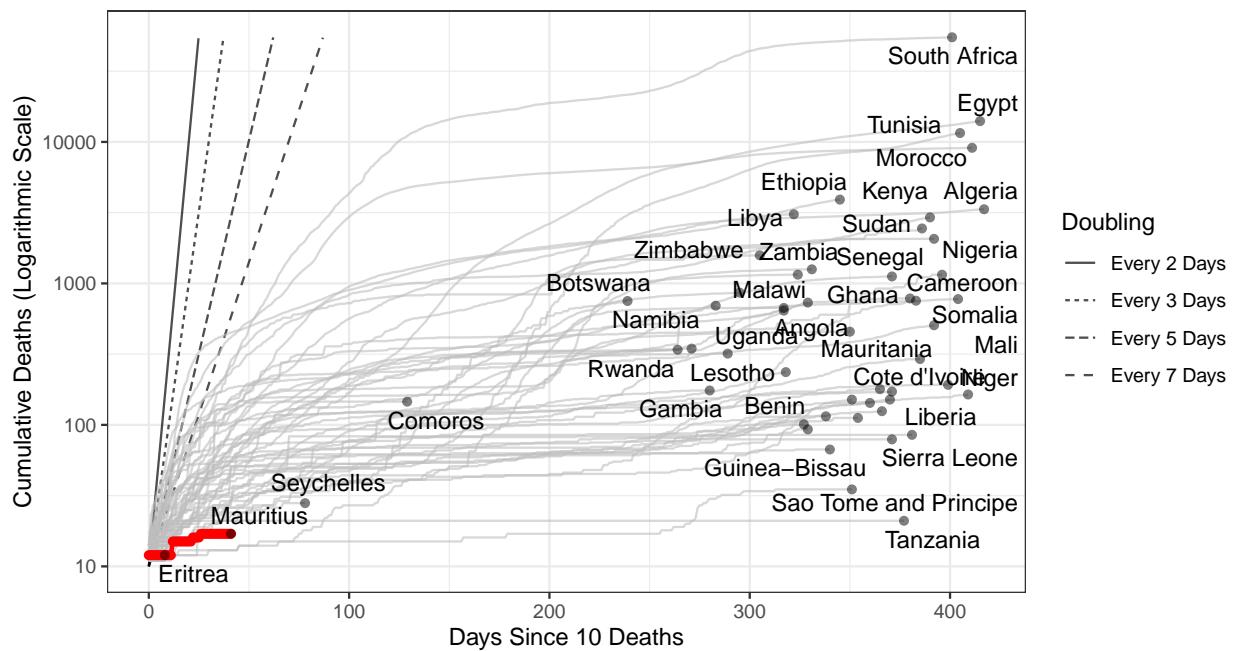


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 1,886 (95% CI: 1,692-2,080) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Mauritius has revised their historic reported cases and thus have reported negative cases.**

Plot on right zoomed in on reported cases

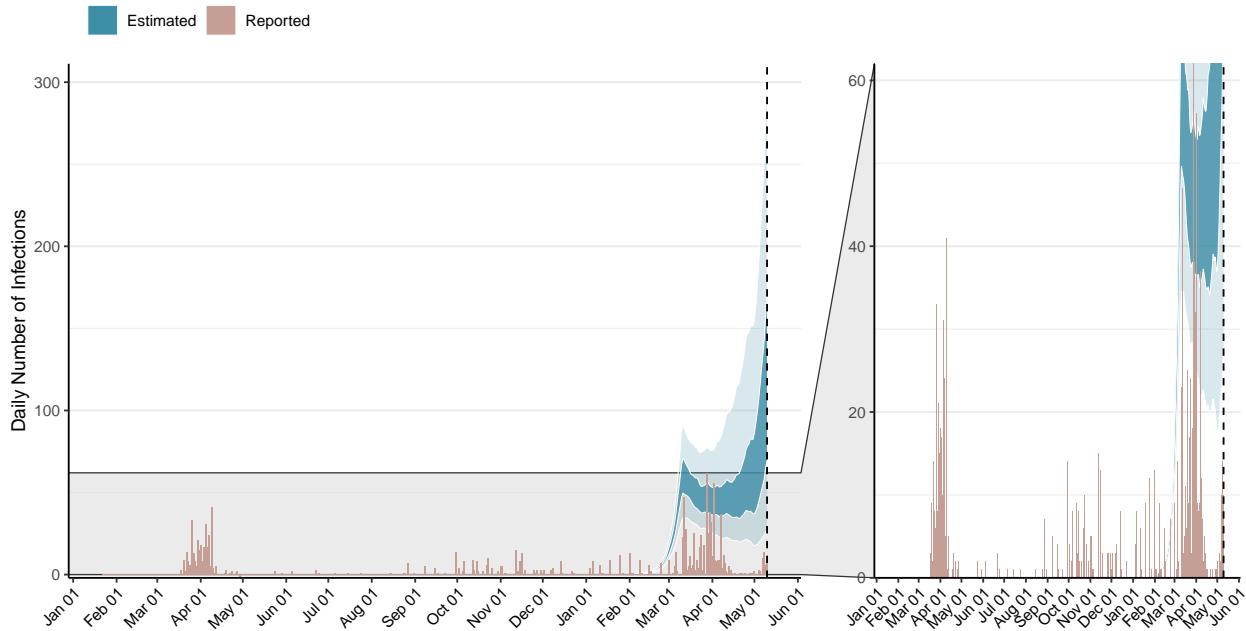
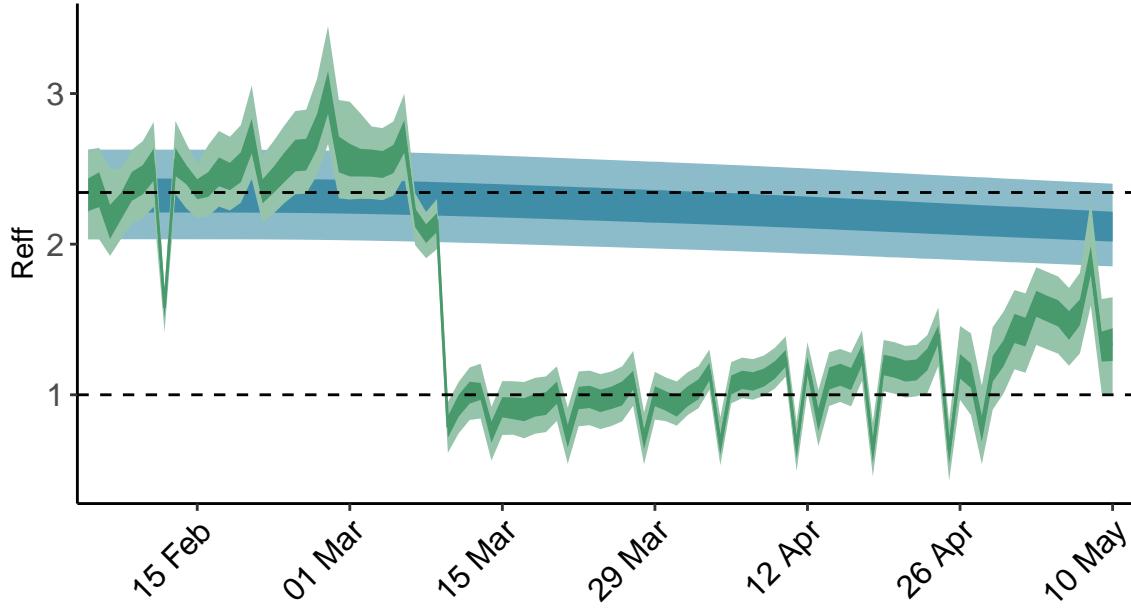


Figure 2: Daily number of infections estimated by fitting to the current total of deaths. Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

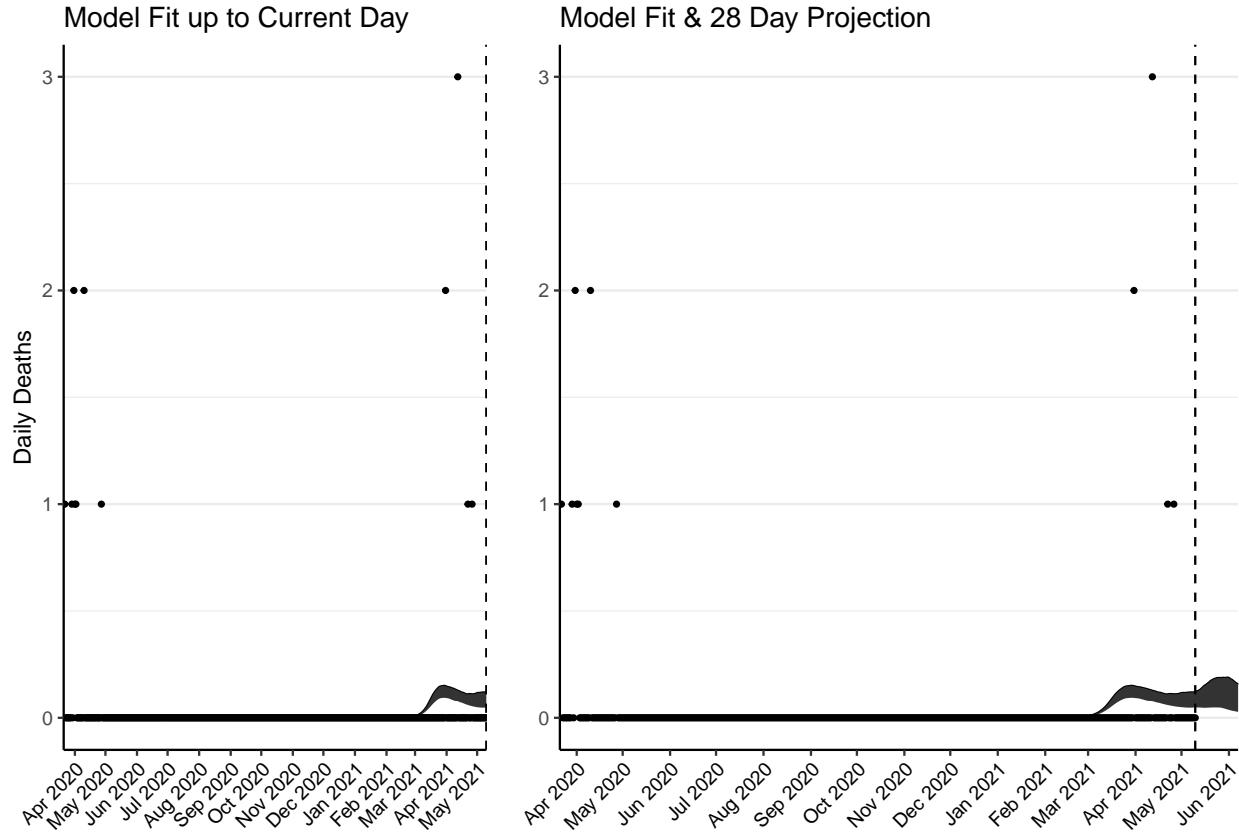


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 6 (95% CI: 5-7) patients requiring treatment with high-pressure oxygen at the current date to 8 (95% CI: 6-9) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 3 (95% CI: 2-3) patients requiring treatment with mechanical ventilation at the current date to 3 (95% CI: 3-4) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

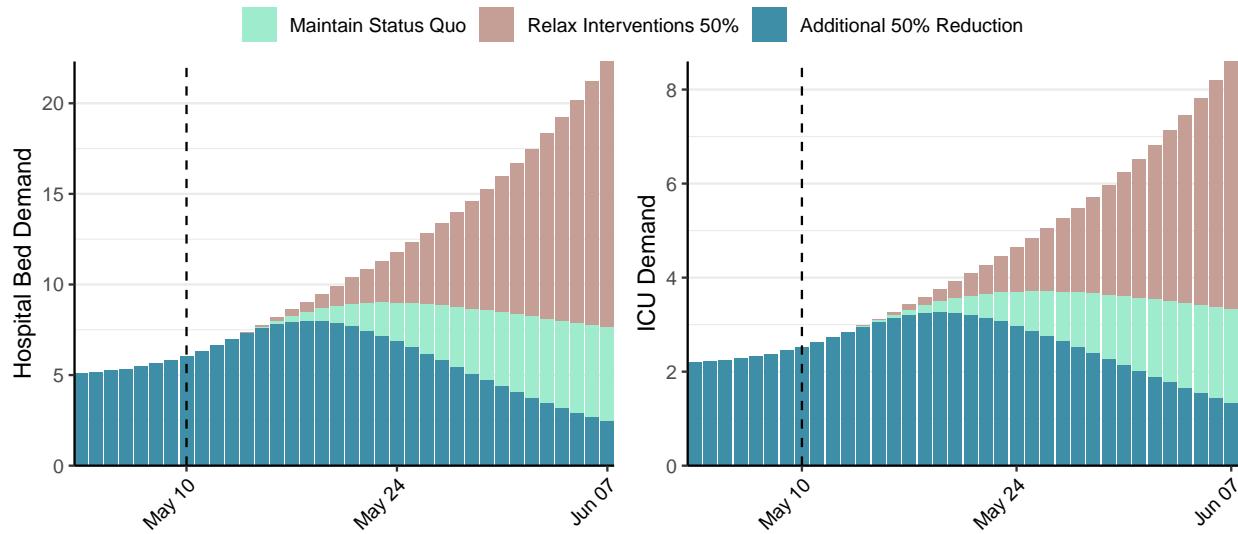


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 124 (95% CI: 109-138) at the current date to 6 (95% CI: 5-8) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 124 (95% CI: 109-138) at the current date to 454 (95% CI: 349-559) by 2021-06-07.

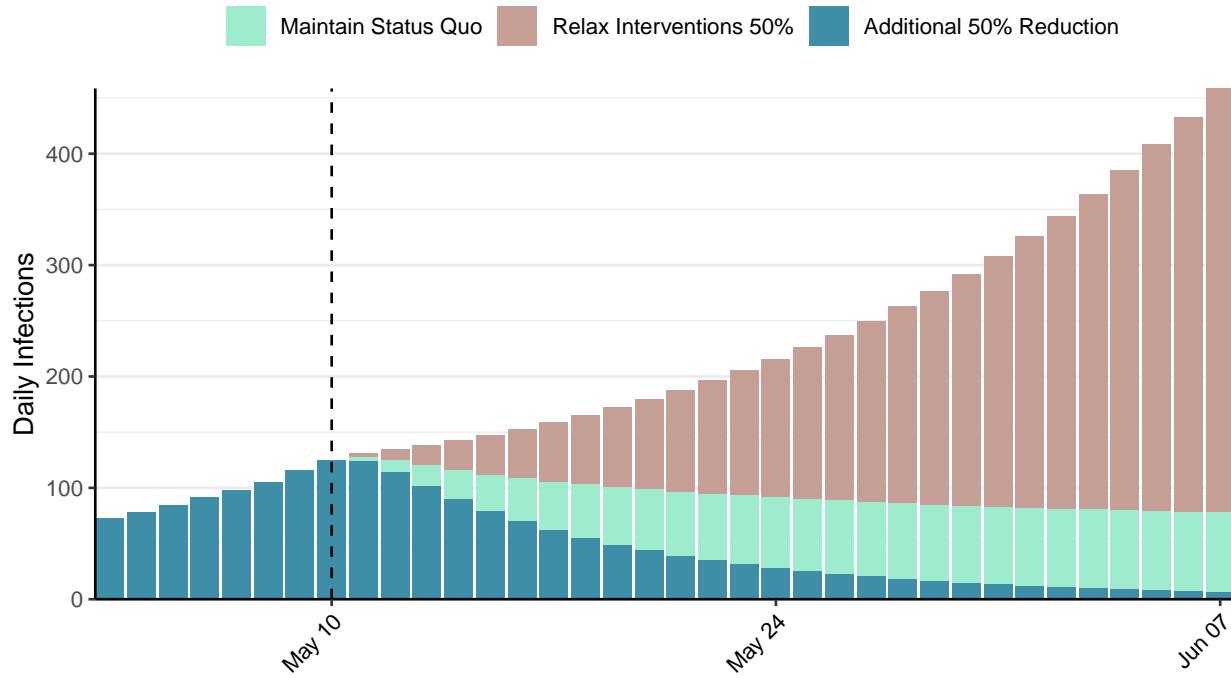


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Malawi, 2021-05-10

[Download the report for Malawi, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
34,180	9	1,153	0	0.63 (95% CI: 0.52-0.76)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

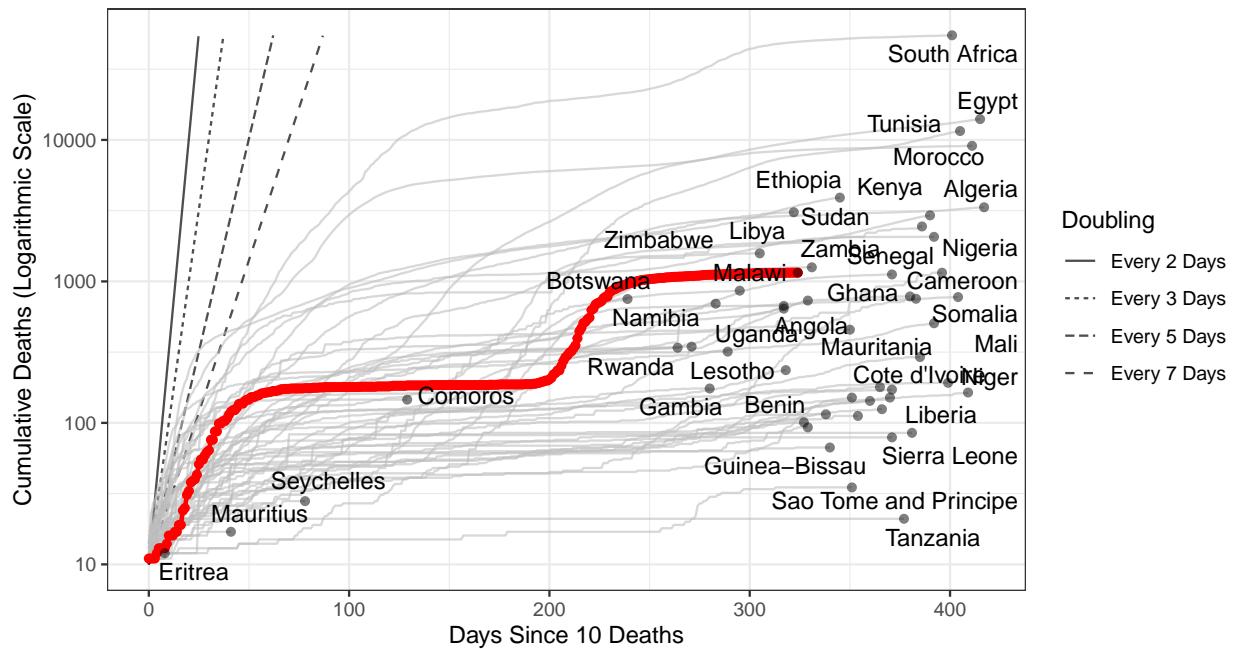


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 3,938 (95% CI: 3,698-4,178) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

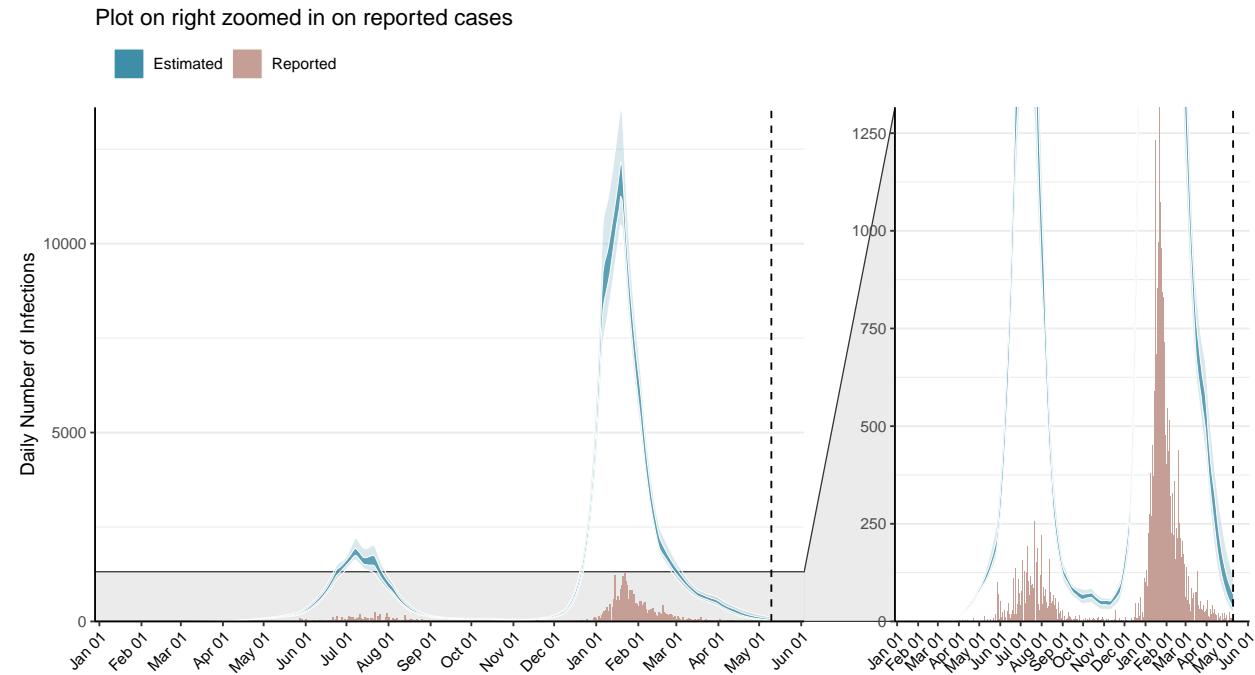
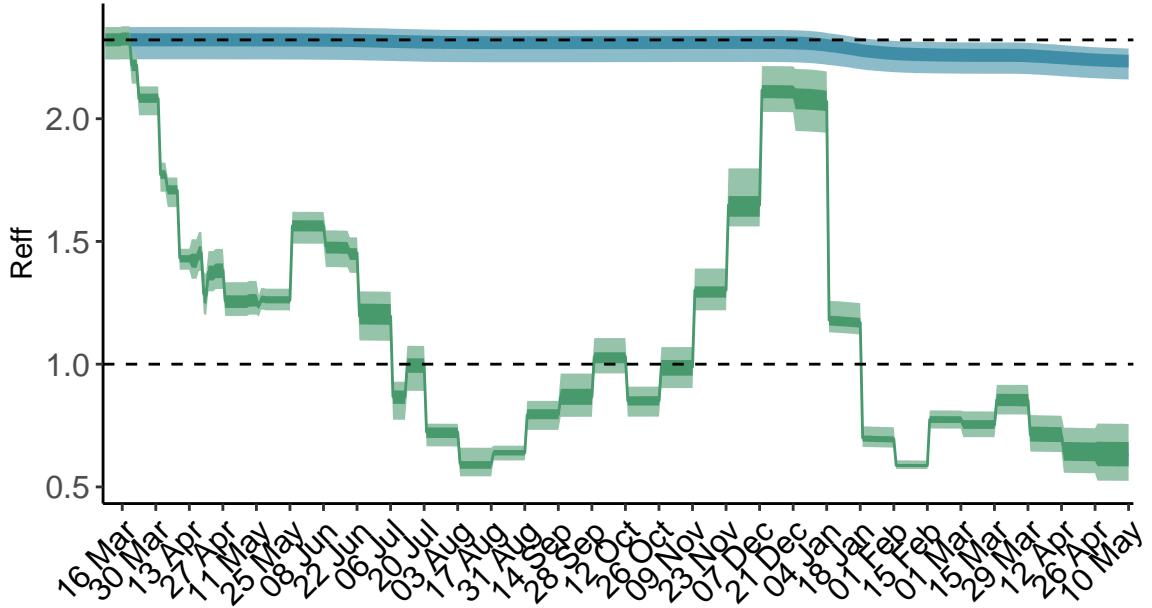


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

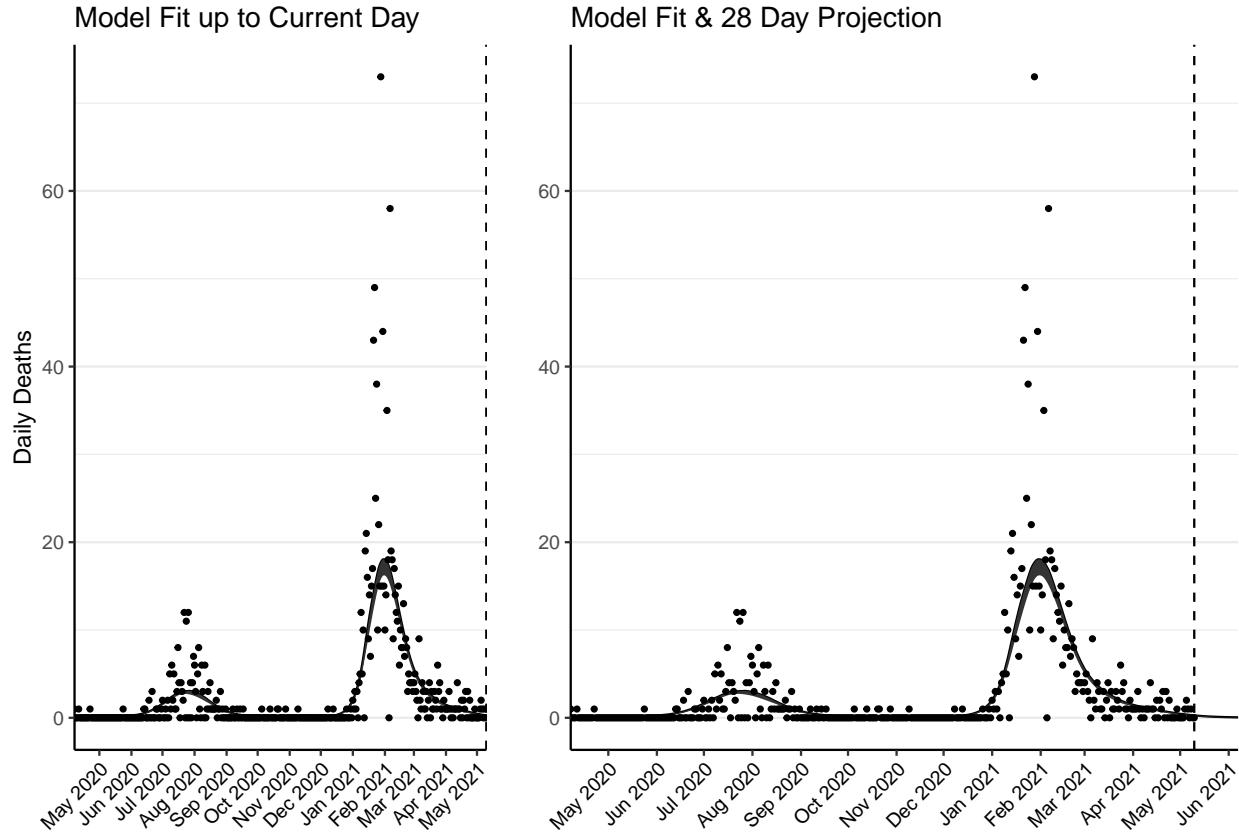


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 9 (95% CI: 9-10) patients requiring treatment with high-pressure oxygen at the current date to 2 (95% CI: 2-2) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 4 (95% CI: 4-5) patients requiring treatment with mechanical ventilation at the current date to 1 (95% CI: 1-1) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

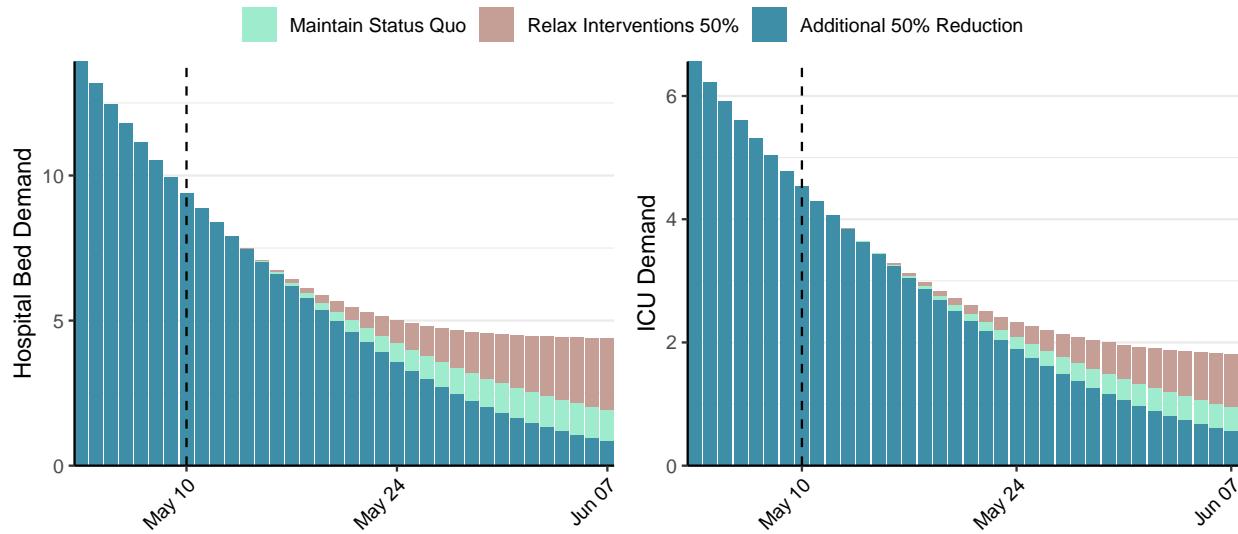


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 57 (95% CI: 51-63) at the current date to 1 (95% CI: 1-2) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 57 (95% CI: 51-63) at the current date to 60 (95% CI: 48-72) by 2021-06-07.

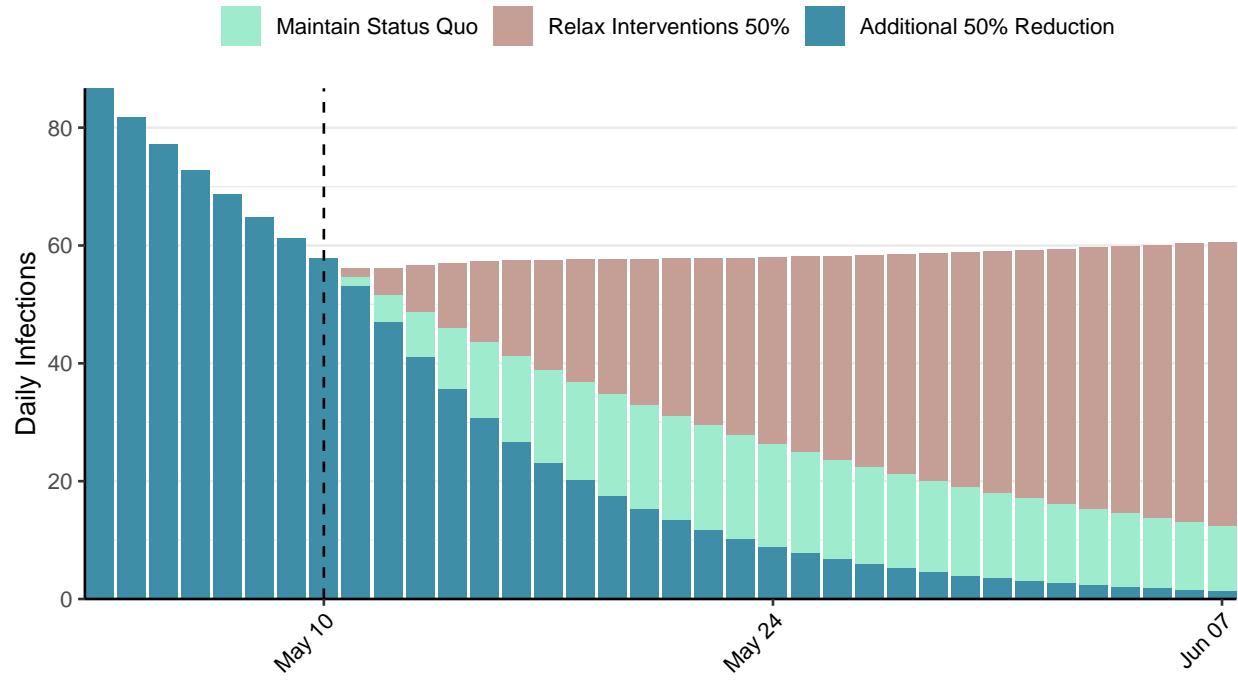


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Malaysia, 2021-05-10

[Download the report for Malaysia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
444,484	3,807	1,700	17	1.11 (95% CI: 1.06-1.19)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

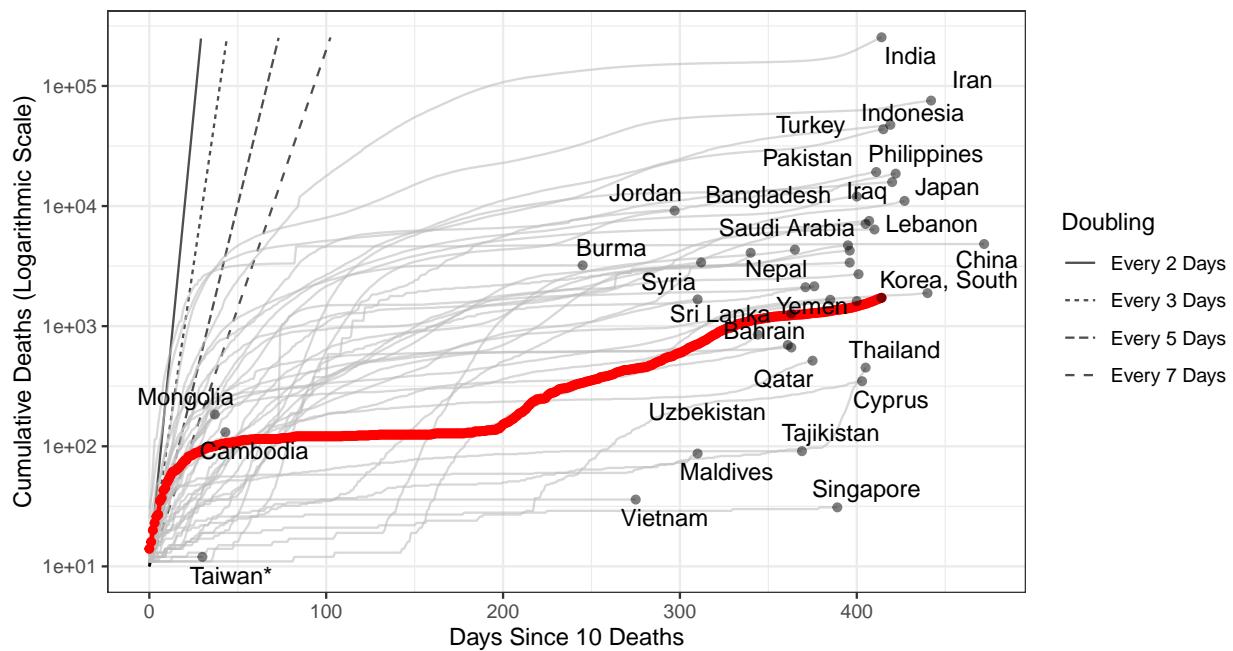


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 222,206 (95% CI: 215,636-228,776) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

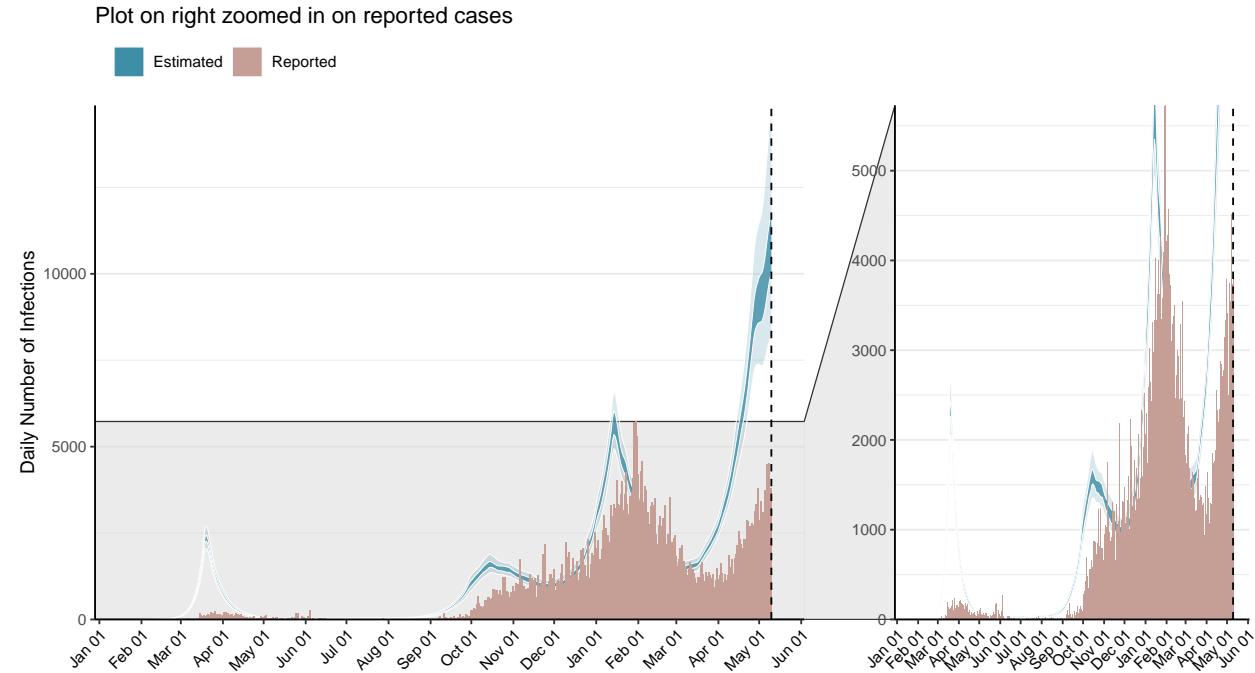
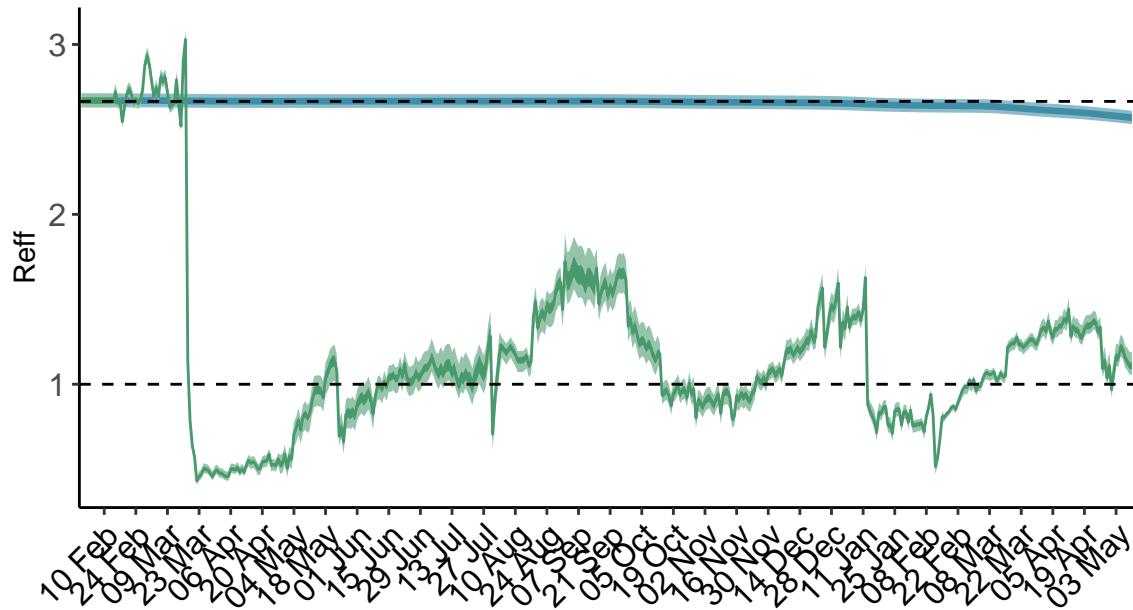


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

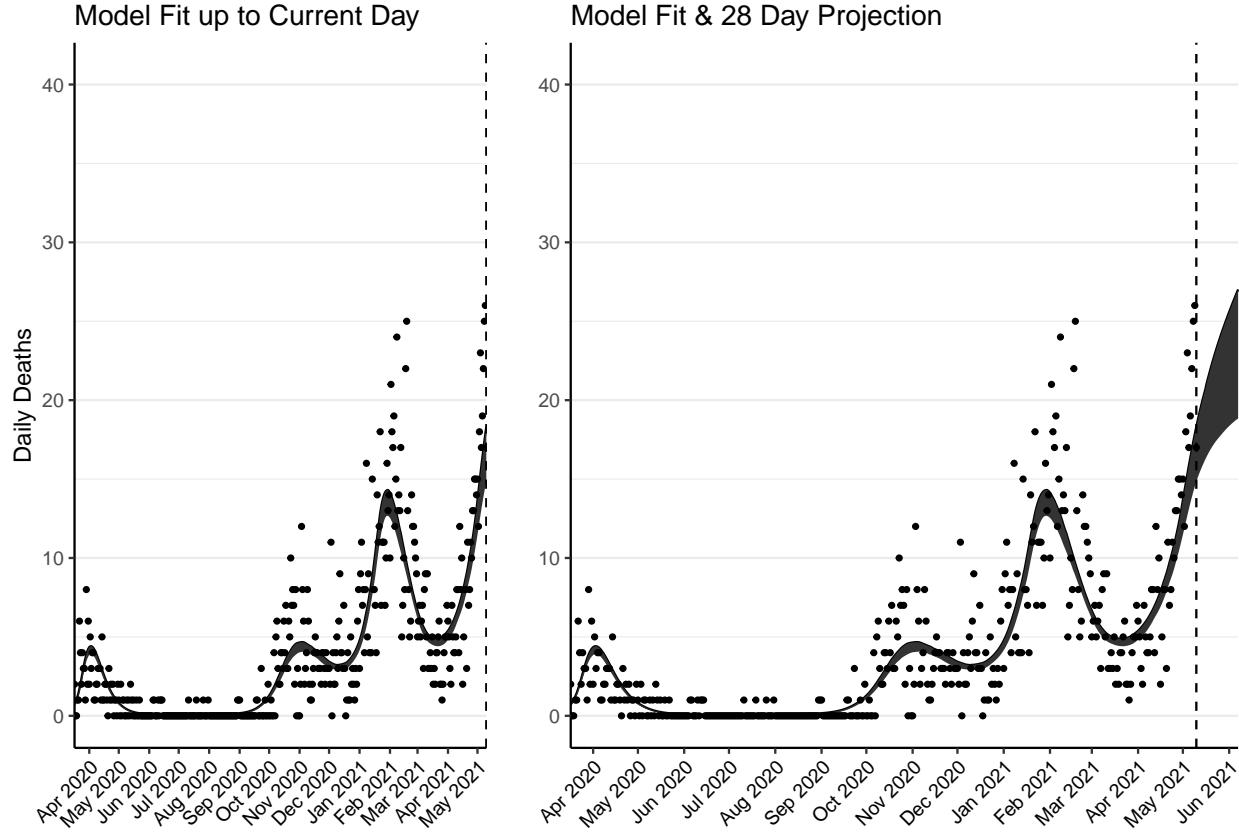


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 839 (95% CI: 814-864) patients requiring treatment with high-pressure oxygen at the current date to 1,273 (95% CI: 1,211-1,335) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 346 (95% CI: 336-356) patients requiring treatment with mechanical ventilation at the current date to 549 (95% CI: 523-574) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

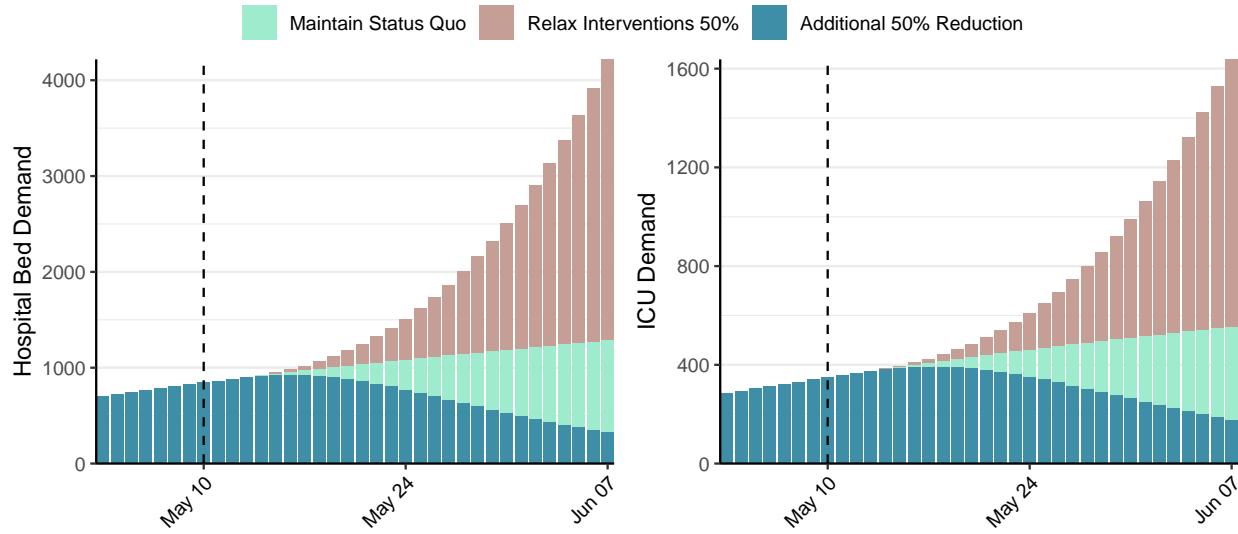
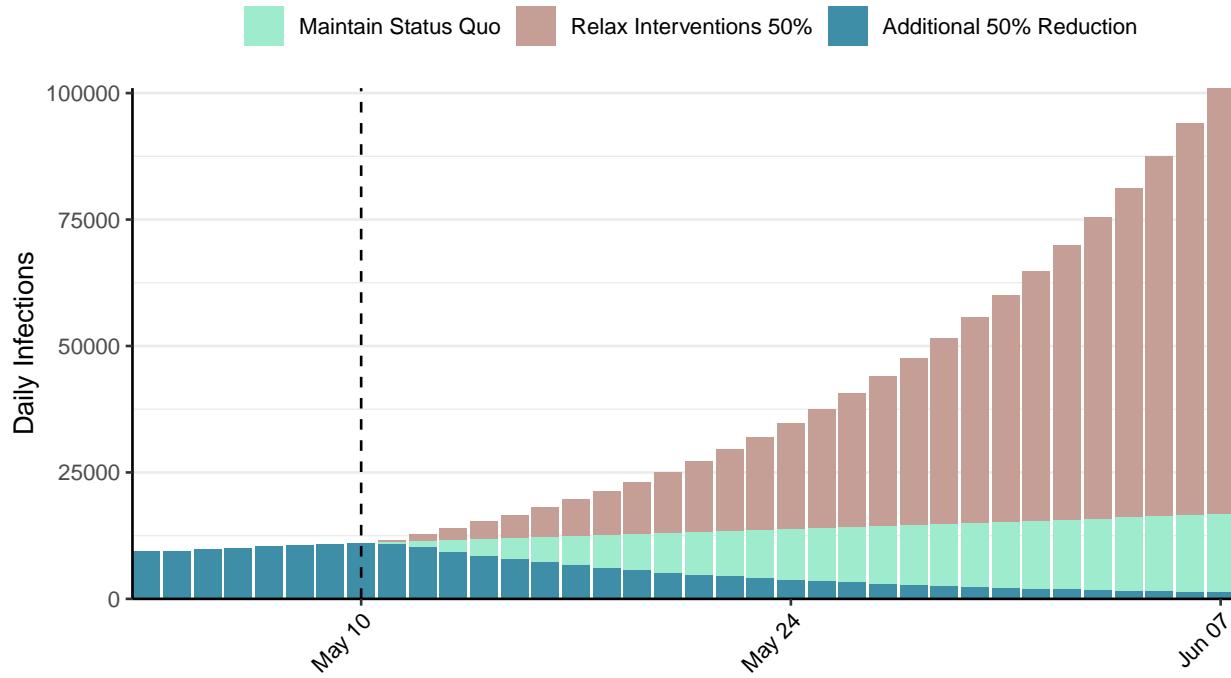


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 10,931 (95% CI: 10,536-11,326) at the current date to 1,210 (95% CI: 1,145-1,275) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 10,931 (95% CI: 10,536-11,326) at the current date to 99,985 (95% CI: 94,191-105,780) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Namibia, 2021-05-10

[Download the report for Namibia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
50,209	139	691	2	0.85 (95% CI: 0.74-0.98)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

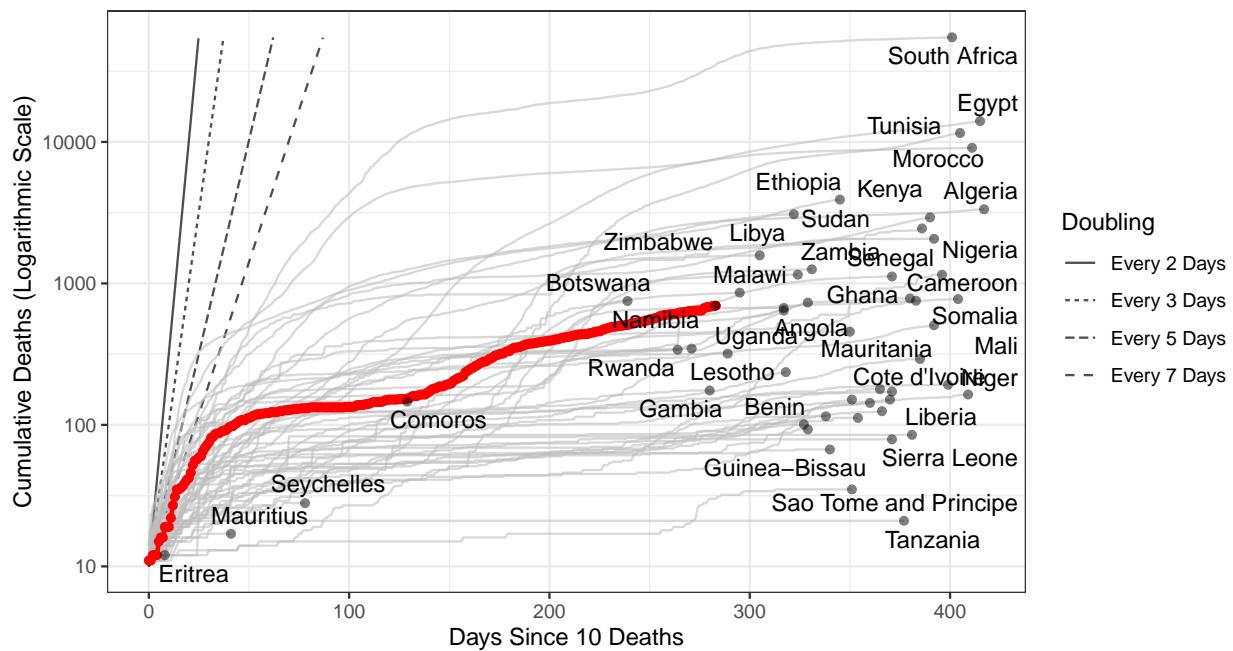


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 60,701 (95% CI: 58,551-62,850) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

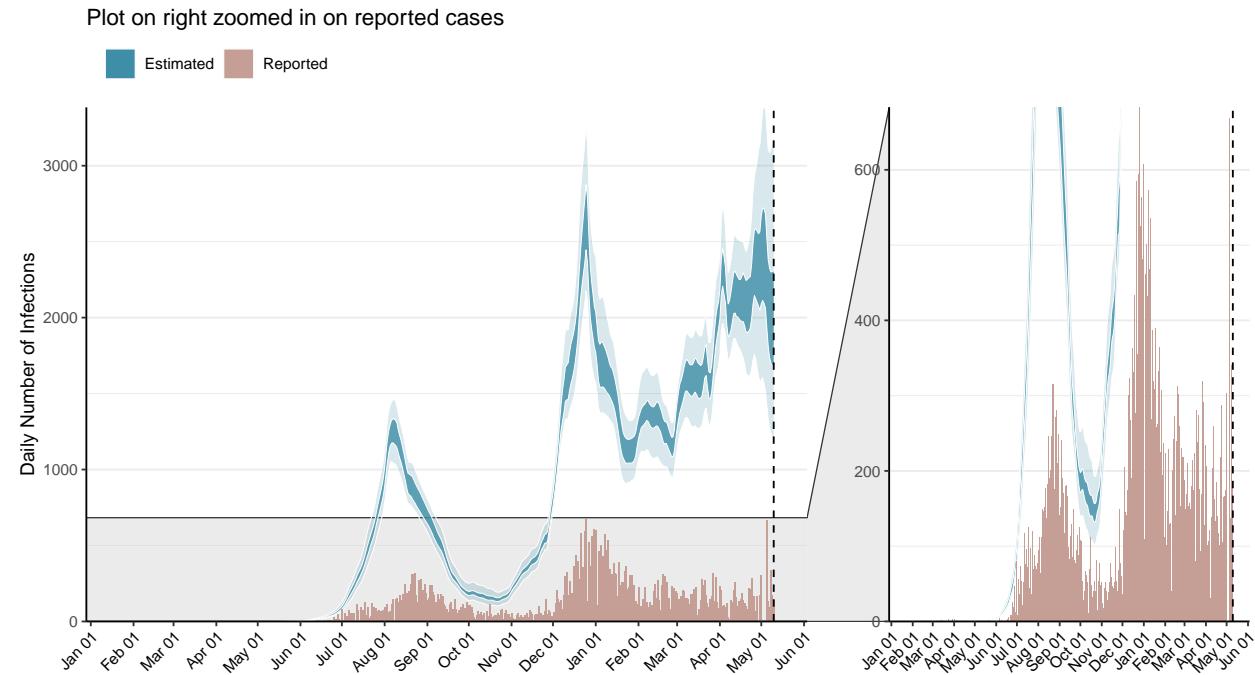
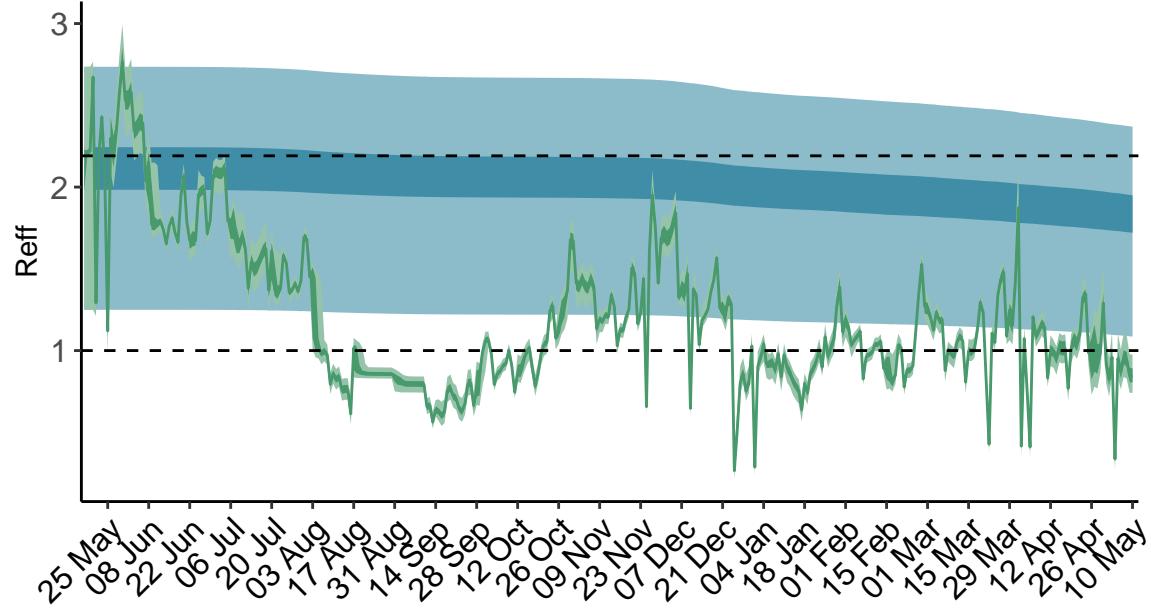


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

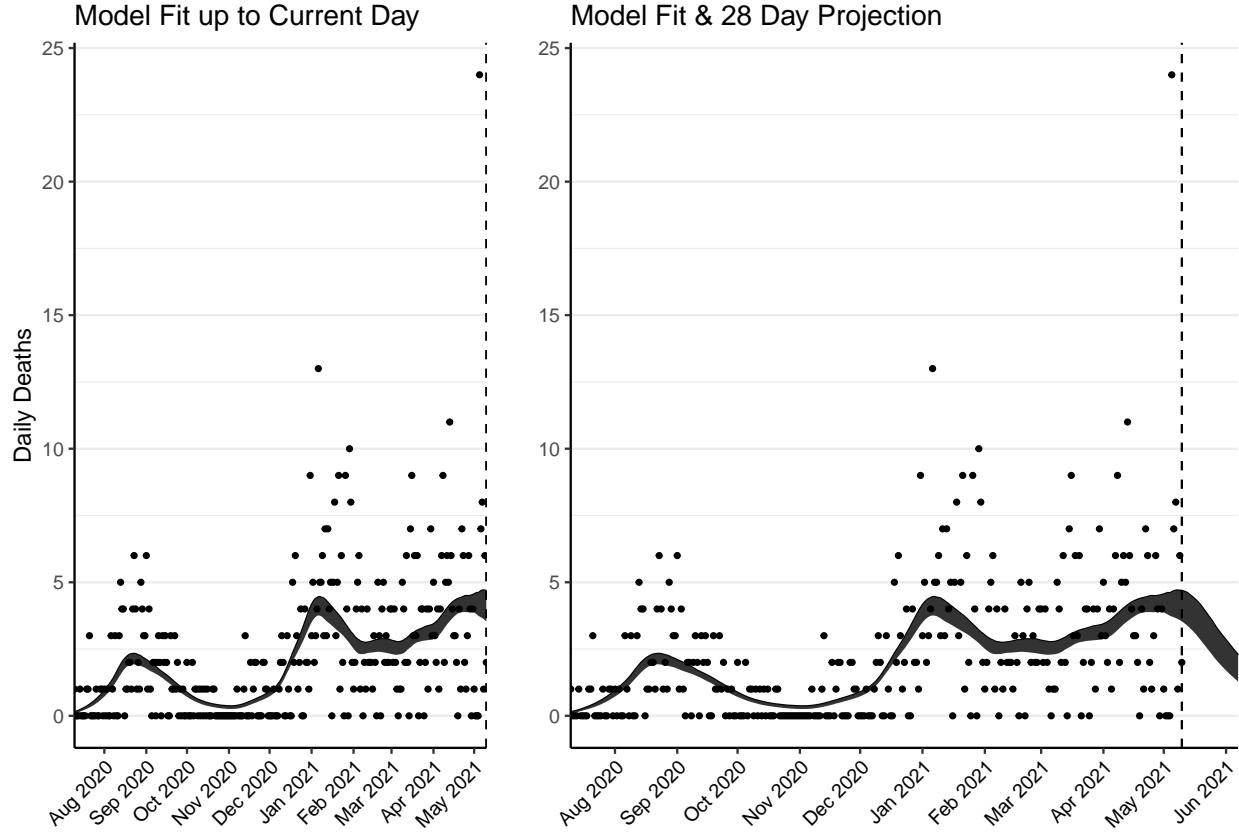


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 185 (95% CI: 178-192) patients requiring treatment with high-pressure oxygen at the current date to 96 (95% CI: 88-103) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 72 (95% CI: 69-74) patients requiring treatment with mechanical ventilation at the current date to 43 (95% CI: 40-47) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

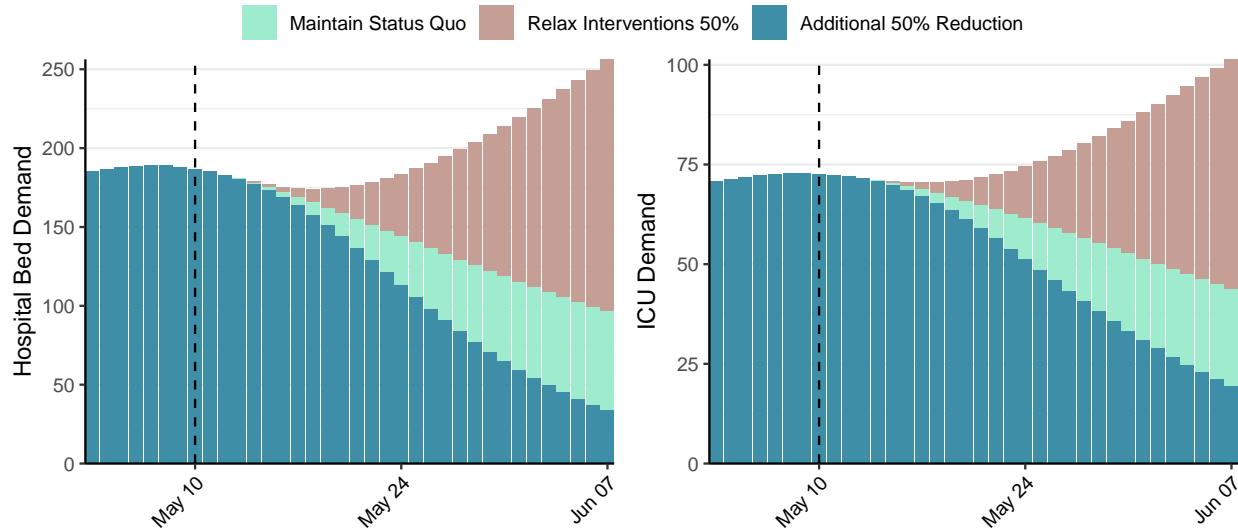


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,976 (95% CI: 1,869-2,084) at the current date to 96 (95% CI: 87-105) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,976 (95% CI: 1,869-2,084) at the current date to 5,437 (95% CI: 4,851-6,023) by 2021-06-07.

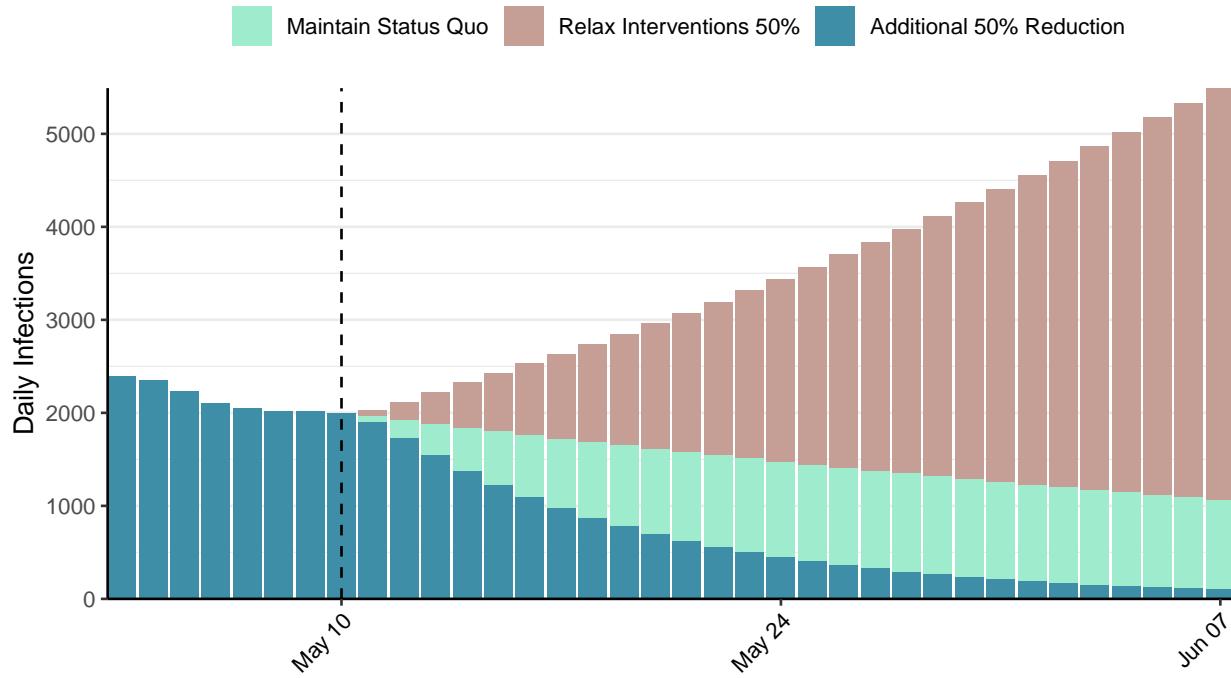


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Niger, 2021-05-10

[Download the report for Niger, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
5,322	3	192	0	0.89 (95% CI: 0.73-1.14)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

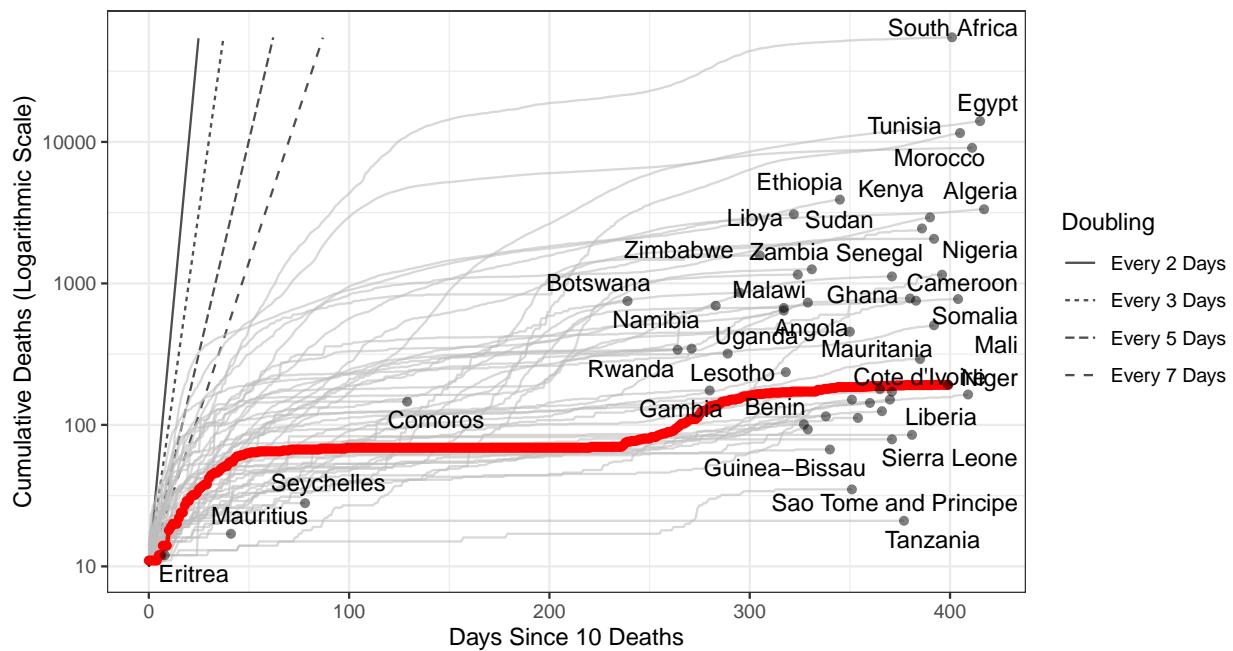


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 1,359 (95% CI: 1,269-1,449) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Niger has revised their historic reported cases and thus have reported negative cases.**

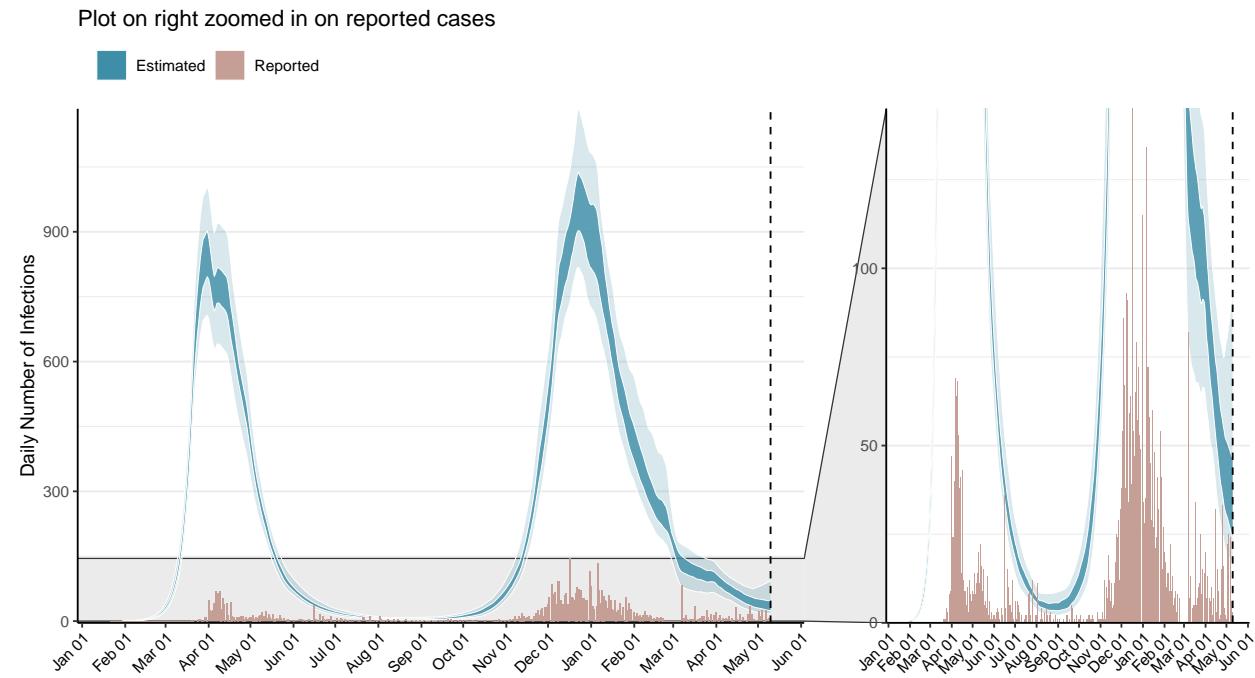
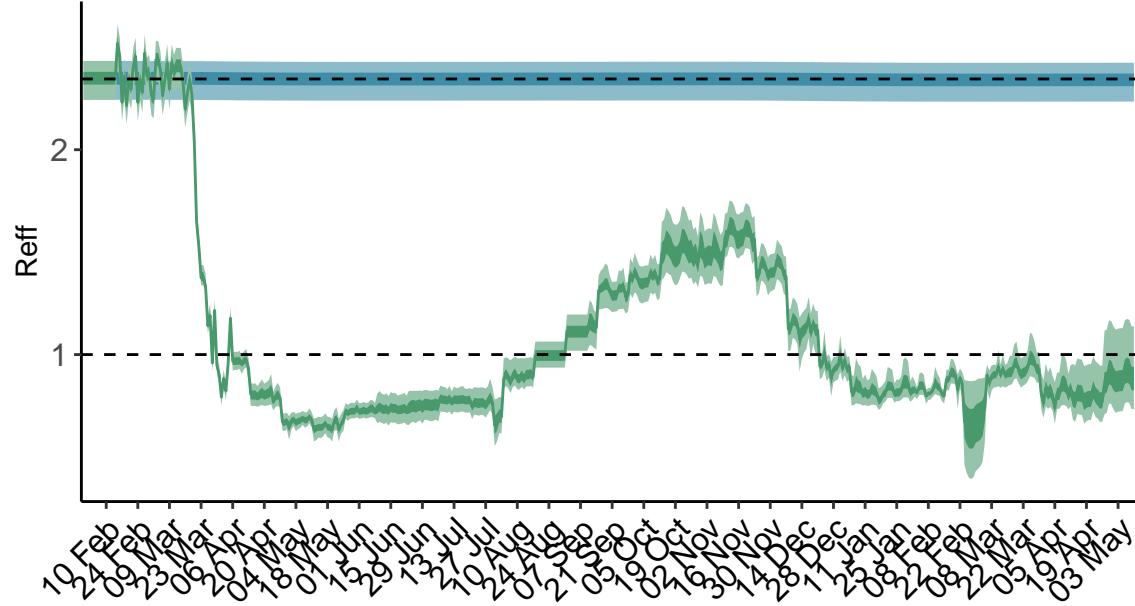


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

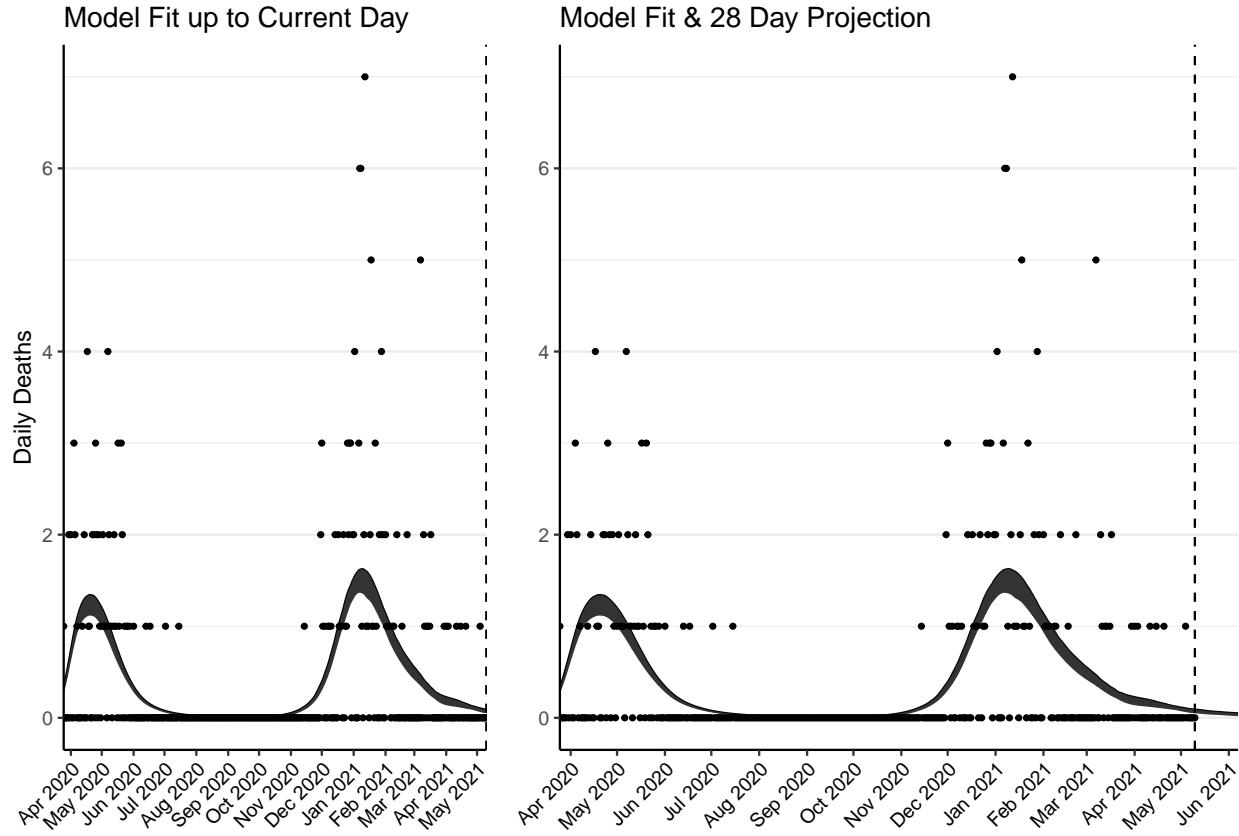


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 3 (95% CI: 3-4) patients requiring treatment with high-pressure oxygen at the current date to 2 (95% CI: 2-3) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1 (95% CI: 1-2) patients requiring treatment with mechanical ventilation at the current date to 1 (95% CI: 1-1) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

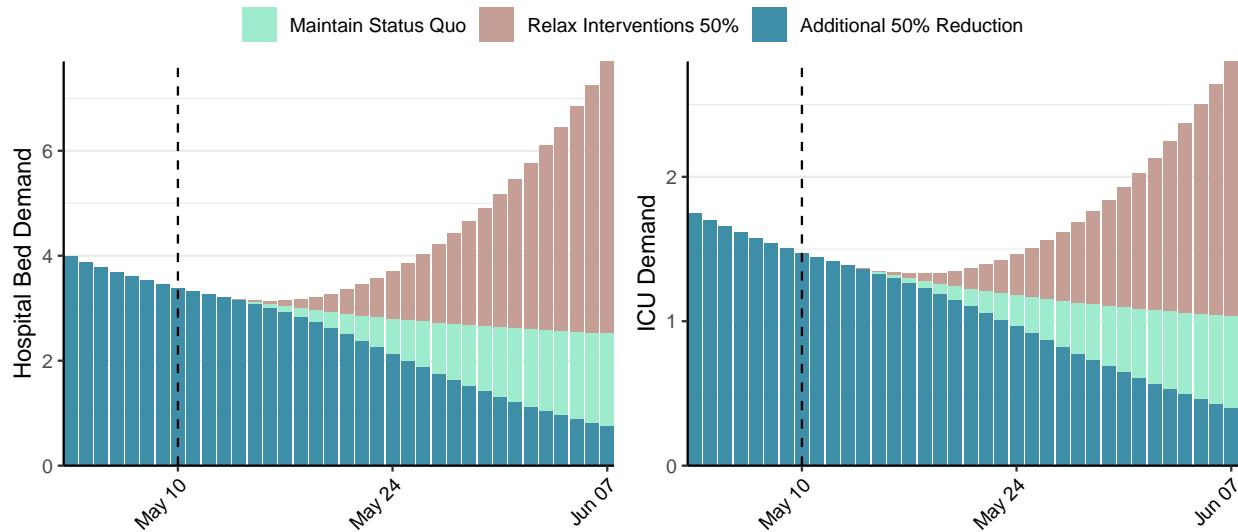


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 38 (95% CI: 34-43) at the current date to 3 (95% CI: 2-3) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 38 (95% CI: 34-43) at the current date to 198 (95% CI: 144-252) by 2021-06-07.

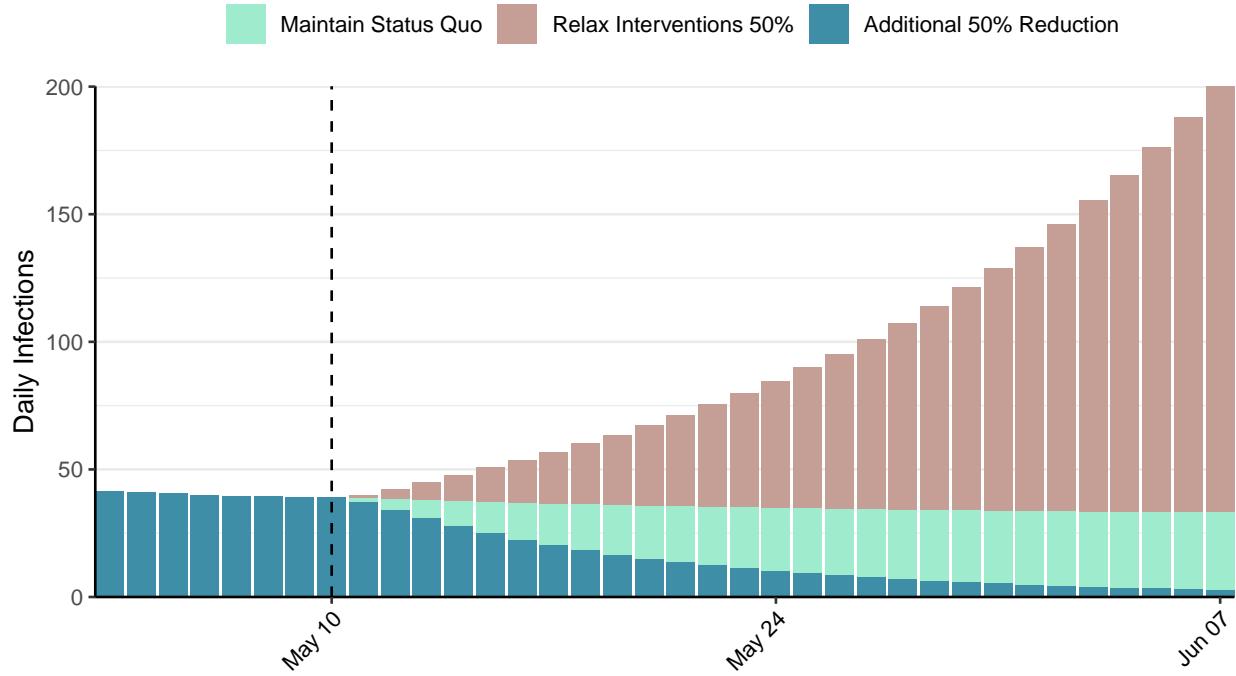


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Nigeria, 2021-05-10

[Download the report for Nigeria, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
165,468	49	2,066	0	0.77 (95% CI: 0.66-0.9)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

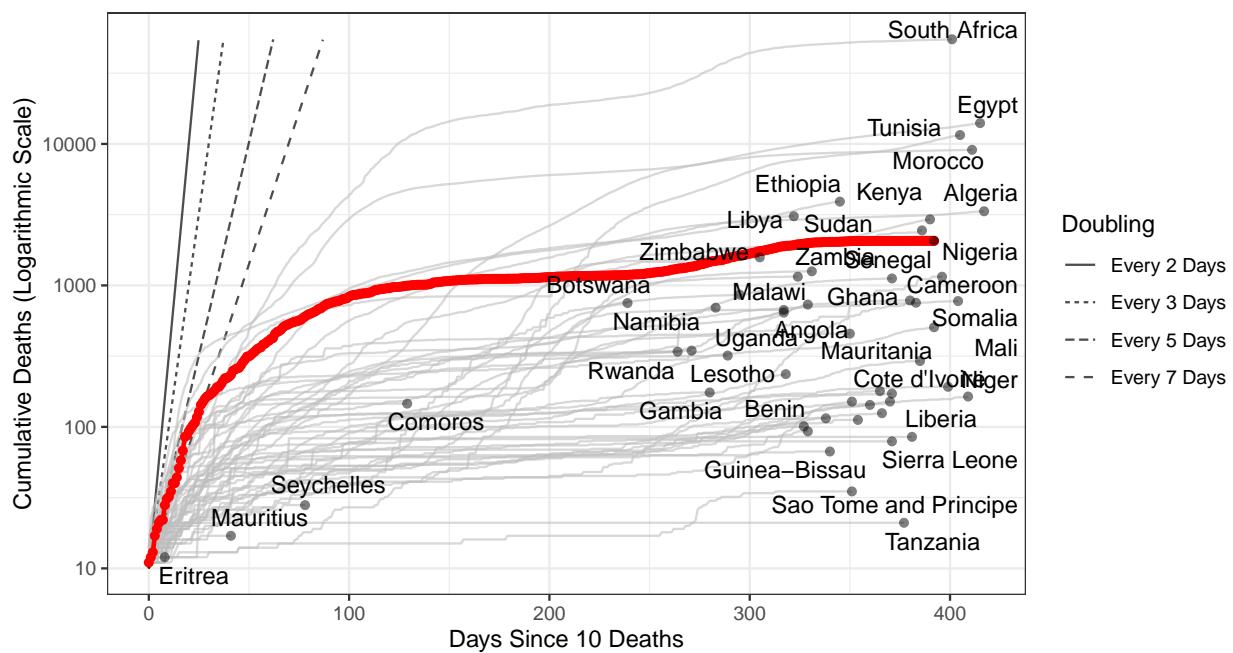


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 1,017 (95% CI: 933-1,102) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

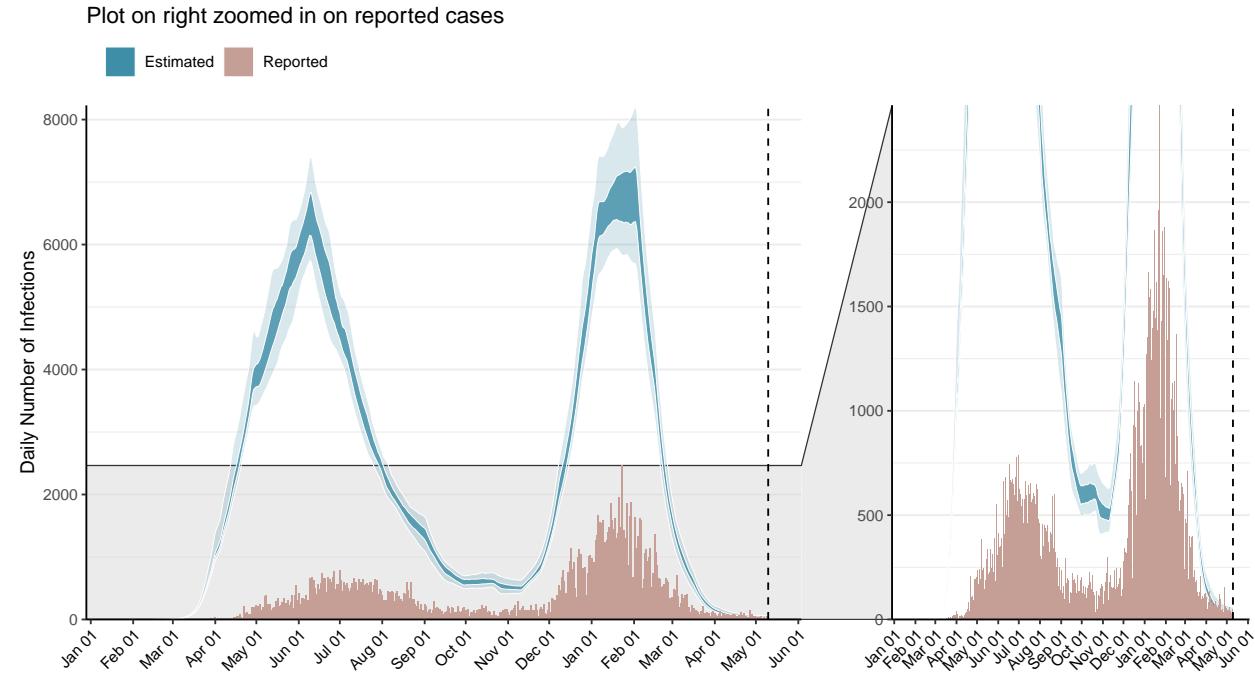
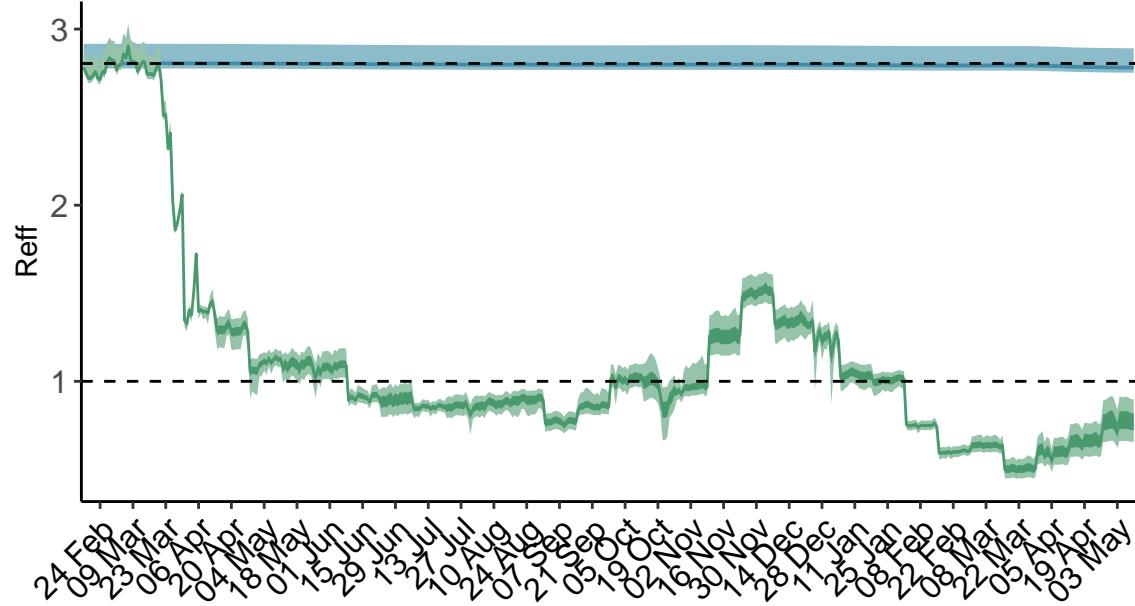


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

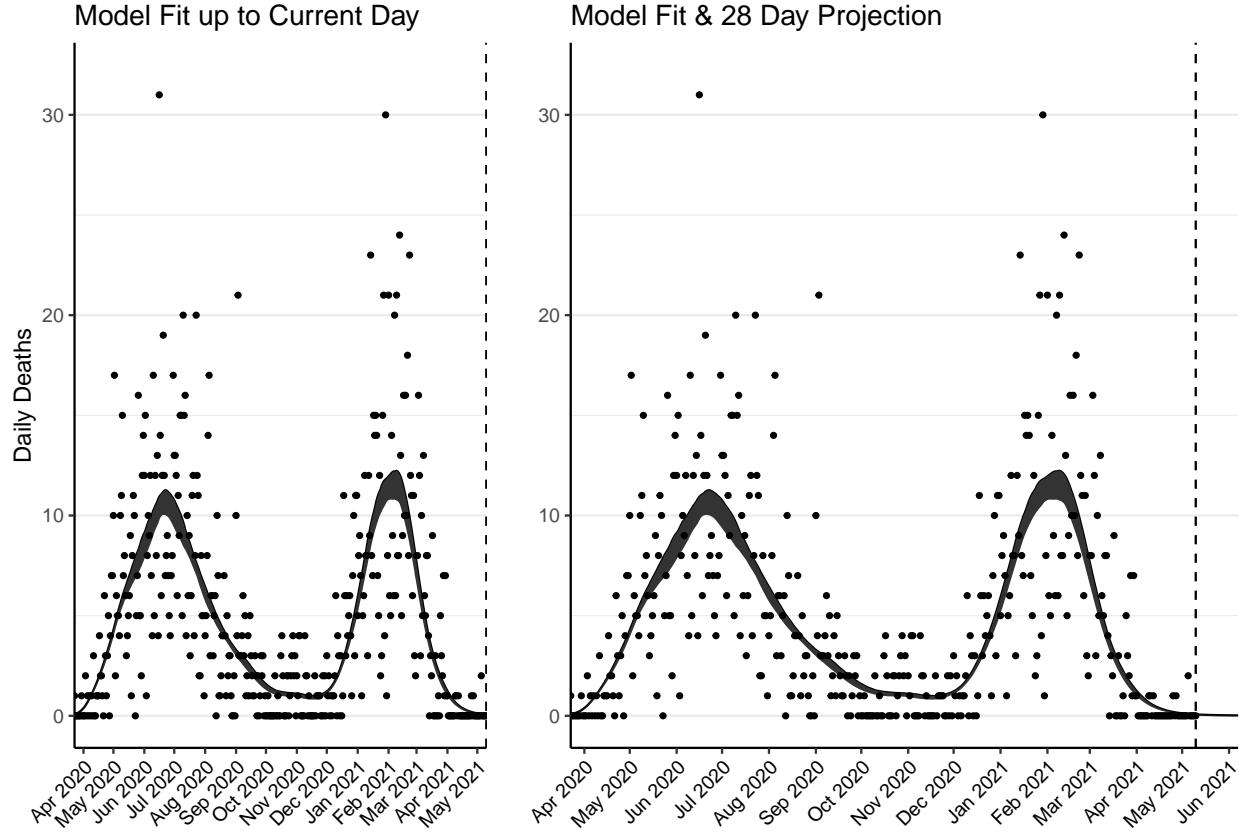


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 3 (95% CI: 2-3) patients requiring treatment with high-pressure oxygen at the current date to 1 (95% CI: 1-1) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1 (95% CI: 1-2) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-1) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

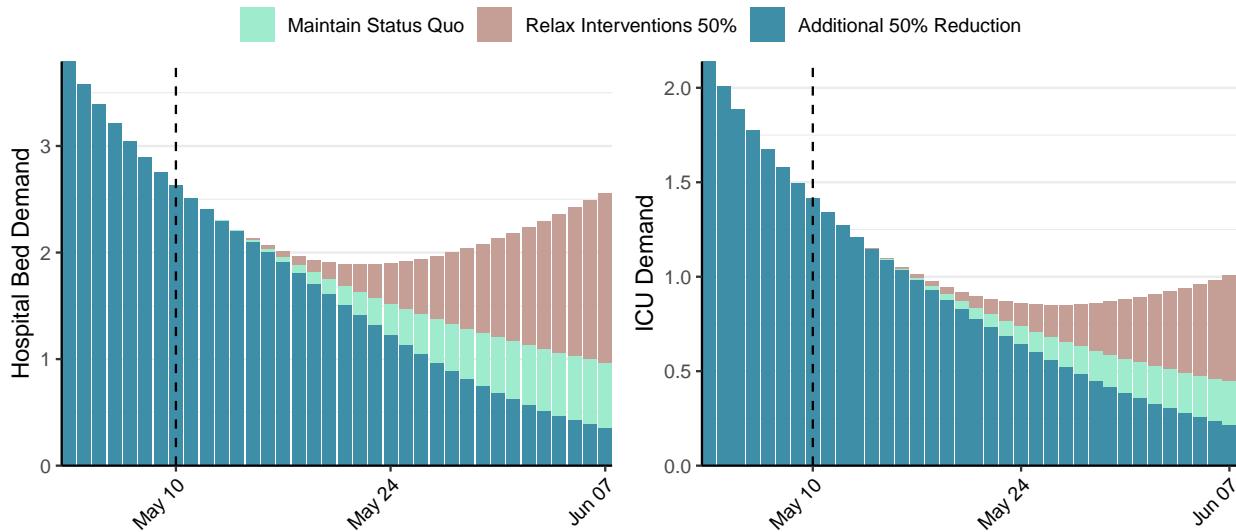
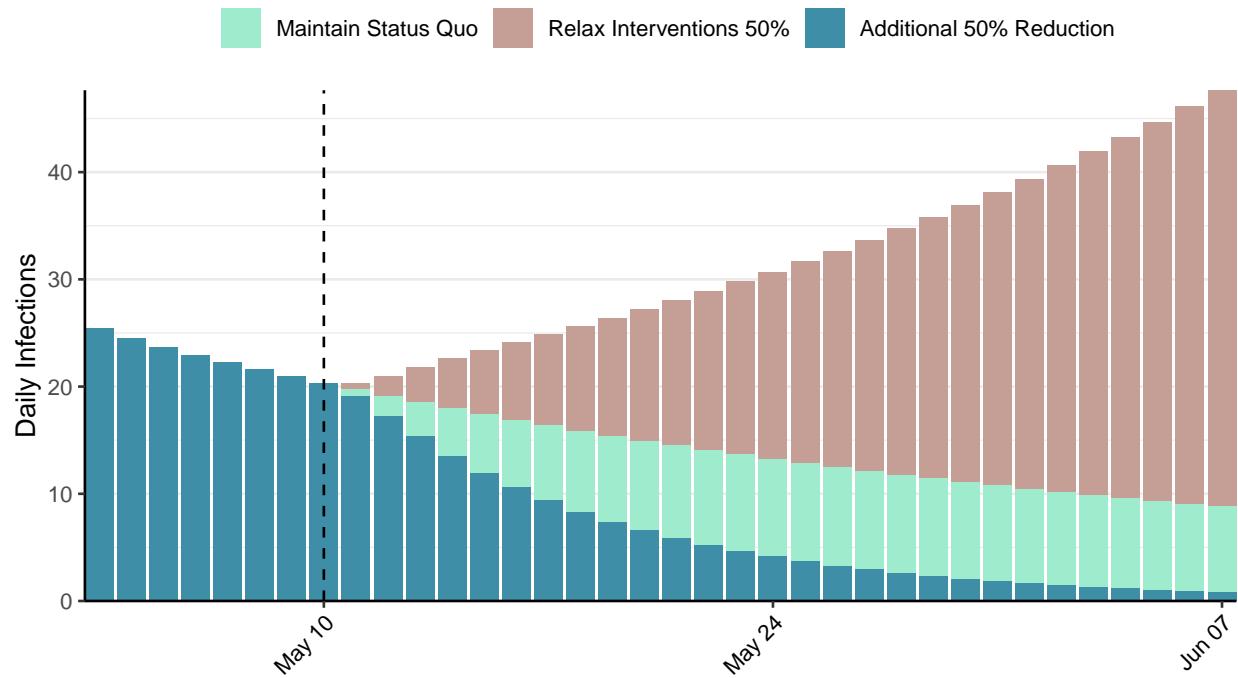


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 20 (95% CI: 18-23) at the current date to 1 (95% CI: 1-1) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 20 (95% CI: 18-23) at the current date to 48 (95% CI: 37-58) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covidsim.org/) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Nicaragua, 2021-05-10

[Download the report for Nicaragua, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
6,989	0	183	0	1.12 (95% CI: 0.84-1.4)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

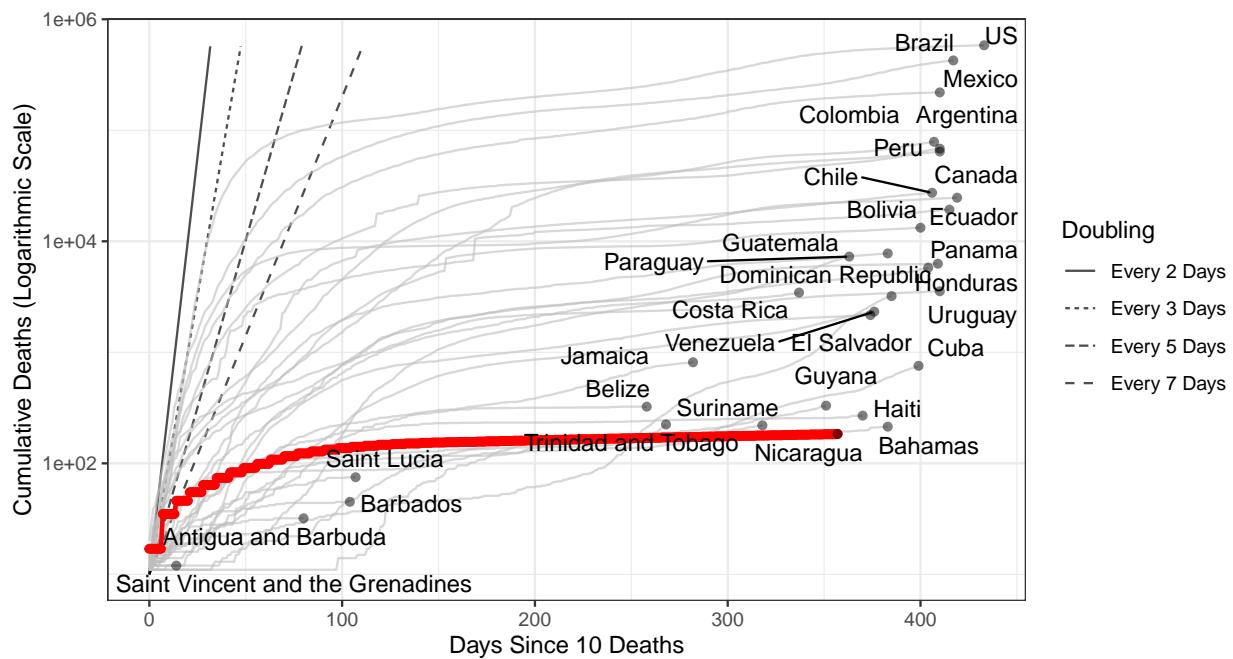


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 2,518 (95% CI: 2,290-2,746) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

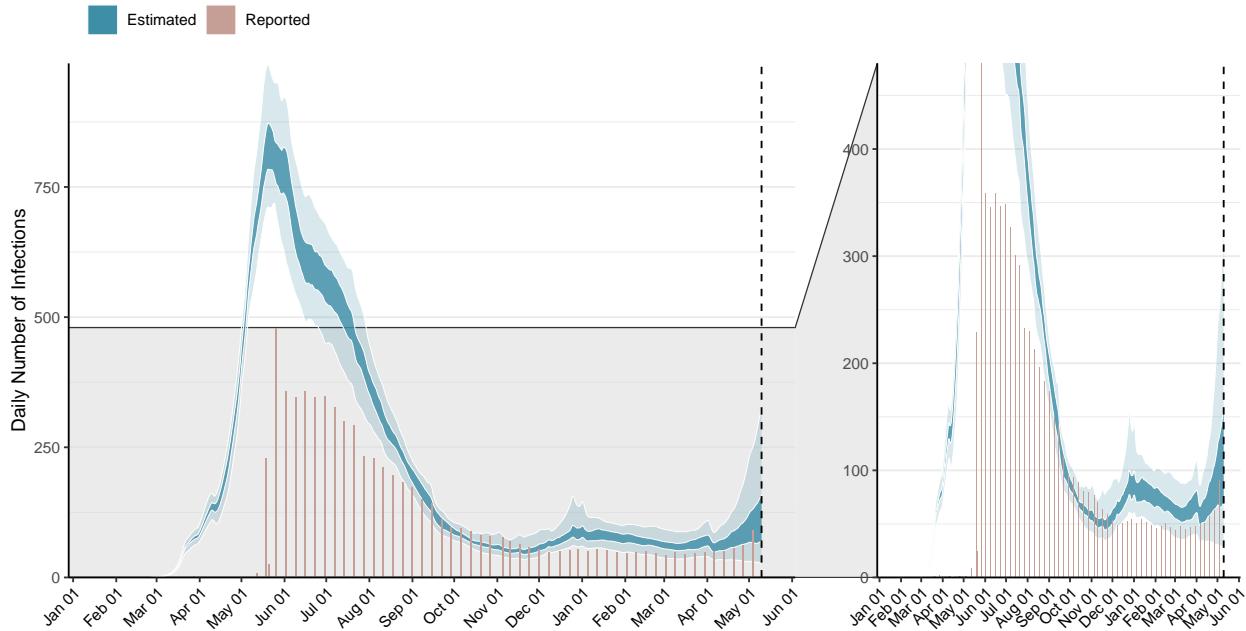
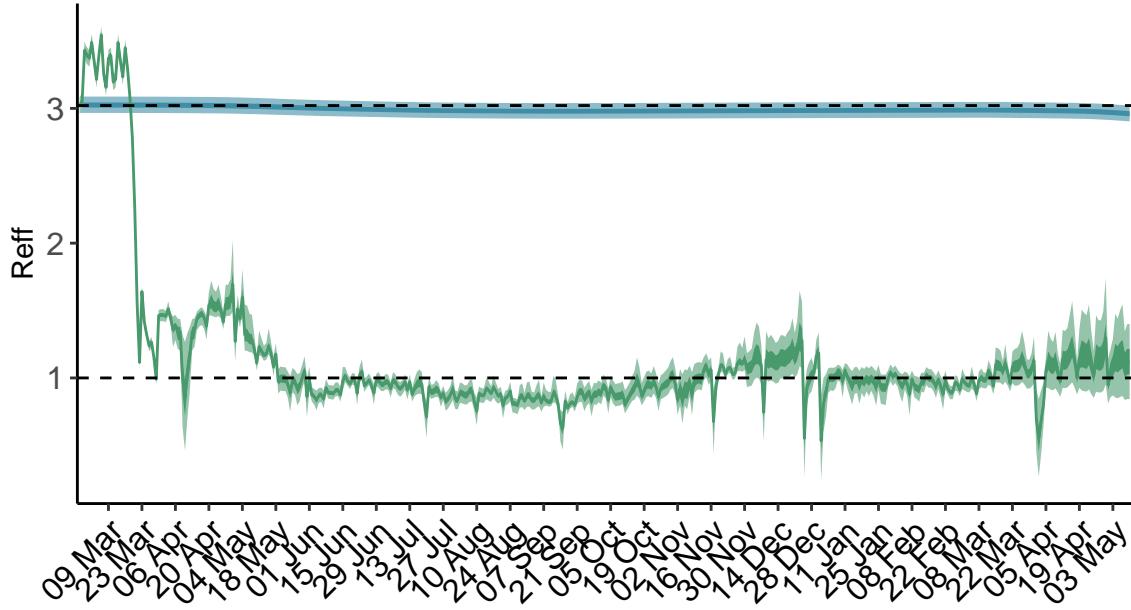


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

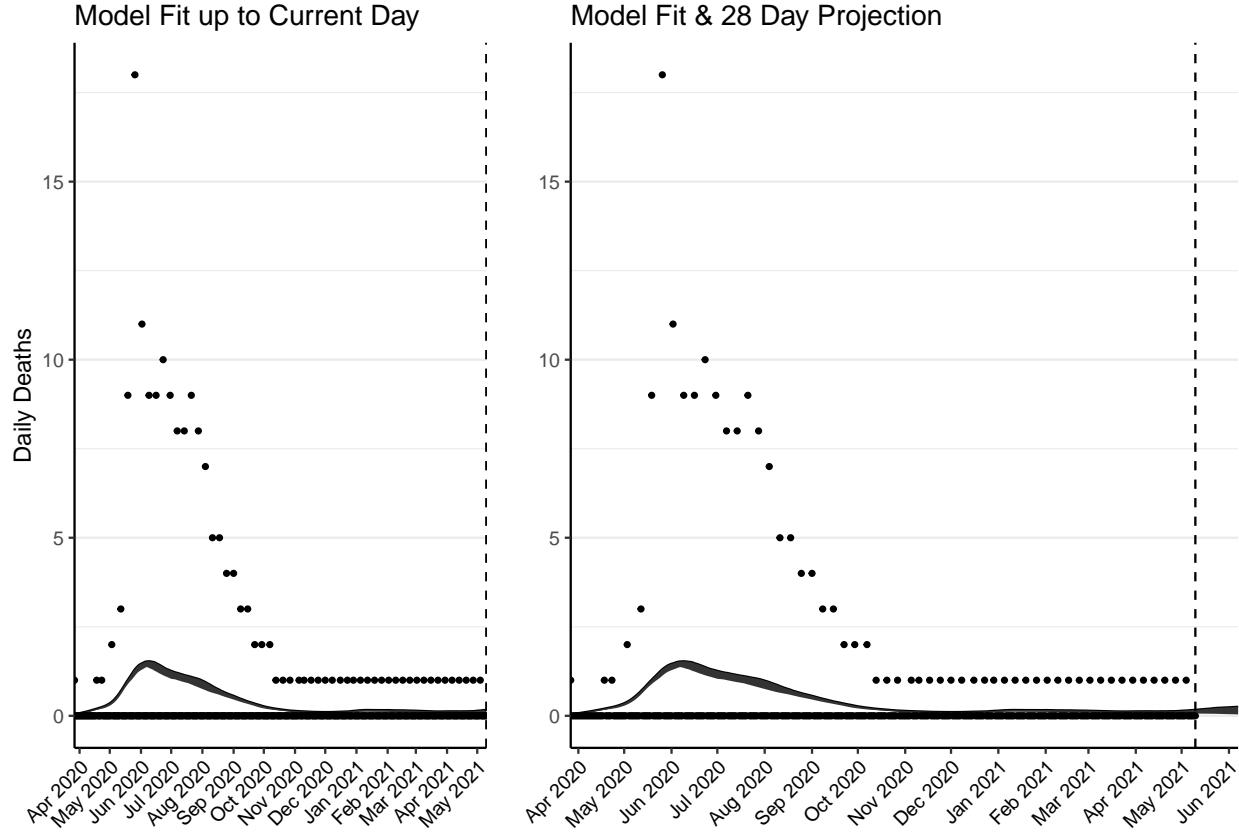


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 7 (95% CI: 6-8) patients requiring treatment with high-pressure oxygen at the current date to 15 (95% CI: 12-18) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 2 (95% CI: 2-3) patients requiring treatment with mechanical ventilation at the current date to 5 (95% CI: 4-6) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

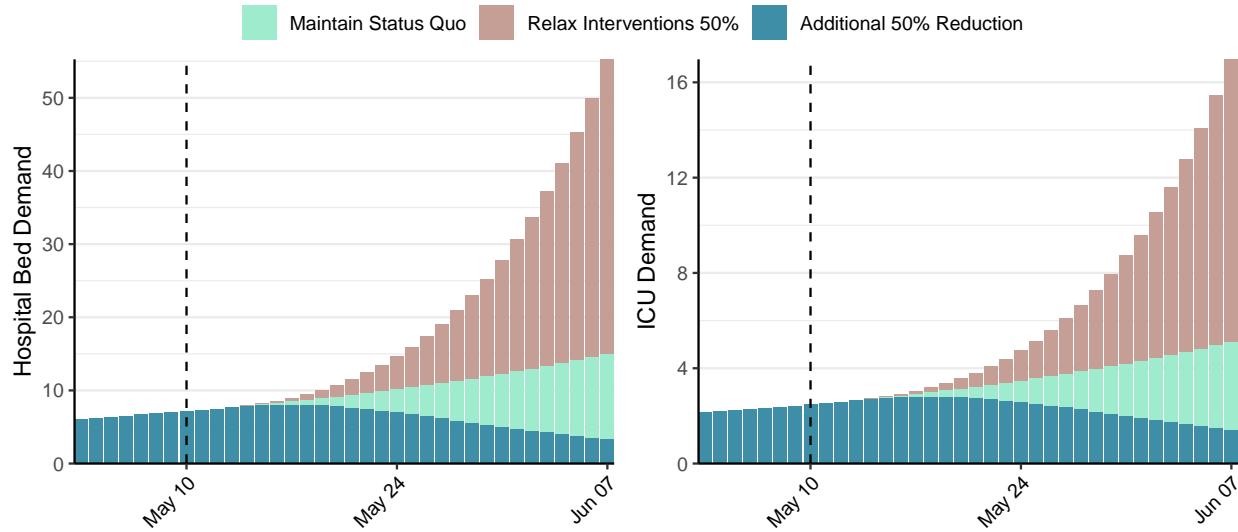


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 124 (95% CI: 108-140) at the current date to 18 (95% CI: 14-23) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 124 (95% CI: 108-140) at the current date to 1,987 (95% CI: 1,404-2,570) by 2021-06-07.

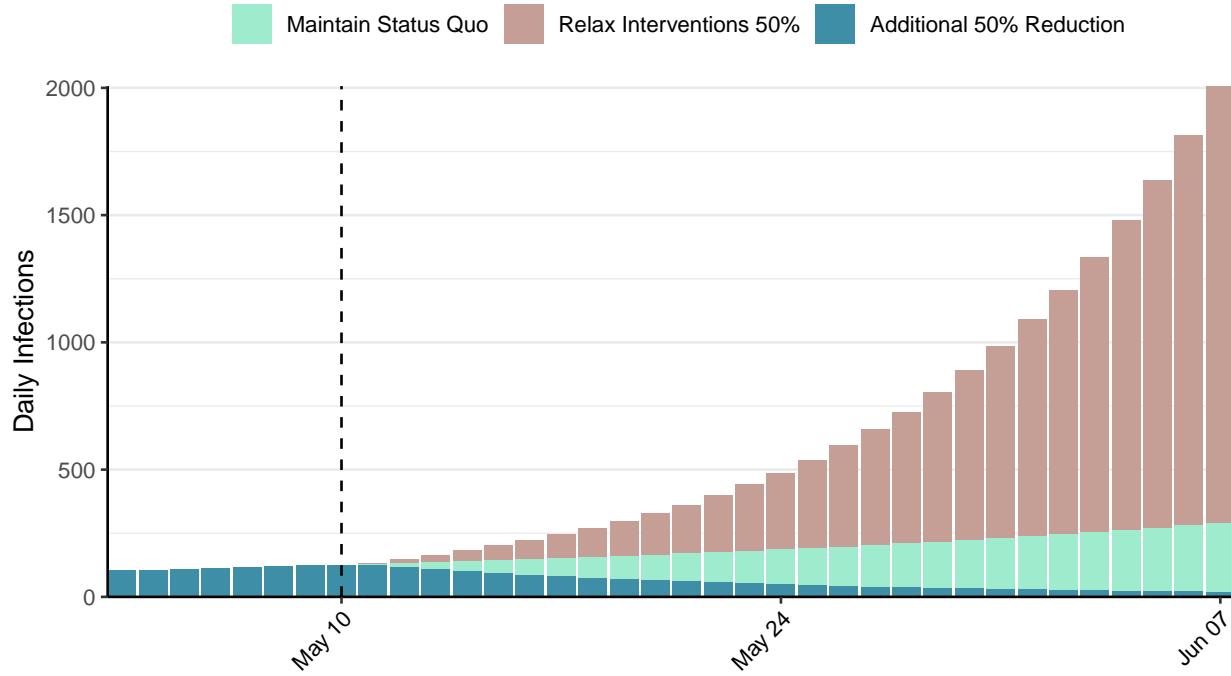


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Nepal, 2021-05-10

[Download the report for Nepal, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
413,110	9,317	4,084	225	1.7 (95% CI: 1.56-1.83)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

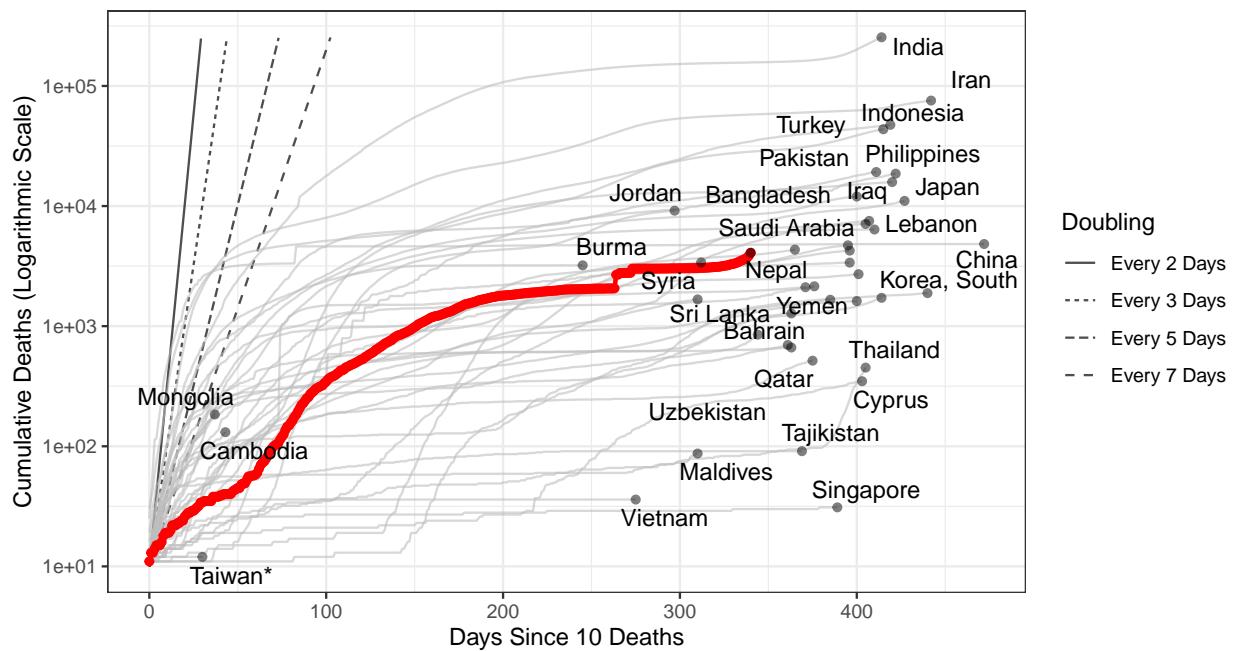


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 837,582 (95% CI: 811,600-863,565) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

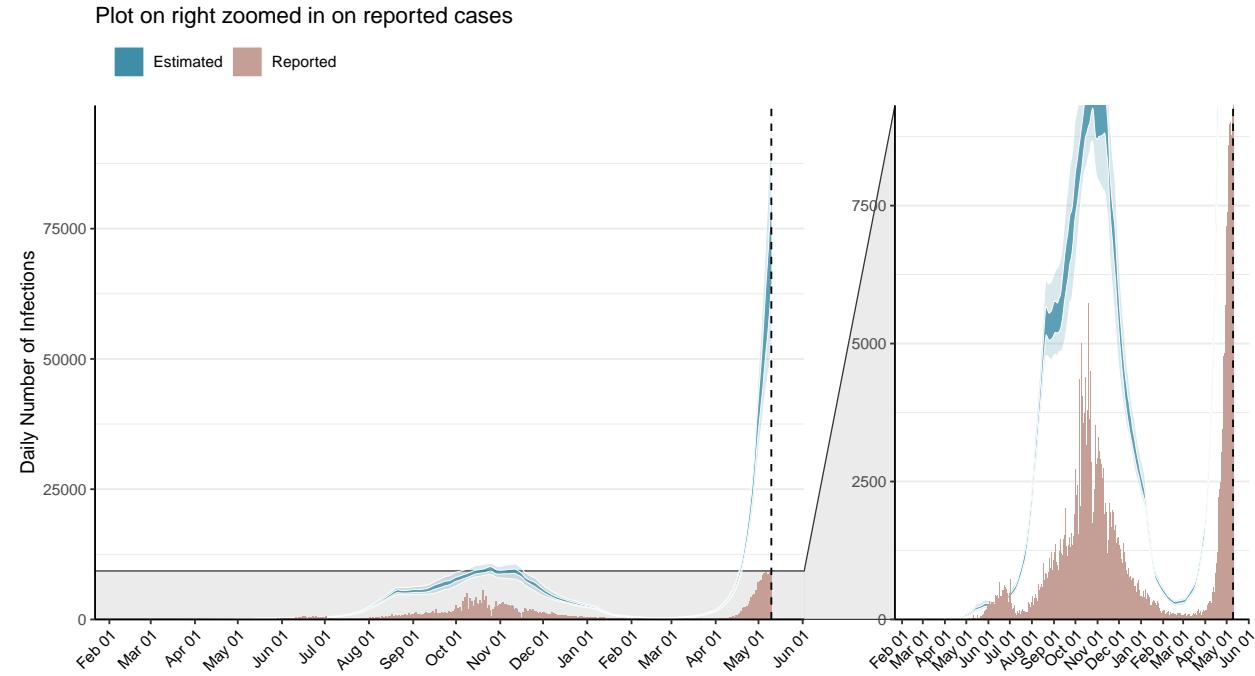
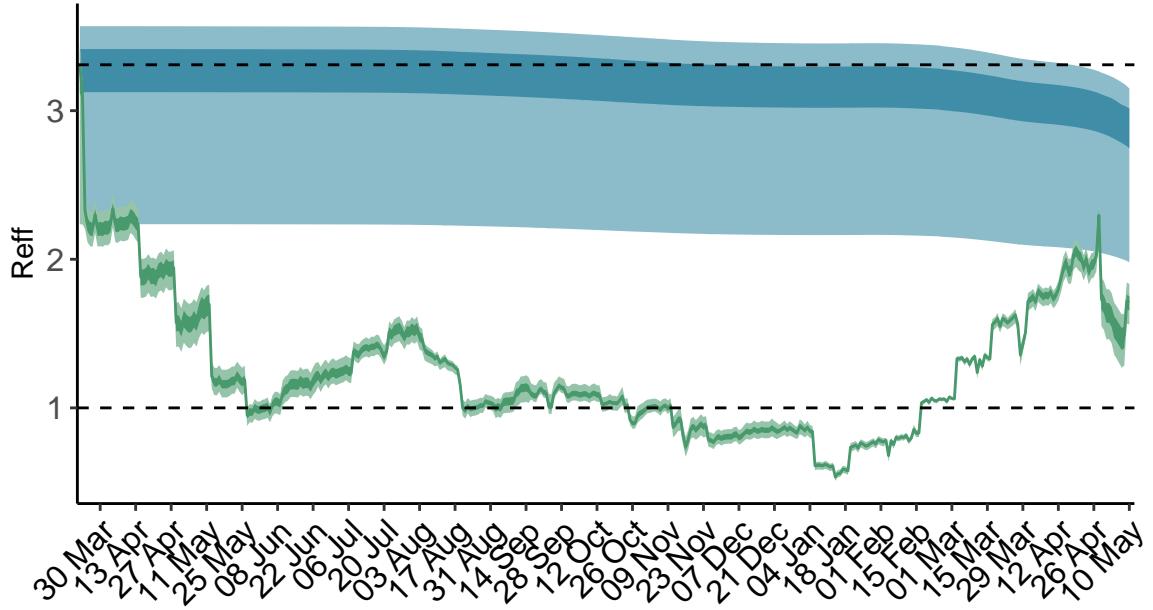


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Nepal is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

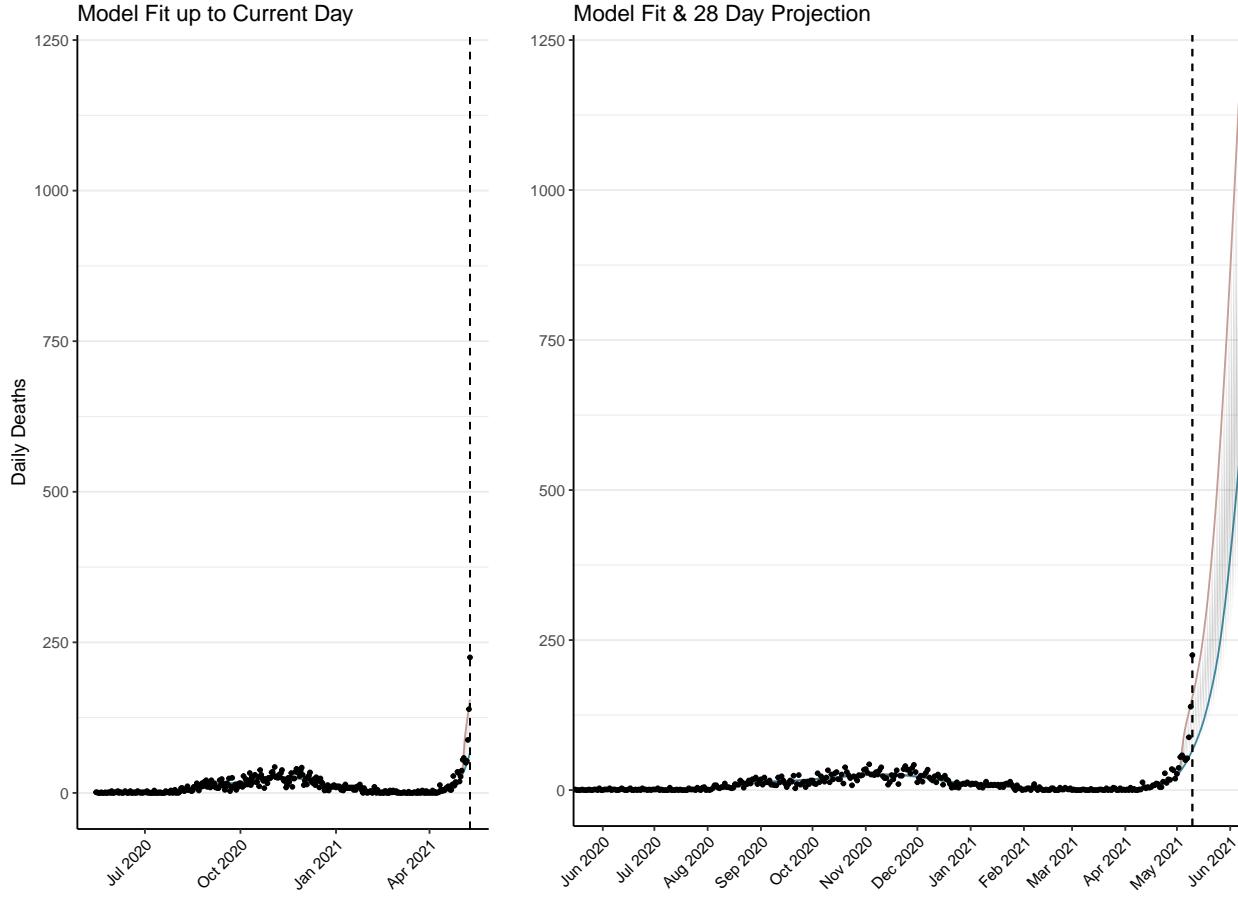


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 3,273 (95% CI: 3,175-3,372) patients requiring treatment with high-pressure oxygen at the current date to 25,073 (95% CI: 23,778-26,368) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 651 (95% CI: 638-665) patients requiring treatment with mechanical ventilation at the current date to 1,750 (95% CI: 1,681-1,819) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

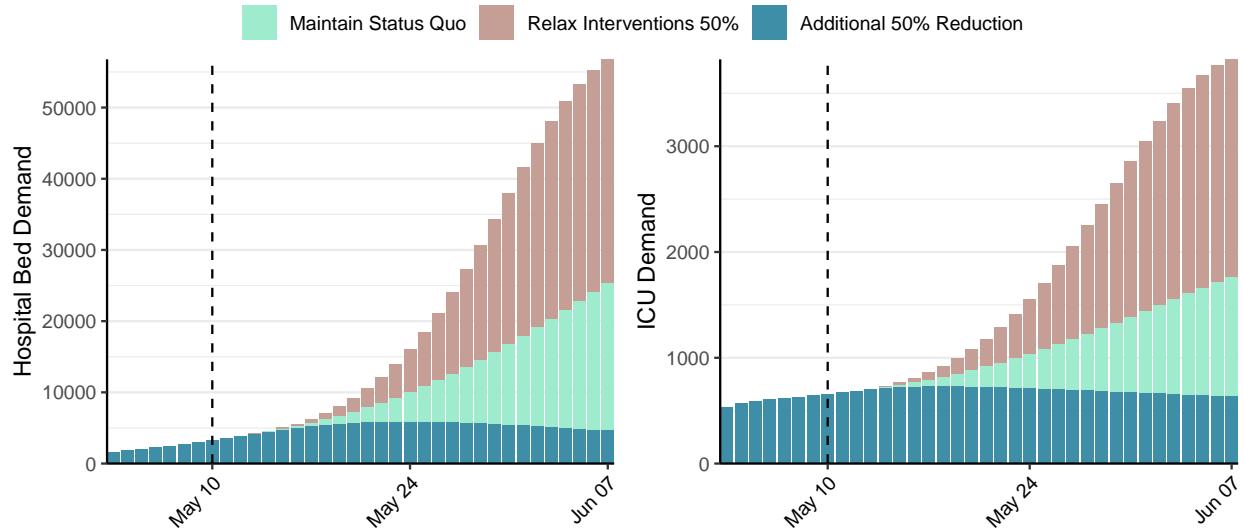


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 73,492 (95% CI: 70,489-76,494) at the current date to 35,605 (95% CI: 33,300-37,911) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 73,492 (95% CI: 70,489-76,494) at the current date to 851,720 (95% CI: 832,037-871,403) by 2021-06-07.

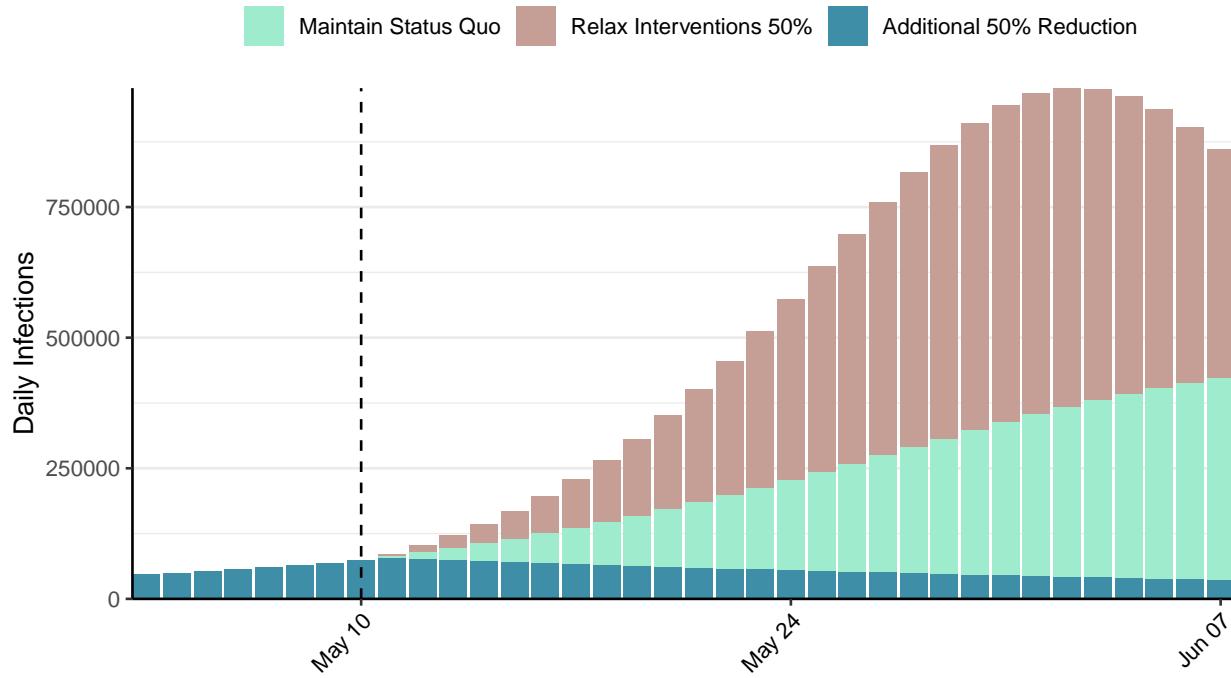


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Pakistan, 2021-05-10

[Download the report for Pakistan, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
864,557	6,531	19,106	191	0.75 (95% CI: 0.69-0.84)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

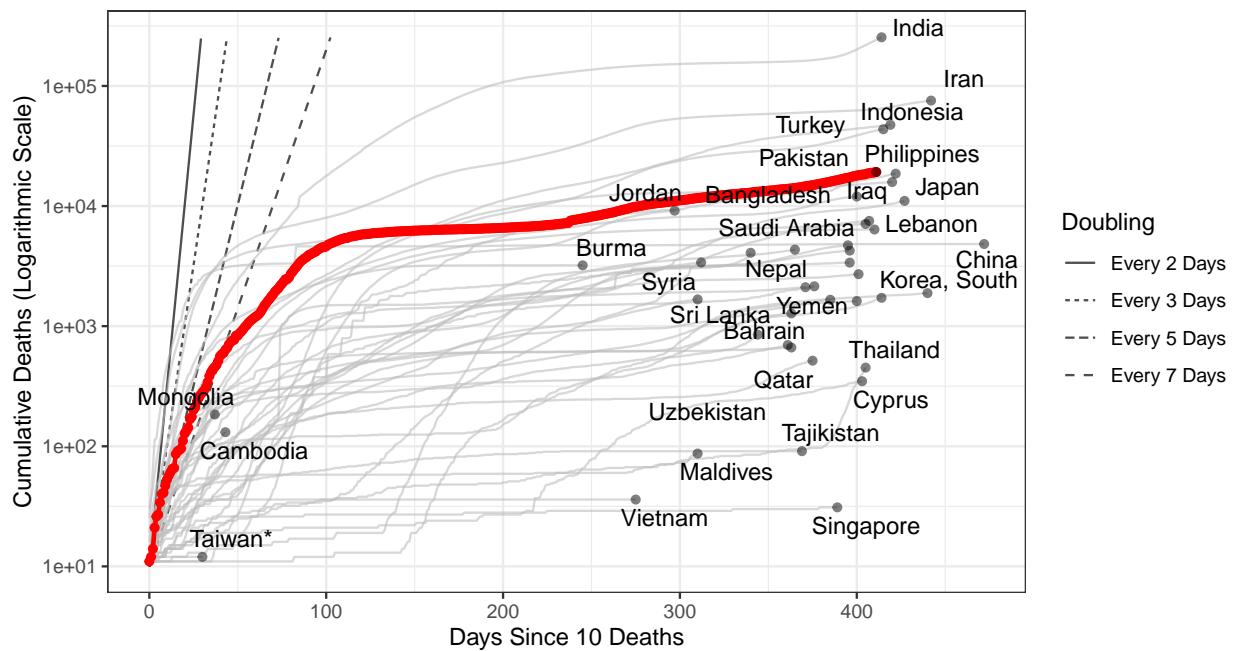


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 1,188,197 (95% CI: 1,143,348–1,233,046) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

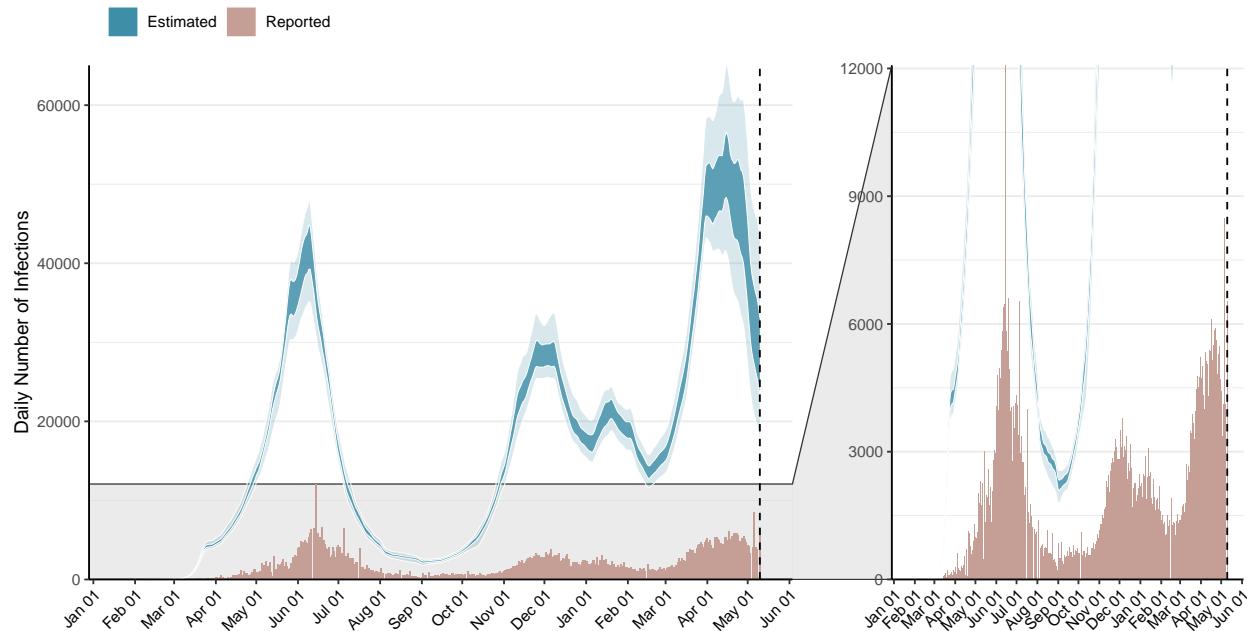
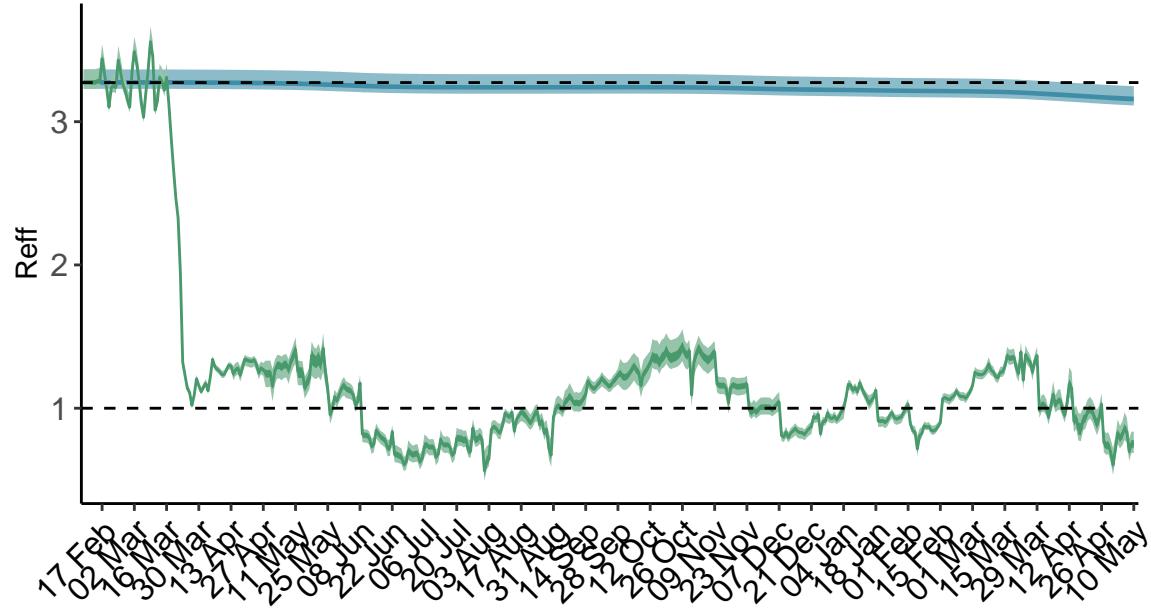


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

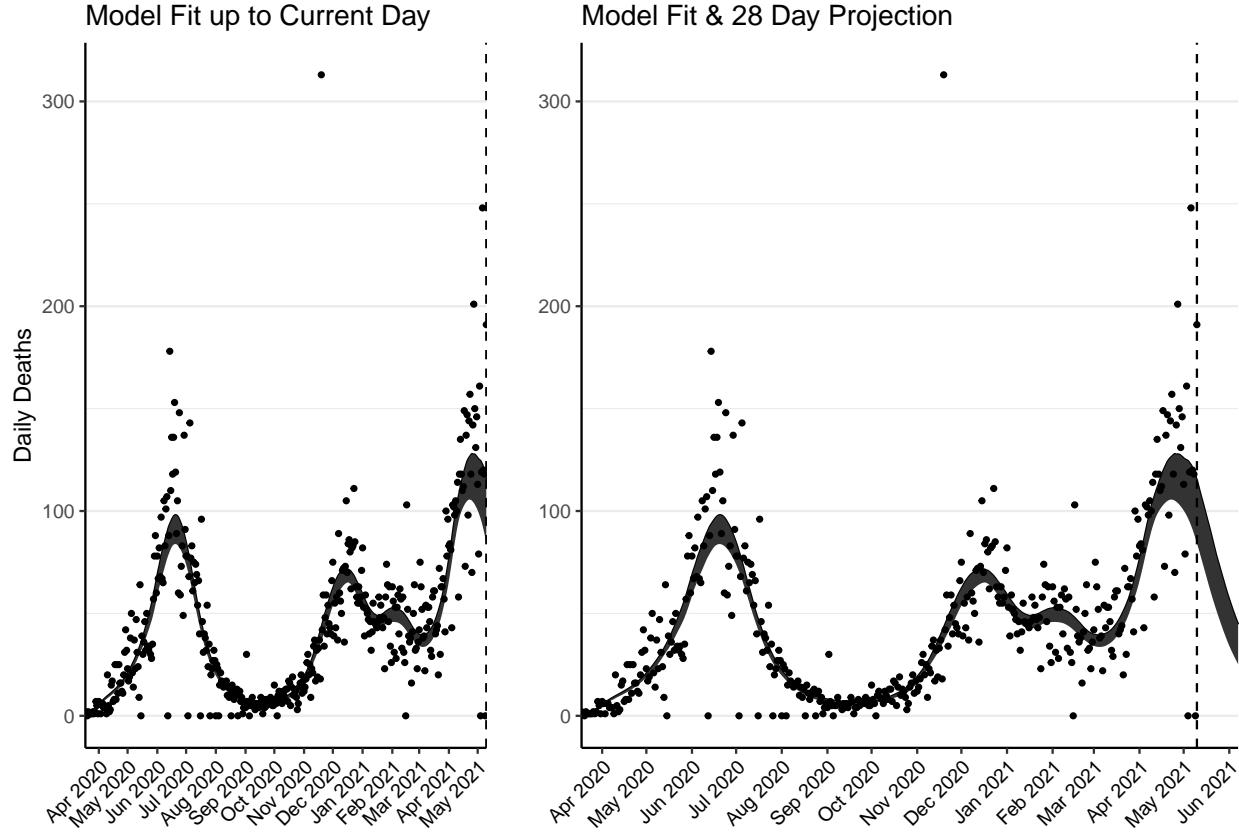


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 3,953 (95% CI: 3,795-4,111) patients requiring treatment with high-pressure oxygen at the current date to 1,510 (95% CI: 1,400-1,621) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1,593 (95% CI: 1,533-1,652) patients requiring treatment with mechanical ventilation at the current date to 664 (95% CI: 619-709) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

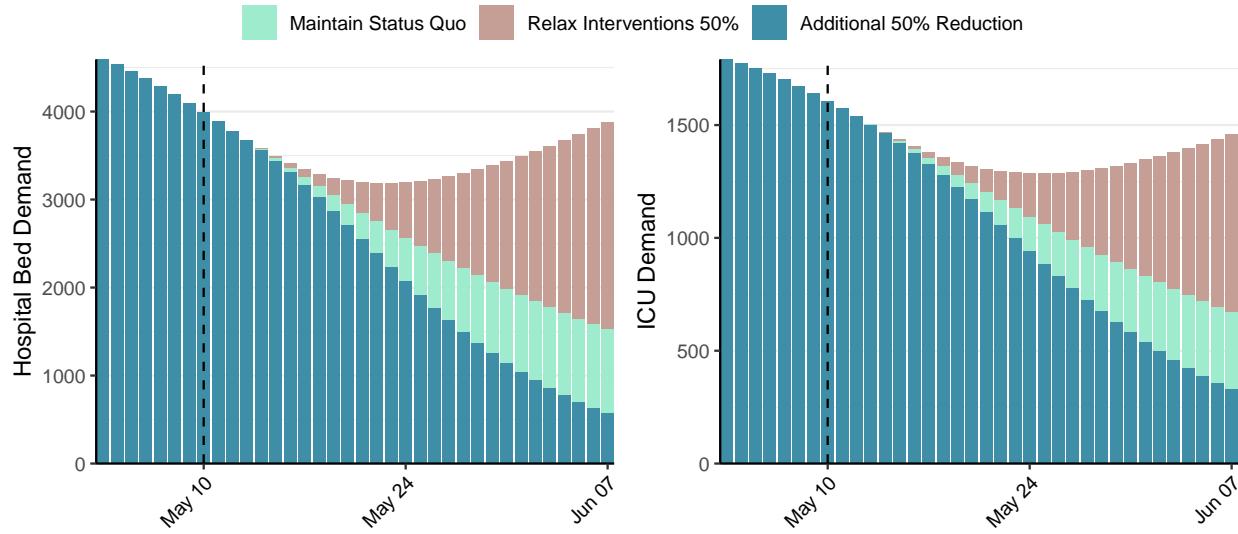


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 28,310 (95% CI: 26,779-29,841) at the current date to 948 (95% CI: 866-1,029) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 28,310 (95% CI: 26,779-29,841) at the current date to 49,884 (95% CI: 44,870-54,897) by 2021-06-07.

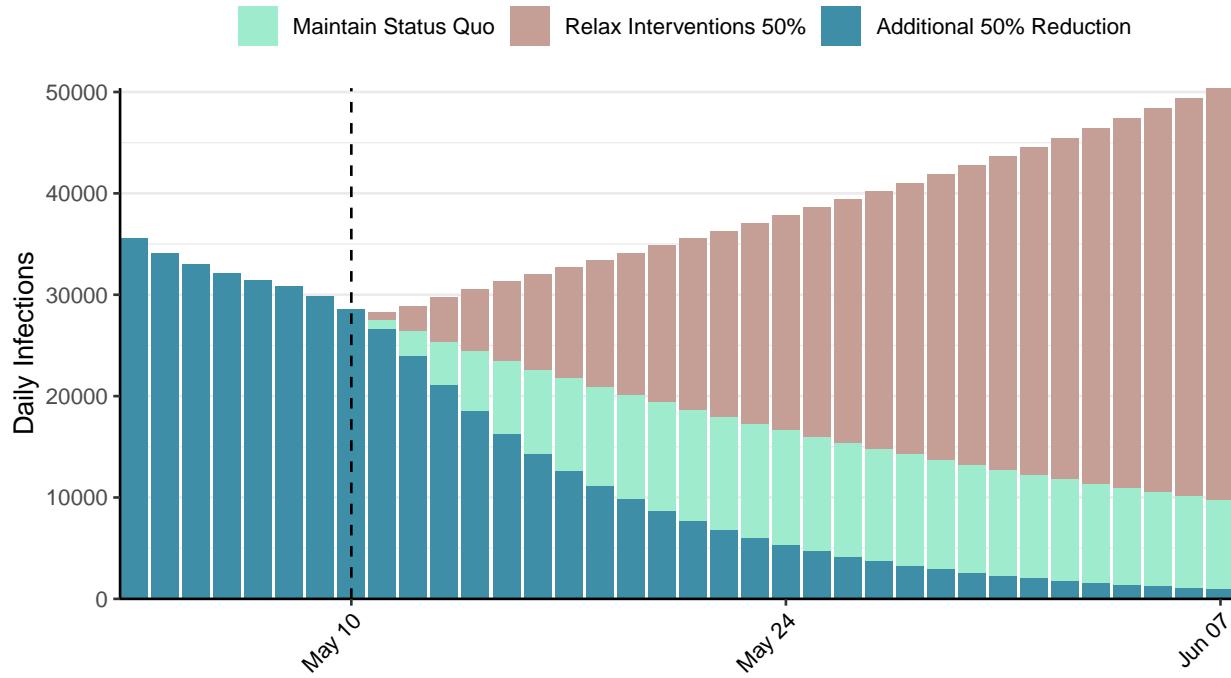


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Panama, 2021-05-10

[Download the report for Panama, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
367,908	252	6,277	6	0.86 (95% CI: 0.78-0.92)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

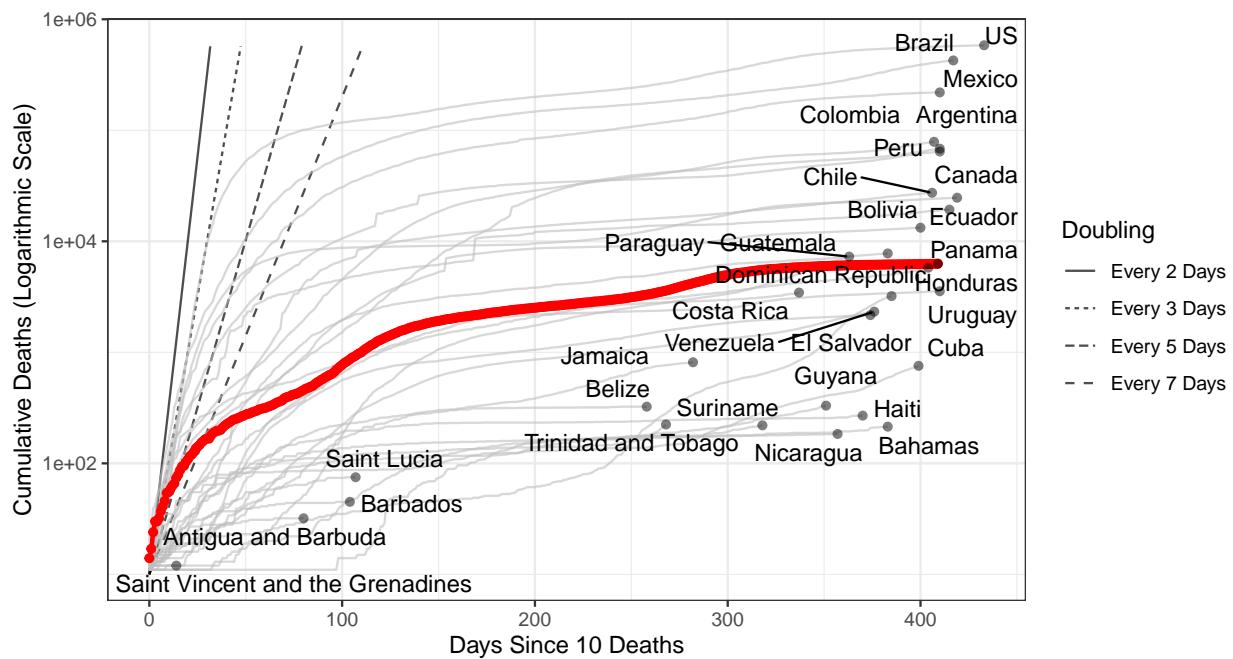


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 54,860 (95% CI: 53,047-56,672) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

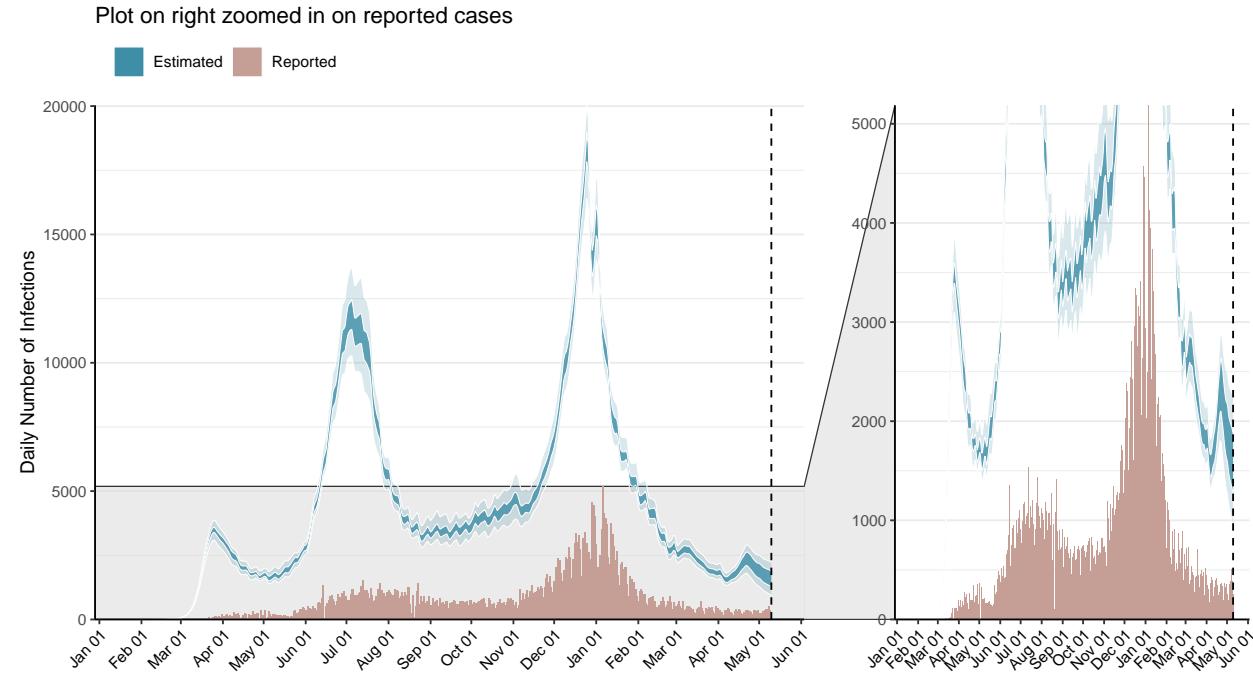
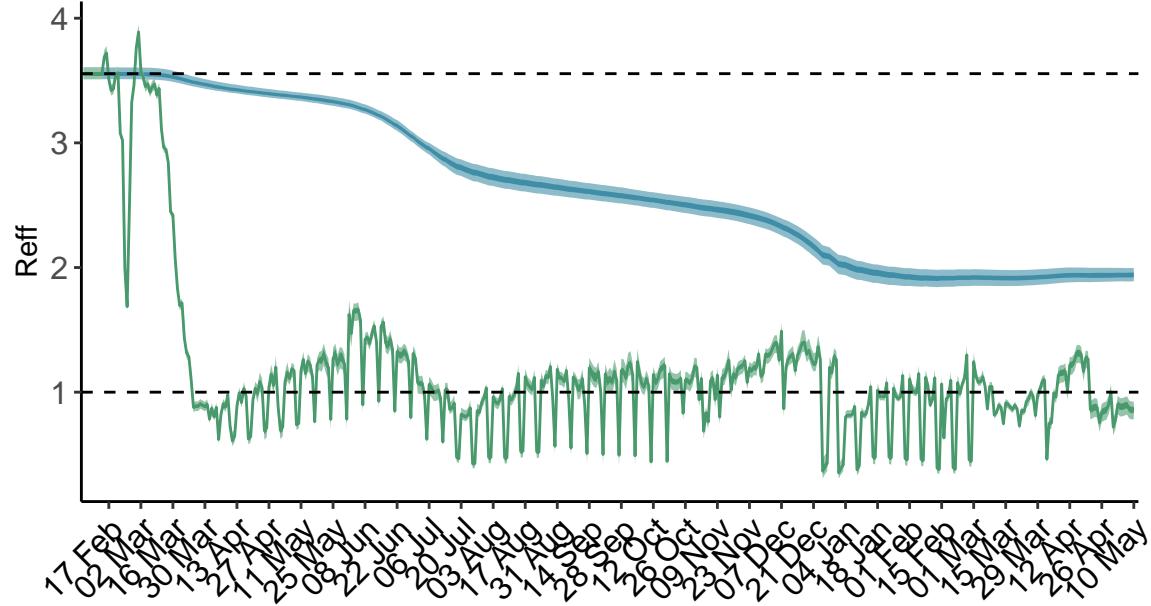


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Panama is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

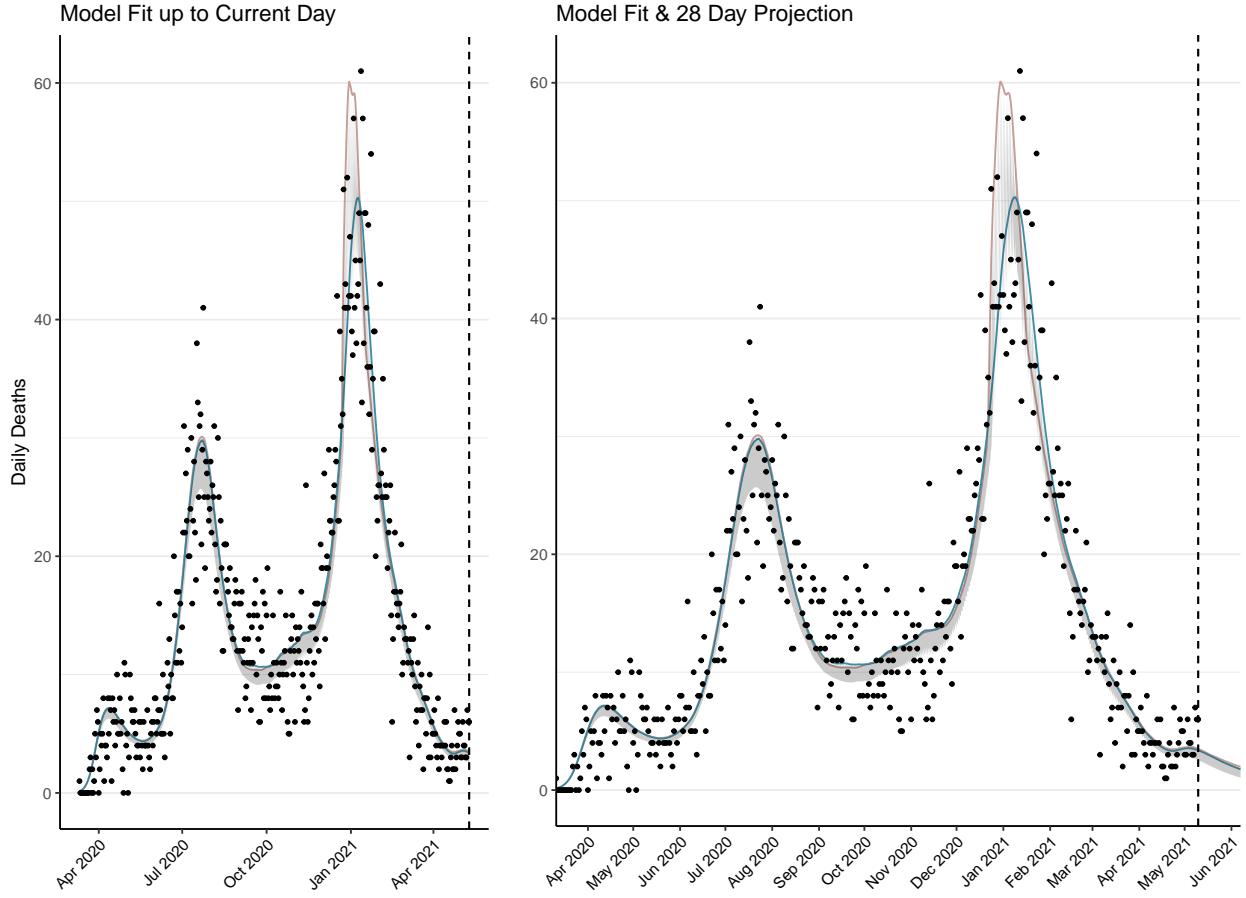


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 145 (95% CI: 139-150) patients requiring treatment with high-pressure oxygen at the current date to 80 (95% CI: 75-85) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 61 (95% CI: 59-63) patients requiring treatment with mechanical ventilation at the current date to 35 (95% CI: 33-37) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

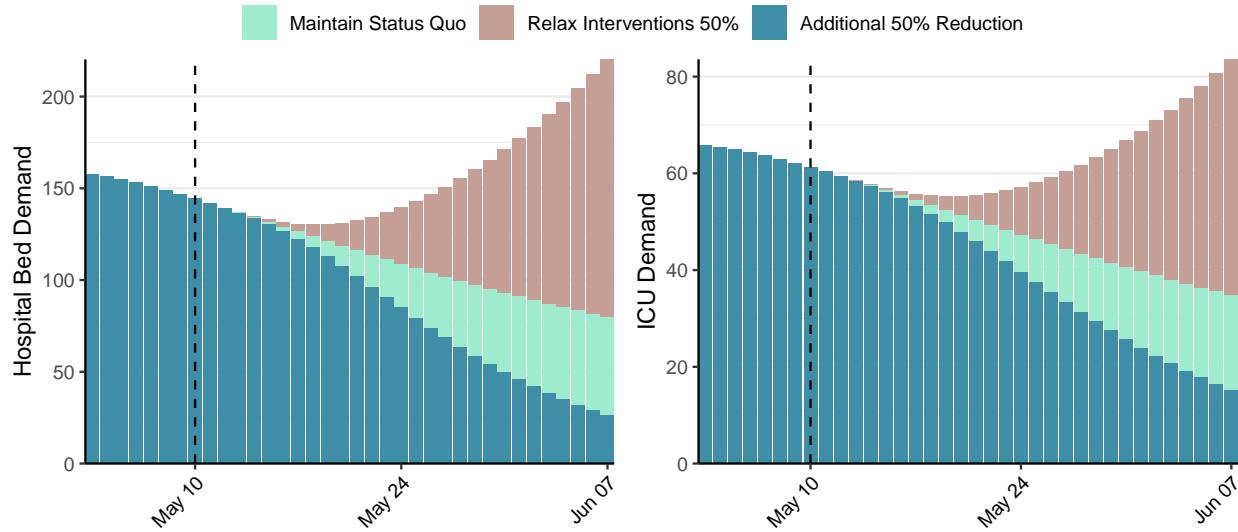


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,574 (95% CI: 1,497-1,651) at the current date to 79 (95% CI: 73-85) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,574 (95% CI: 1,497-1,651) at the current date to 4,686 (95% CI: 4,309-5,063) by 2021-06-07.

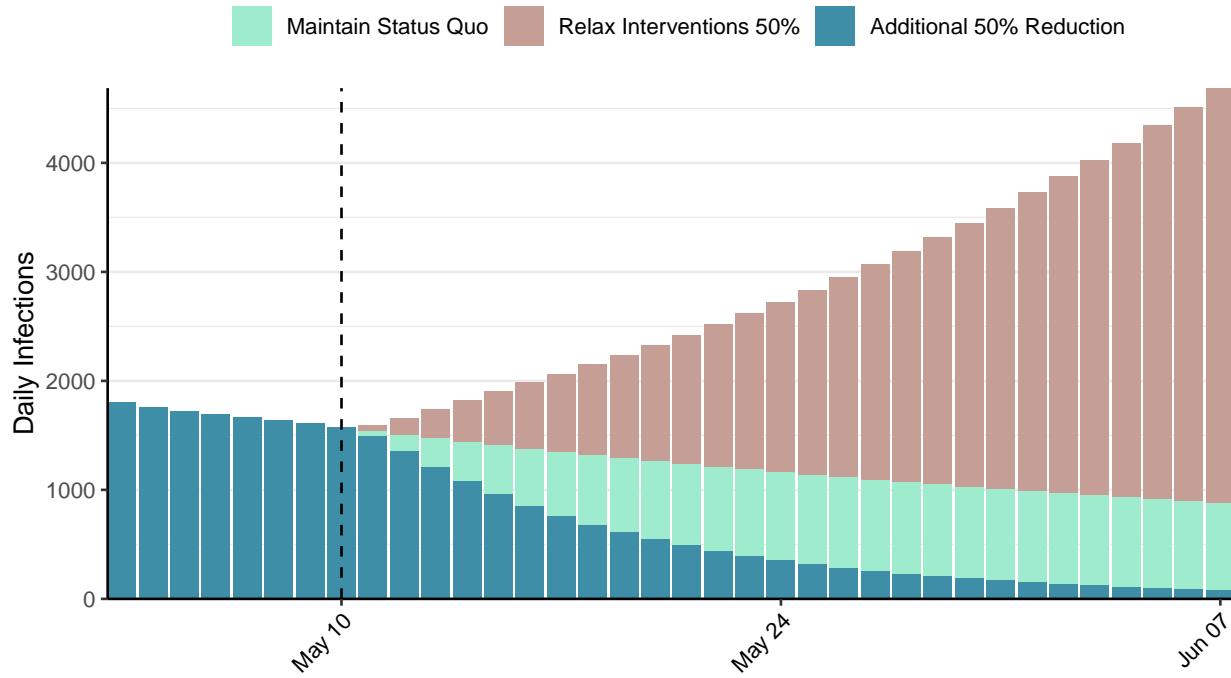


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Peru, 2021-05-10

[Download the report for Peru, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
1,858,238	4,869	64,691	318	0.76 (95% CI: 0.72-0.79)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

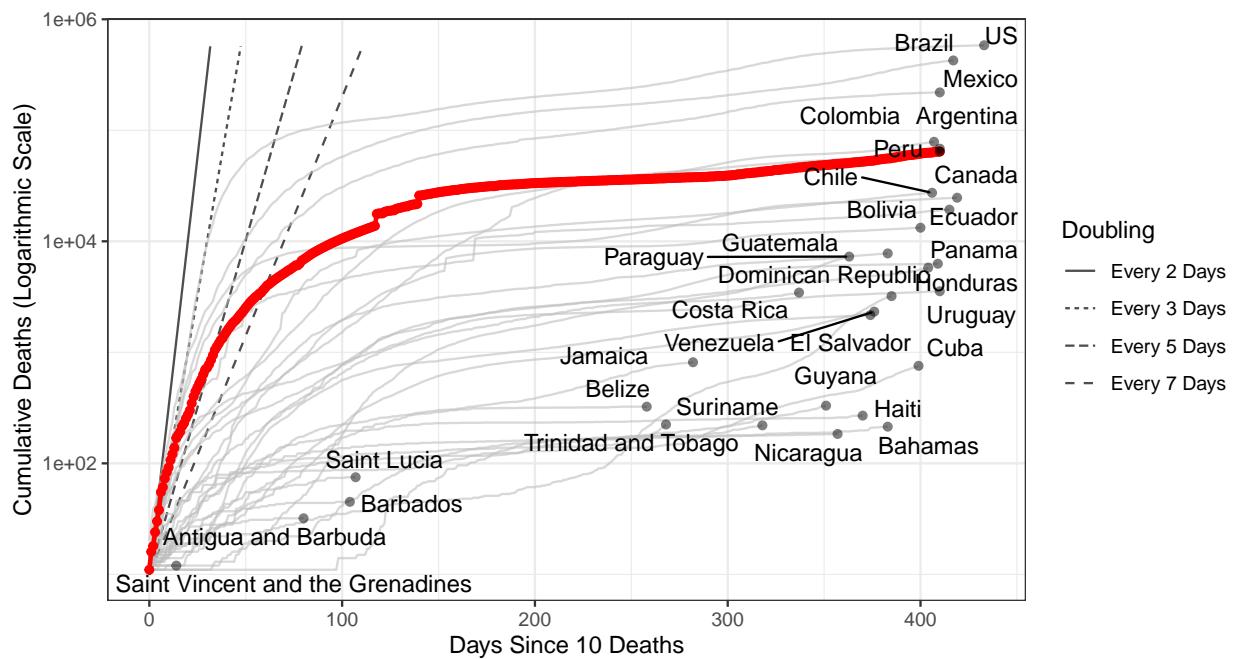


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 2,241,758 (95% CI: 2,214,226-2,269,289) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

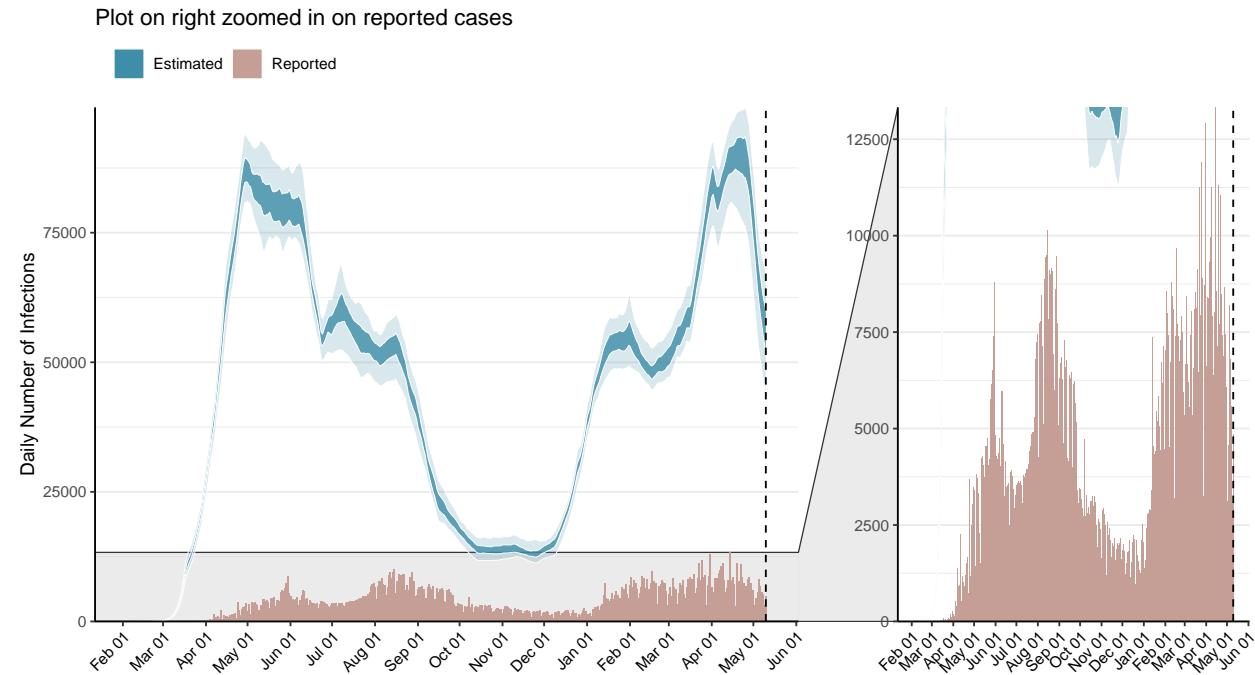
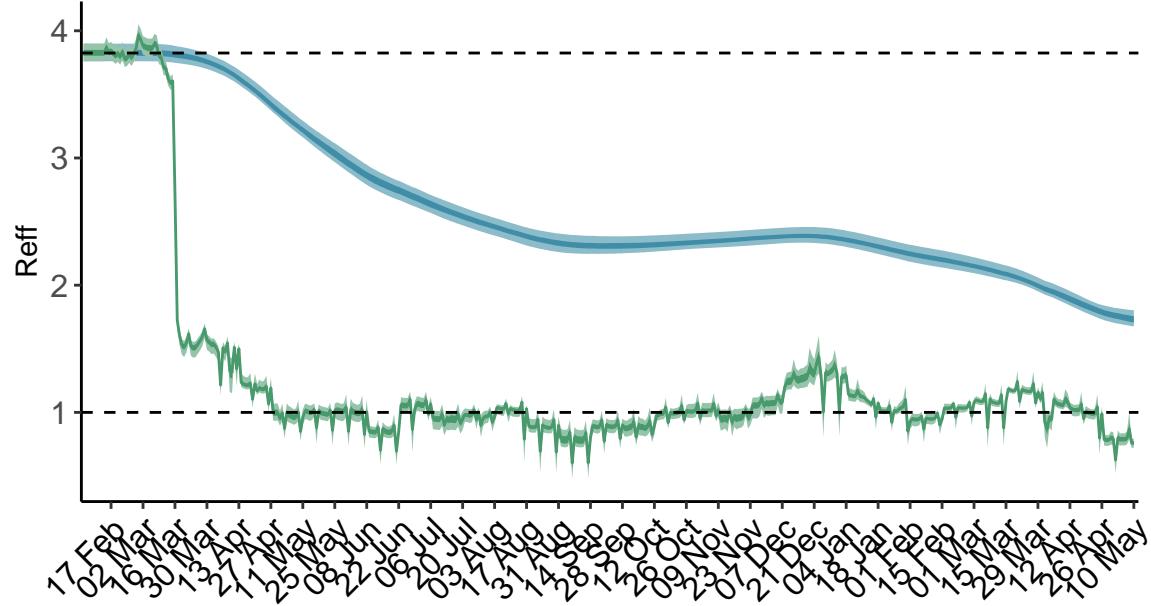


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Peru is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

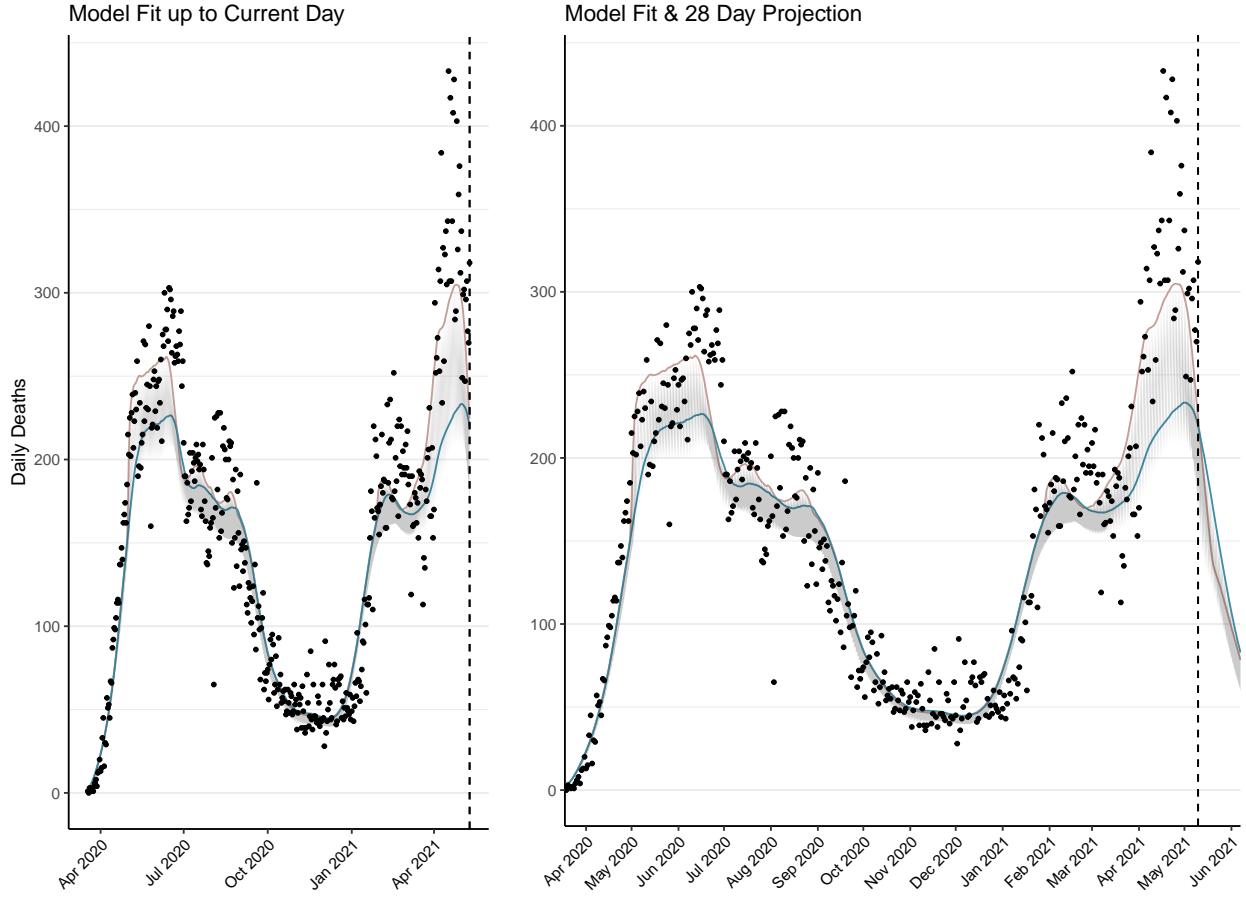


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 7,825 (95% CI: 7,721-7,929) patients requiring treatment with high-pressure oxygen at the current date to 2,779 (95% CI: 2,700-2,858) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 2,170 (95% CI: 2,164-2,175) patients requiring treatment with mechanical ventilation at the current date to 1,317 (95% CI: 1,285-1,348) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

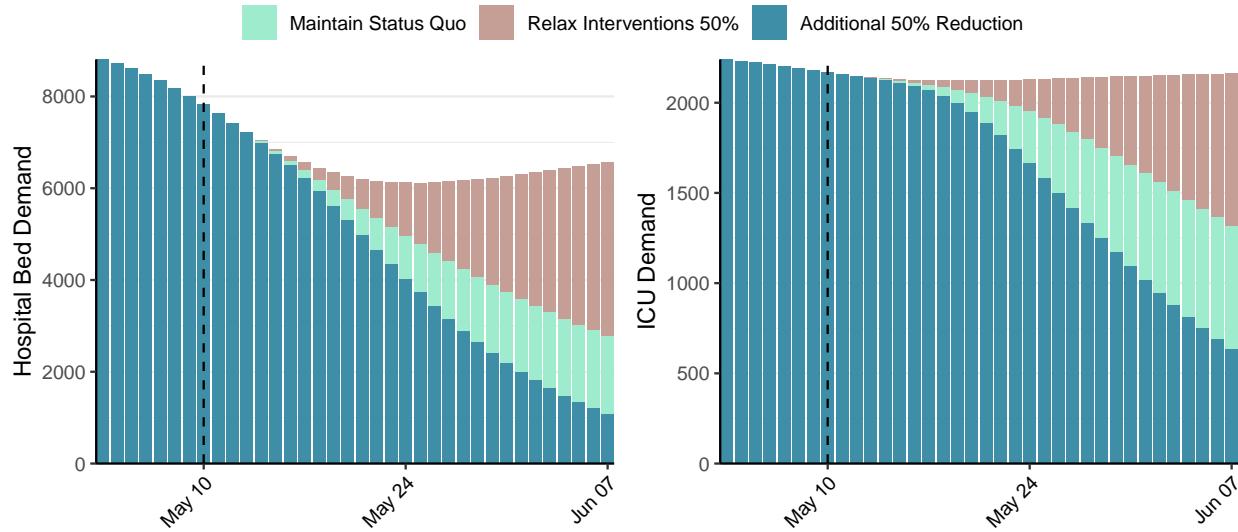


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 56,049 (95% CI: 54,857-57,242) at the current date to 1,910 (95% CI: 1,844-1,976) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 56,049 (95% CI: 54,857-57,242) at the current date to 80,274 (95% CI: 77,641-82,906) by 2021-06-07.

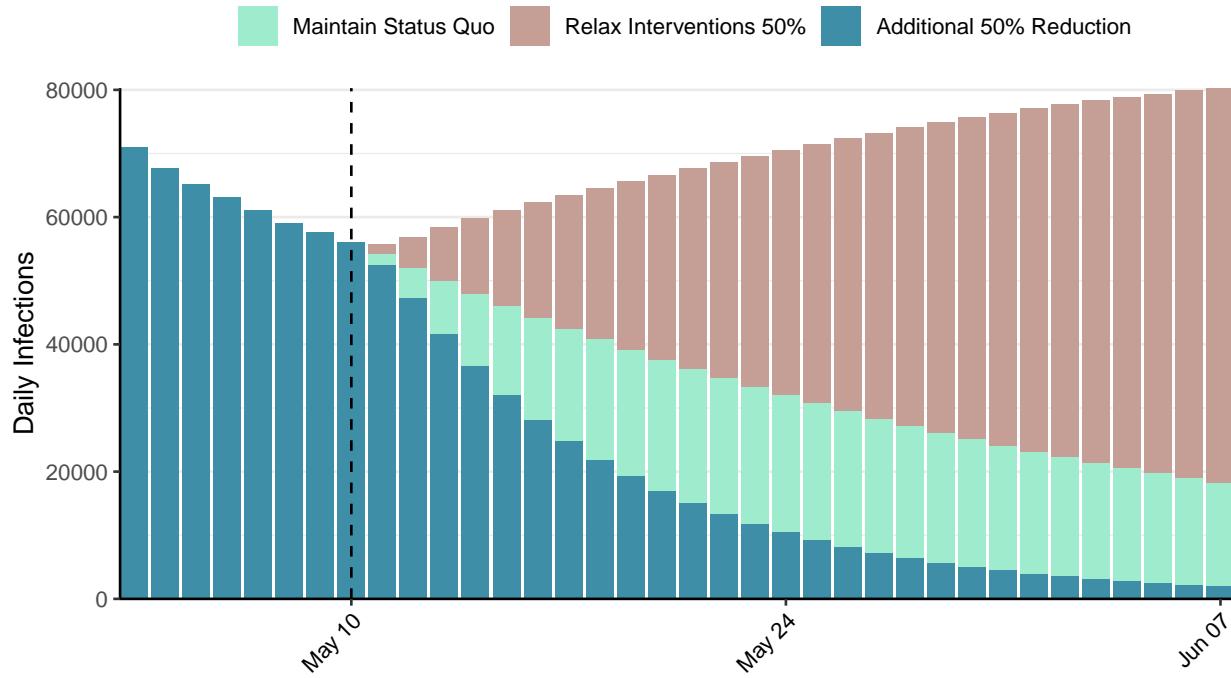


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Philippines, 2021-05-10

[Download the report for Philippines, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
1,108,826	6,836	18,564	90	0.9 (95% CI: 0.86-0.96)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

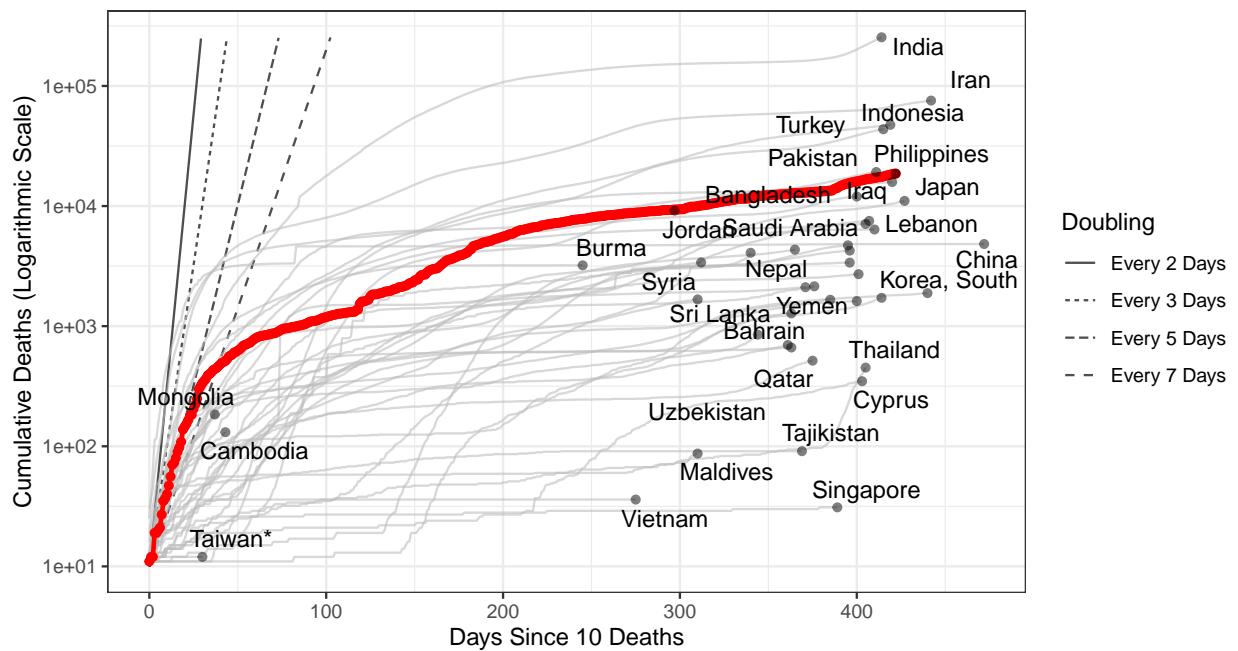


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 1,382,611 (95% CI: 1,344,363-1,420,859) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

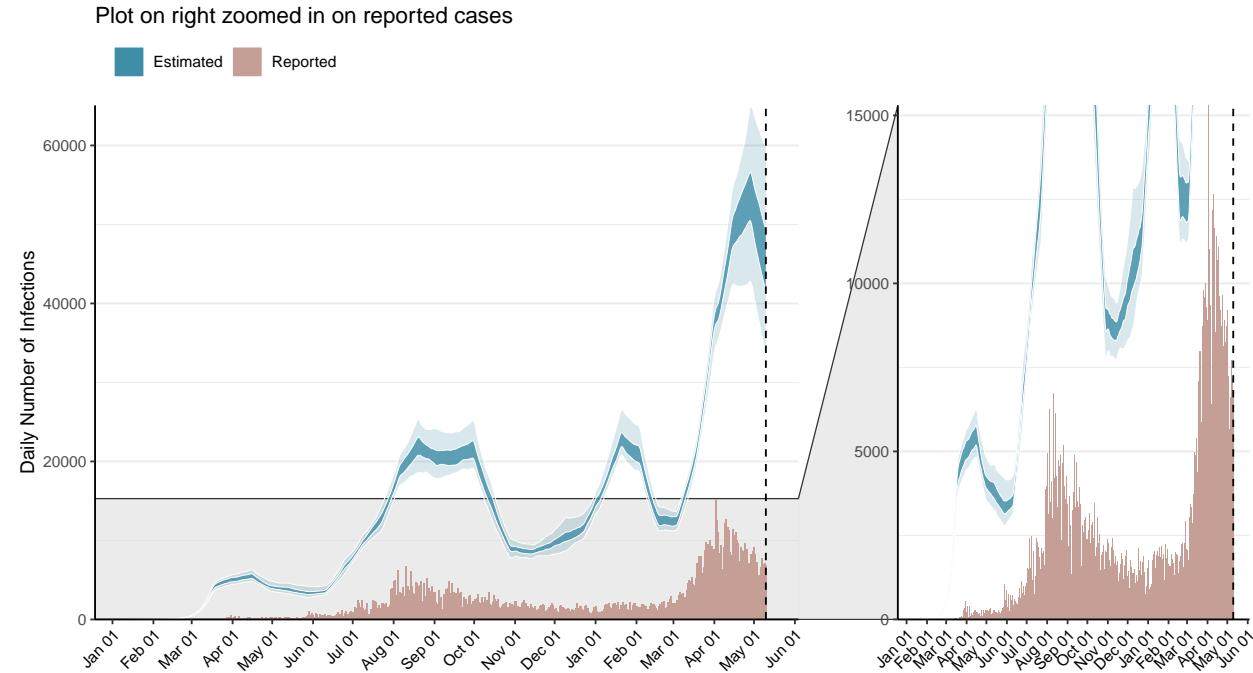
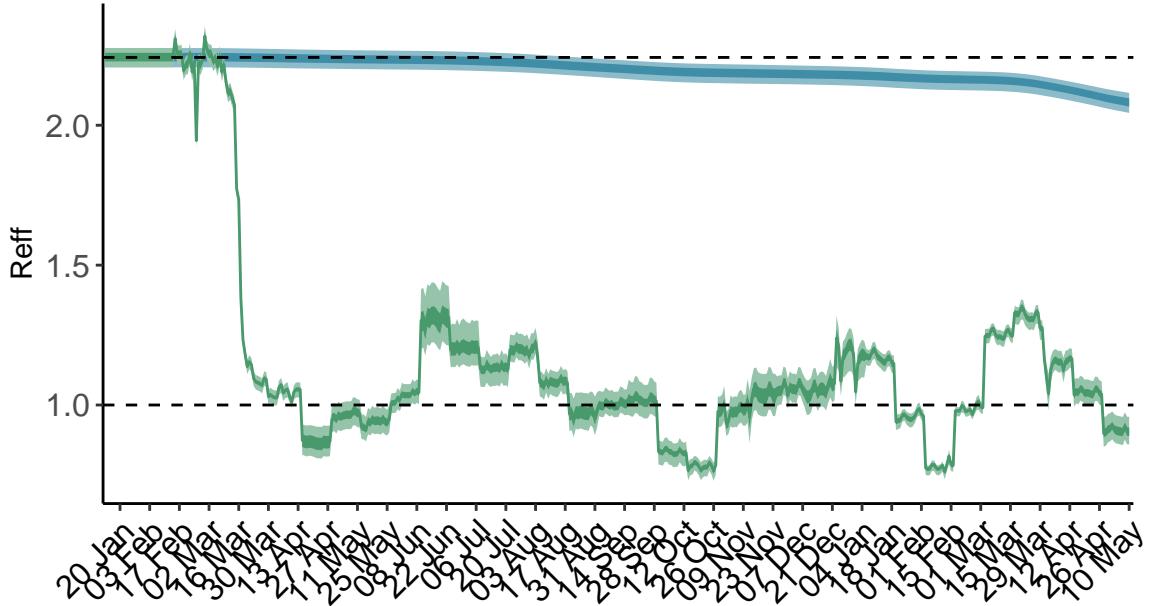


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

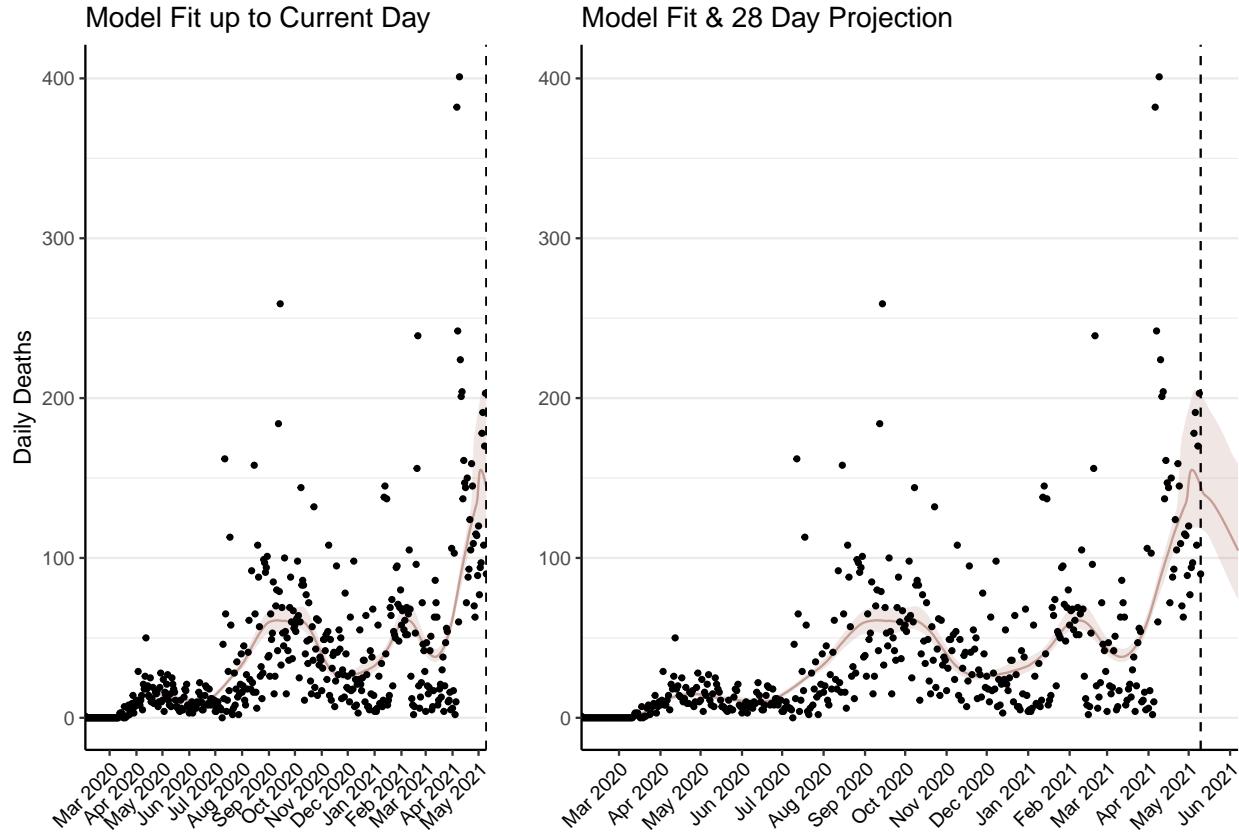


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 5,493 (95% CI: 5,338-5,648) patients requiring treatment with high-pressure oxygen at the current date to 3,890 (95% CI: 3,713-4,067) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1,996 (95% CI: 1,953-2,040) patients requiring treatment with mechanical ventilation at the current date to 1,558 (95% CI: 1,500-1,616) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

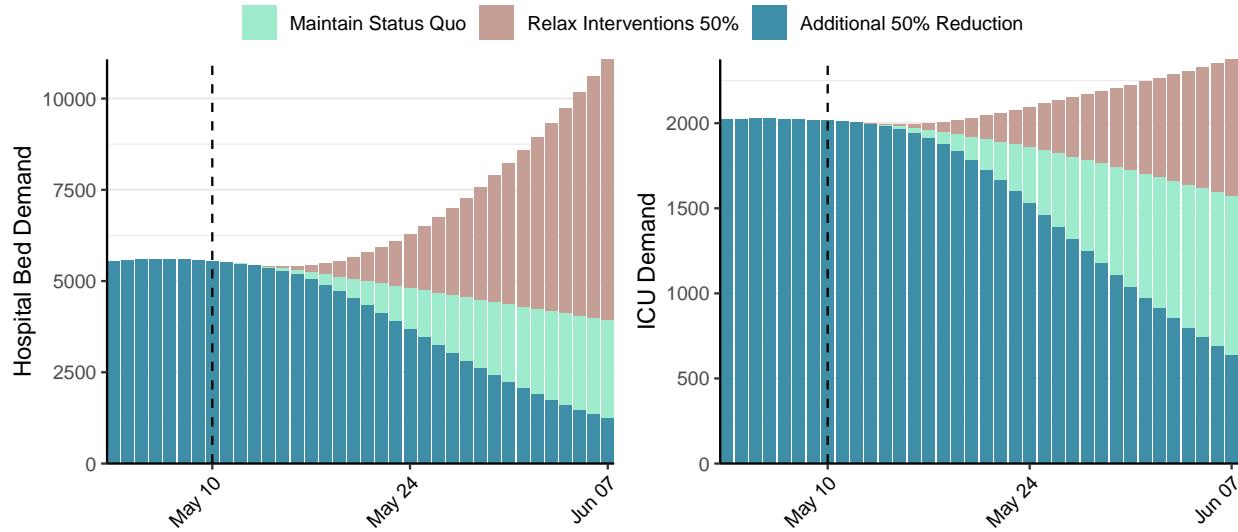
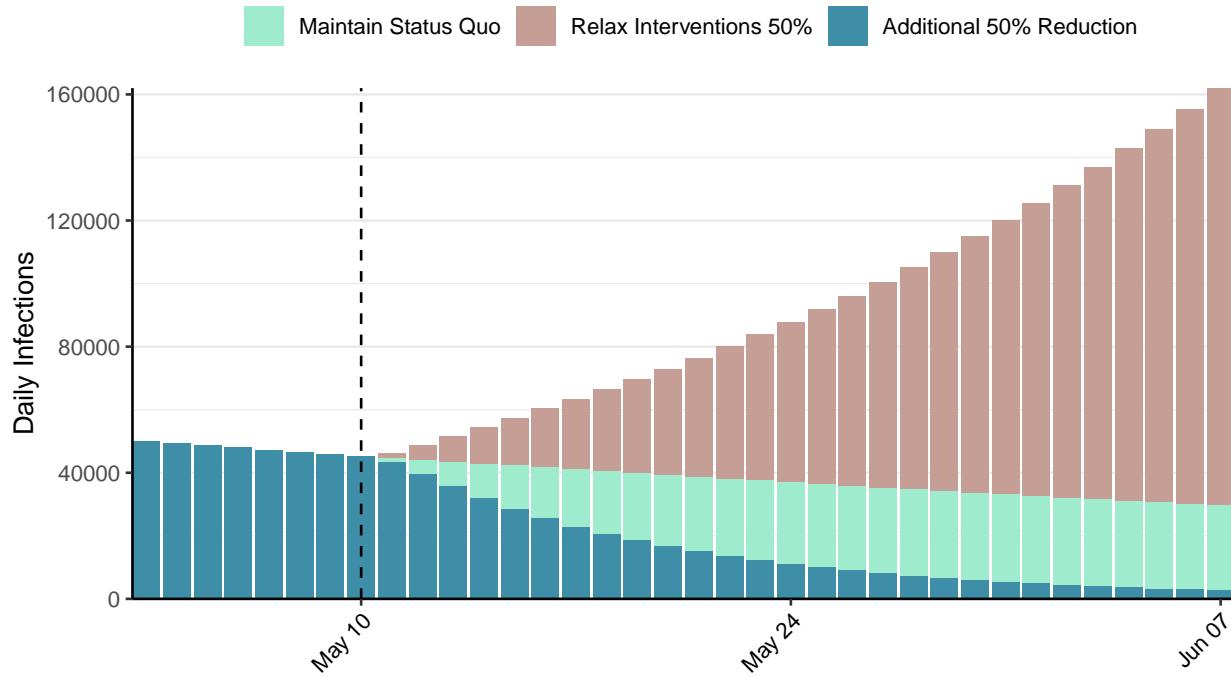


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 44,885 (95% CI: 43,314-46,455) at the current date to 2,548 (95% CI: 2,416-2,680) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 44,885 (95% CI: 43,314-46,455) at the current date to 160,391 (95% CI: 151,187-169,596) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Papua New Guinea, 2021-05-10

[Download the report for Papua New Guinea, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
12,086	456	122	0	0.73 (95% CI: 0.6-0.89)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

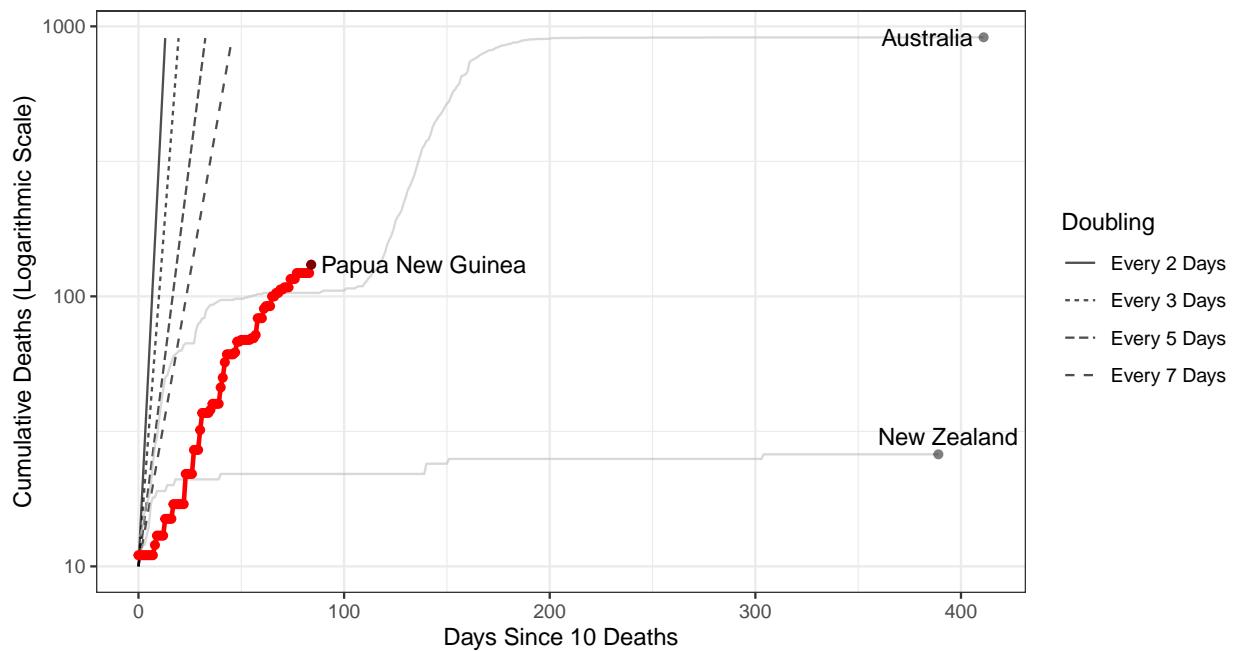


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 17,337 (95% CI: 16,506-18,169) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Papua New Guinea has revised their historic reported cases and thus have reported negative cases.**

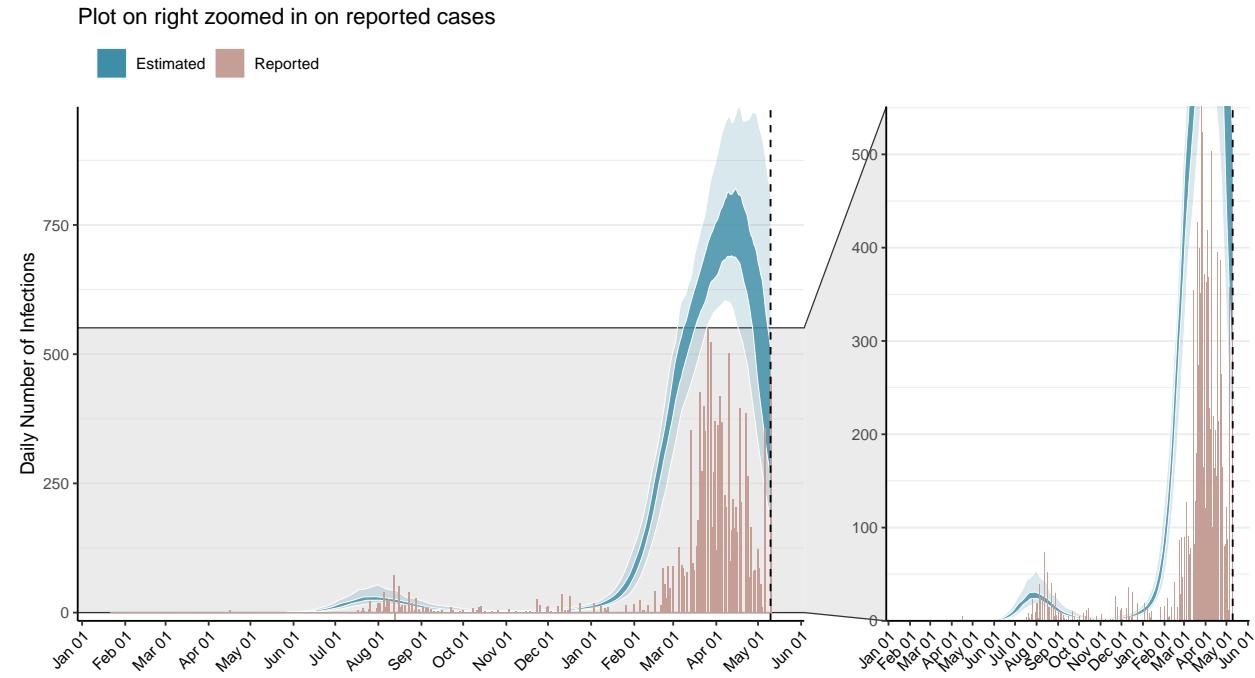
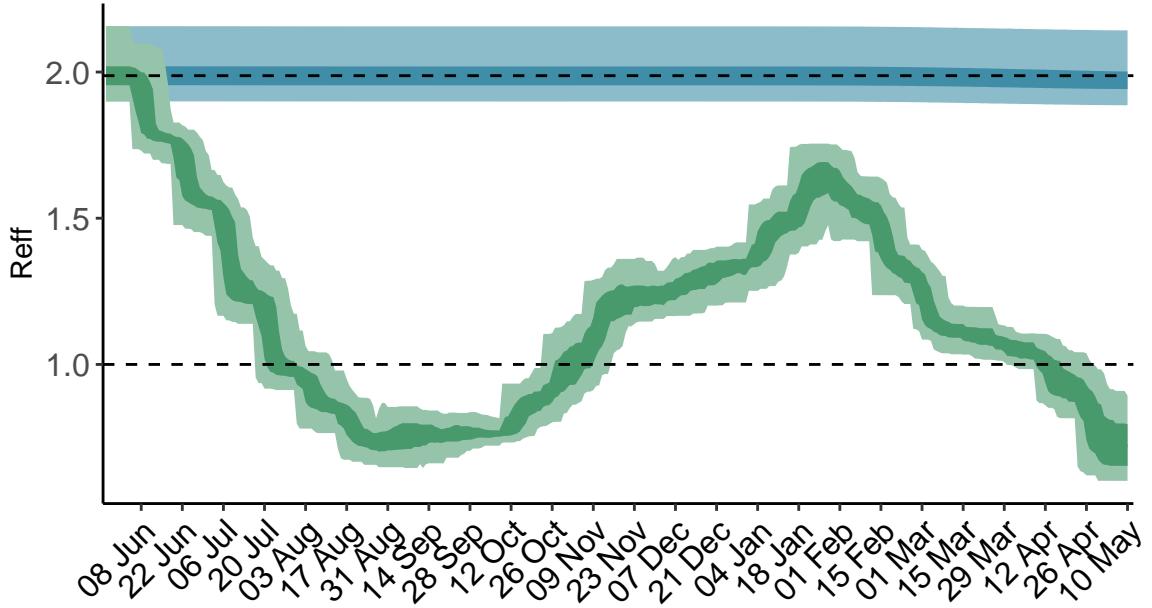


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

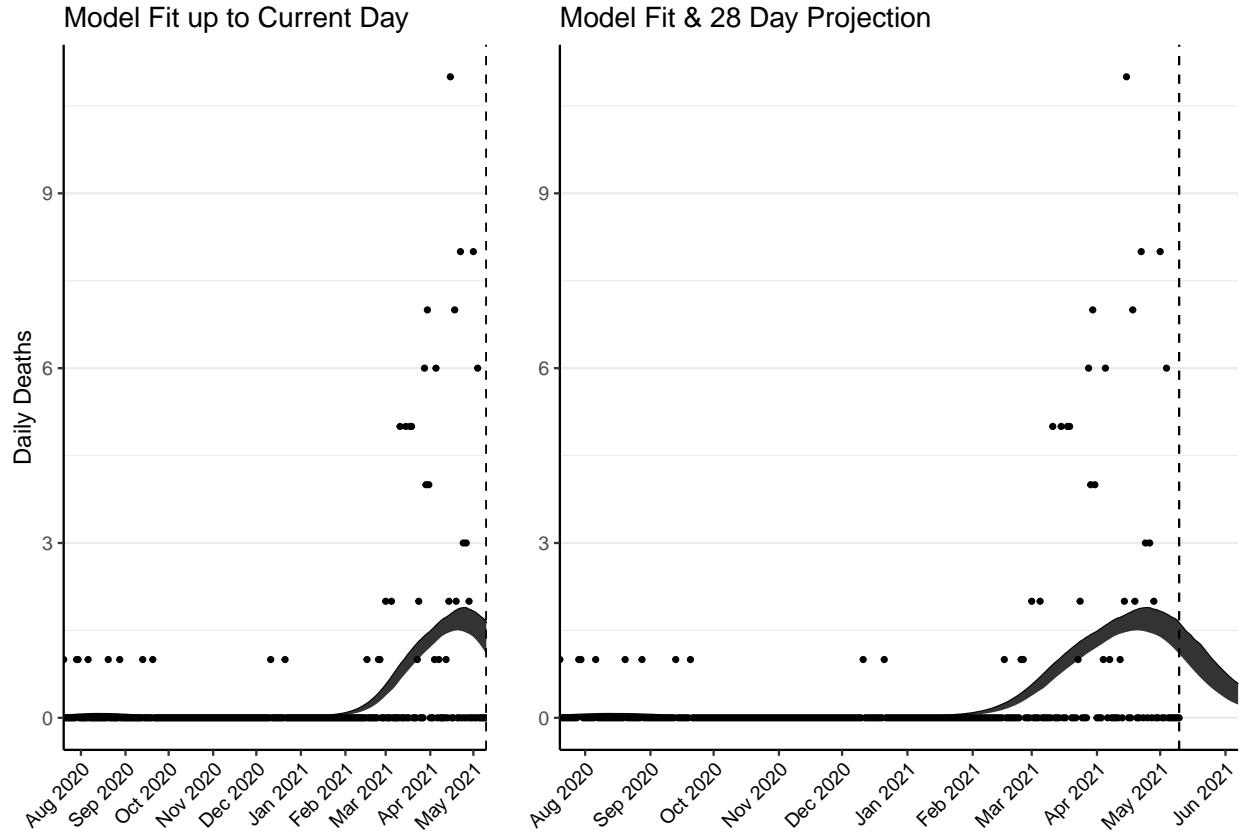


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 61 (95% CI: 58-64) patients requiring treatment with high-pressure oxygen at the current date to 23 (95% CI: 20-27) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 25 (95% CI: 24-27) patients requiring treatment with mechanical ventilation at the current date to 11 (95% CI: 9-12) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

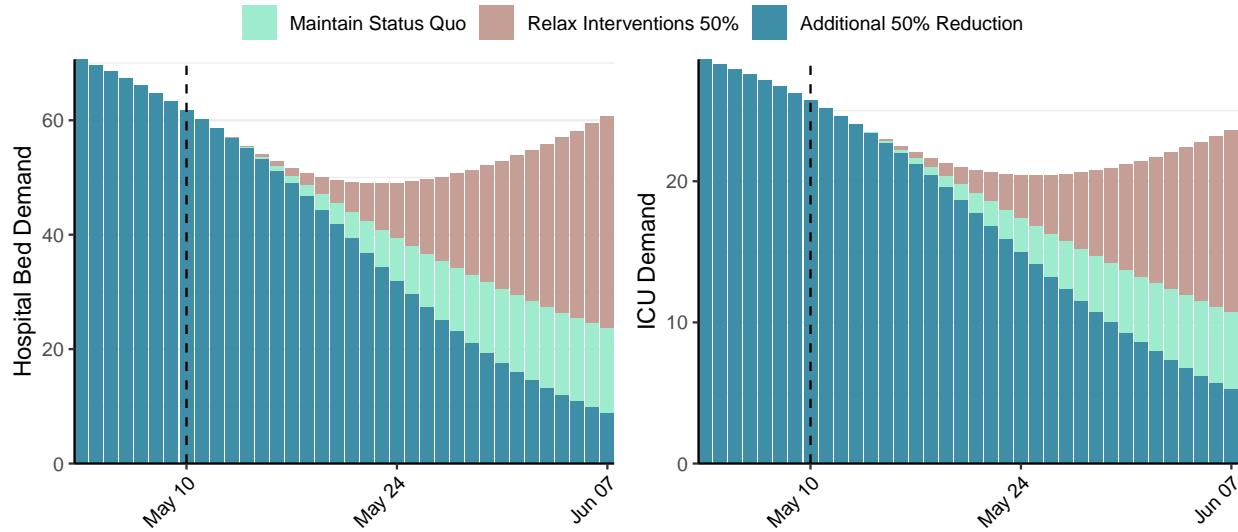


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 406 (95% CI: 370-442) at the current date to 14 (95% CI: 12-16) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 406 (95% CI: 370-442) at the current date to 767 (95% CI: 611-923) by 2021-06-07.

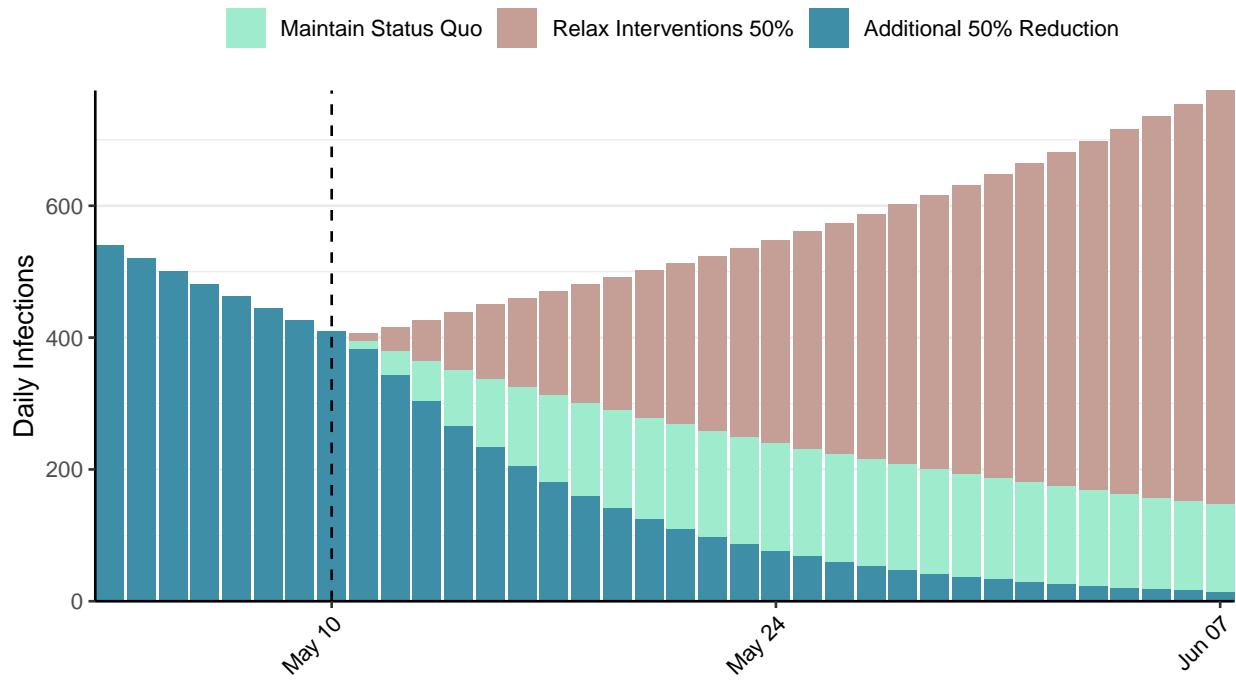


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Paraguay, 2021-05-10

[Download the report for Paraguay, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
299,684	1,895	7,209	79	0.79 (95% CI: 0.75-0.83)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

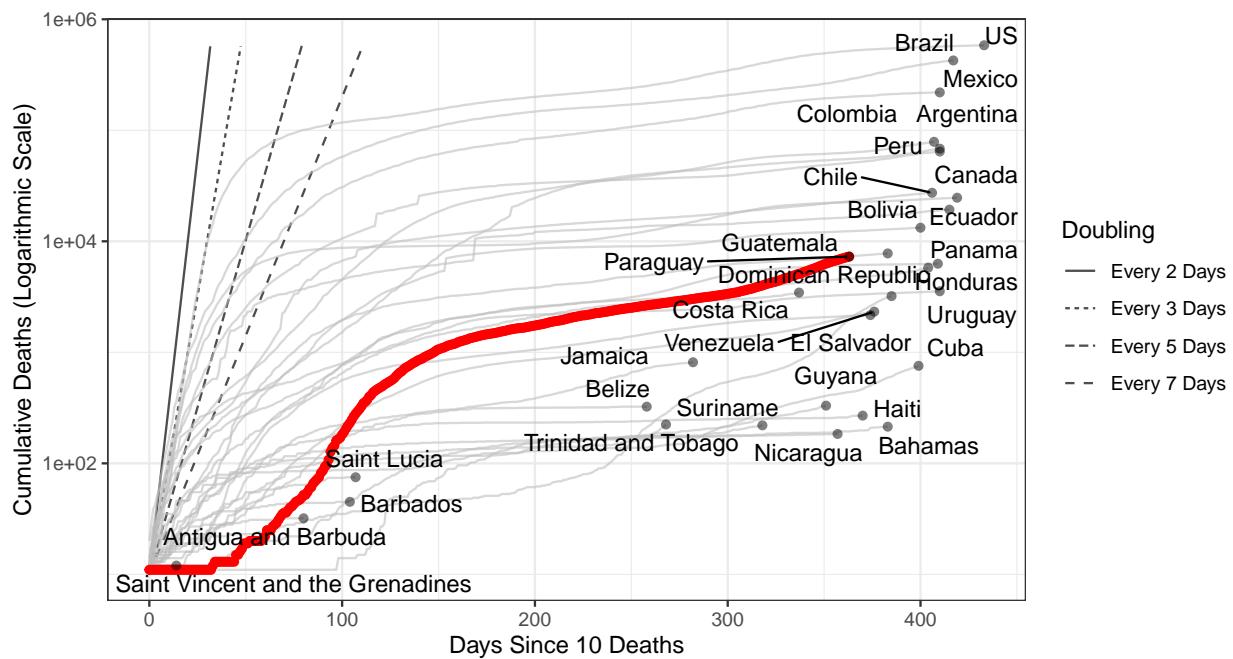


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 604,476 (95% CI: 589,606-619,345) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

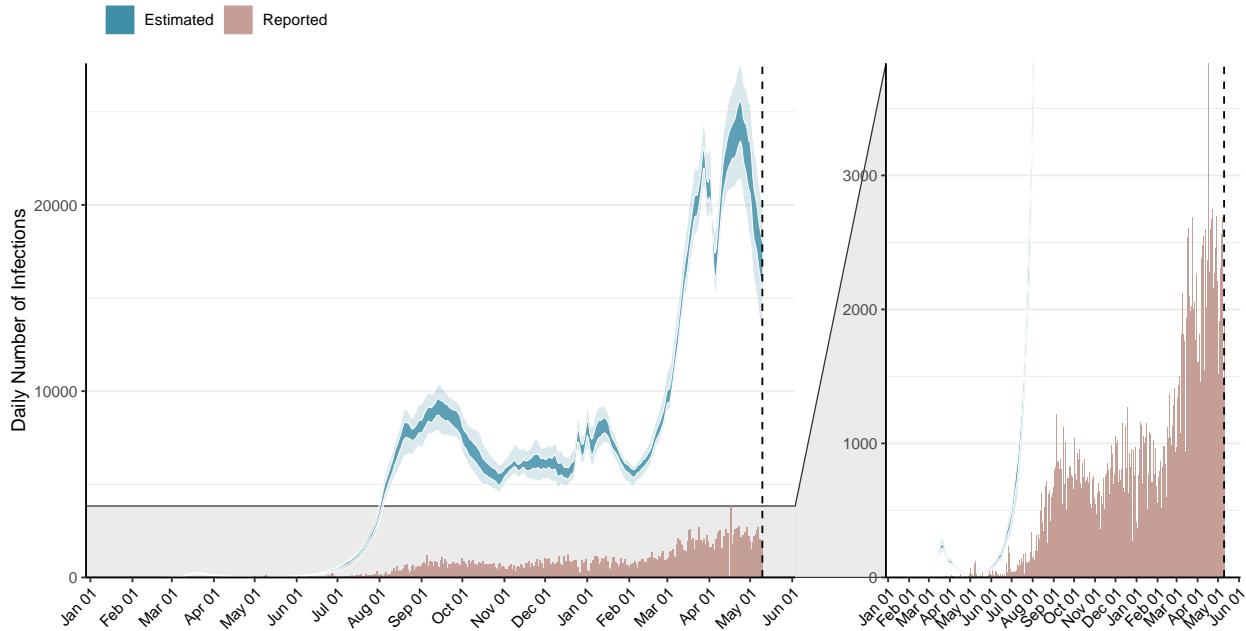
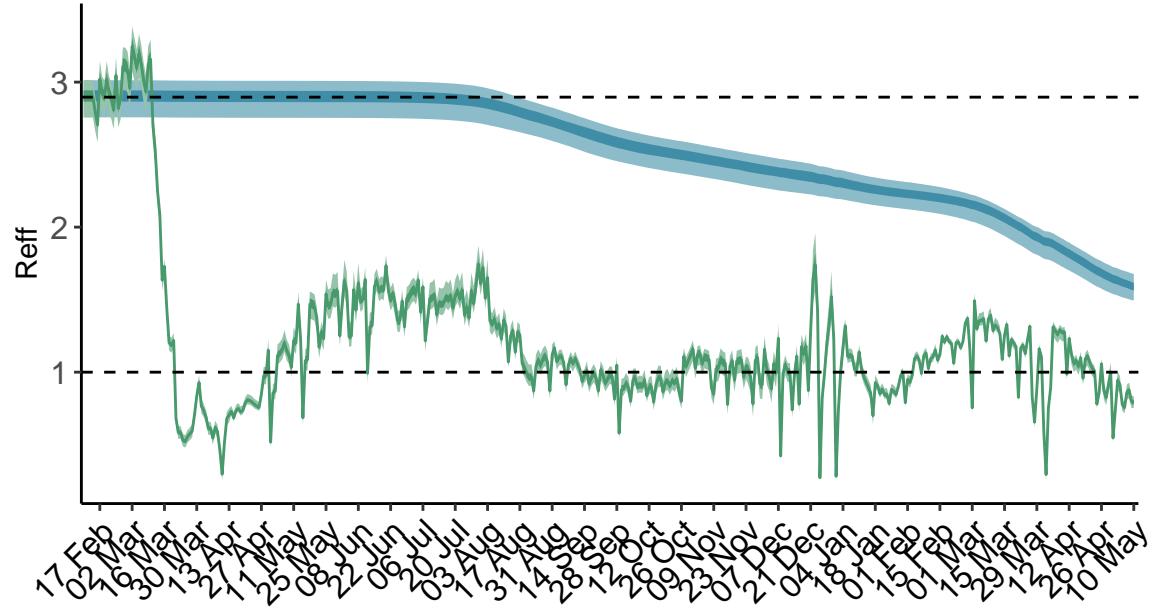


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Paraguay is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

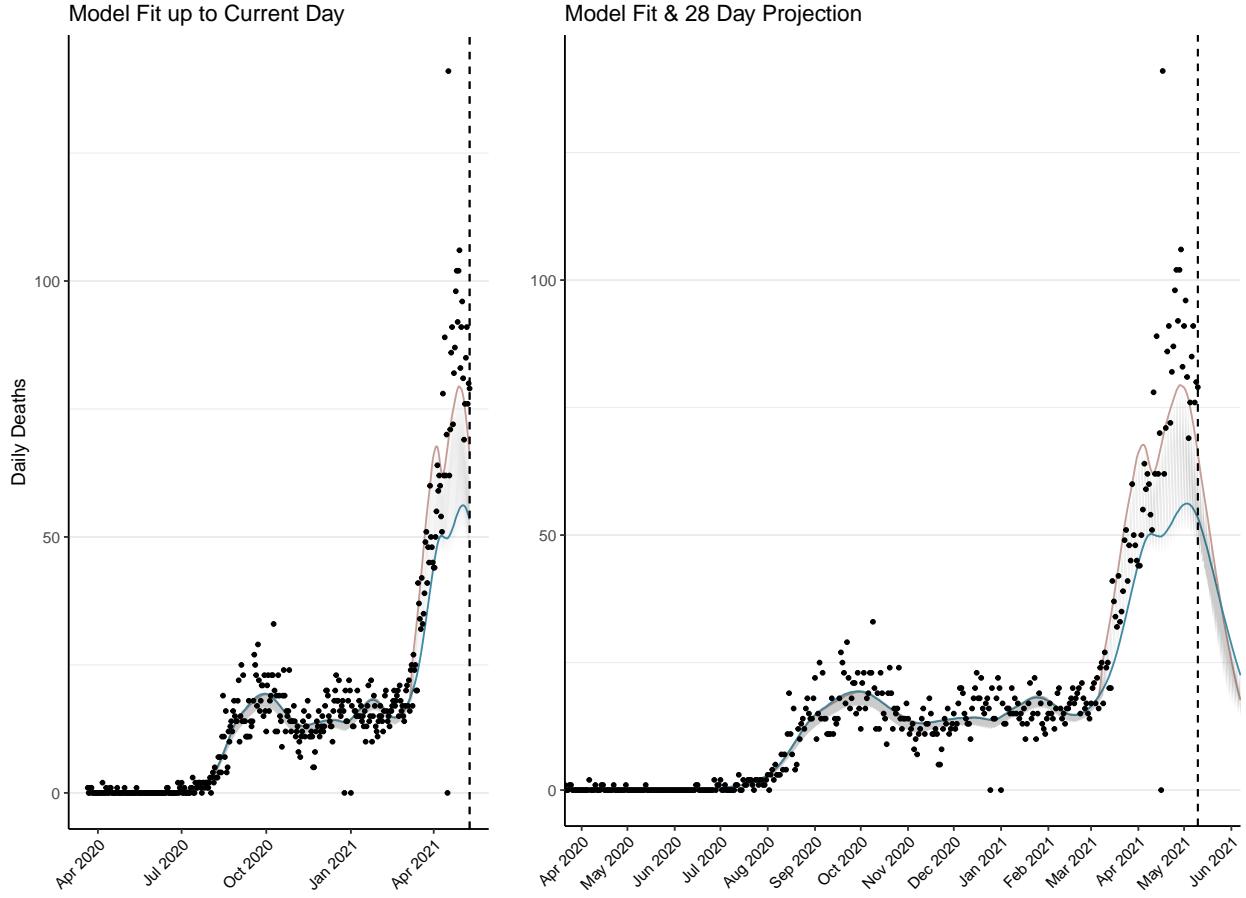


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 1,886 (95% CI: 1,838-1,934) patients requiring treatment with high-pressure oxygen at the current date to 771 (95% CI: 743-799) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 305 (95% CI: 299-311) patients requiring treatment with mechanical ventilation at the current date to 256 (95% CI: 250-261) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

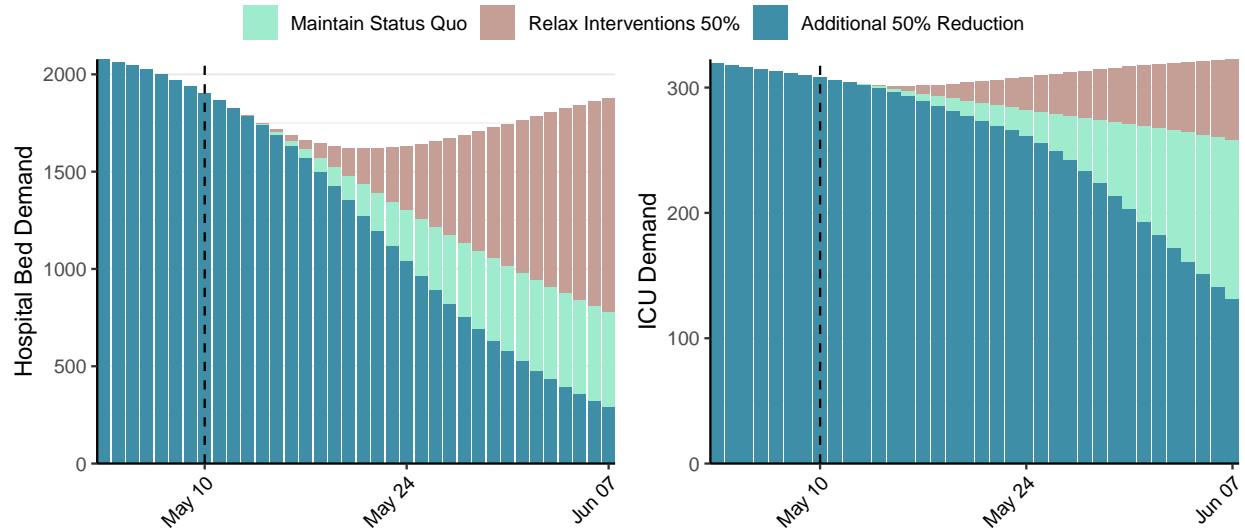


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 16,549 (95% CI: 16,044-17,053) at the current date to 624 (95% CI: 598-650) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 16,549 (95% CI: 16,044-17,053) at the current date to 25,476 (95% CI: 24,477-26,475) by 2021-06-07.

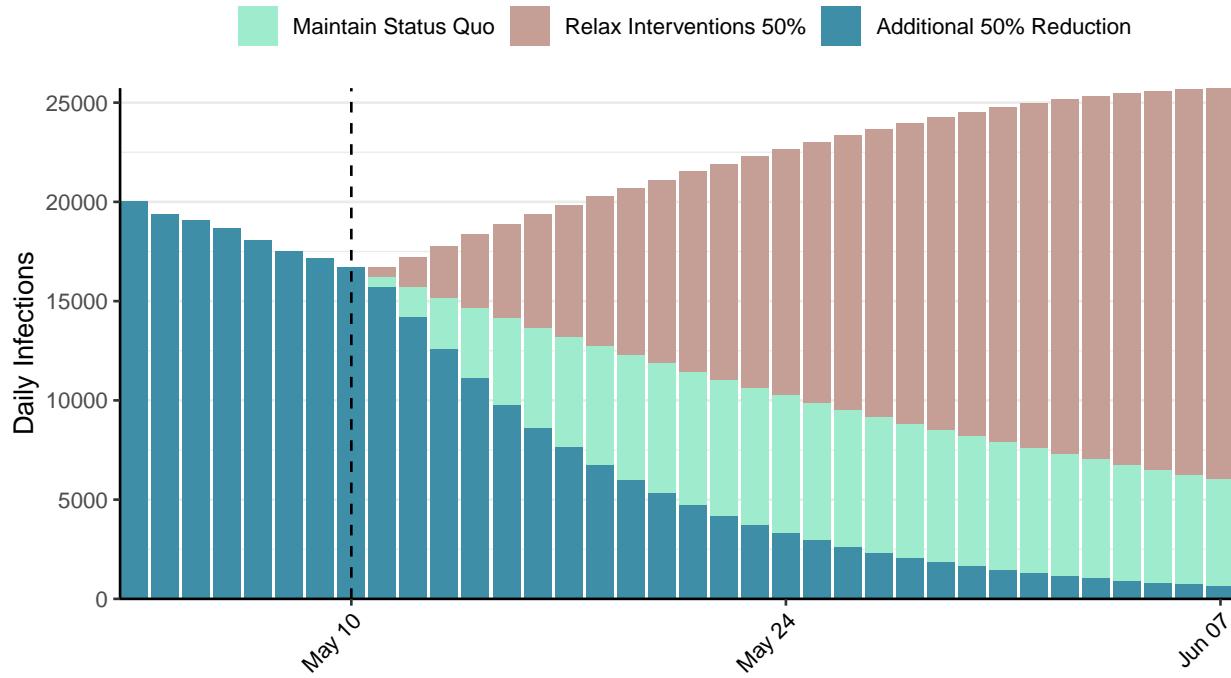


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: State of Palestine, 2021-05-10

[Download the report for State of Palestine, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
302,249	498	3,378	20	0.64 (95% CI: 0.61-0.66)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

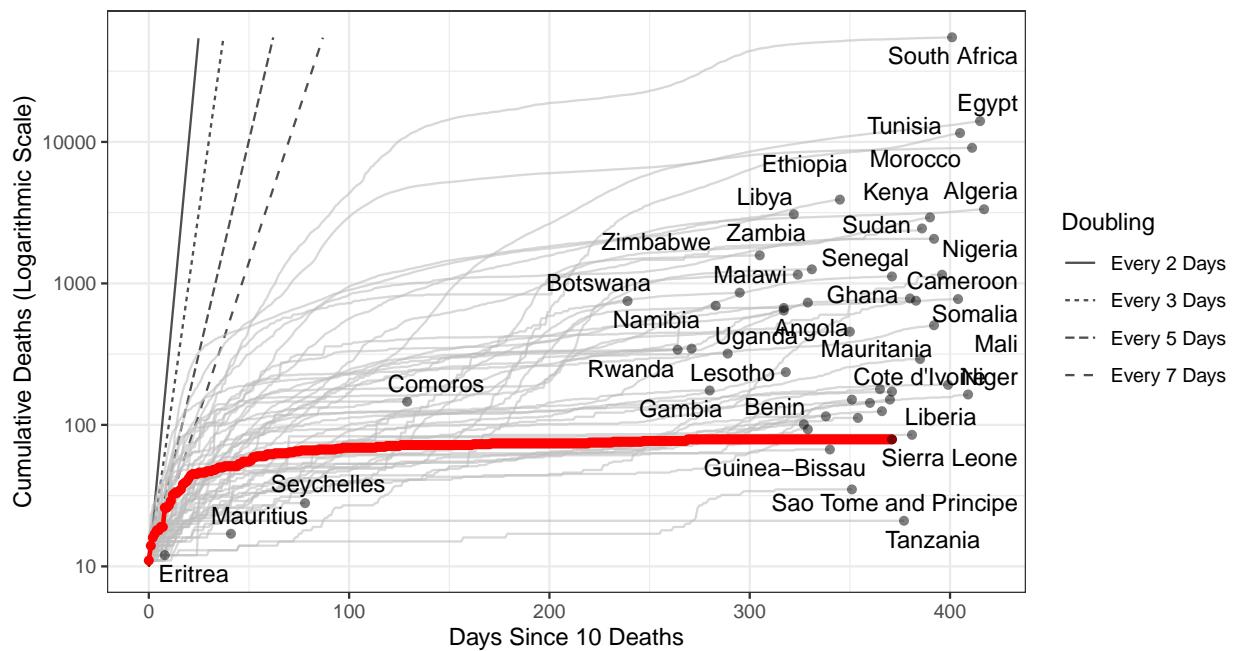


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 155,512 (95% CI: 151,320-159,703) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

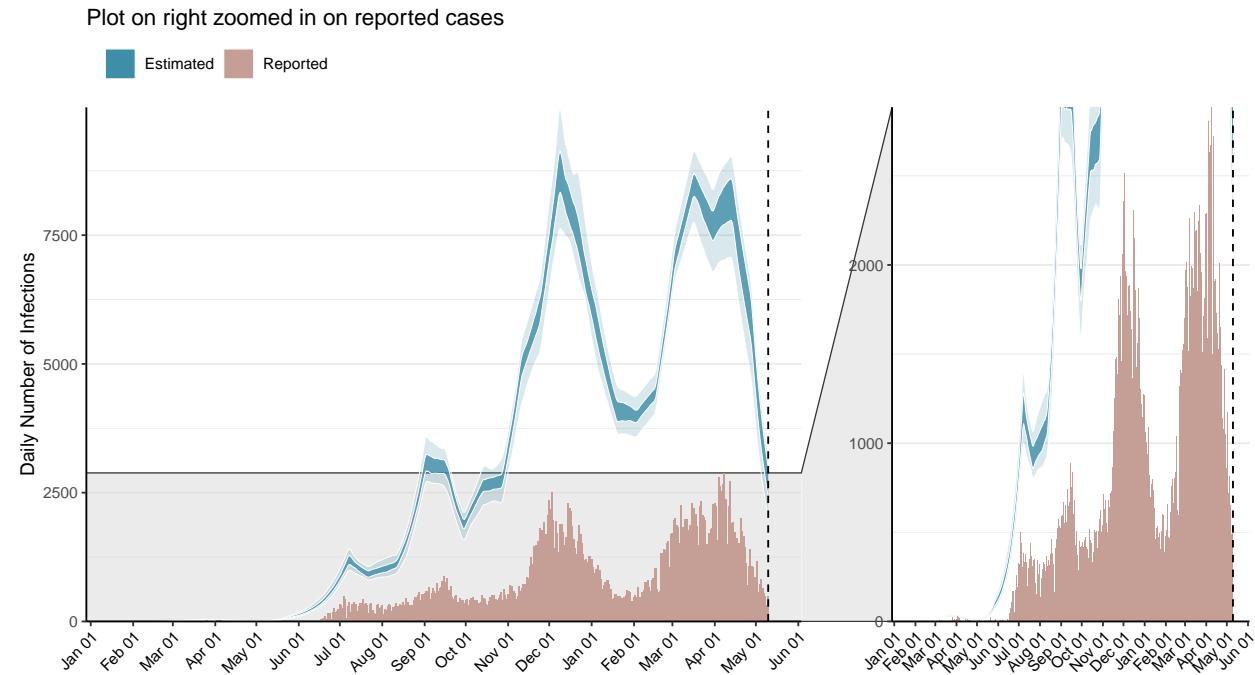
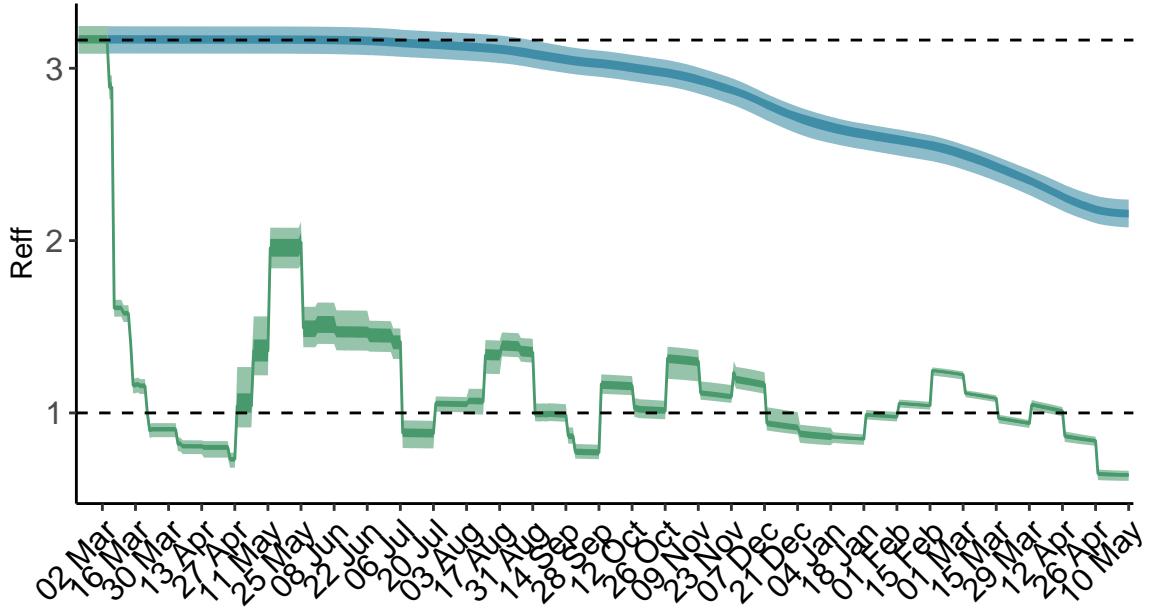


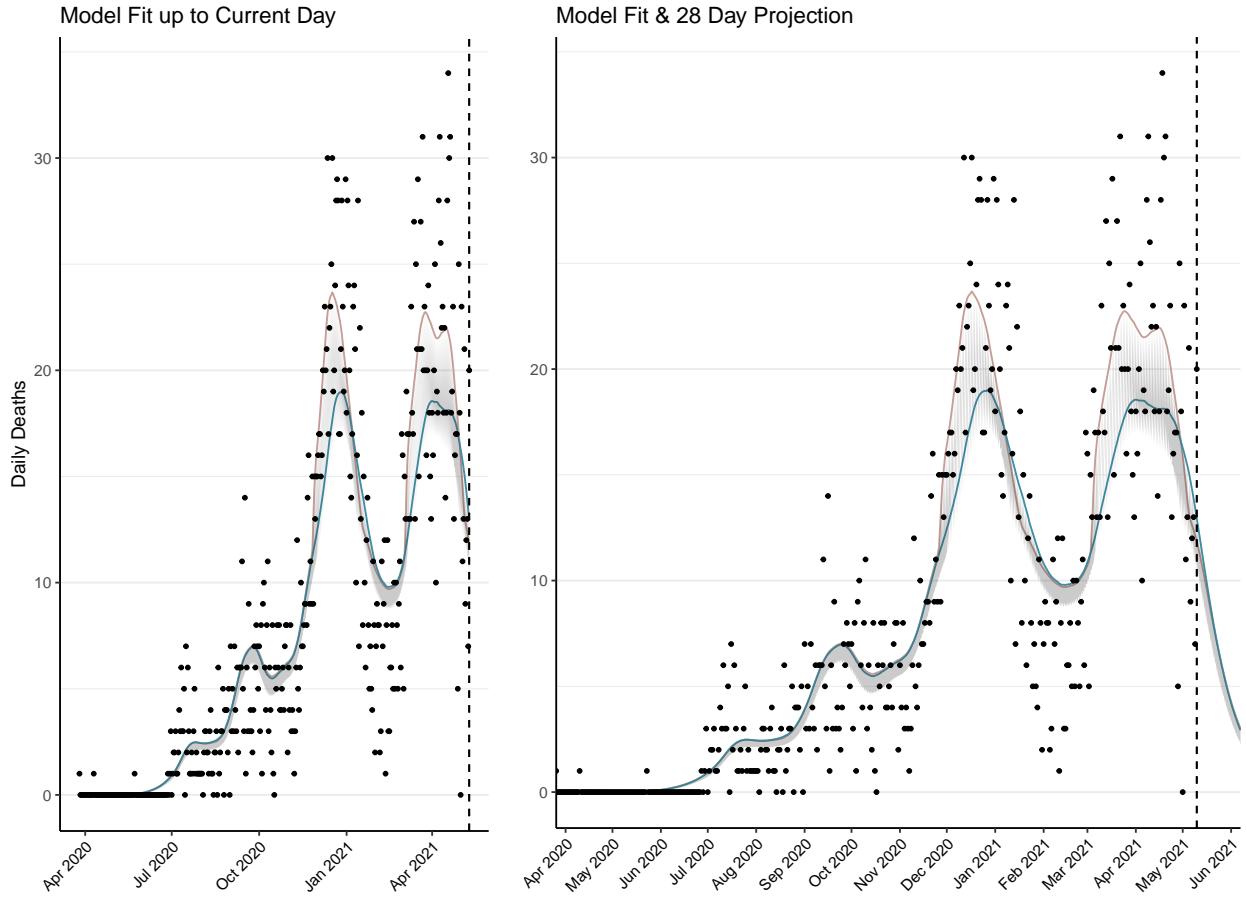
Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. State of Palestine is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)



**Figure 4: Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 450 (95% CI: 438-462) patients requiring treatment with high-pressure oxygen at the current date to 96 (95% CI: 92-99) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 164 (95% CI: 160-167) patients requiring treatment with mechanical ventilation at the current date to 46 (95% CI: 45-48) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

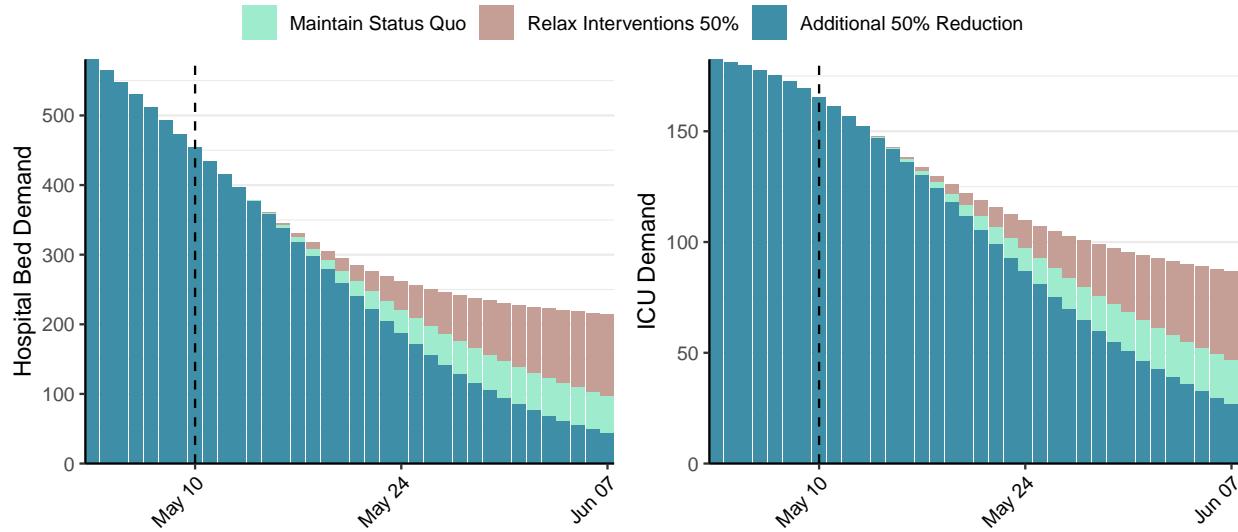
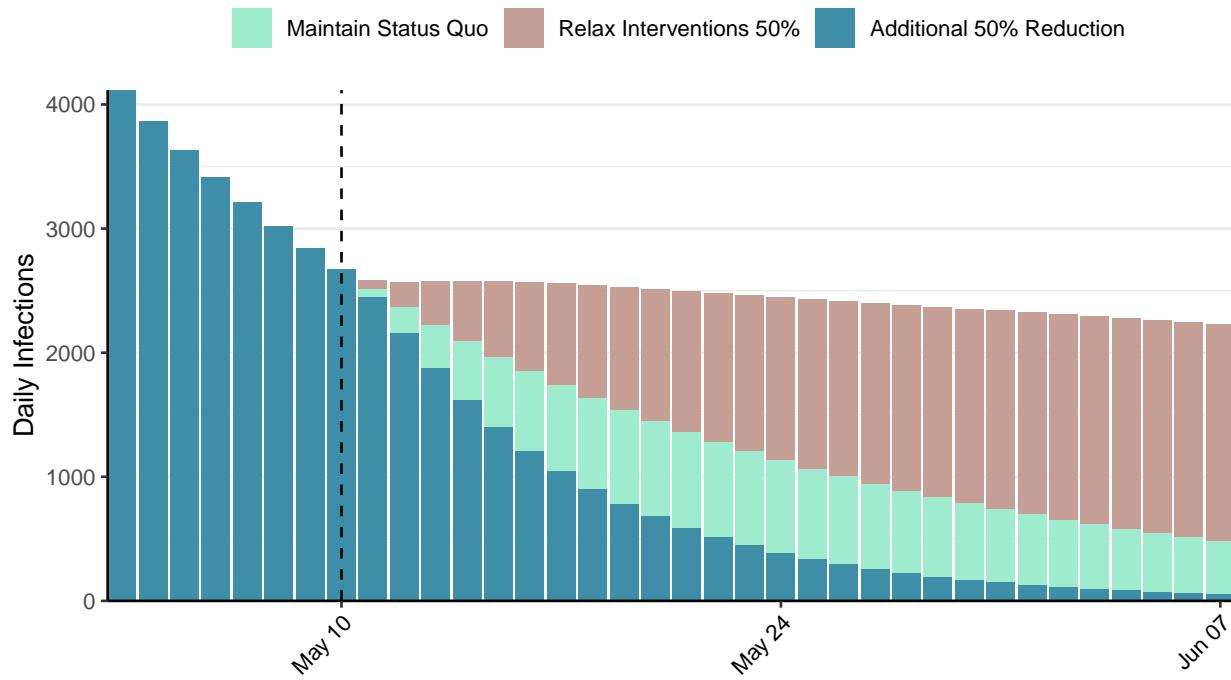


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 2,643 (95% CI: 2,558-2,729) at the current date to 54 (95% CI: 52-56) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 2,643 (95% CI: 2,558-2,729) at the current date to 2,207 (95% CI: 2,107-2,307) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Romania, 2021-05-10

[Download the report for Romania, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
1,066,731	620	29,034	68	0.6 (95% CI: 0.58-0.63)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

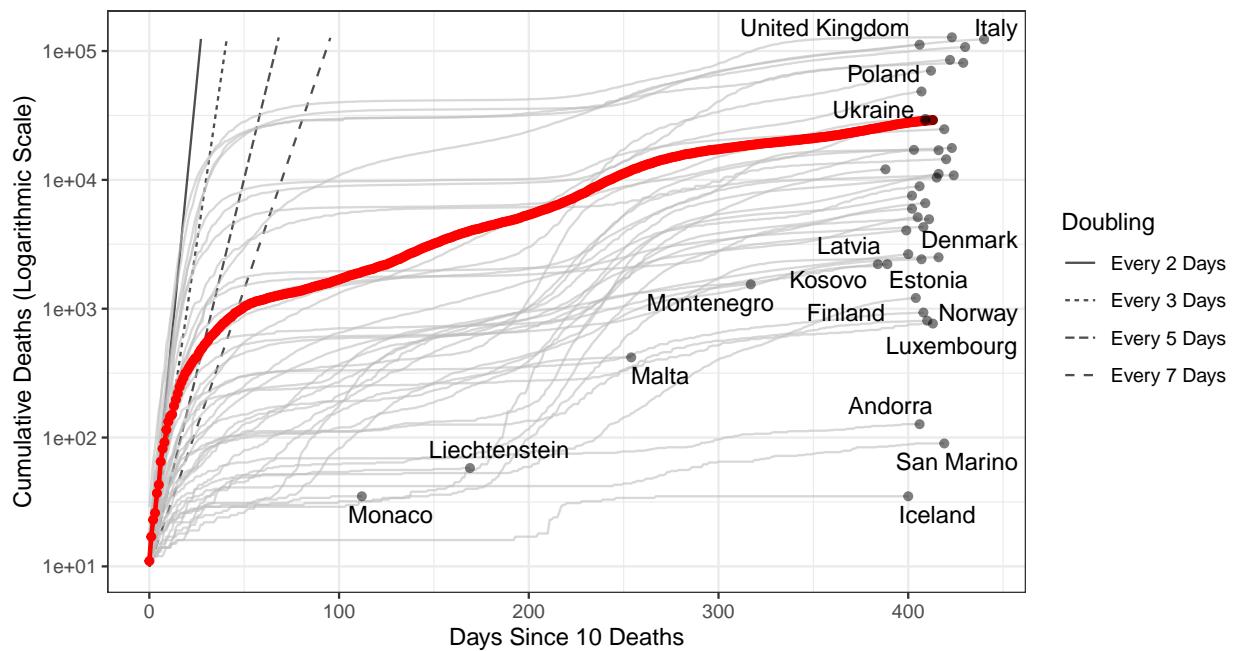


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 835,157 (95% CI: 813,930–856,384) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

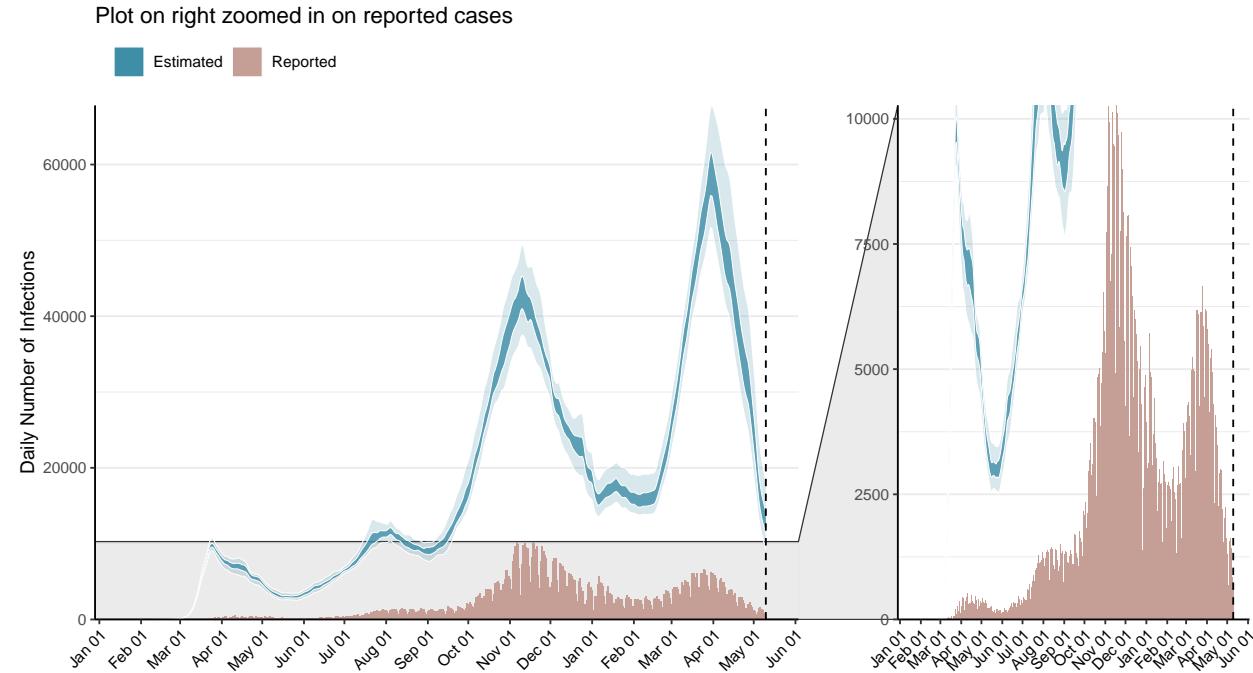
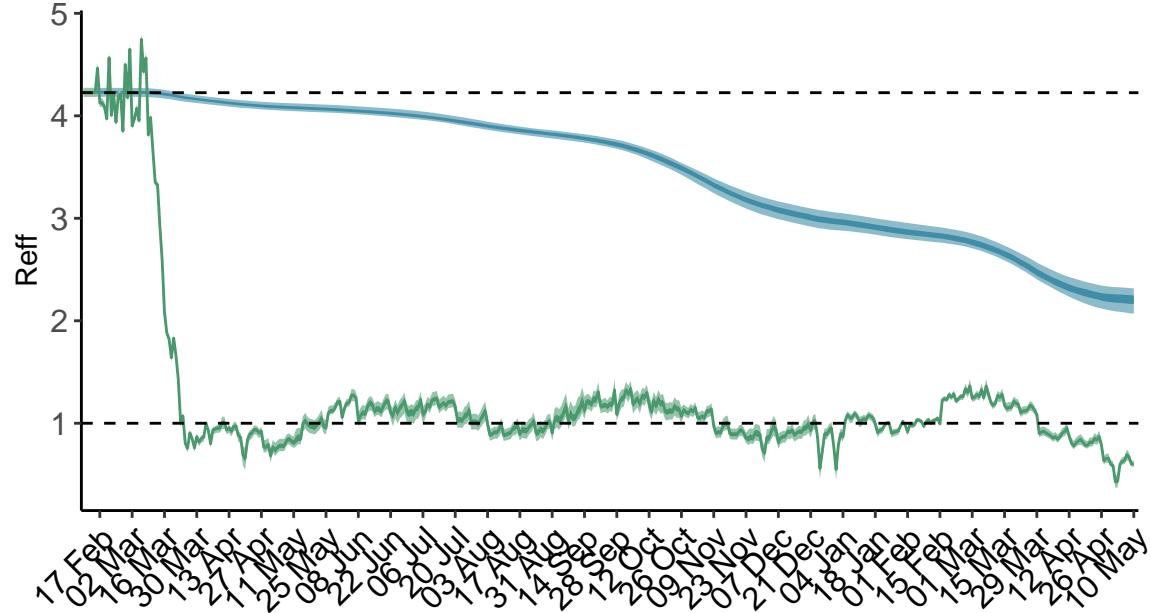


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

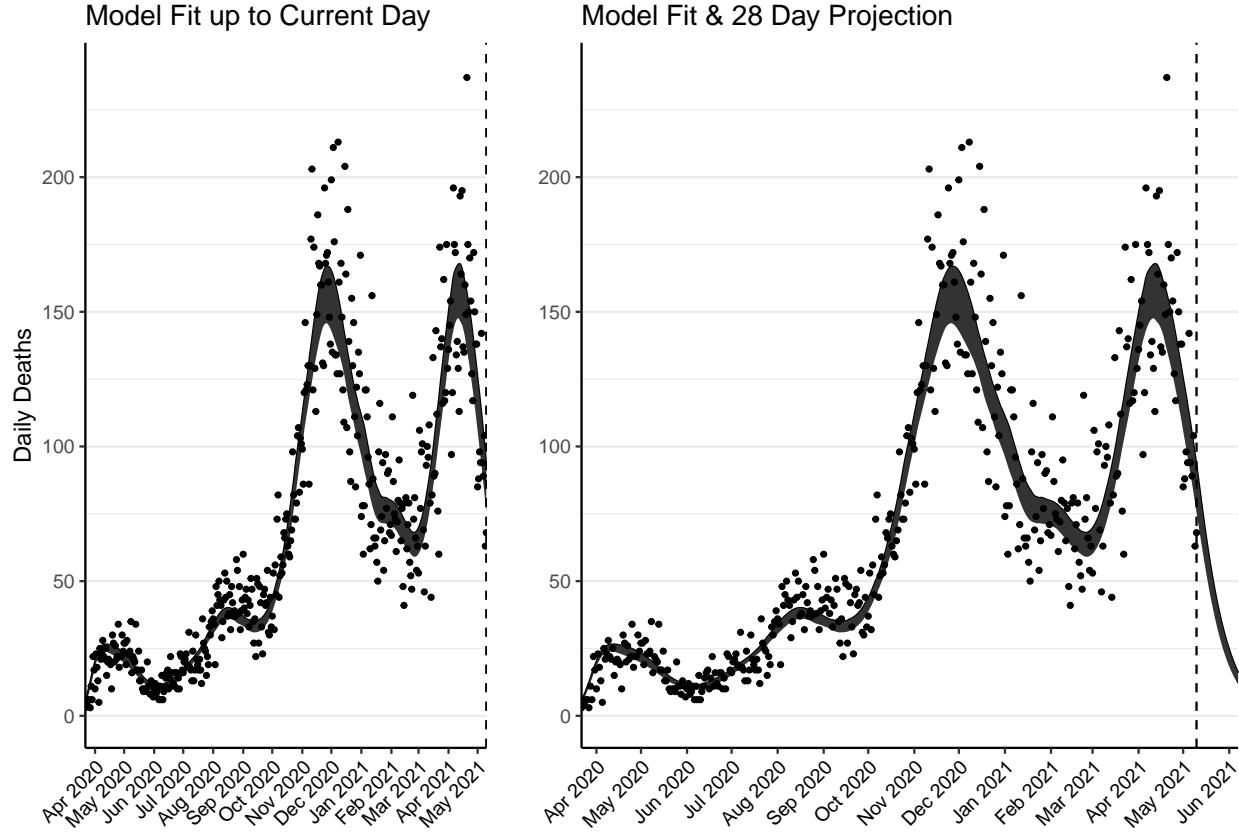


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 3,159 (95% CI: 3,072-3,246) patients requiring treatment with high-pressure oxygen at the current date to 508 (95% CI: 487-530) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1,579 (95% CI: 1,538-1,619) patients requiring treatment with mechanical ventilation at the current date to 297 (95% CI: 286-309) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

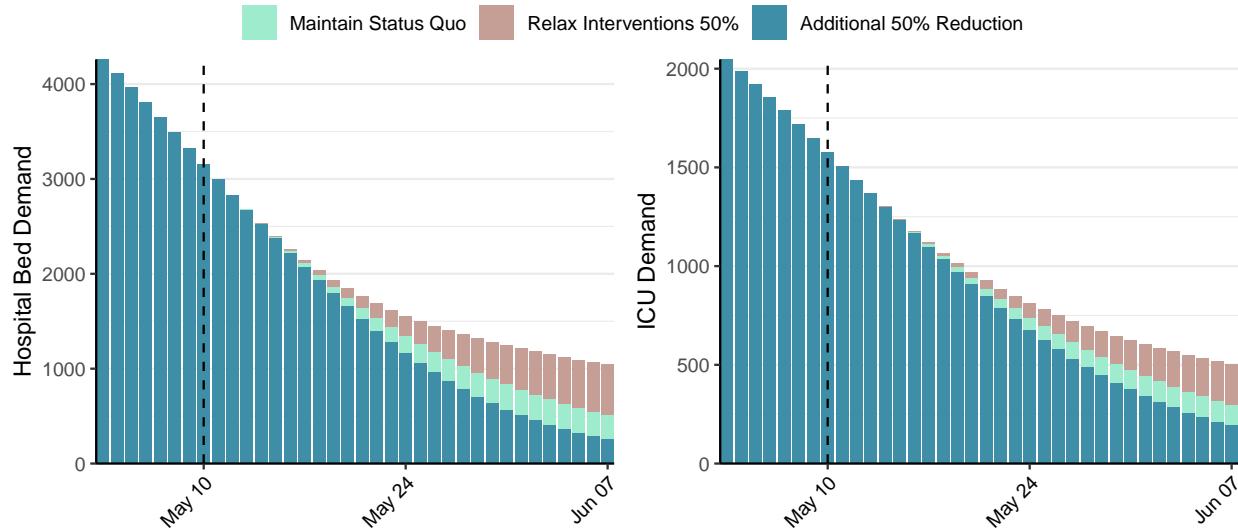


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 12,663 (95% CI: 12,215-13,112) at the current date to 206 (95% CI: 196-216) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 12,663 (95% CI: 12,215-13,112) at the current date to 7,523 (95% CI: 7,129-7,917) by 2021-06-07.

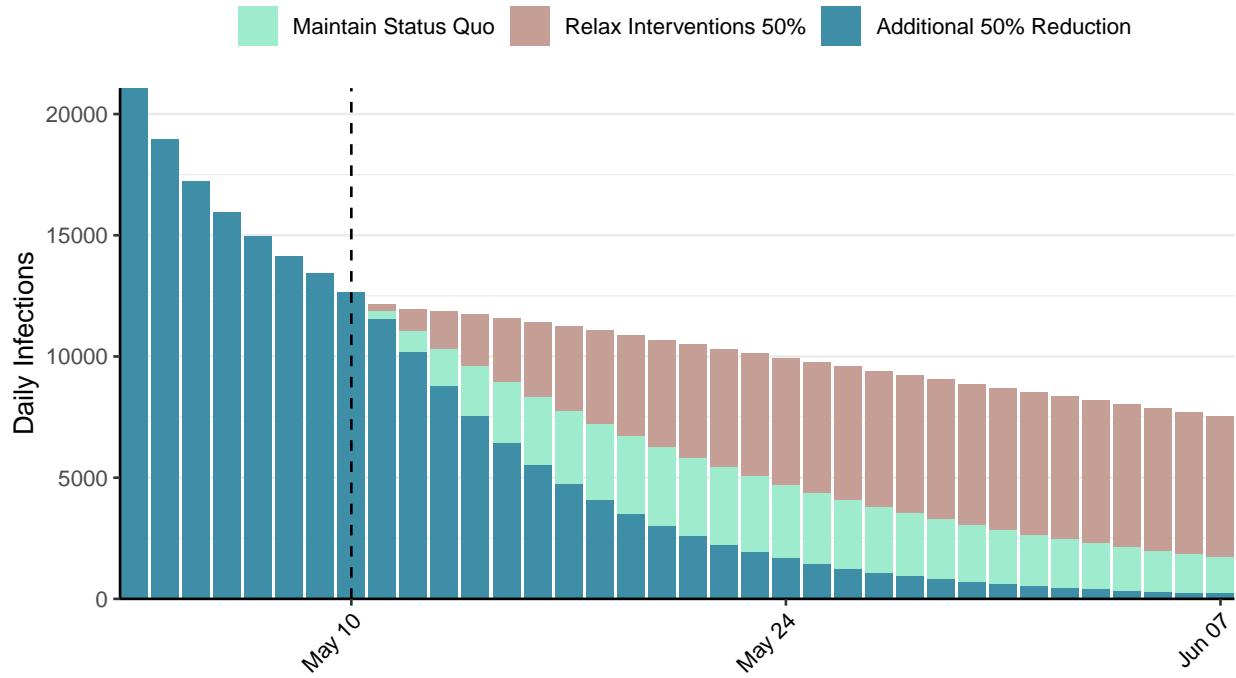


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Russia, 2021-05-10

[Download the report for Russia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
4,832,959	8,338	111,740	315	0.88 (95% CI: 0.8-0.94)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

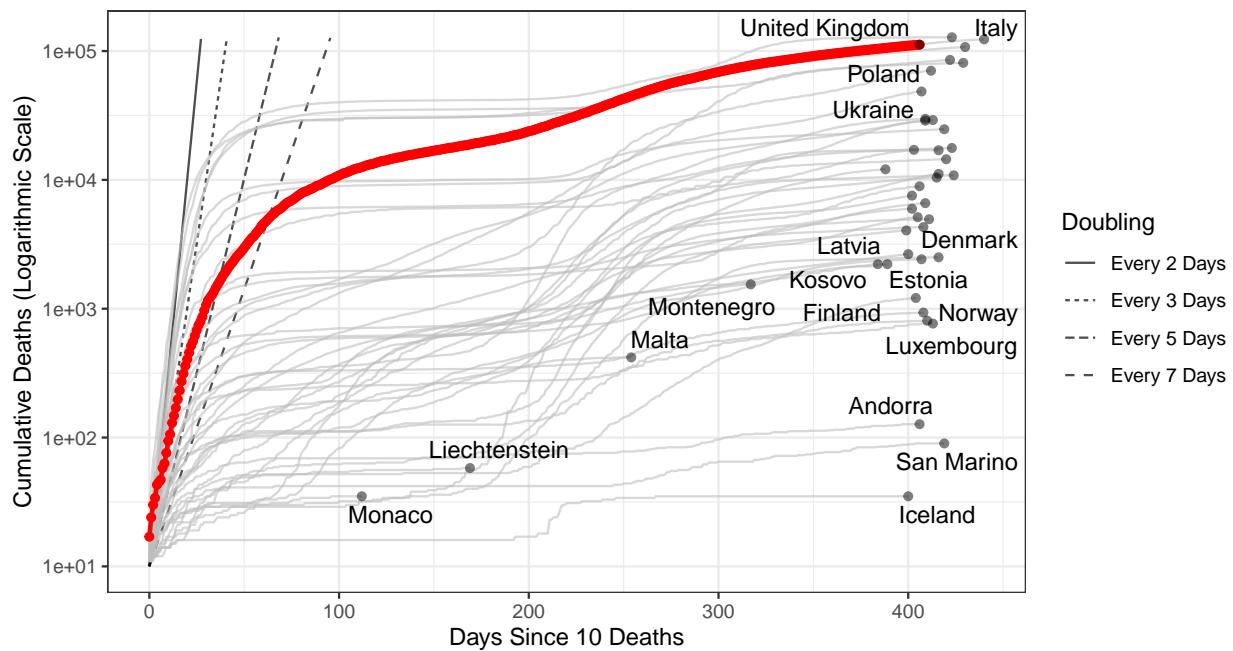


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 3,575,523 (95% CI: 3,446,459-3,704,586) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

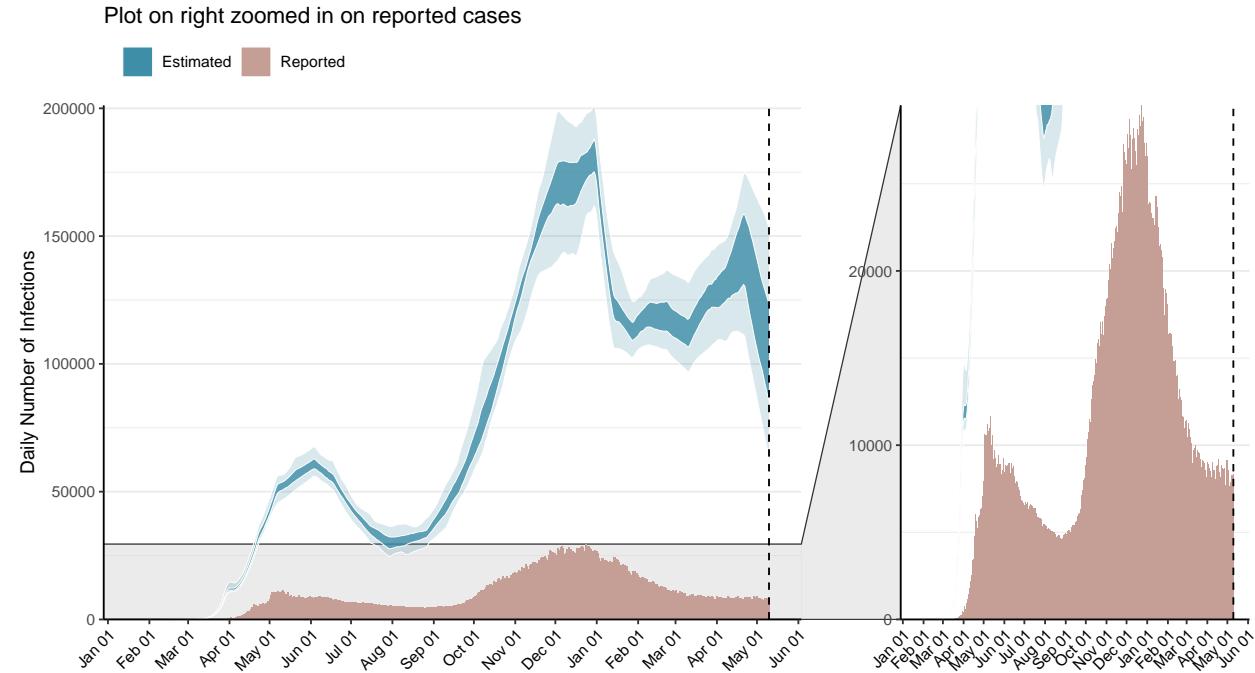
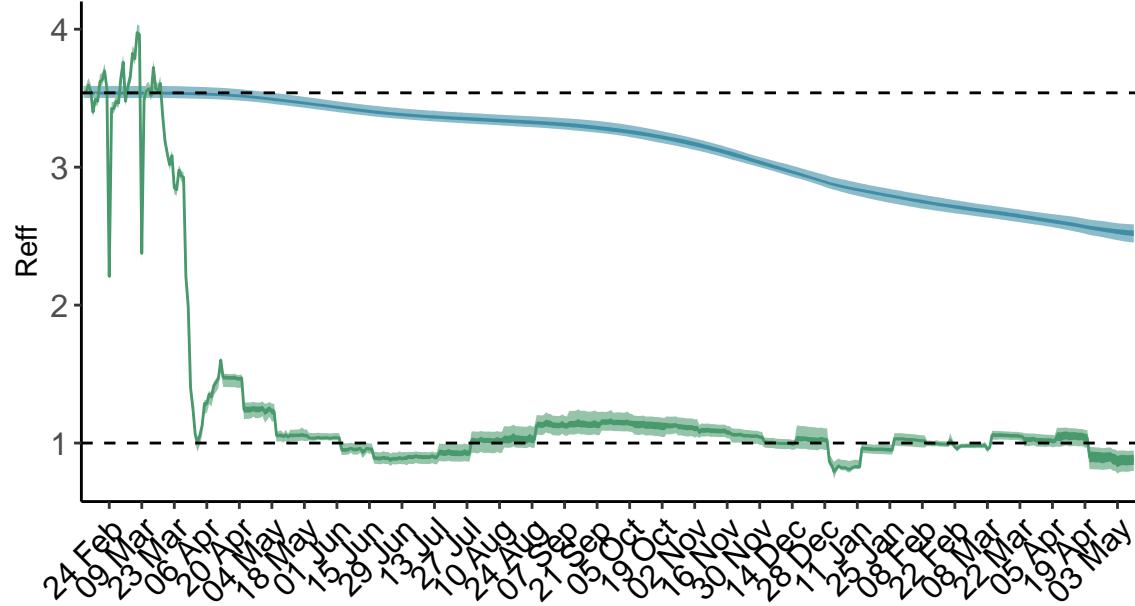


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

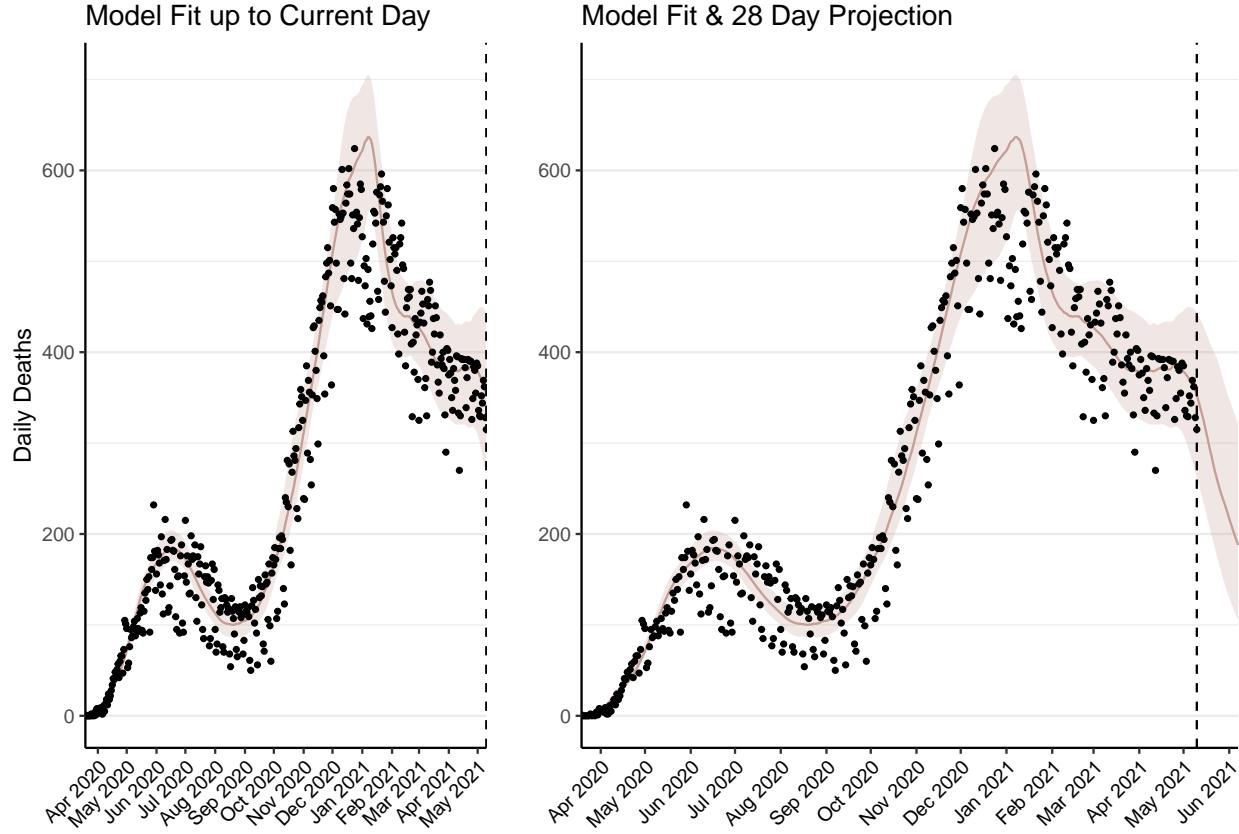


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 13,401 (95% CI: 12,891-13,910) patients requiring treatment with high-pressure oxygen at the current date to 7,766 (95% CI: 7,231-8,301) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 6,100 (95% CI: 5,882-6,318) patients requiring treatment with mechanical ventilation at the current date to 3,679 (95% CI: 3,440-3,918) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B.** These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.

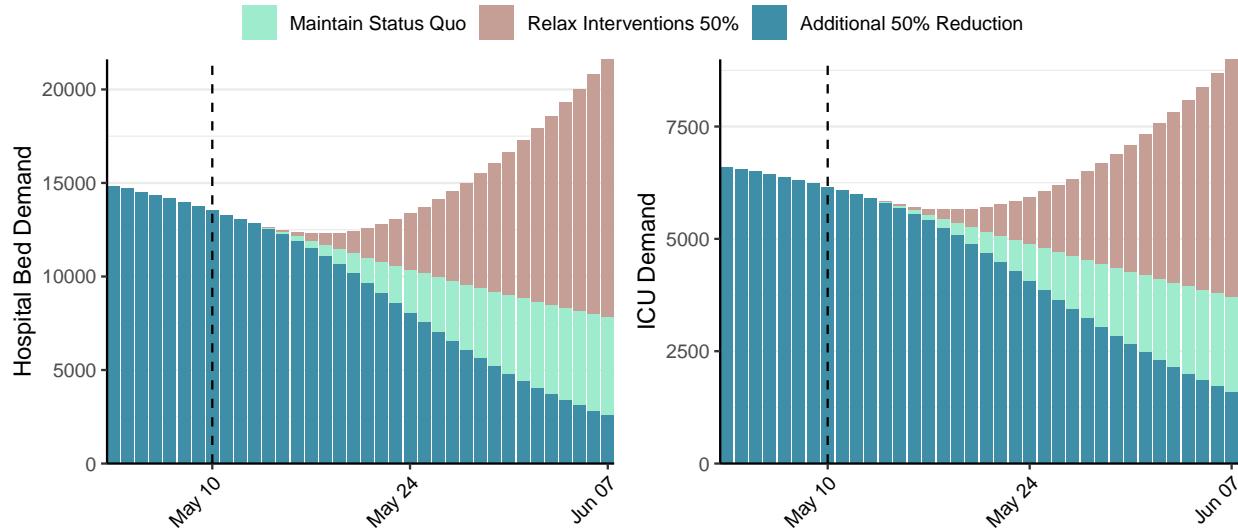


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 103,822 (95% CI: 98,474-109,169) at the current date to 5,606 (95% CI: 5,172-6,041) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 103,822 (95% CI: 98,474-109,169) at the current date to 322,405 (95% CI: 296,500-348,310) by 2021-06-07.

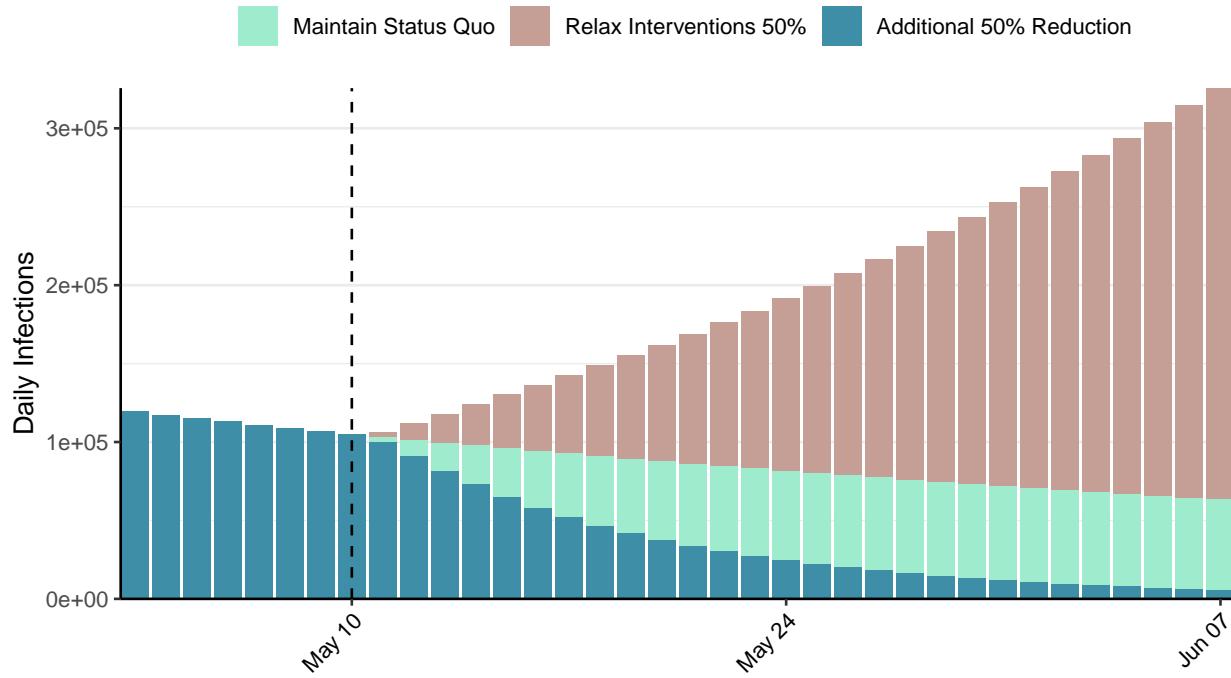


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool - https://covid19sim.org/](https://covid19sim.org/), which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Rwanda, 2021-05-10

[Download the report for Rwanda, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
25,714	62	338	0	0.82 (95% CI: 0.65-0.99)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

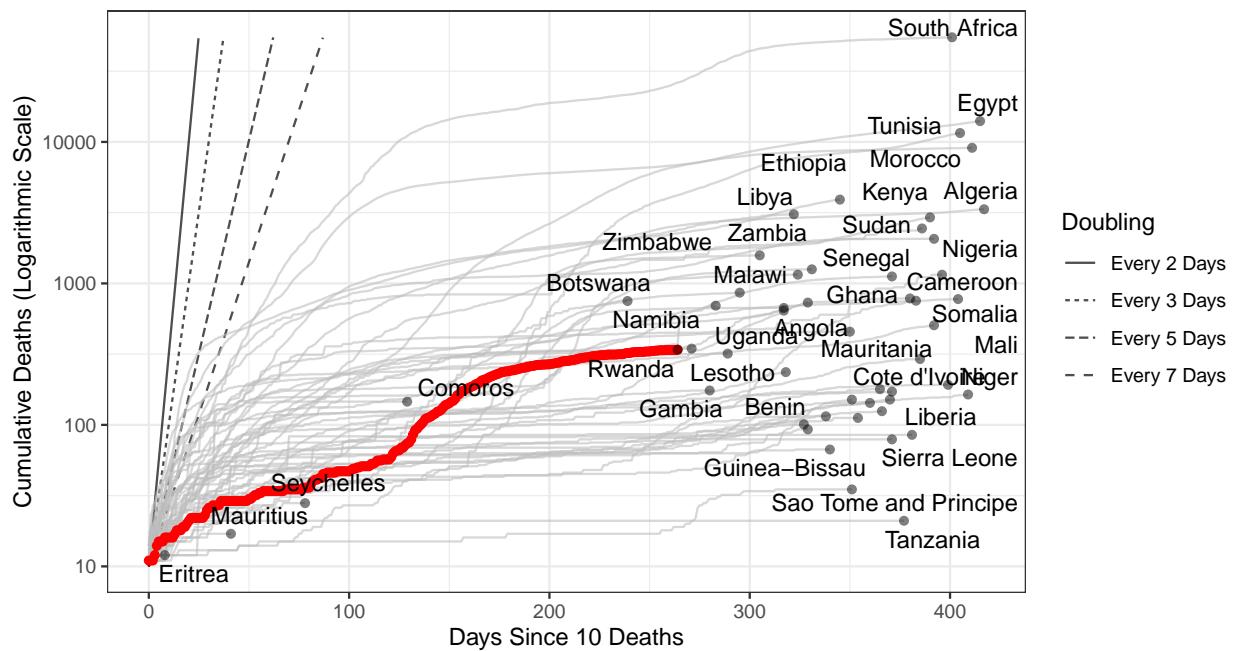


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 5,801 (95% CI: 5,476-6,127) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

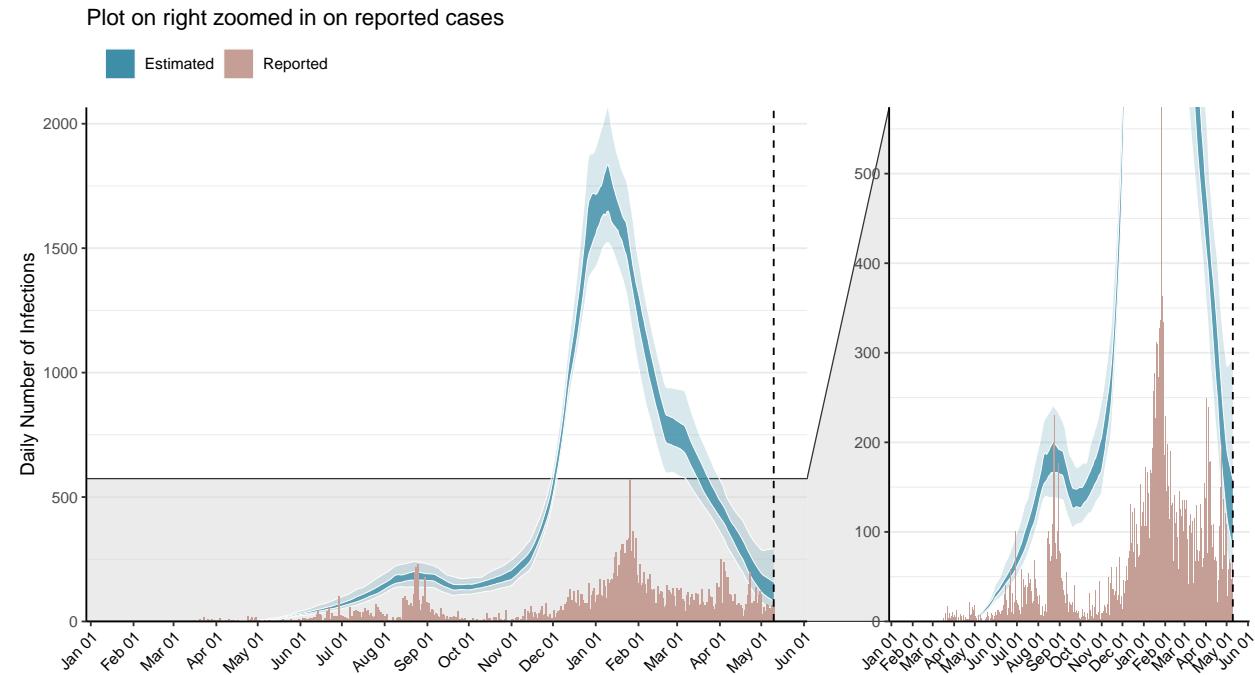
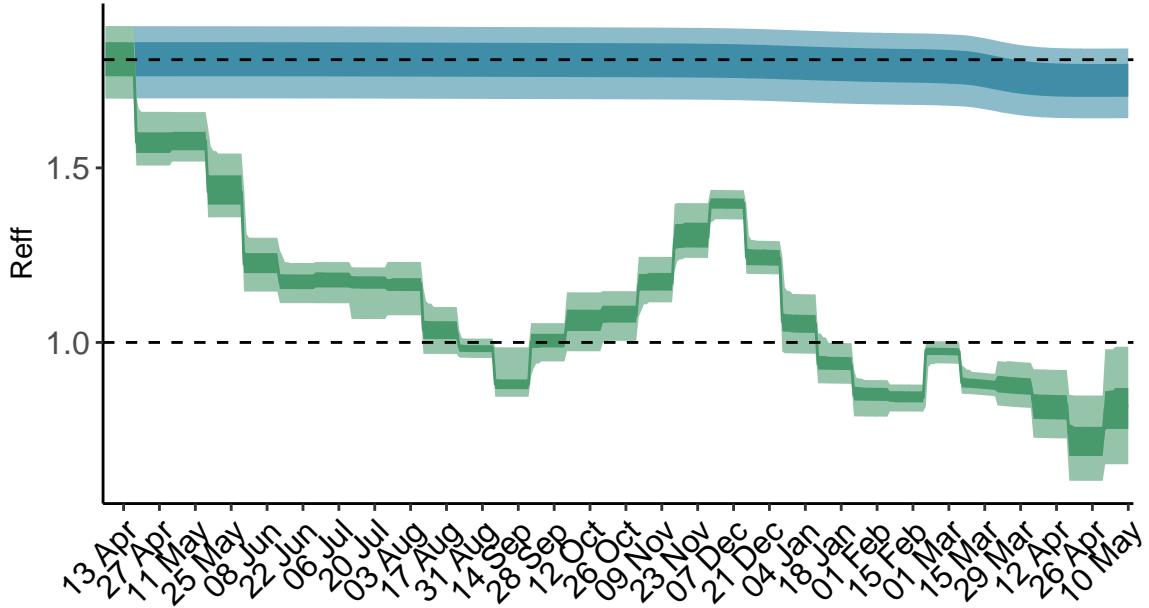


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

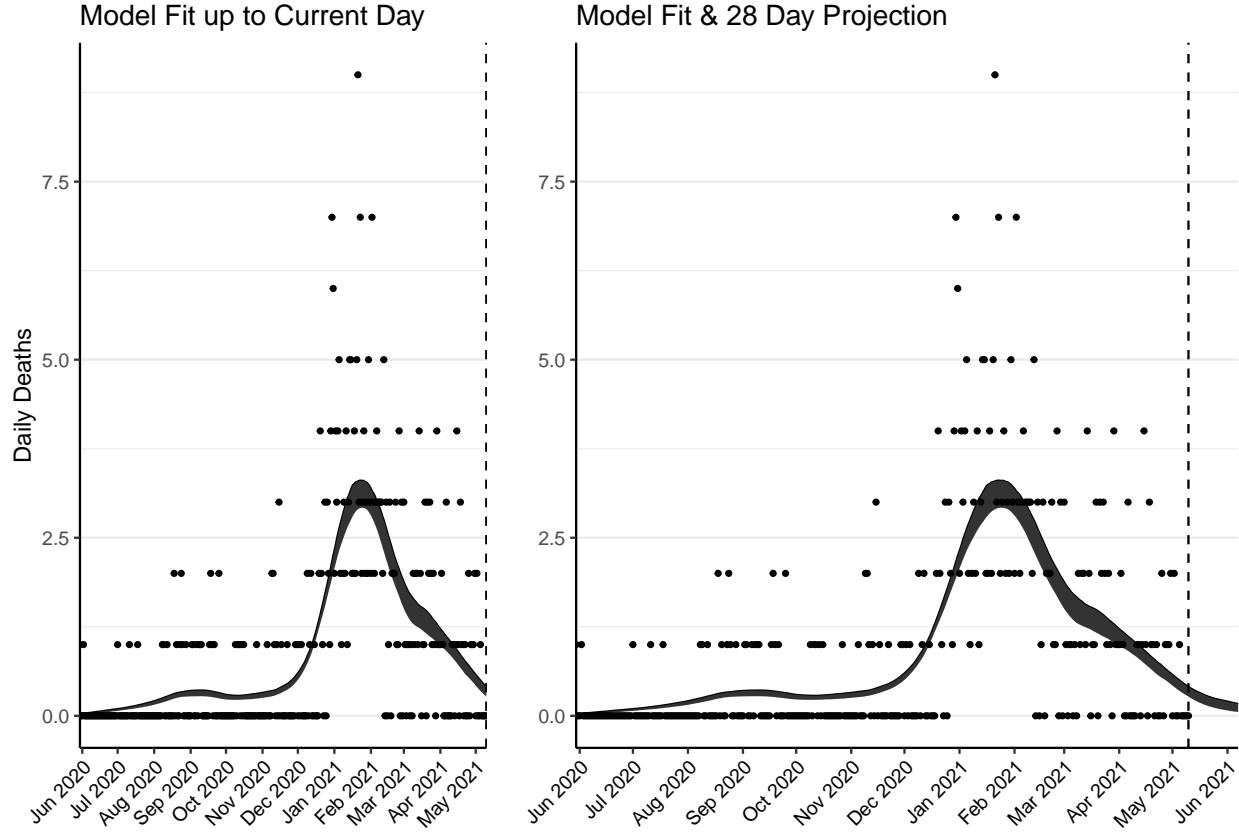


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 15 (95% CI: 14-16) patients requiring treatment with high-pressure oxygen at the current date to 7 (95% CI: 6-8) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 7 (95% CI: 6-7) patients requiring treatment with mechanical ventilation at the current date to 3 (95% CI: 3-3) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

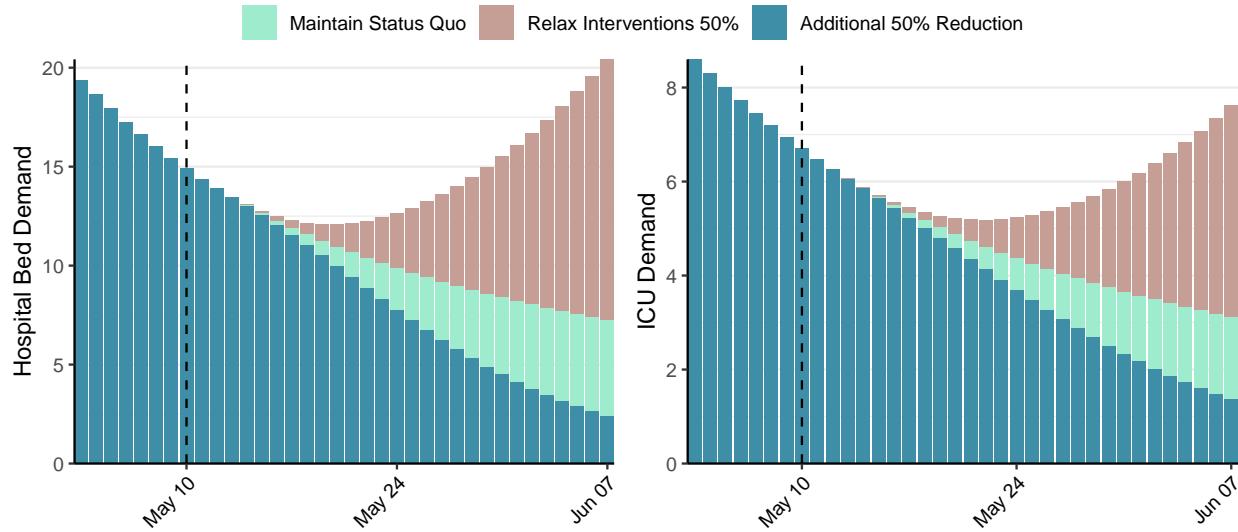


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 127 (95% CI: 115-139) at the current date to 6 (95% CI: 5-7) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 127 (95% CI: 115-139) at the current date to 412 (95% CI: 328-496) by 2021-06-07.

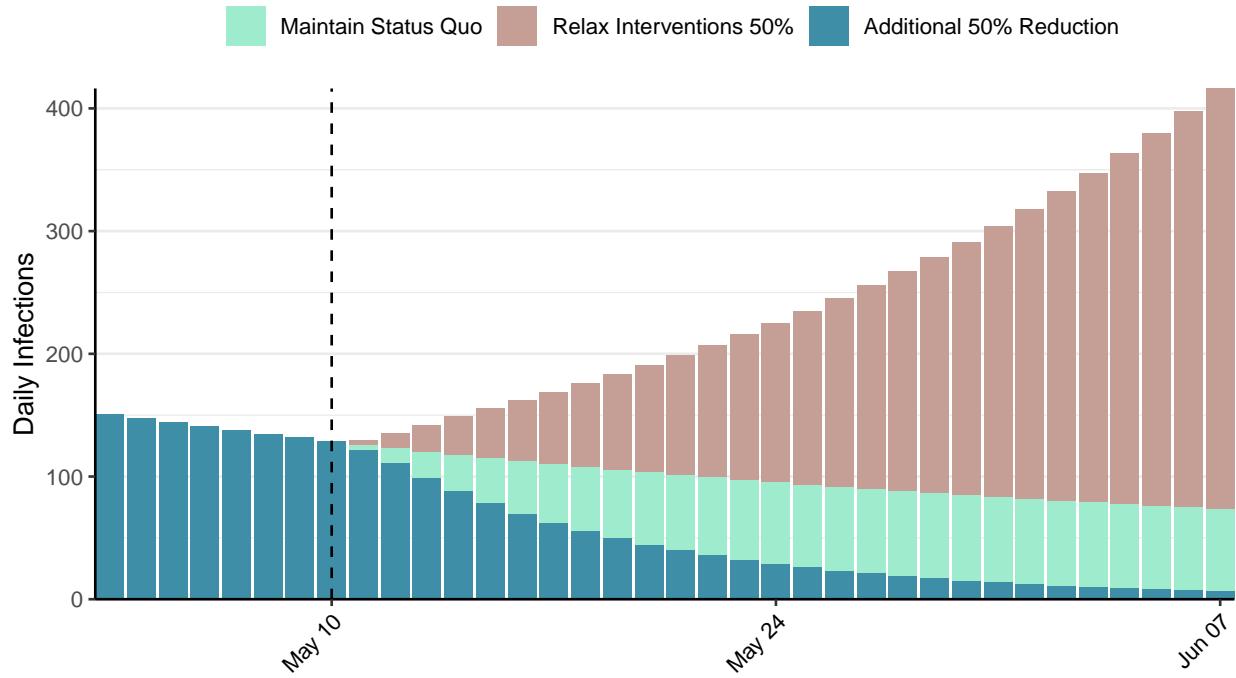


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Sudan, 2021-05-10

[Download the report for Sudan, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
34,271	0	2,446	0	1.04 (95% CI: 0.9-1.18)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

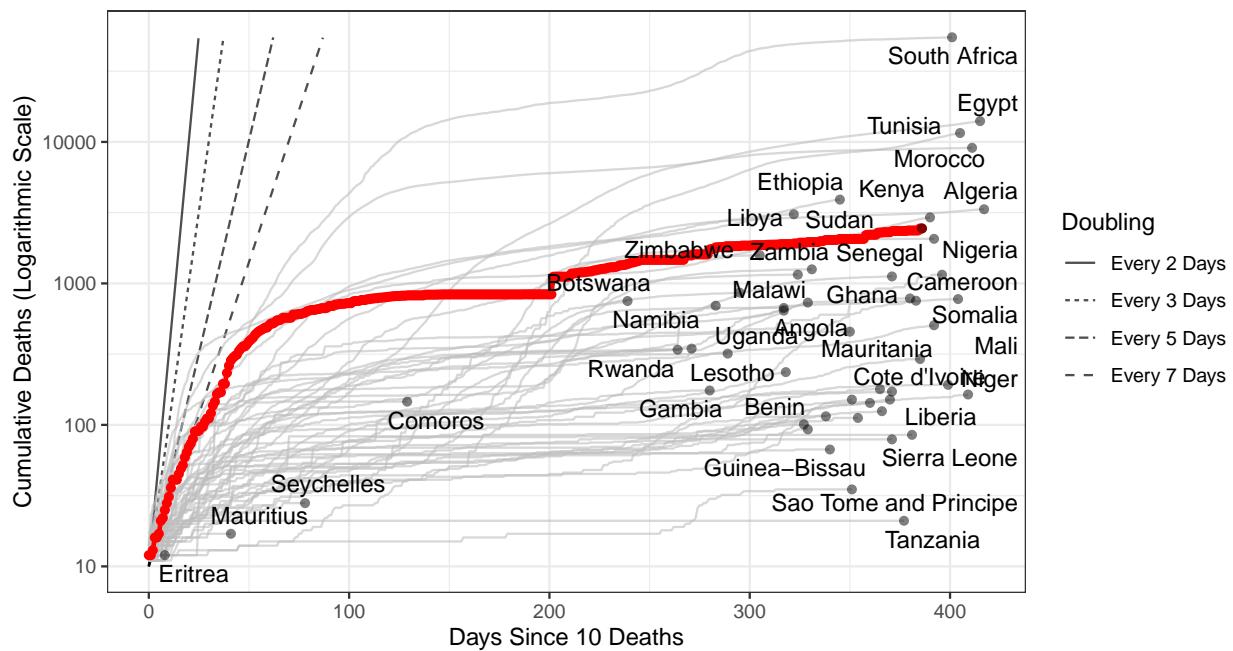


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 126,509 (95% CI: 120,991-132,026) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

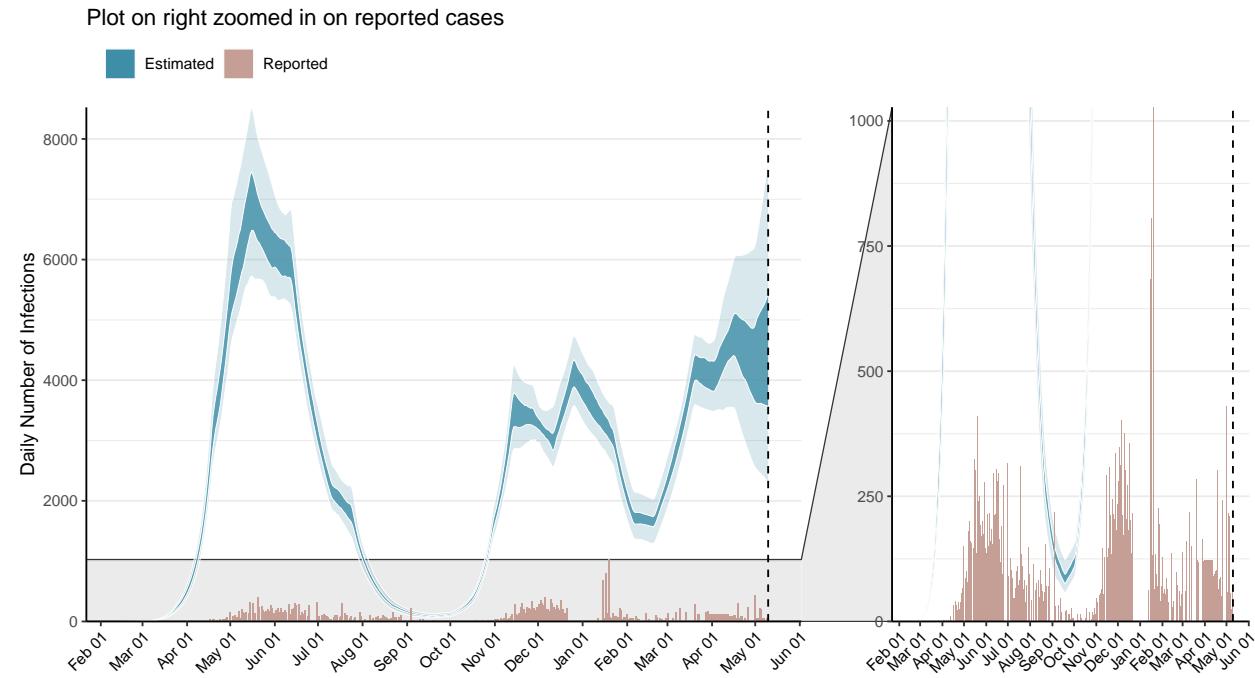


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.

We are aware of under-reporting of deaths in Khartoum, Sudan. This is not represented in this report, but please see [Report 39](#)

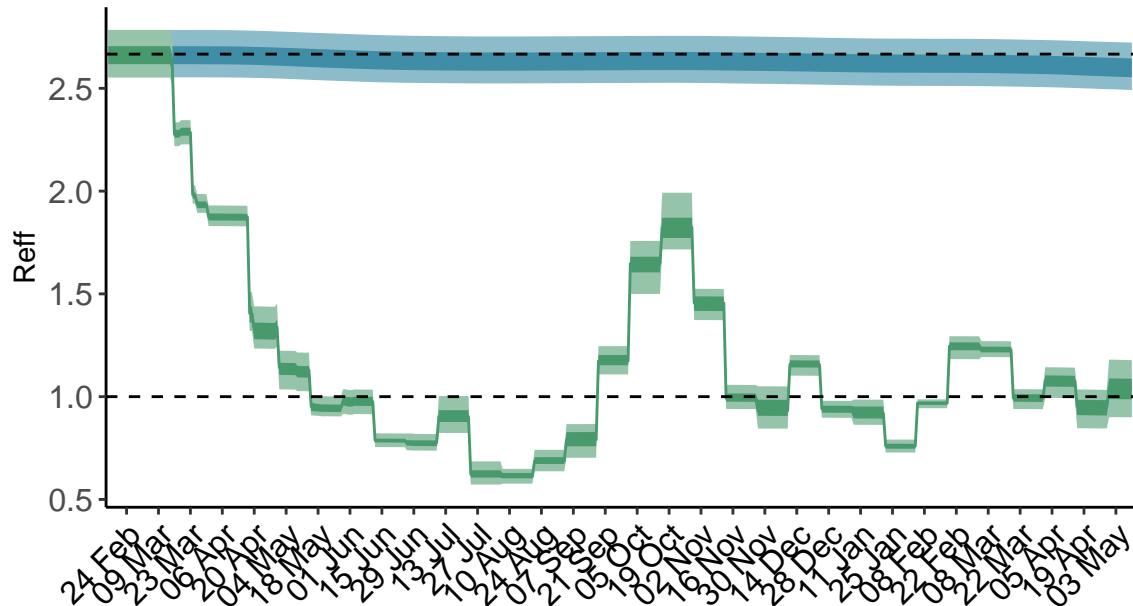


Figure 3: **Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

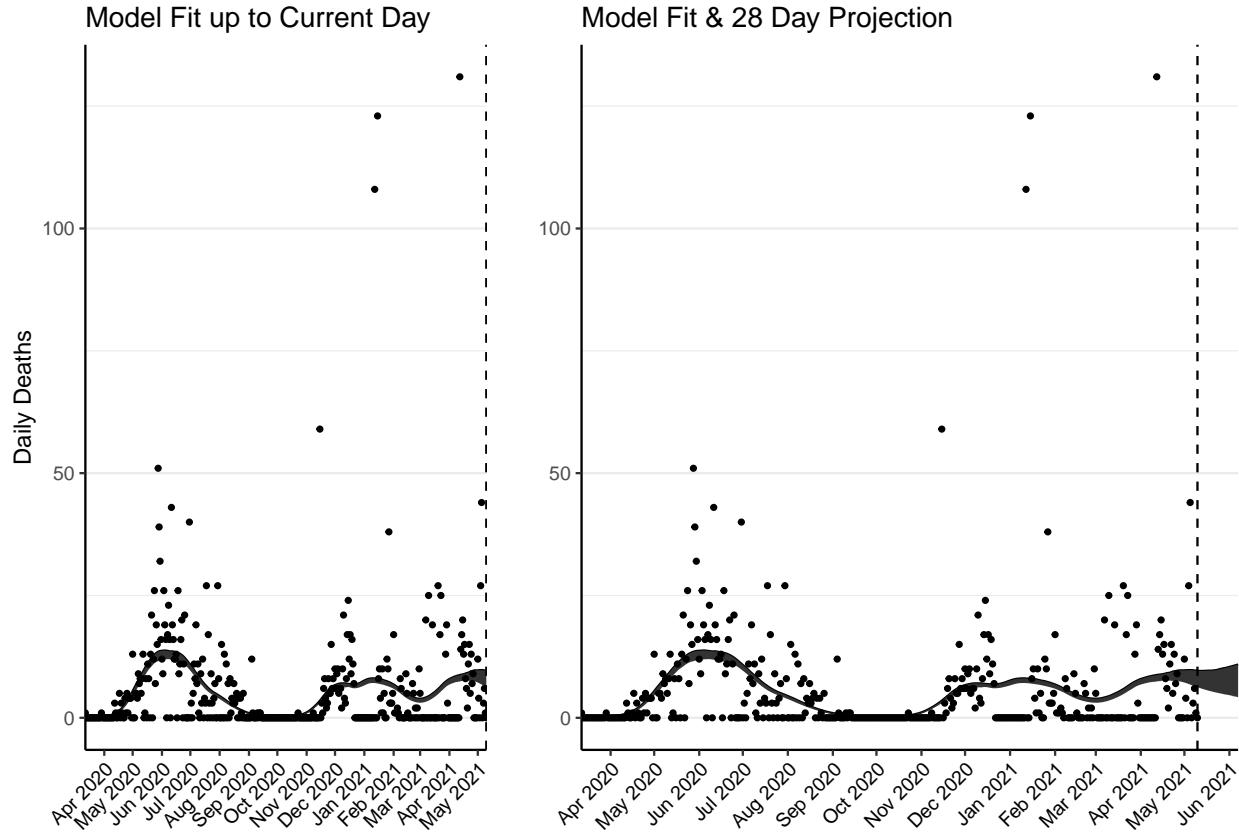


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 369 (95% CI: 352-386) patients requiring treatment with high-pressure oxygen at the current date to 446 (95% CI: 404-489) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 145 (95% CI: 139-151) patients requiring treatment with mechanical ventilation at the current date to 171 (95% CI: 156-187) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

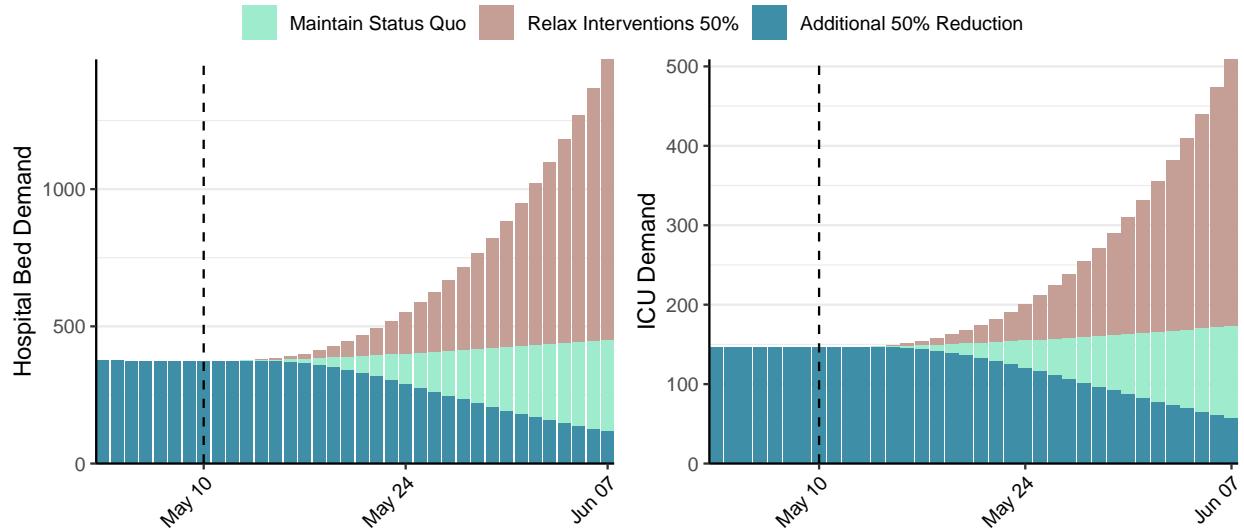
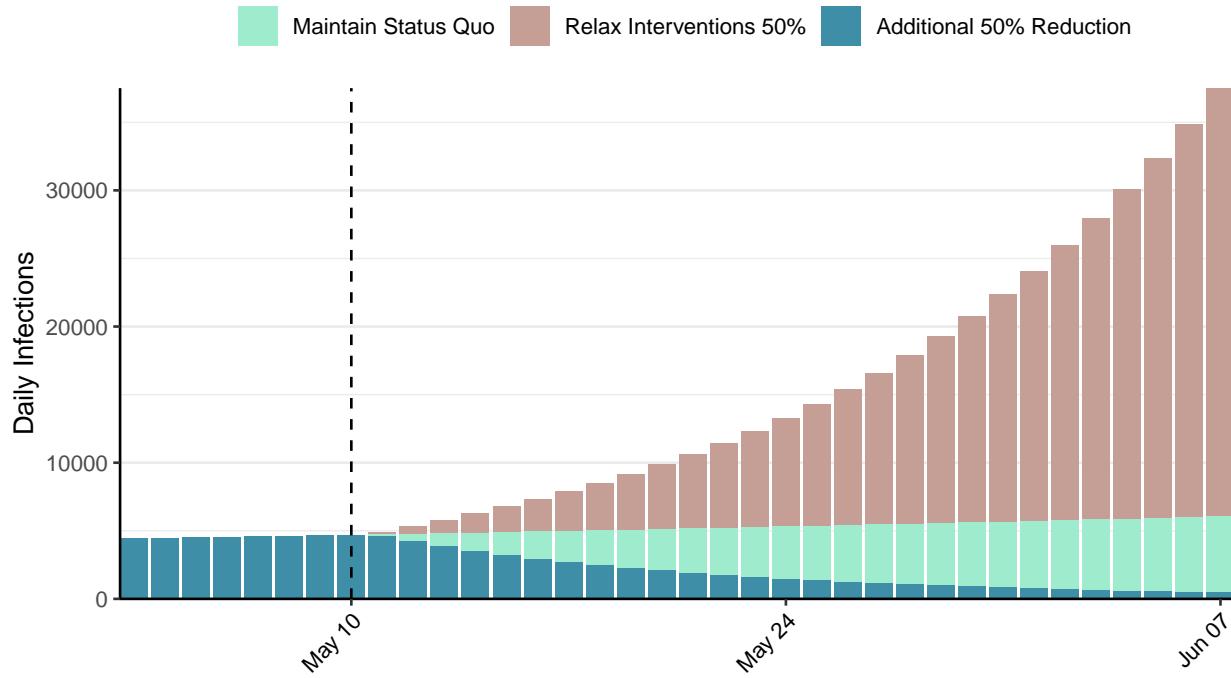


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 4,643 (95% CI: 4,346-4,940) at the current date to 446 (95% CI: 398-493) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 4,643 (95% CI: 4,346-4,940) at the current date to 37,137 (95% CI: 32,565-41,710) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Senegal, 2021-05-10

[Download the report for Senegal, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
40,714	22	1,120	1	0.9 (95% CI: 0.82-1)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

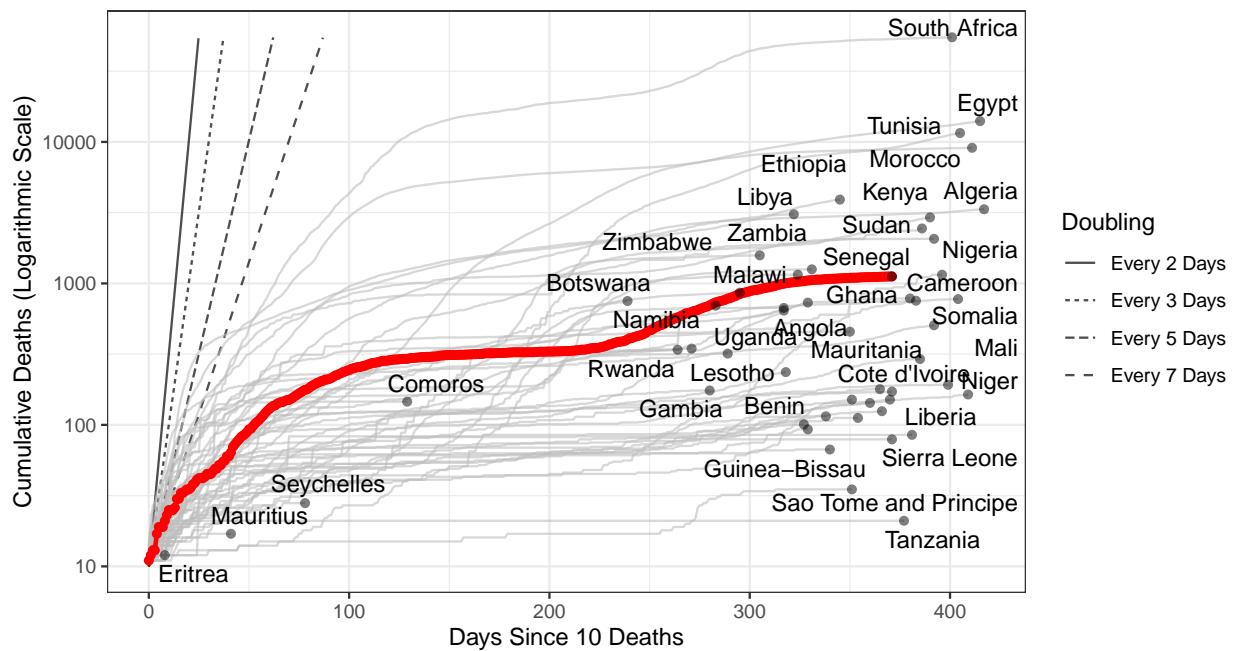


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 11,926 (95% CI: 11,415-12,438) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

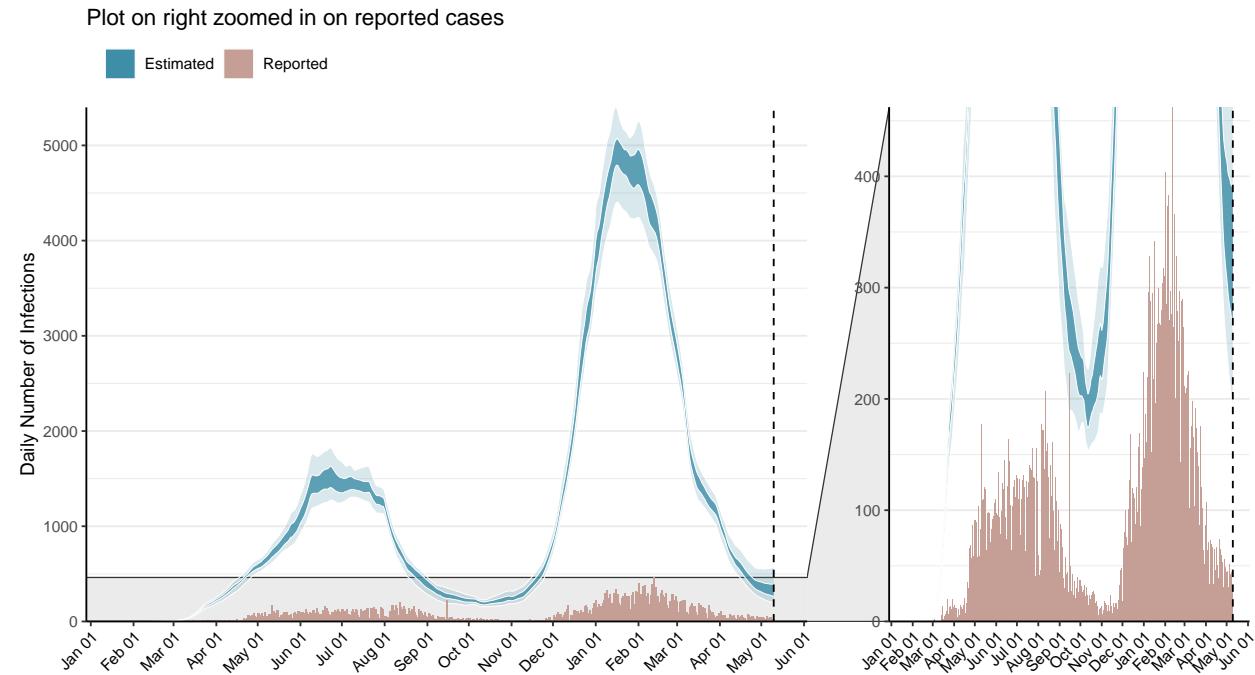
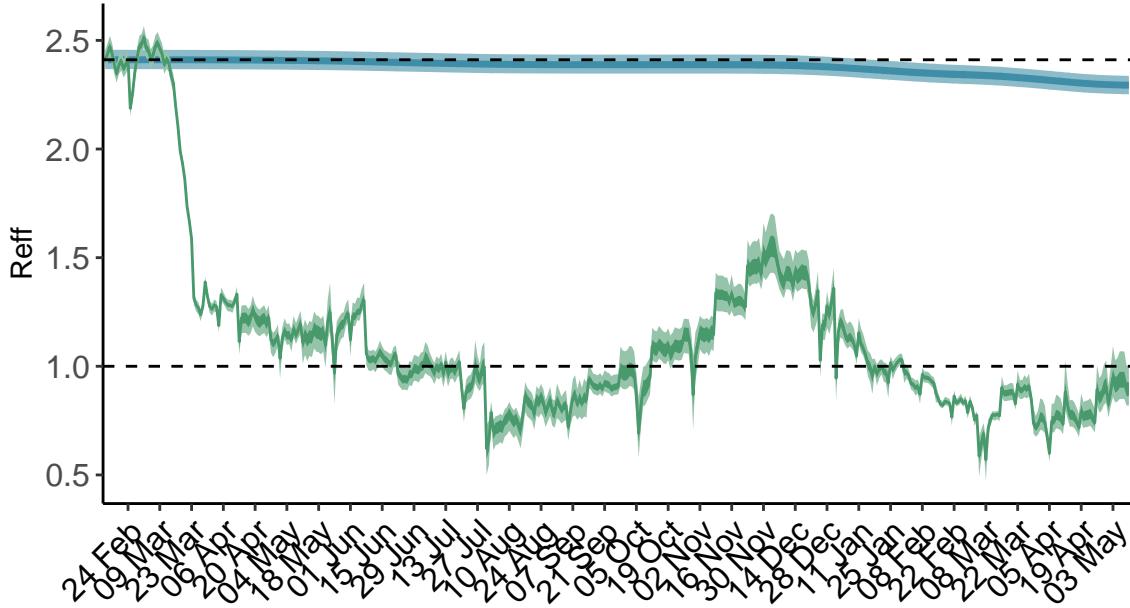


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

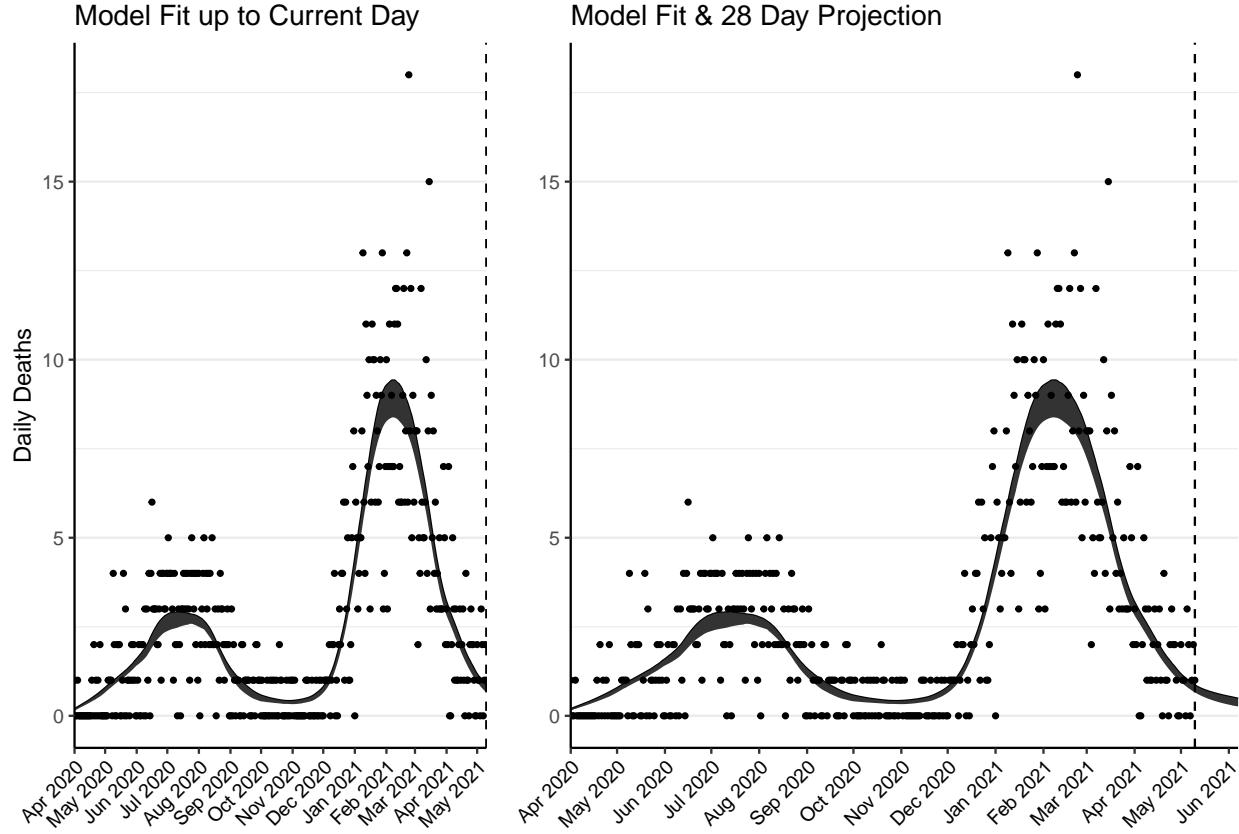


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 31 (95% CI: 30-32) patients requiring treatment with high-pressure oxygen at the current date to 20 (95% CI: 18-22) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 14 (95% CI: 13-14) patients requiring treatment with mechanical ventilation at the current date to 8 (95% CI: 8-9) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

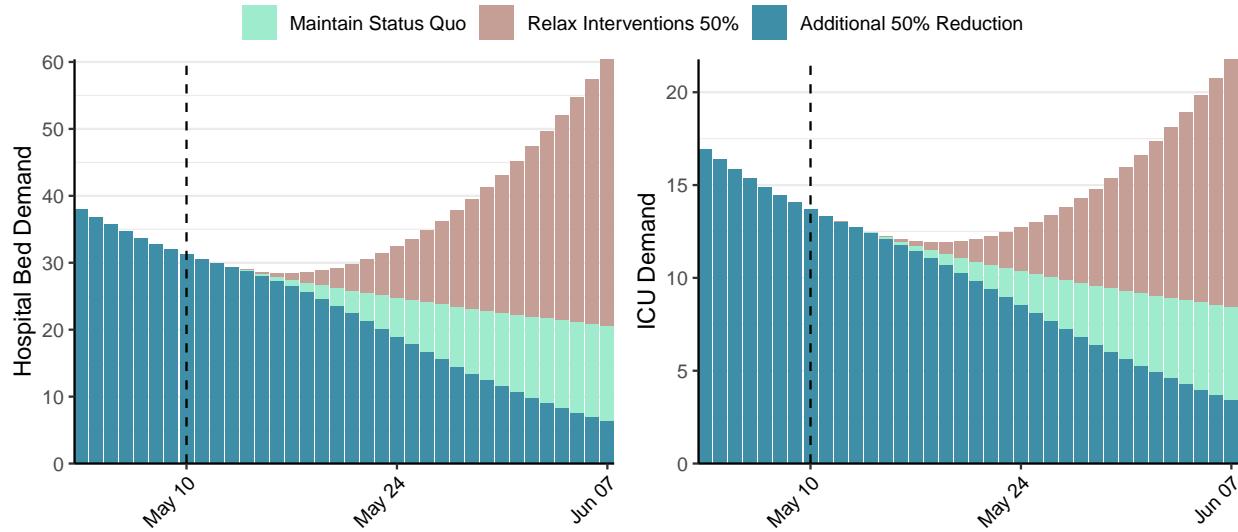


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 327 (95% CI: 306-349) at the current date to 19 (95% CI: 17-21) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 327 (95% CI: 306-349) at the current date to 1,334 (95% CI: 1,164-1,504) by 2021-06-07.

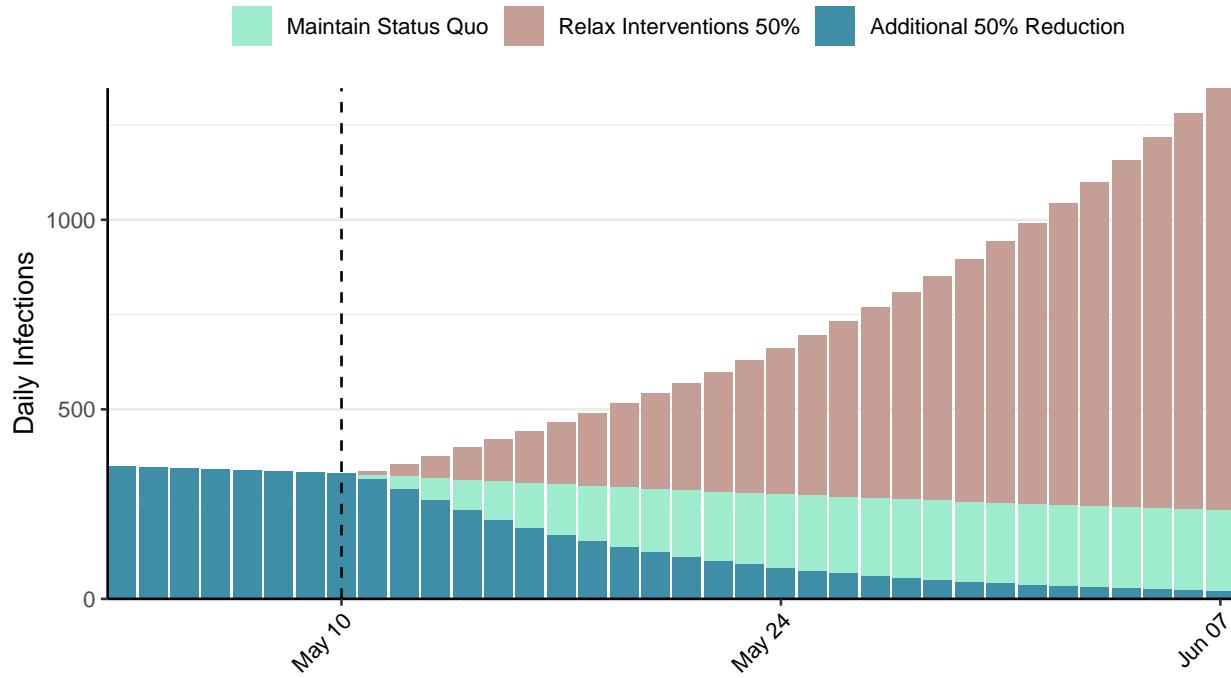


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Sierra Leone, 2021-05-10

[Download the report for Sierra Leone, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
4,089	21	79	0	0.73 (95% CI: 0.5-1.03)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

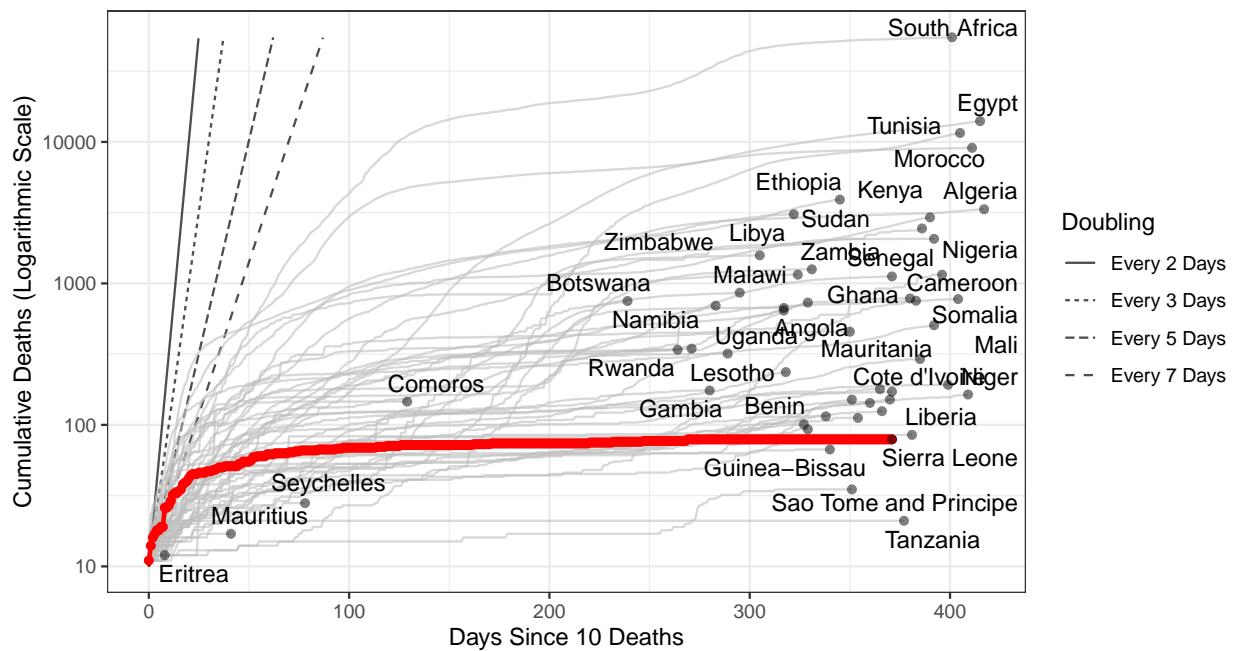


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 11 (95% CI: 7-15) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

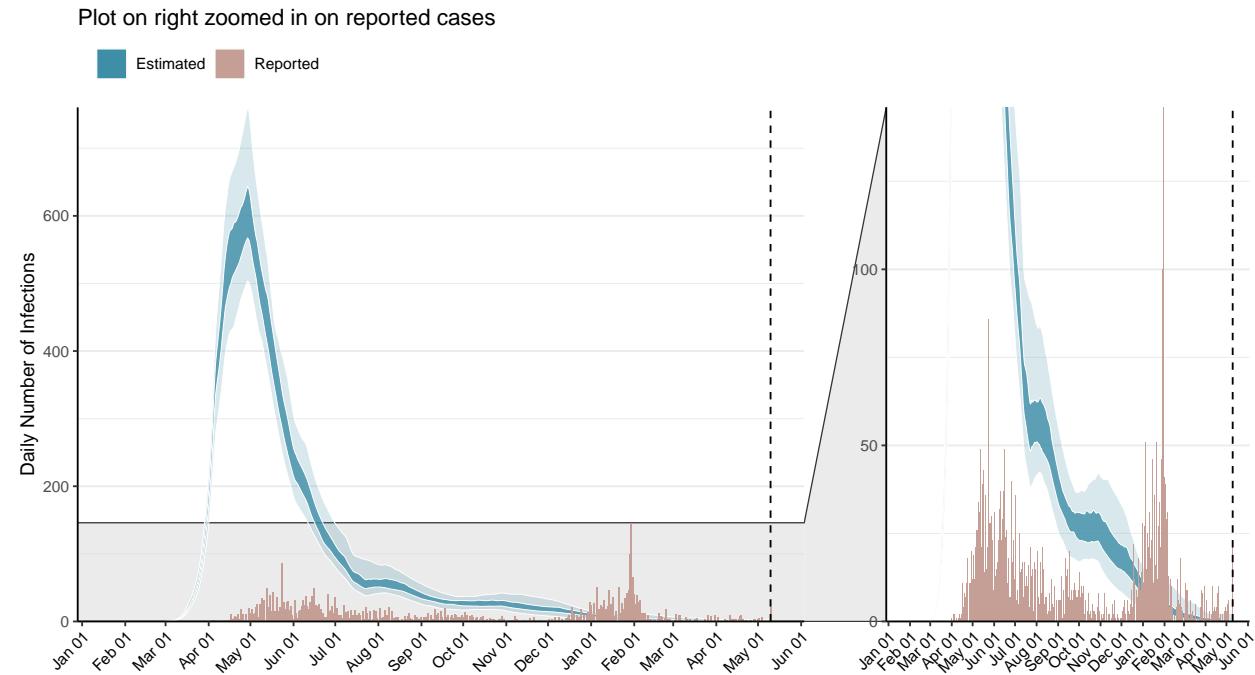
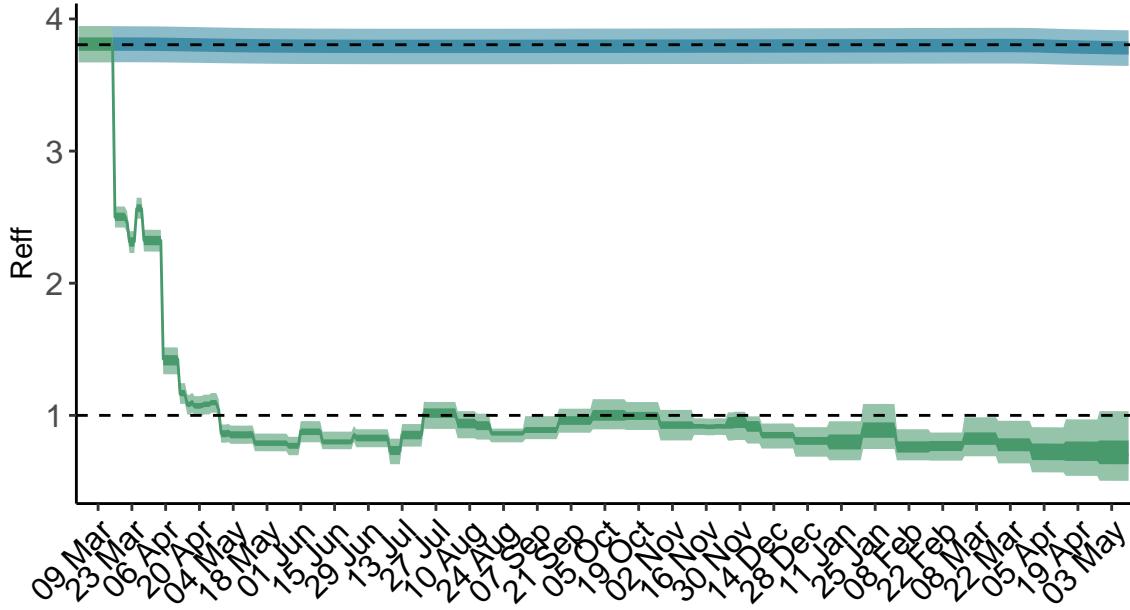


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

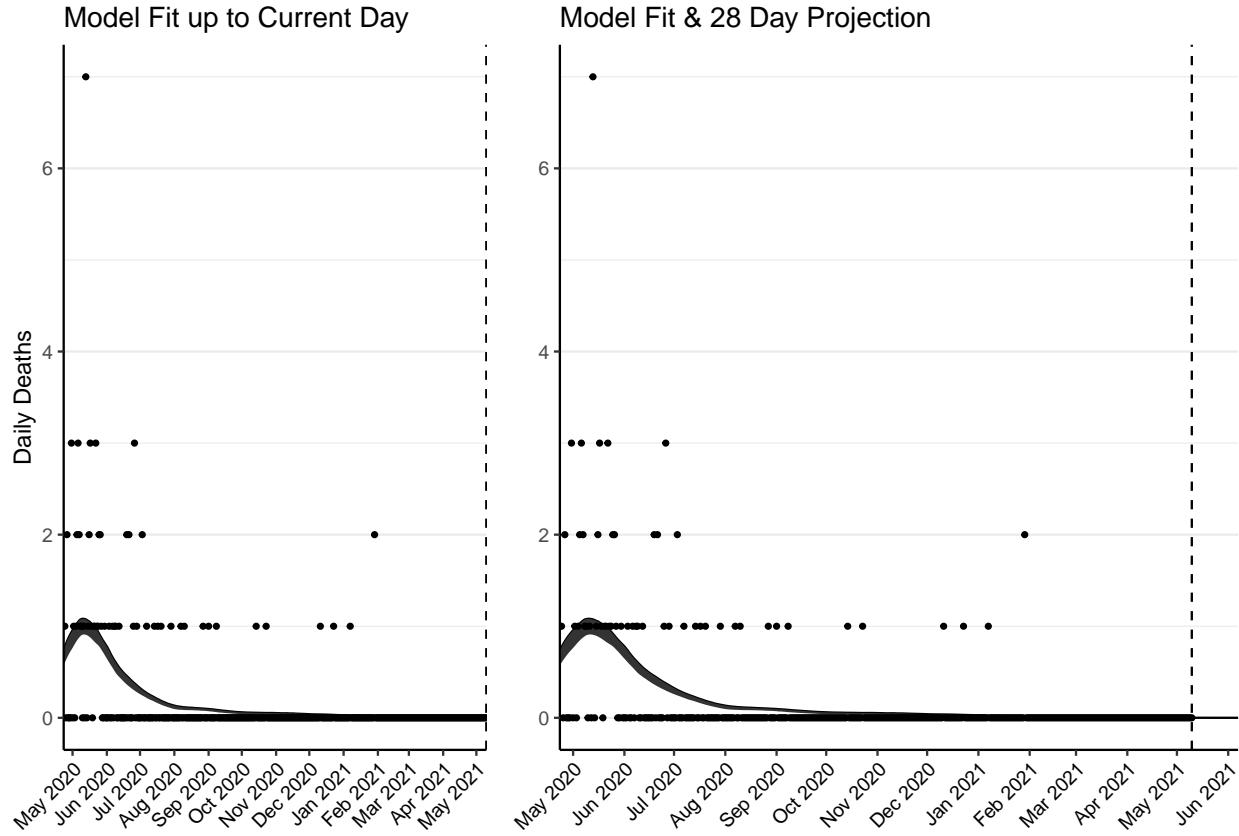


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 0 (95% CI: 0-0) patients requiring treatment with high-pressure oxygen at the current date to 0 (95% CI: 0-0) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 0 (95% CI: 0-0) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

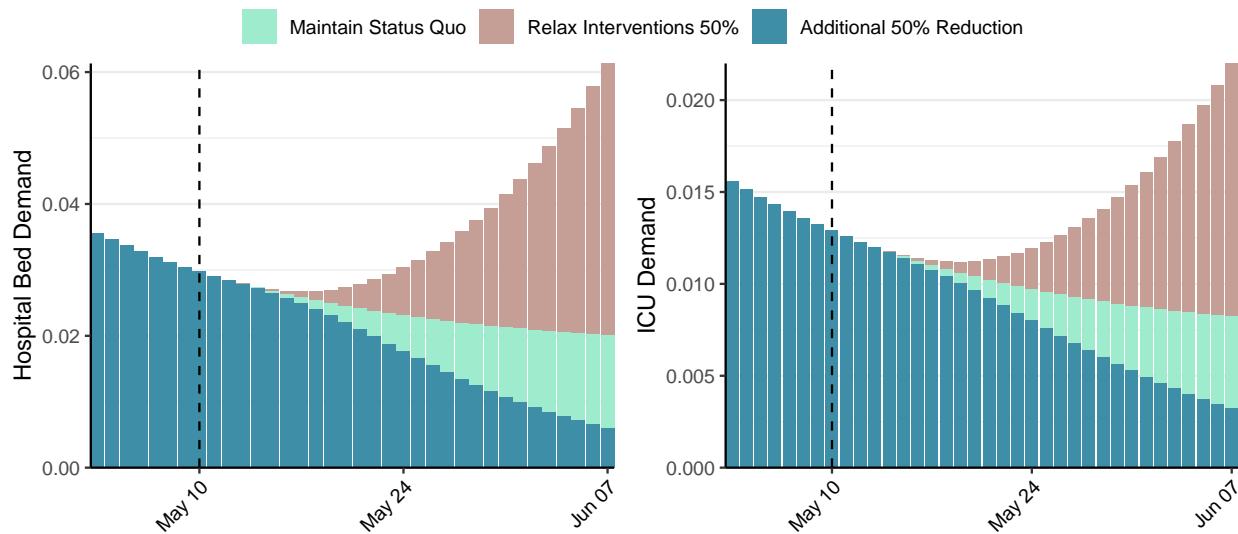


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 0 (95% CI: 0-0) at the current date to 0 (95% CI: 0-0) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 0 (95% CI: 0-0) at the current date to 1 (95% CI: 0-2) by 2021-06-07.

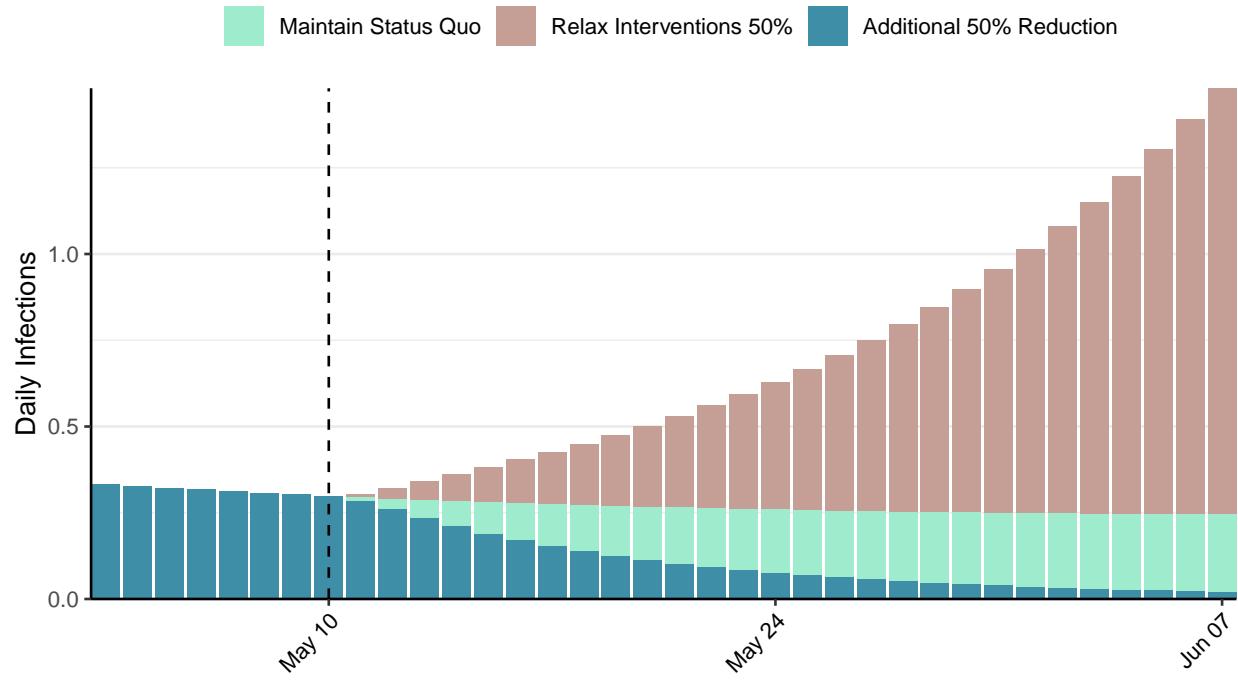


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: El Salvador, 2021-05-10

[Download the report for El Salvador, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
70,380	0	2,158	4	0.77 (95% CI: 0.64-0.89)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

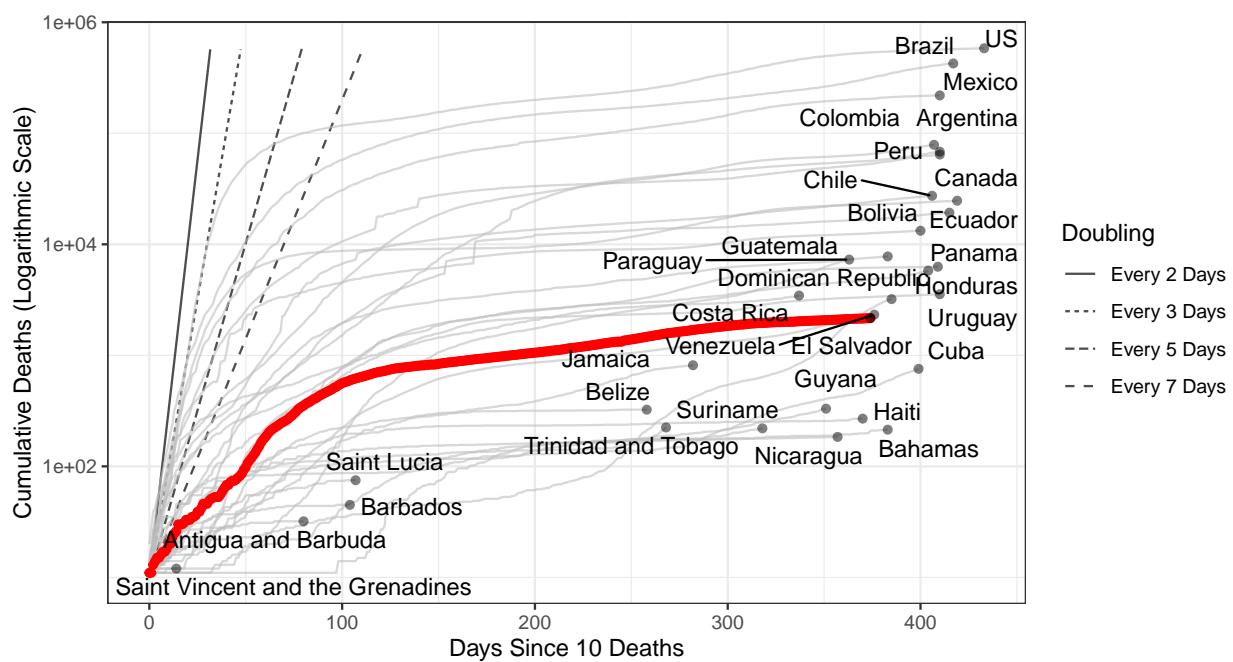


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 33,109 (95% CI: 31,750-34,467) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. El Salvador has revised their historic reported cases and thus have reported negative cases.**

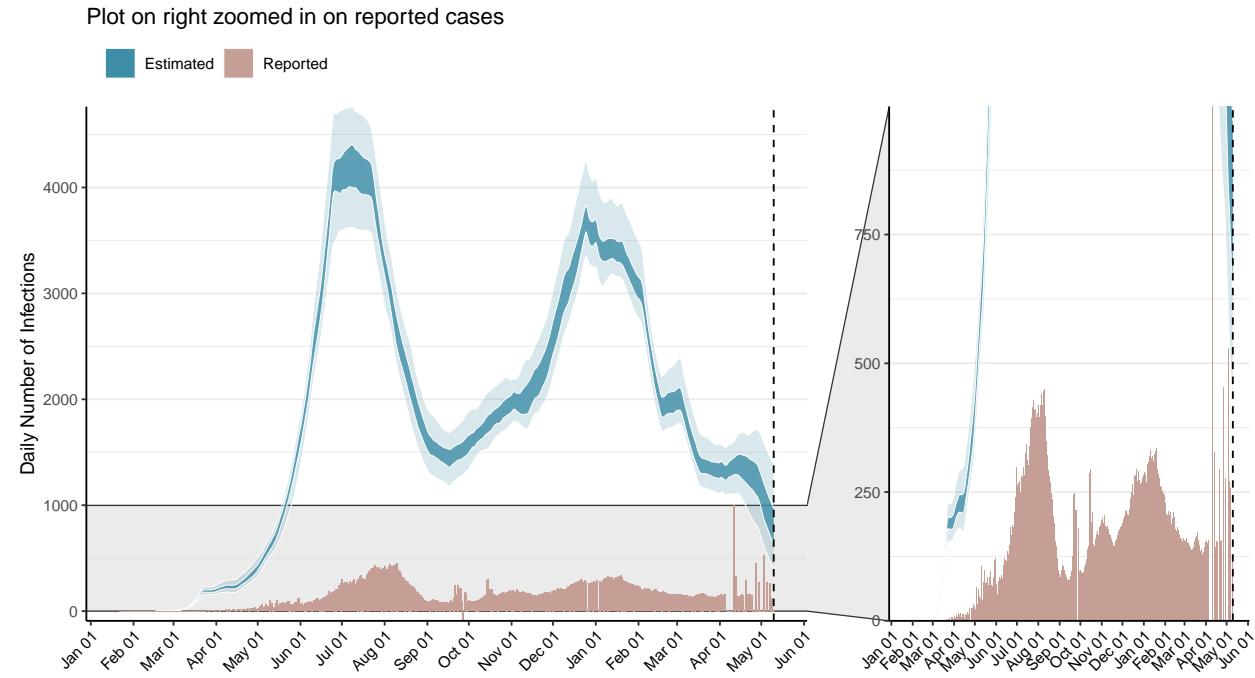
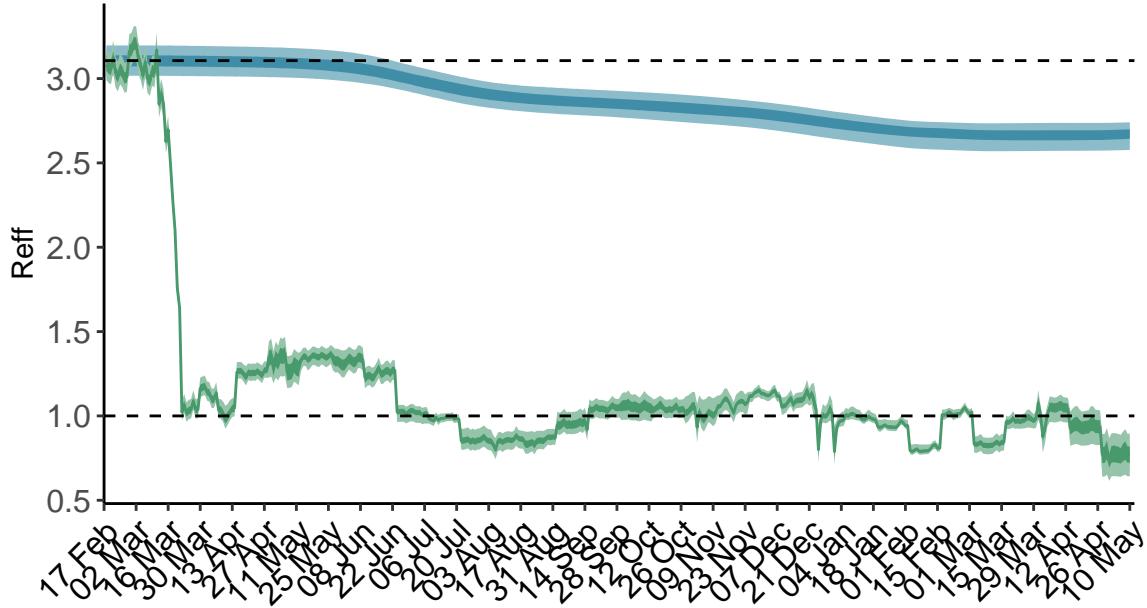


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

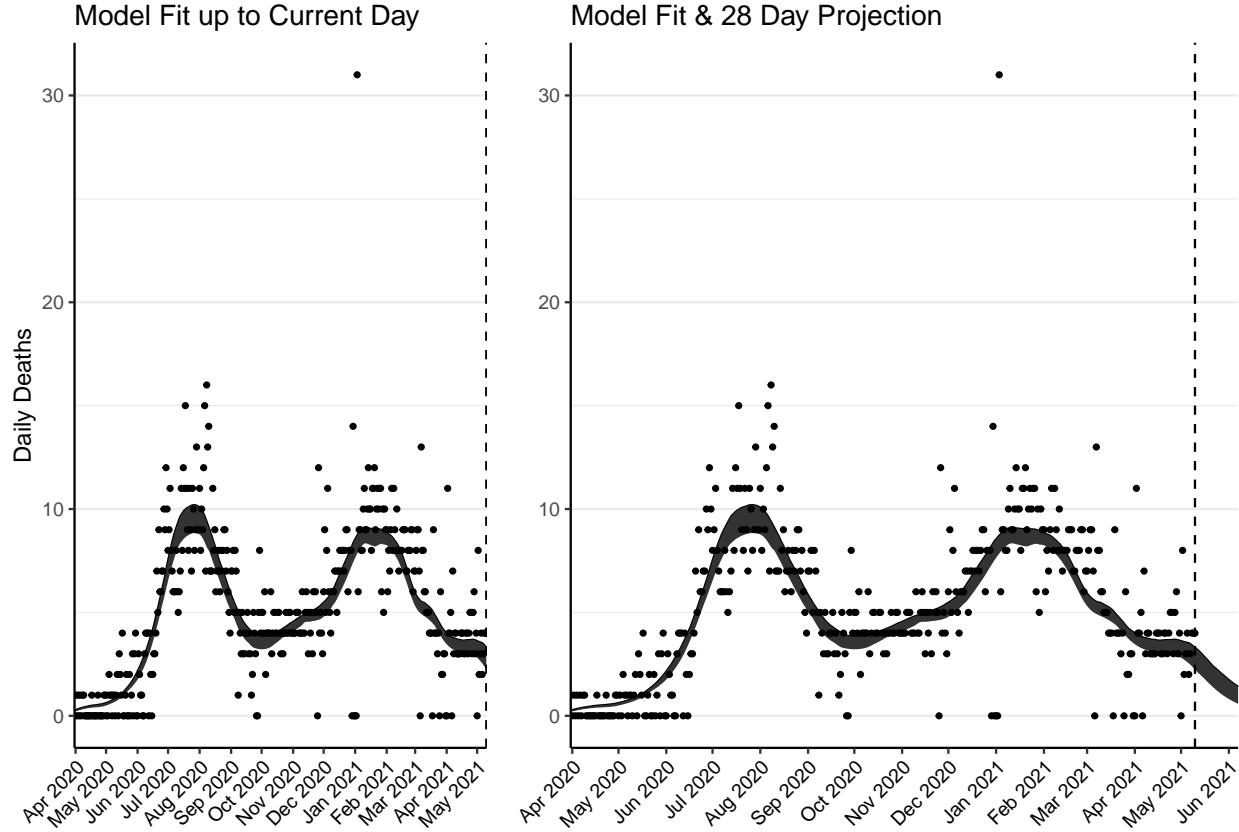


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 110 (95% CI: 105-115) patients requiring treatment with high-pressure oxygen at the current date to 48 (95% CI: 43-53) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 40 (95% CI: 39-42) patients requiring treatment with mechanical ventilation at the current date to 19 (95% CI: 17-21) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

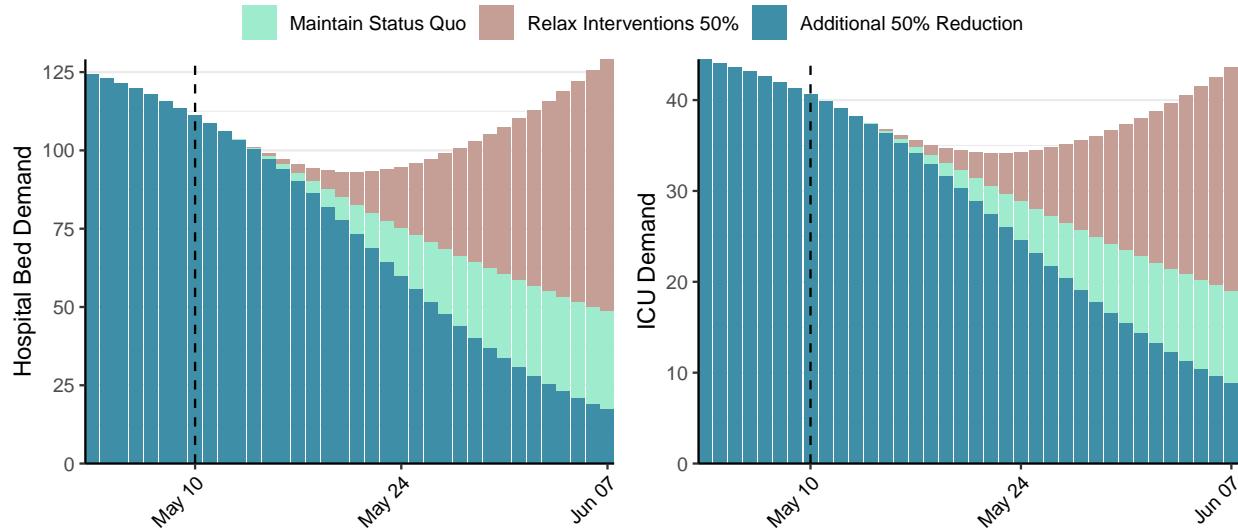
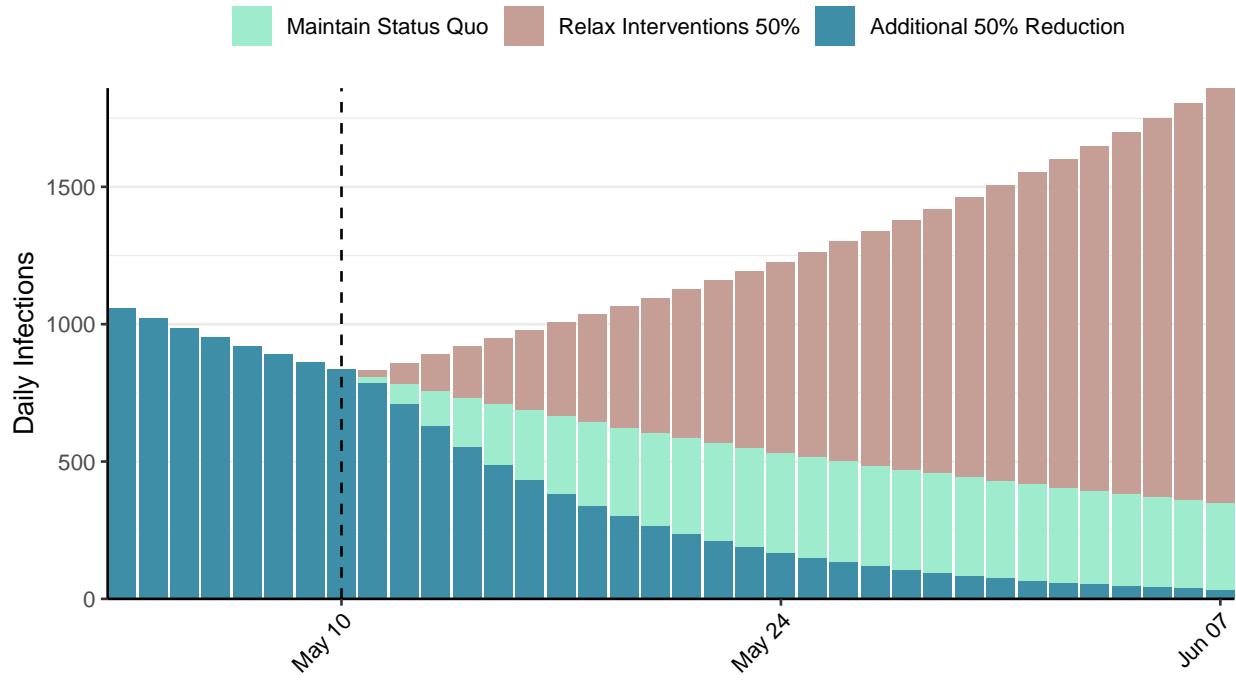


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 827 (95% CI: 770-883) at the current date to 32 (95% CI: 28-36) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 827 (95% CI: 770-883) at the current date to 1,841 (95% CI: 1,581-2,101) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Somalia, 2021-05-10

[Download the report for Somalia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
14,415	0	748	0	0.6 (95% CI: 0.54-0.66)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

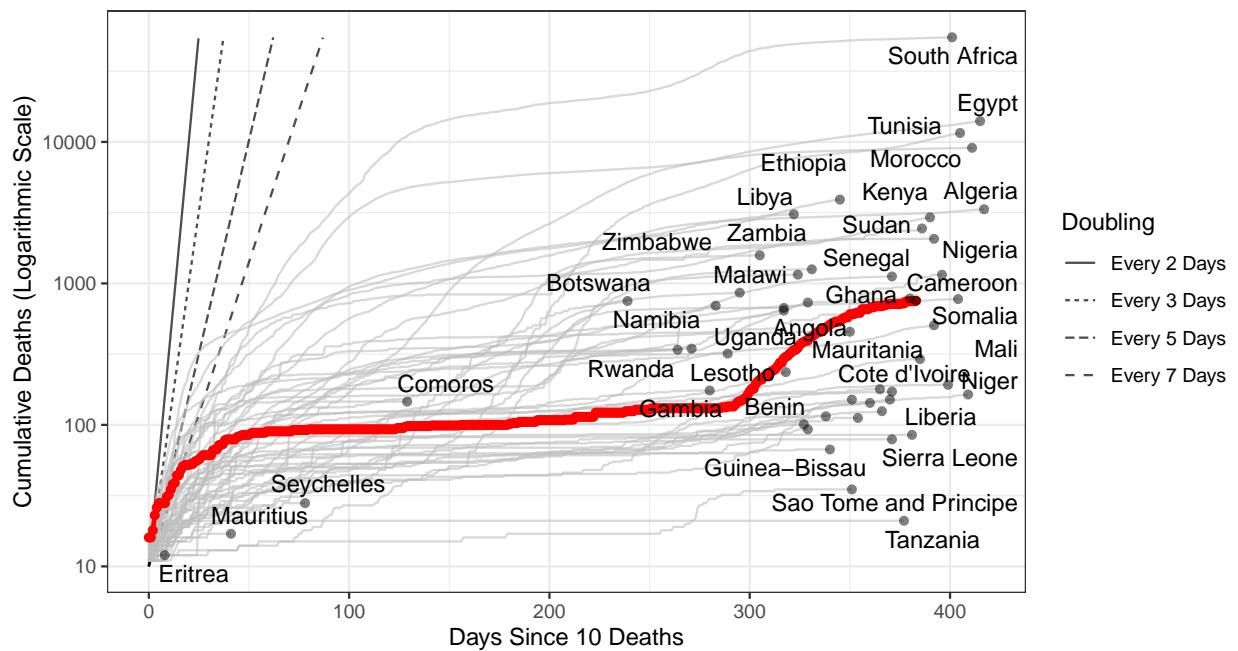


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 47,756 (95% CI: 46,101-49,411) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

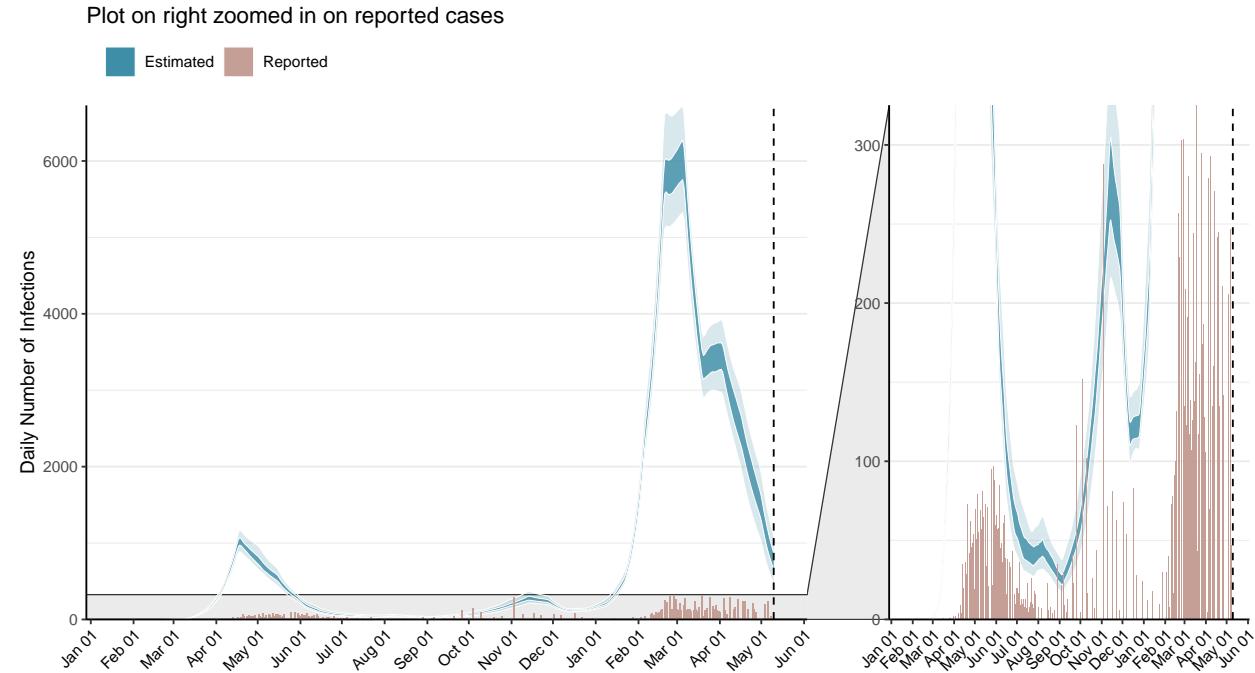
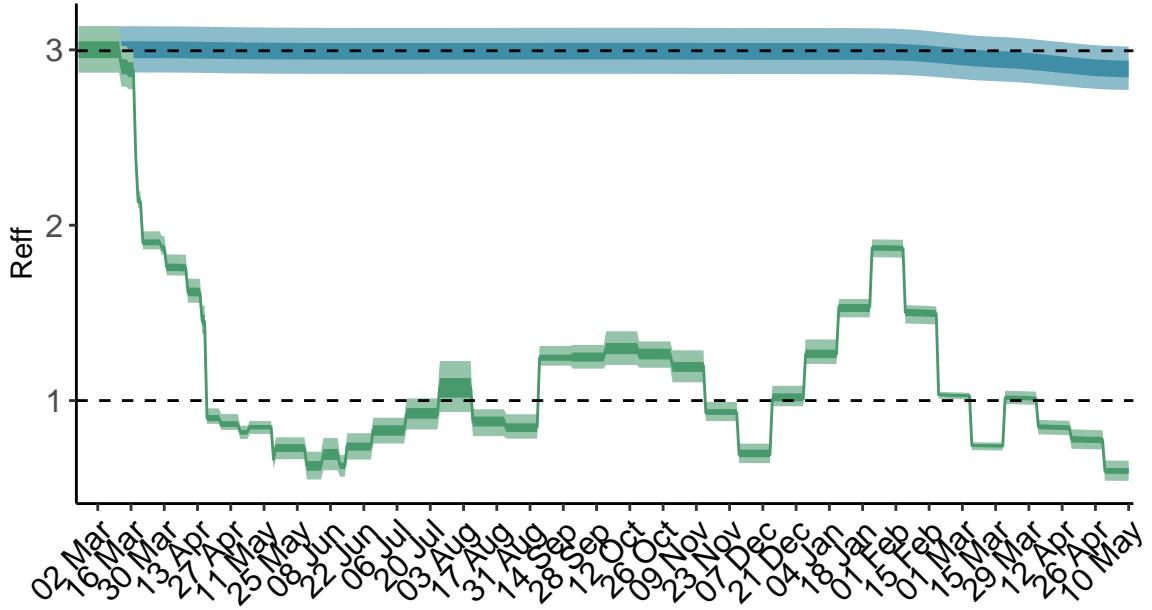


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

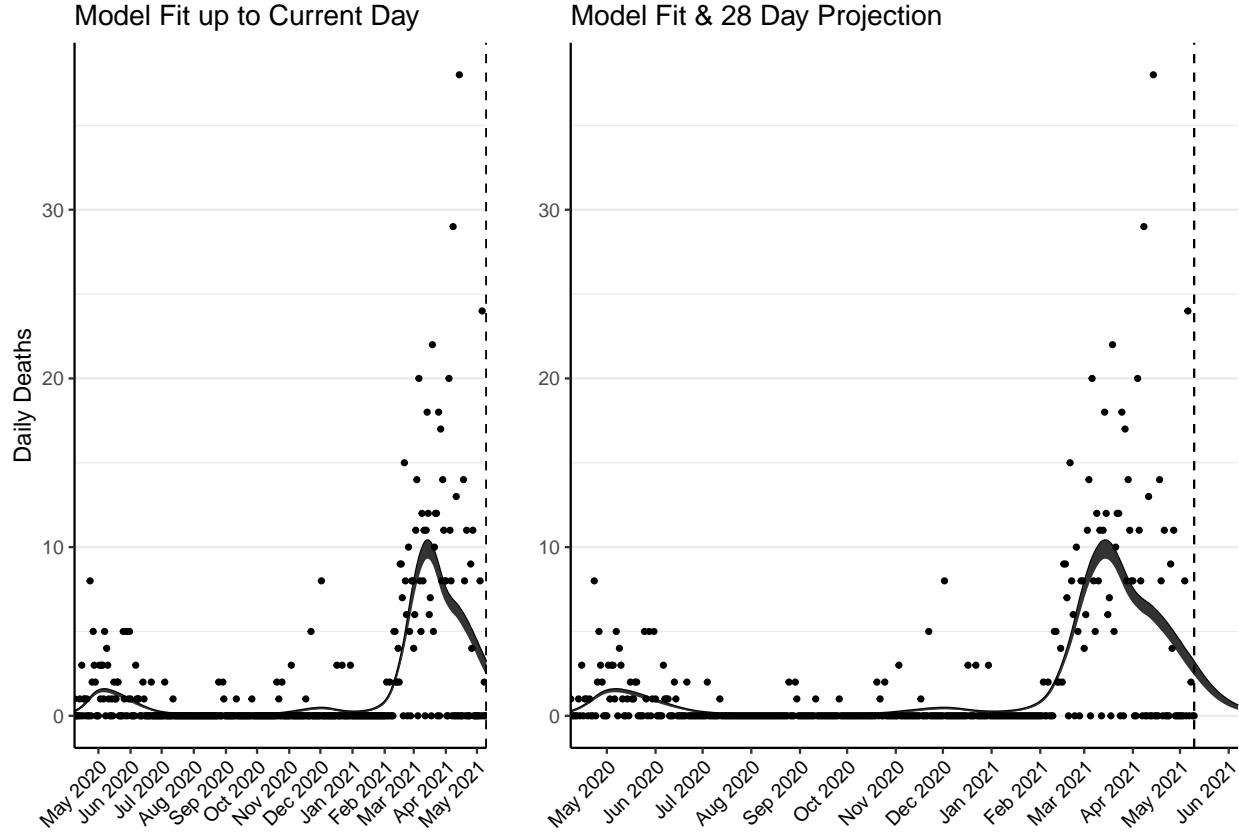


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 111 (95% CI: 107-115) patients requiring treatment with high-pressure oxygen at the current date to 20 (95% CI: 19-21) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 50 (95% CI: 48-51) patients requiring treatment with mechanical ventilation at the current date to 10 (95% CI: 10-11) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

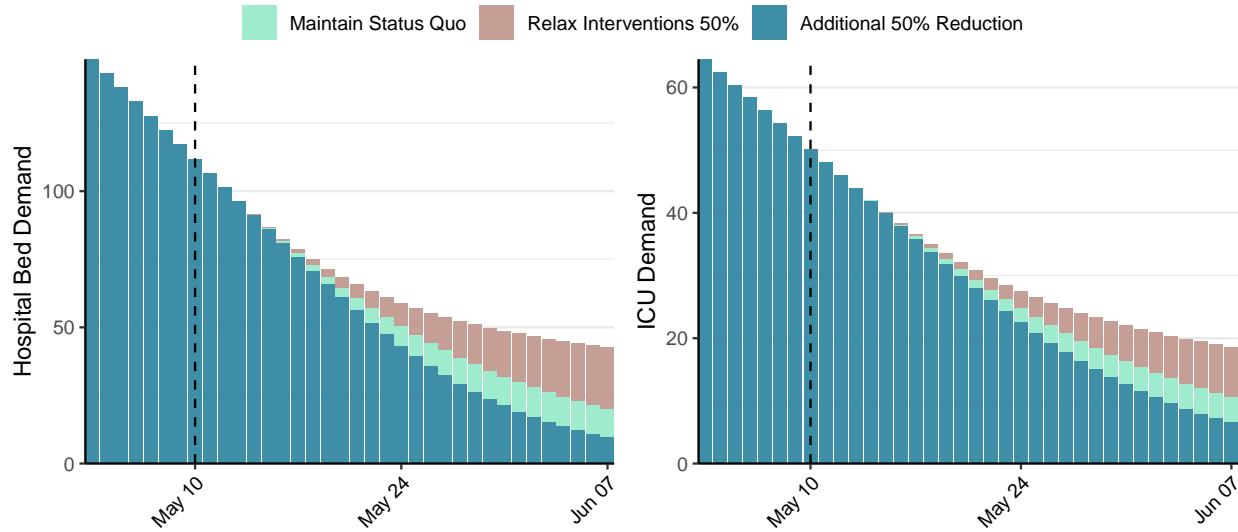


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 763 (95% CI: 726-800) at the current date to 13 (95% CI: 12-14) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 763 (95% CI: 726-800) at the current date to 519 (95% CI: 475-563) by 2021-06-07.

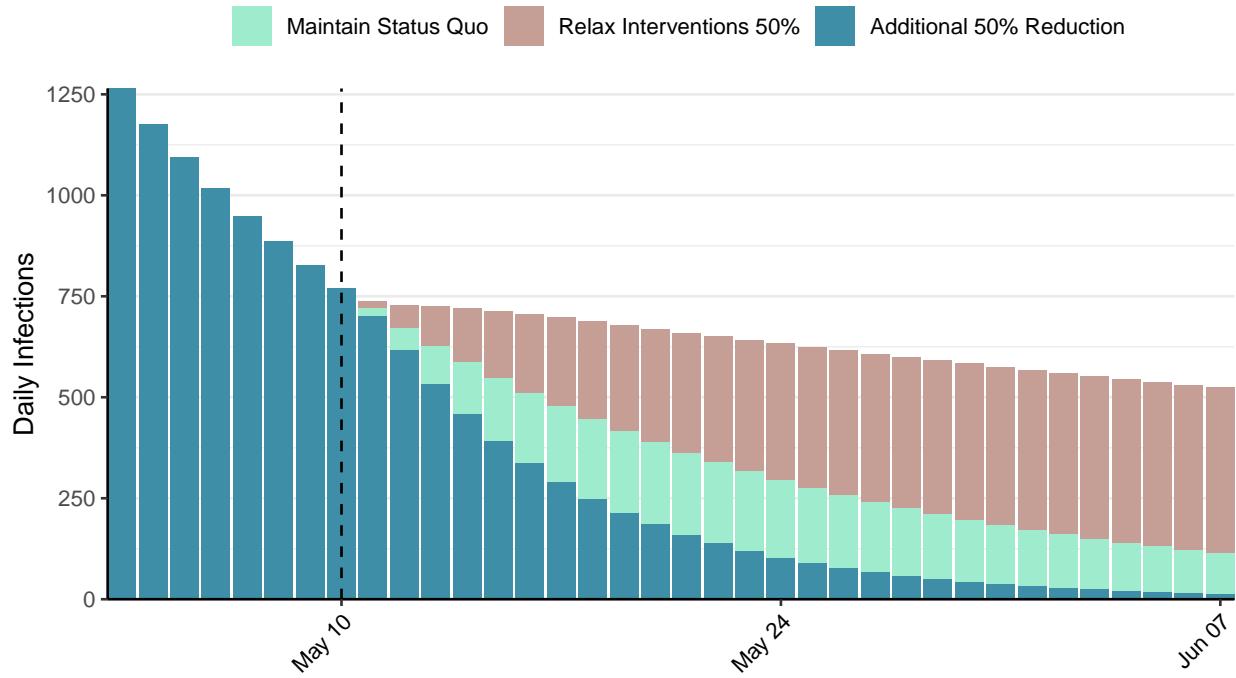


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Serbia, 2021-05-10

[Download the report for Serbia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
701,326	918	6,579	18	0.58 (95% CI: 0.54-0.62)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

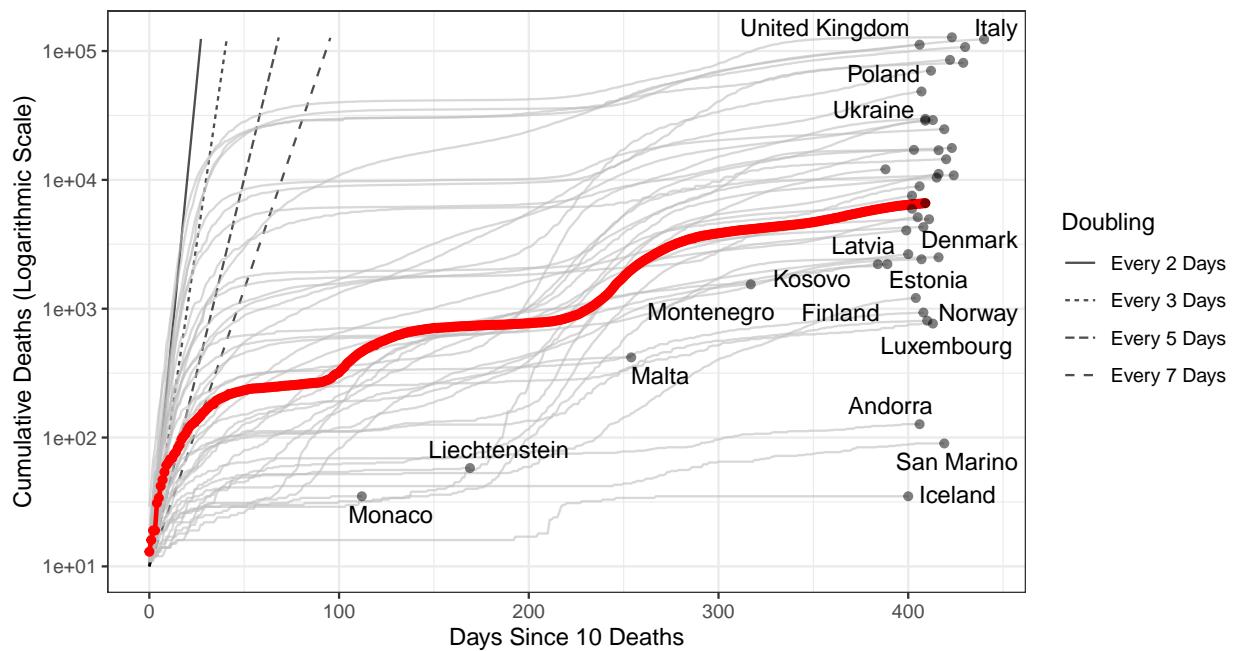


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 290,307 (95% CI: 281,902–298,711) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

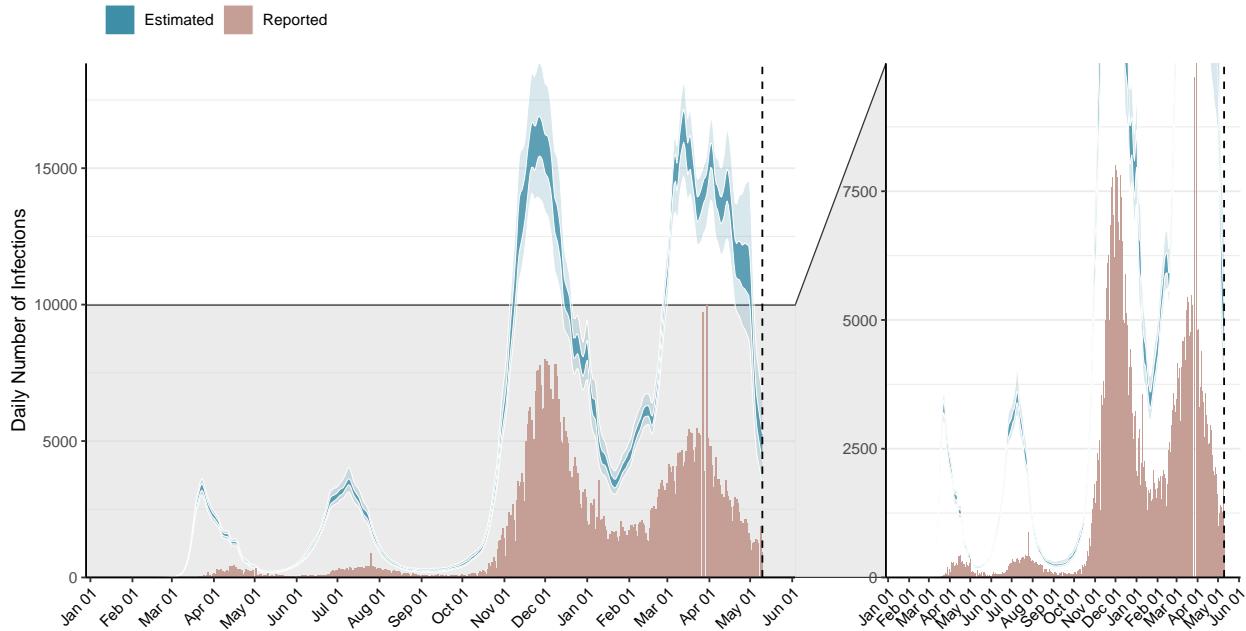
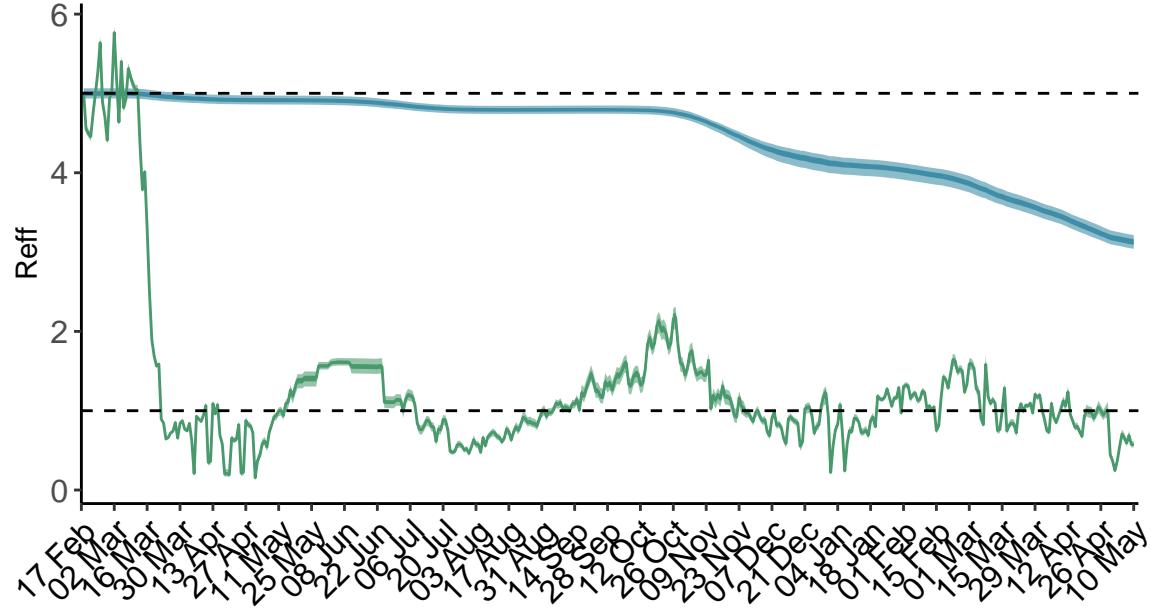


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

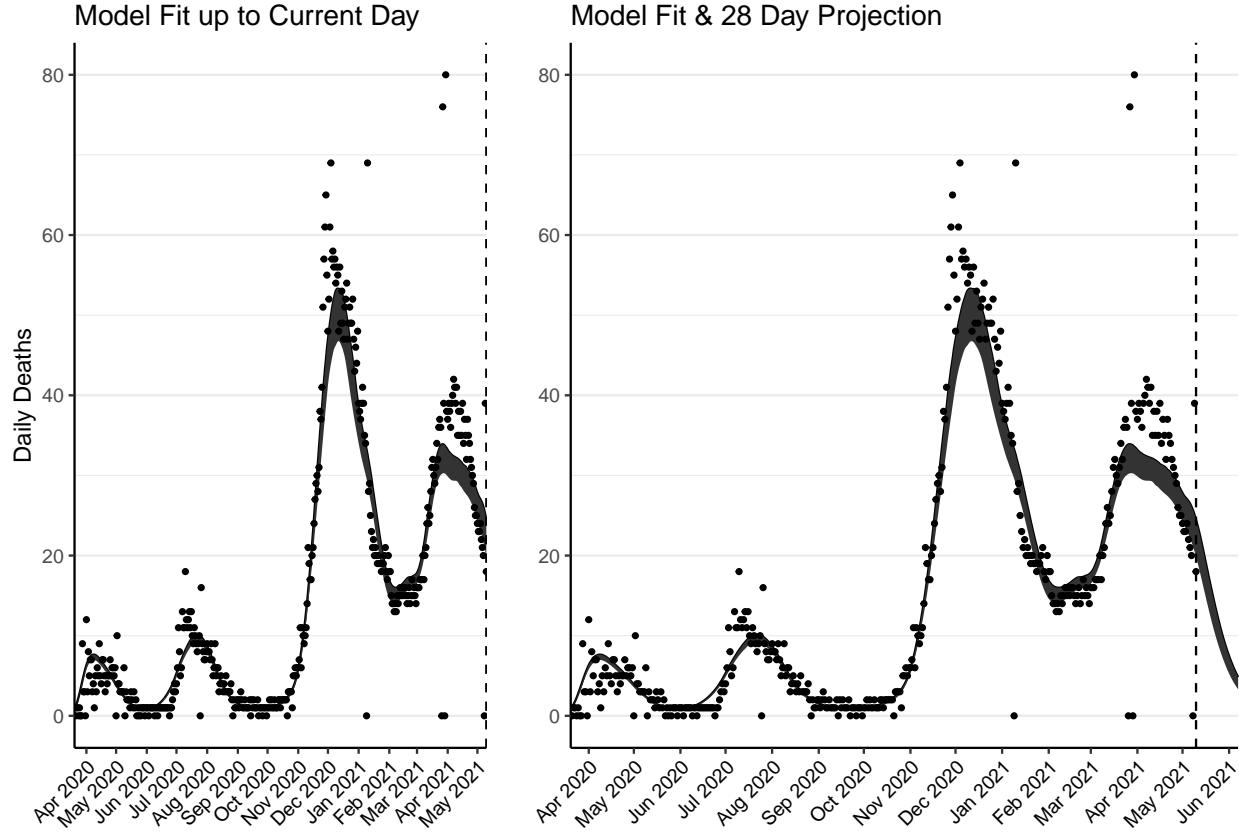


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 923 (95% CI: 894-951) patients requiring treatment with high-pressure oxygen at the current date to 149 (95% CI: 142-156) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 424 (95% CI: 411-436) patients requiring treatment with mechanical ventilation at the current date to 85 (95% CI: 82-89) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

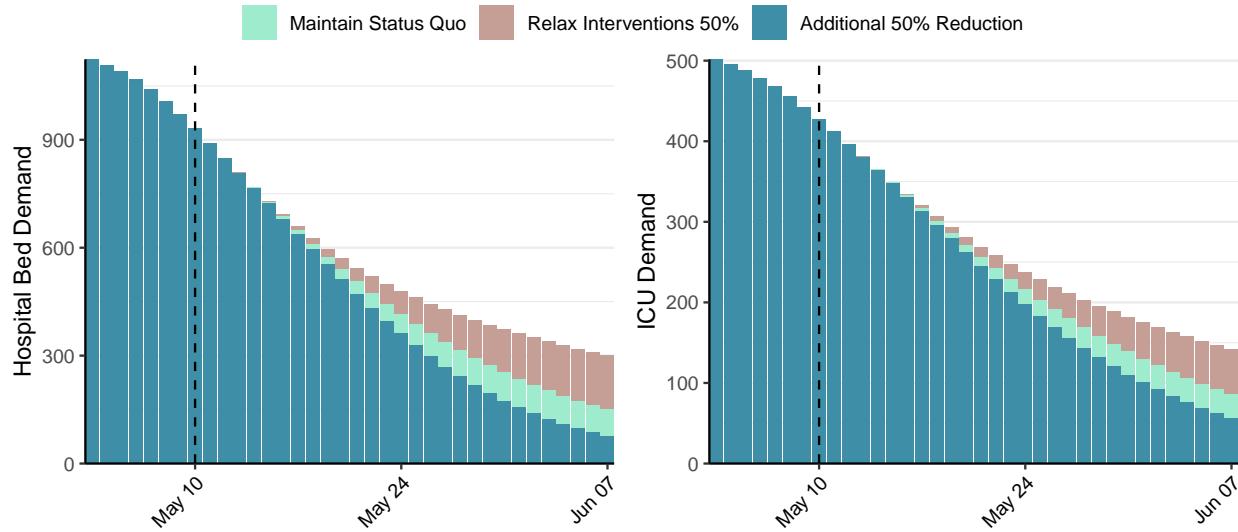
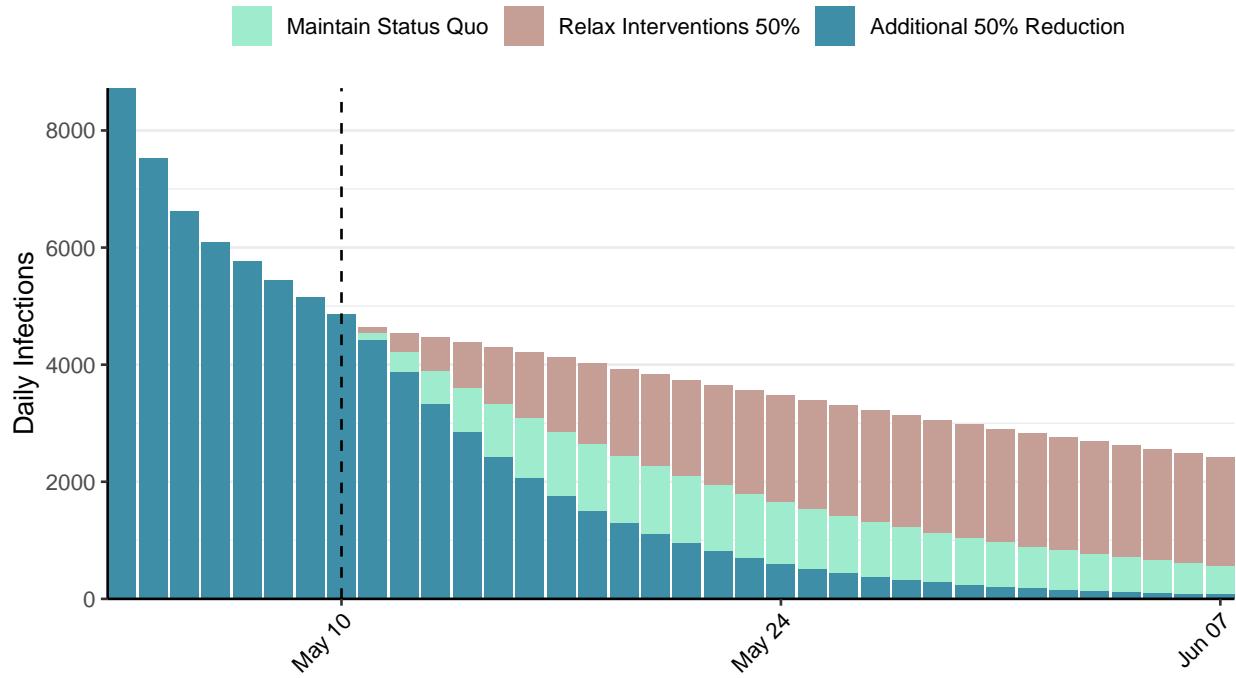


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 4,810 (95% CI: 4,622-4,998) at the current date to 68 (95% CI: 64-72) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 4,810 (95% CI: 4,622-4,998) at the current date to 2,393 (95% CI: 2,244-2,543) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: South Sudan, 2021-05-10

[Download the report for South Sudan, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
10,641	4	115	0	0.83 (95% CI: 0.74-0.95)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

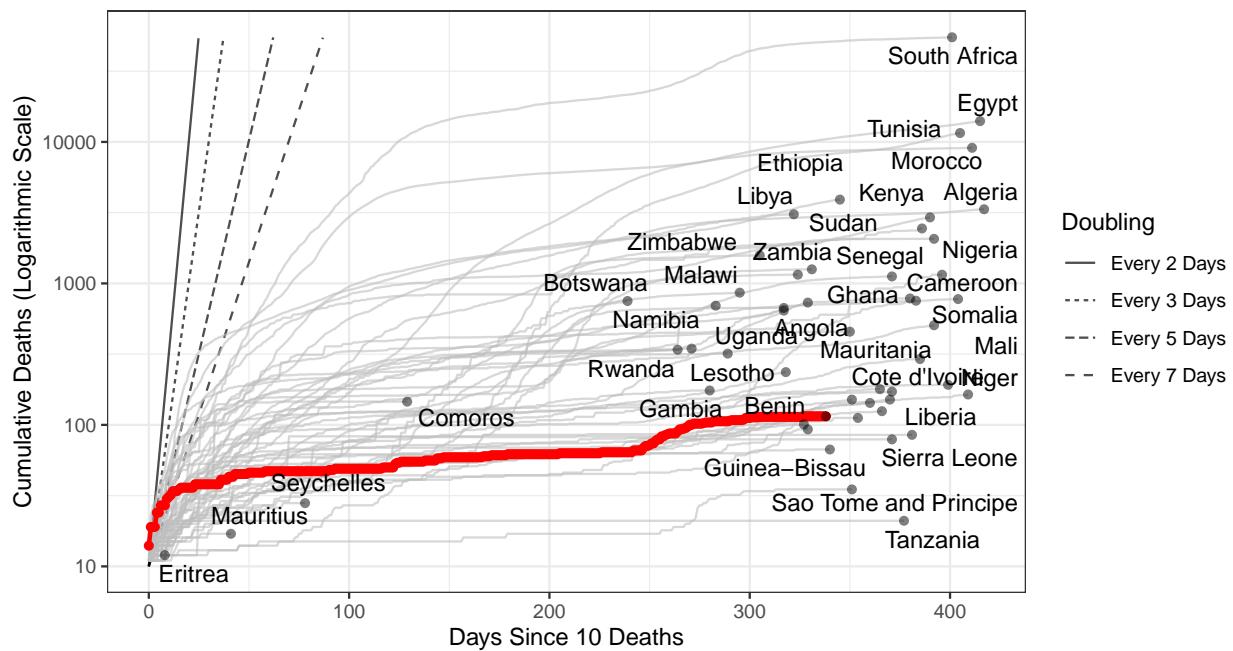


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 547 (95% CI: 505-589) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

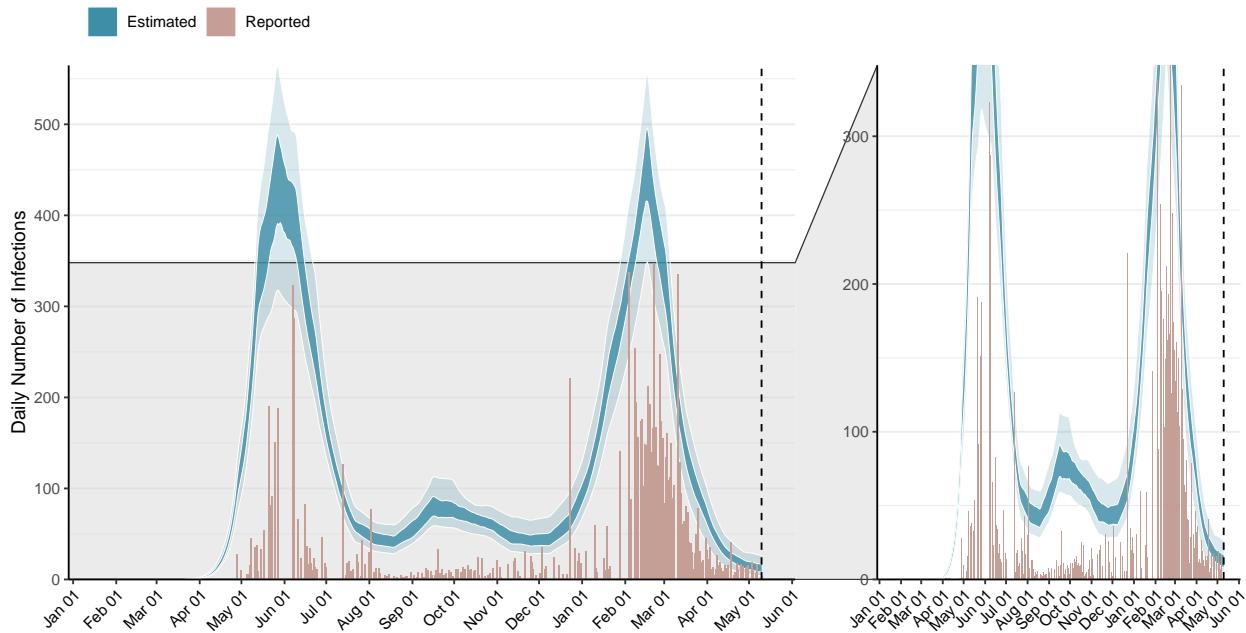
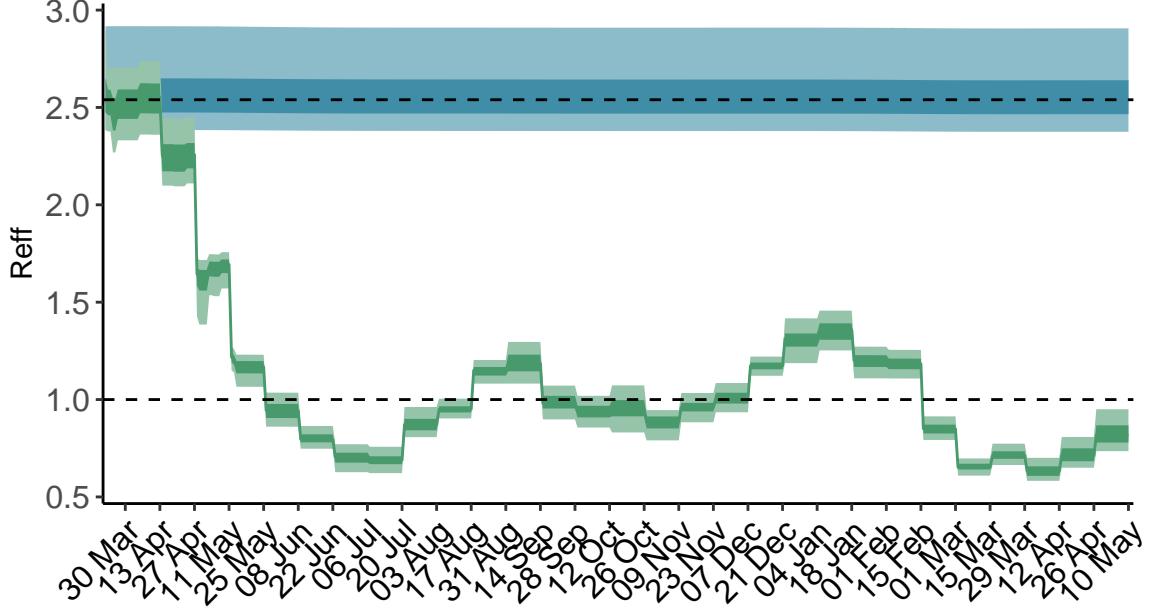


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

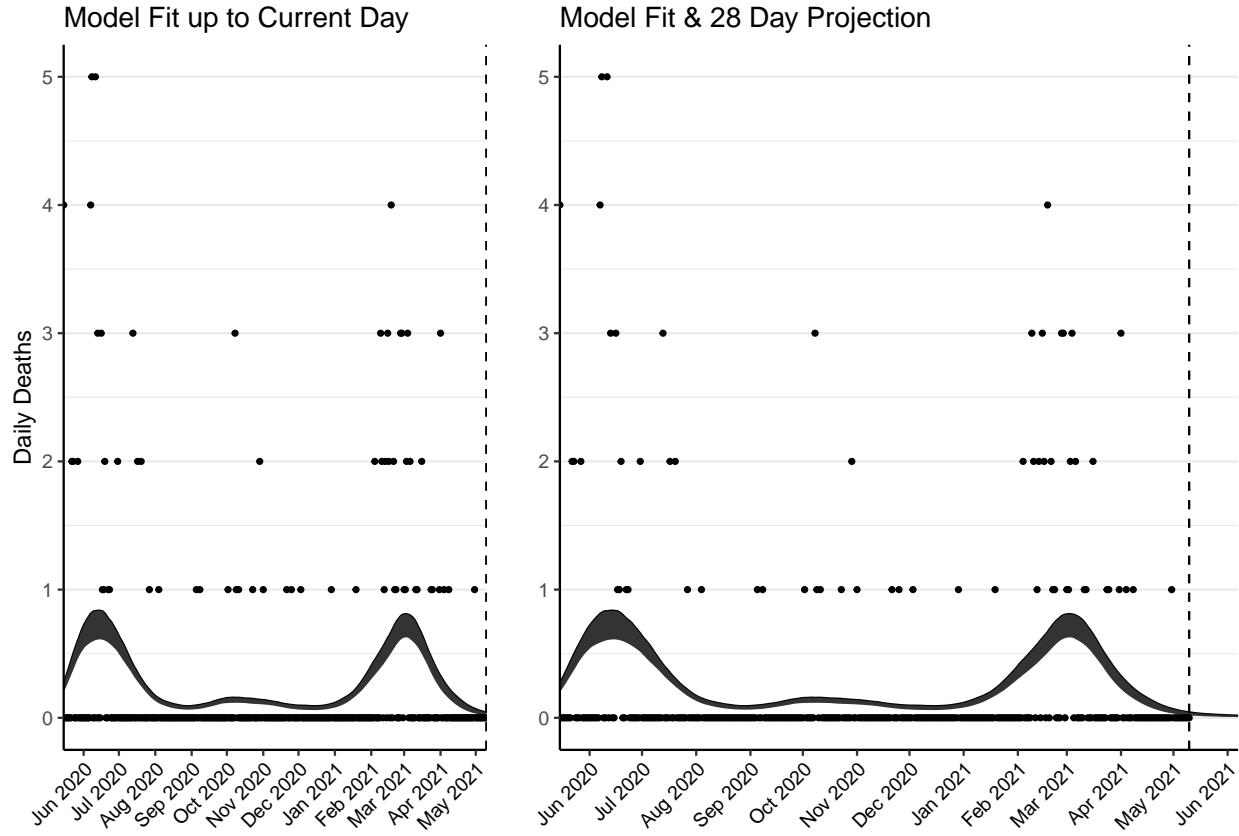


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 2 (95% CI: 1-2) patients requiring treatment with high-pressure oxygen at the current date to 1 (95% CI: 1-1) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1 (95% CI: 1-1) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

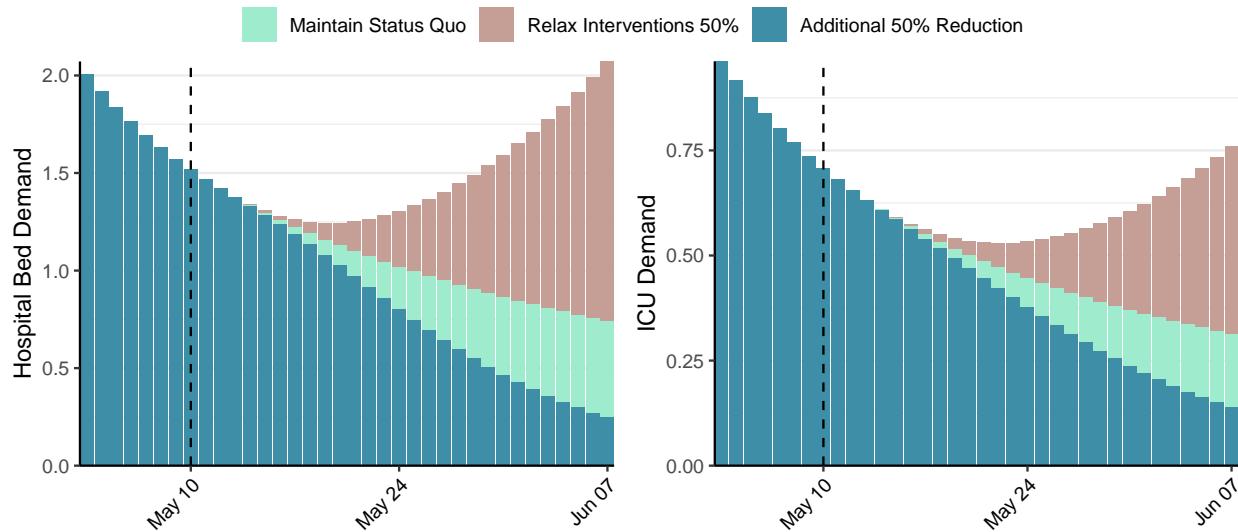


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 13 (95% CI: 11-14) at the current date to 1 (95% CI: 1-1) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 13 (95% CI: 11-14) at the current date to 39 (95% CI: 32-46) by 2021-06-07.

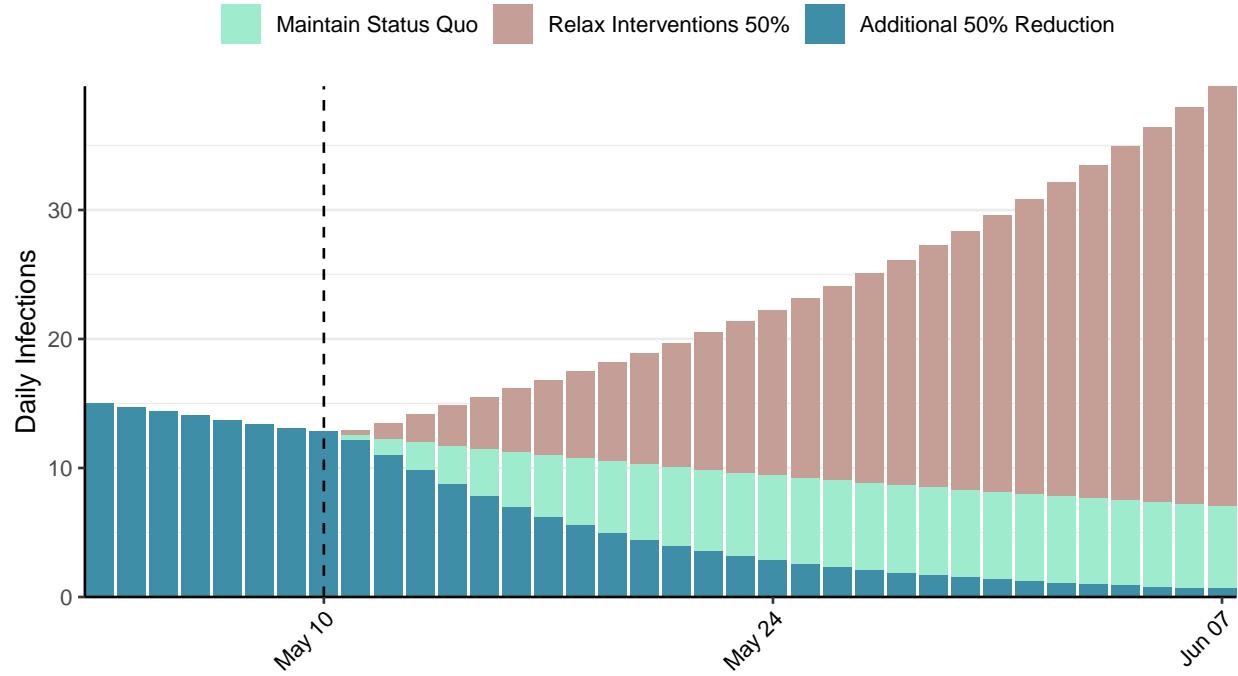


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Sao Tome and Principe, 2021-05-10

[Download the report for Sao Tome and Principe, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
2,318	0	35	0	0.47 (95% CI: 0.31-0.66)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

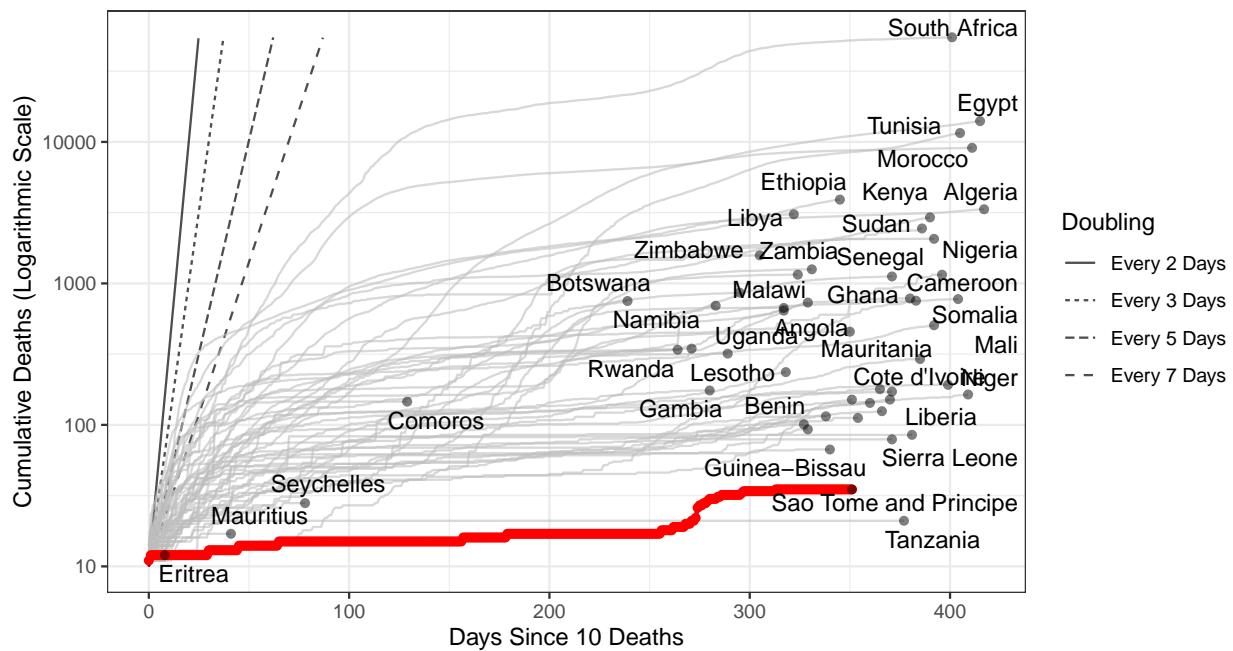


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 90 (95% CI: 81-98) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

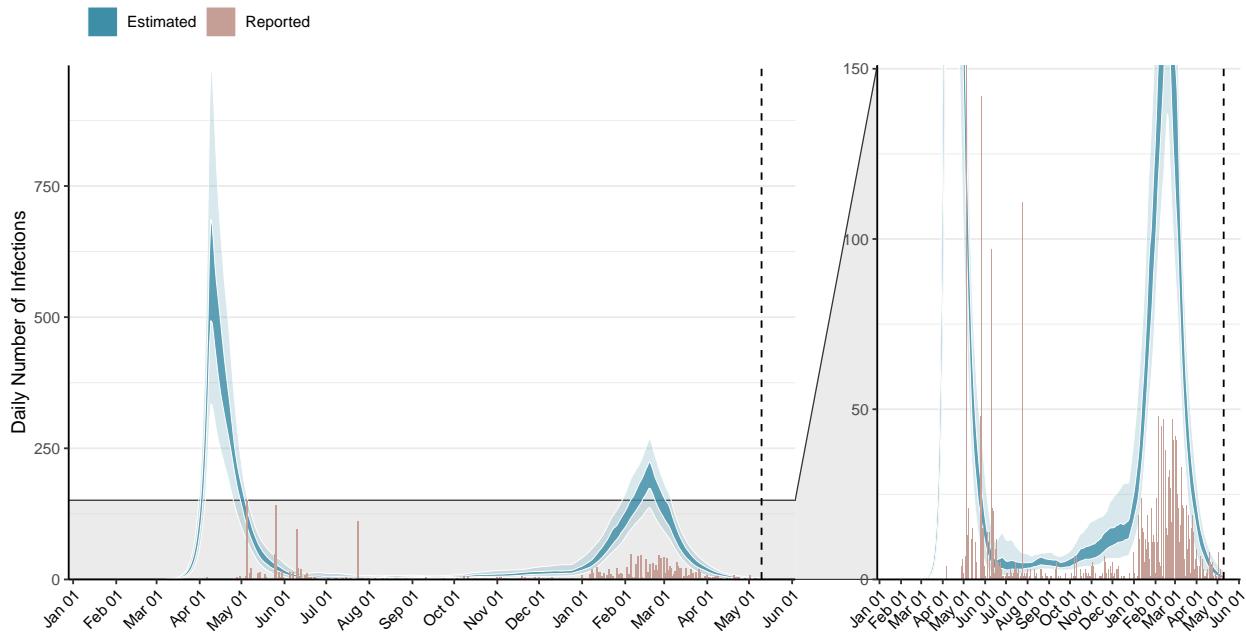
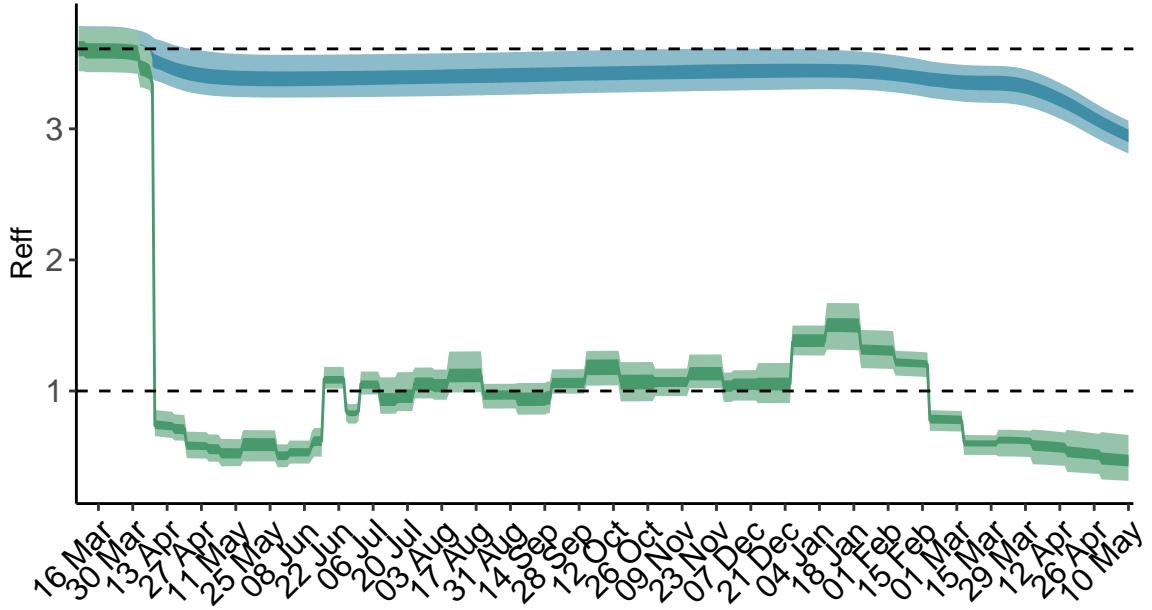


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Sao Tome and Principe is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

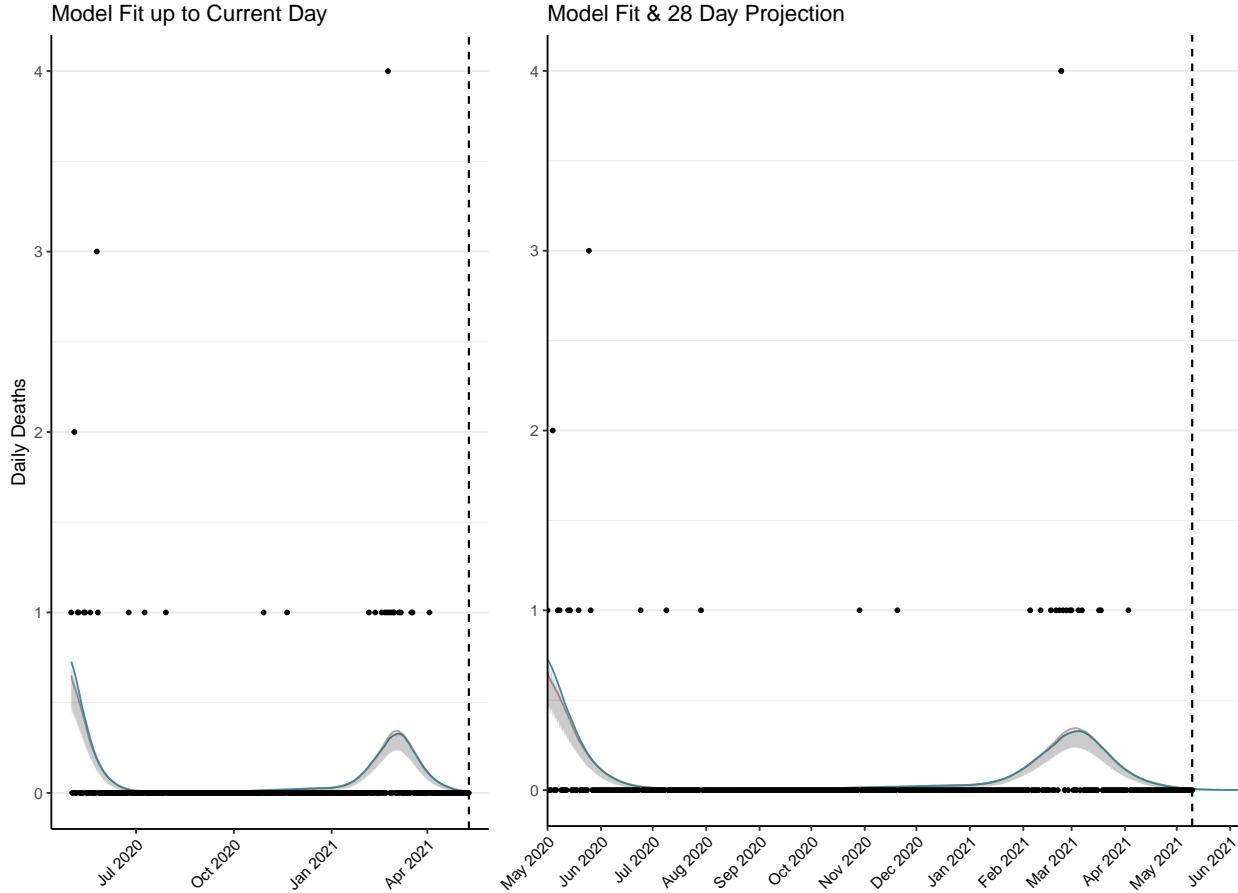


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 0 (95% CI: 0-0) patients requiring treatment with high-pressure oxygen at the current date to 0 (95% CI: 0-0) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 0 (95% CI: 0-0) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

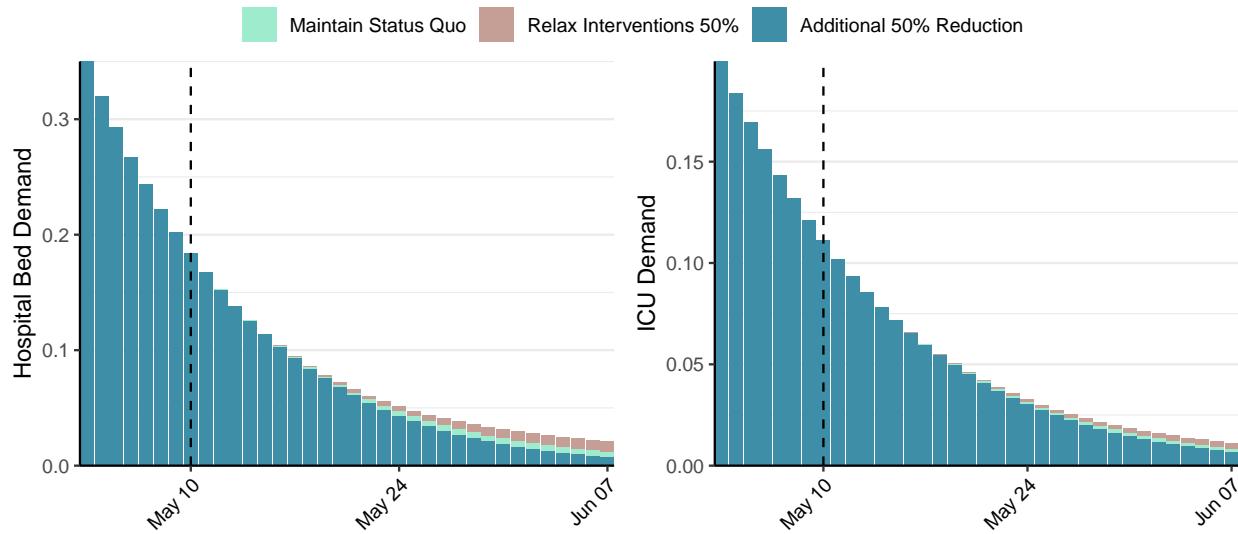


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1 (95% CI: 1-1) at the current date to 0 (95% CI: 0-0) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1 (95% CI: 1-1) at the current date to 0 (95% CI: 0-0) by 2021-06-07.

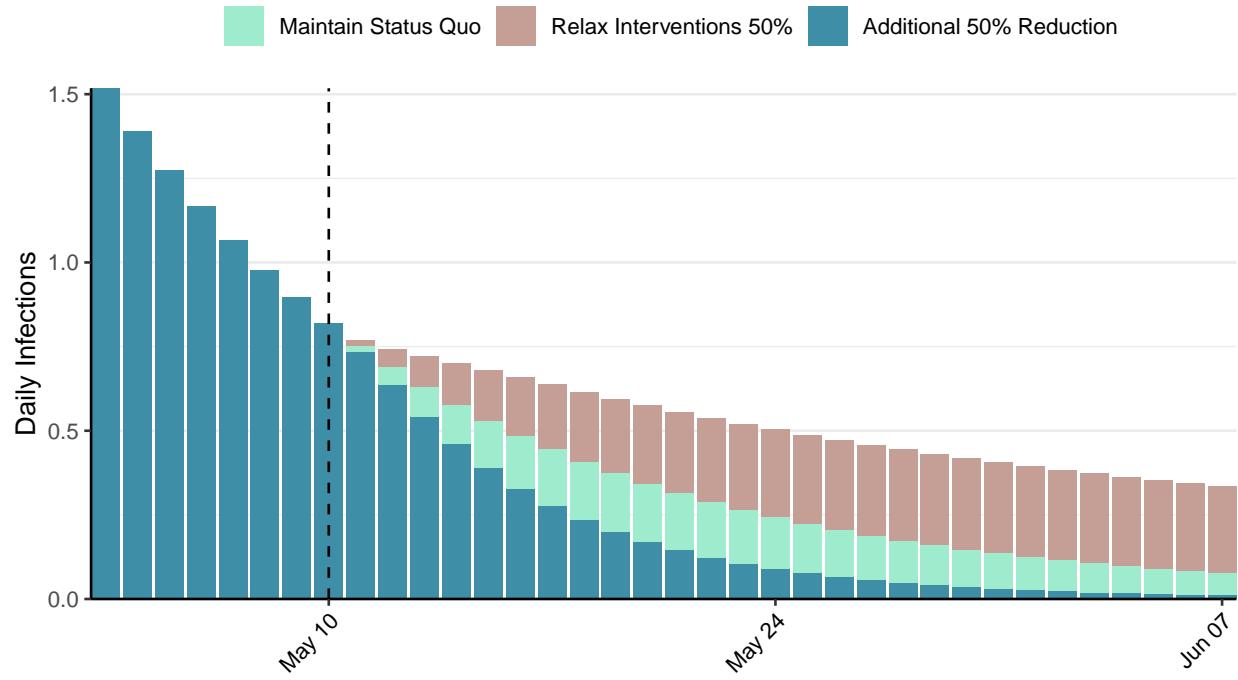


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Suriname, 2021-05-10

[Download the report for Suriname, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
11,213	101	218	3	1.09 (95% CI: 1.01-1.16)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

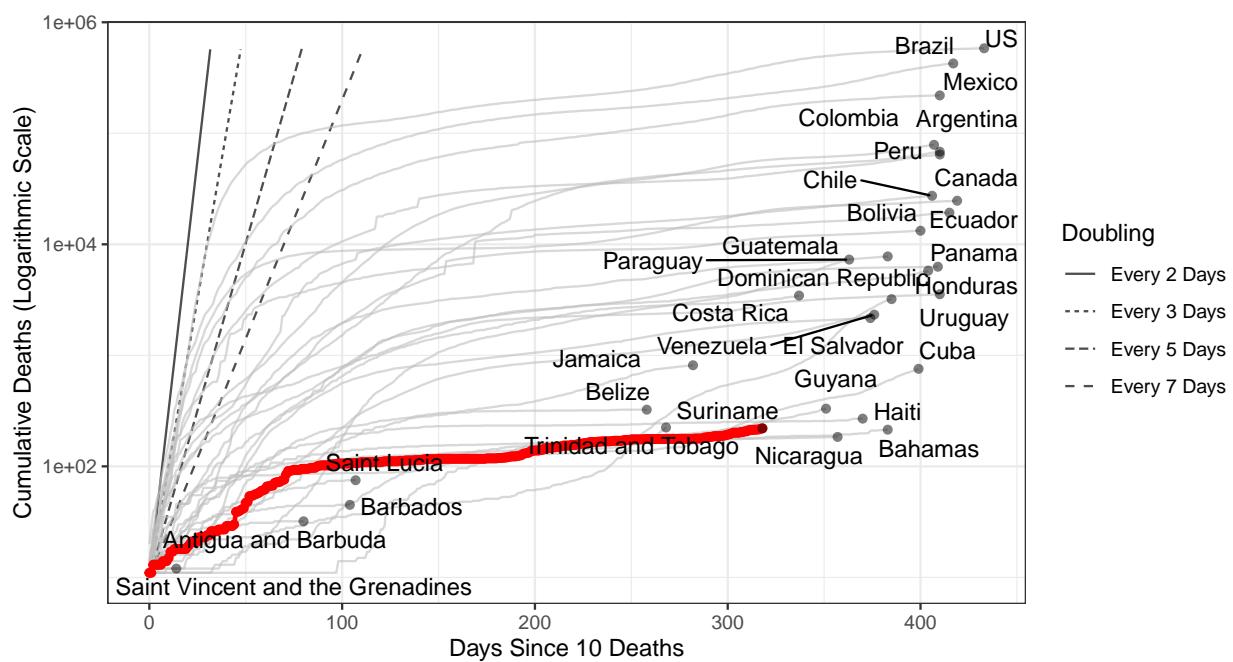


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 32,199 (95% CI: 30,968–33,430) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

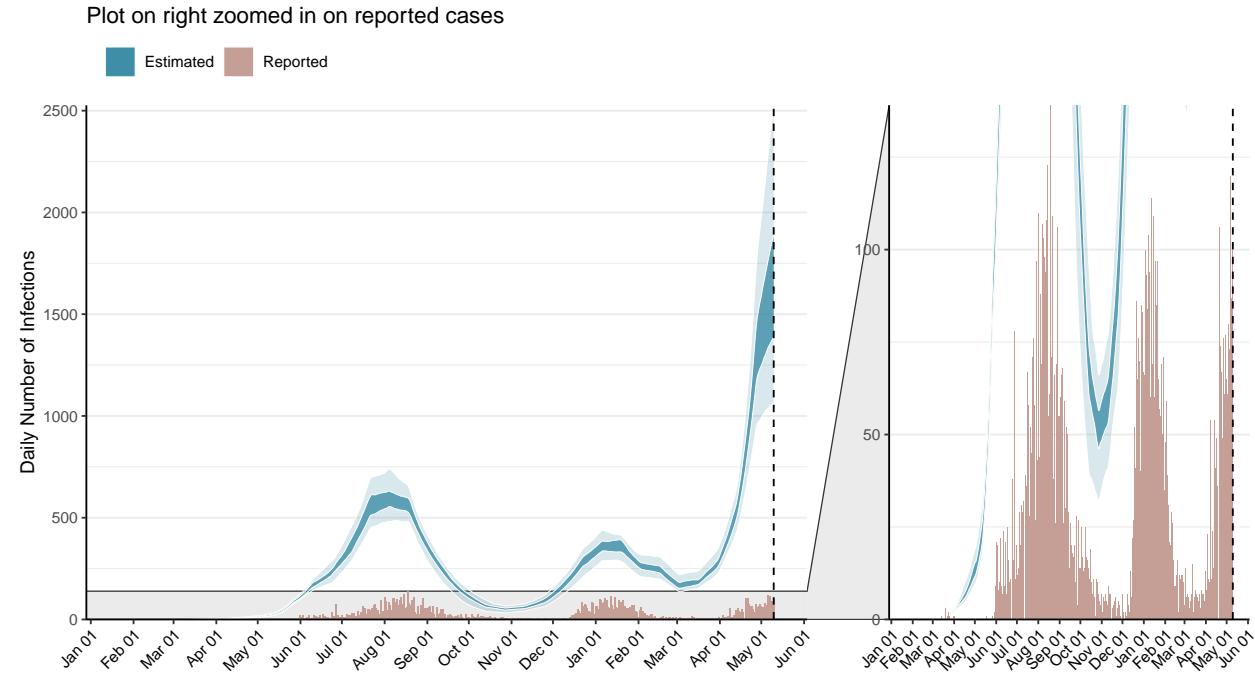
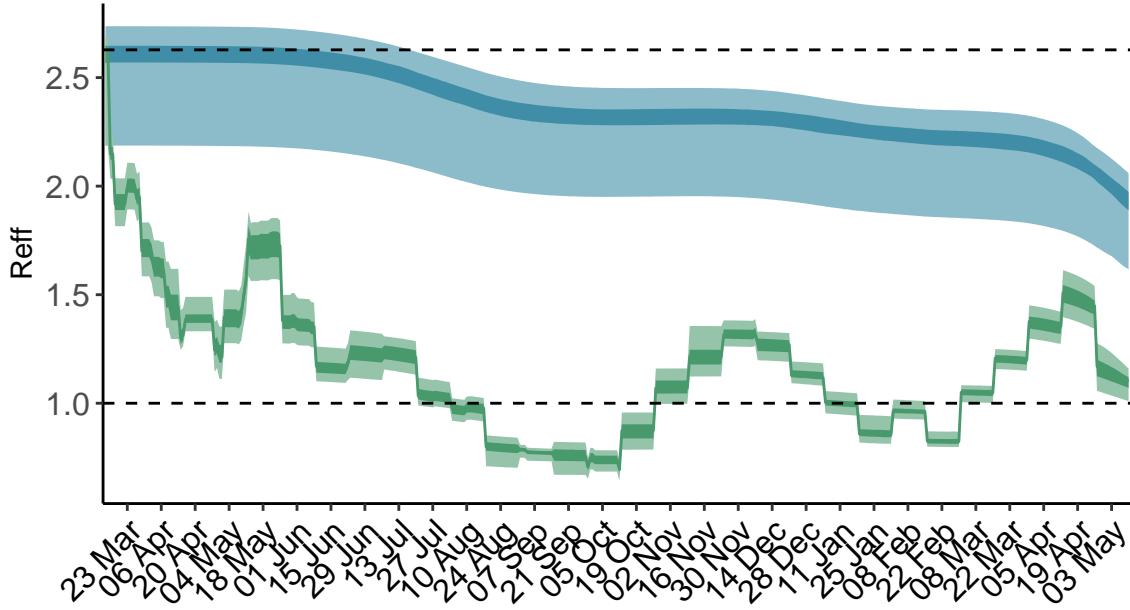


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

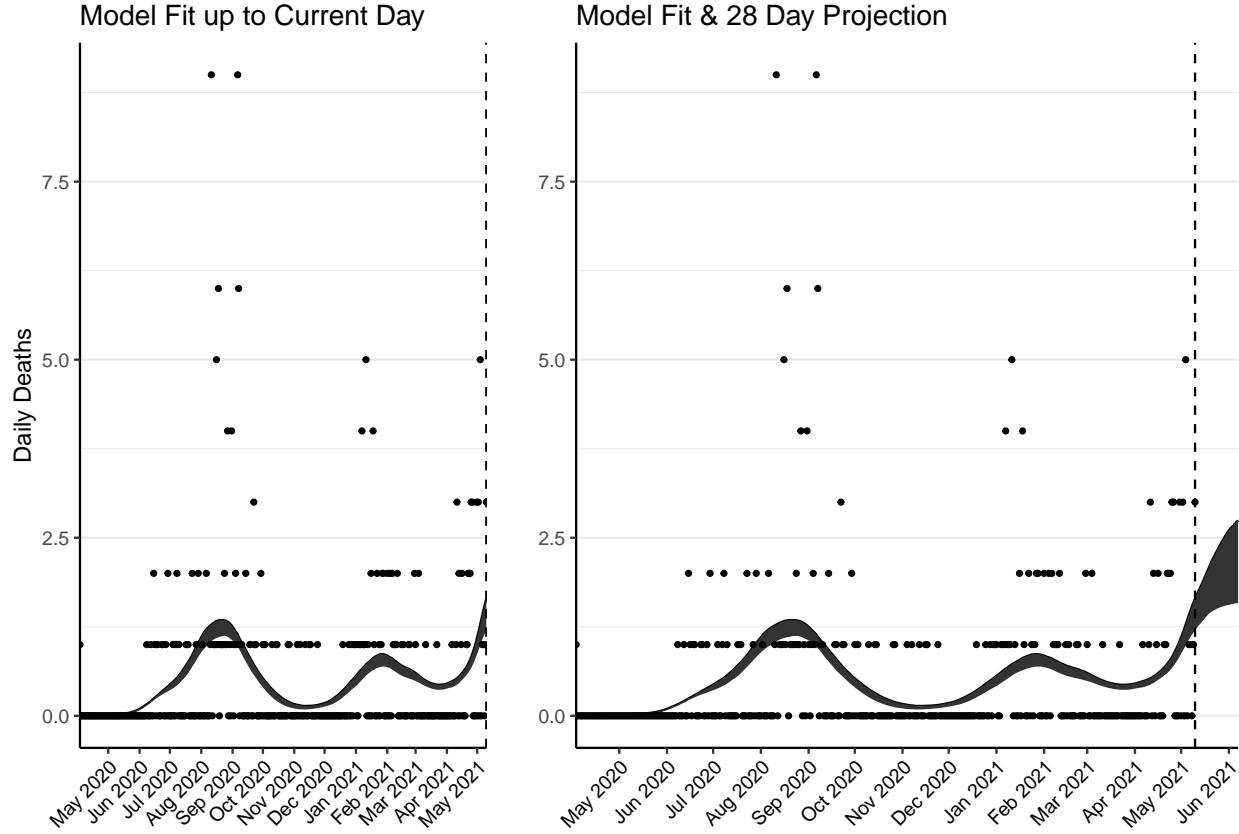


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 83 (95% CI: 79-86) patients requiring treatment with high-pressure oxygen at the current date to 124 (95% CI: 117-131) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 32 (95% CI: 31-33) patients requiring treatment with mechanical ventilation at the current date to 46 (95% CI: 44-48) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

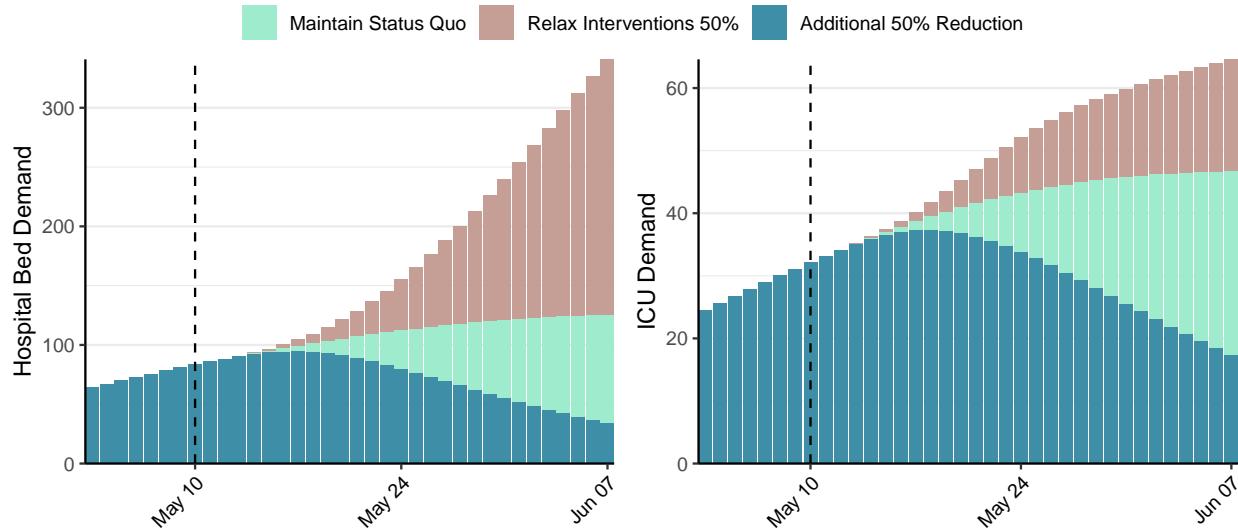


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,659 (95% CI: 1,579-1,739) at the current date to 164 (95% CI: 154-174) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,659 (95% CI: 1,579-1,739) at the current date to 6,399 (95% CI: 6,171-6,626) by 2021-06-07.

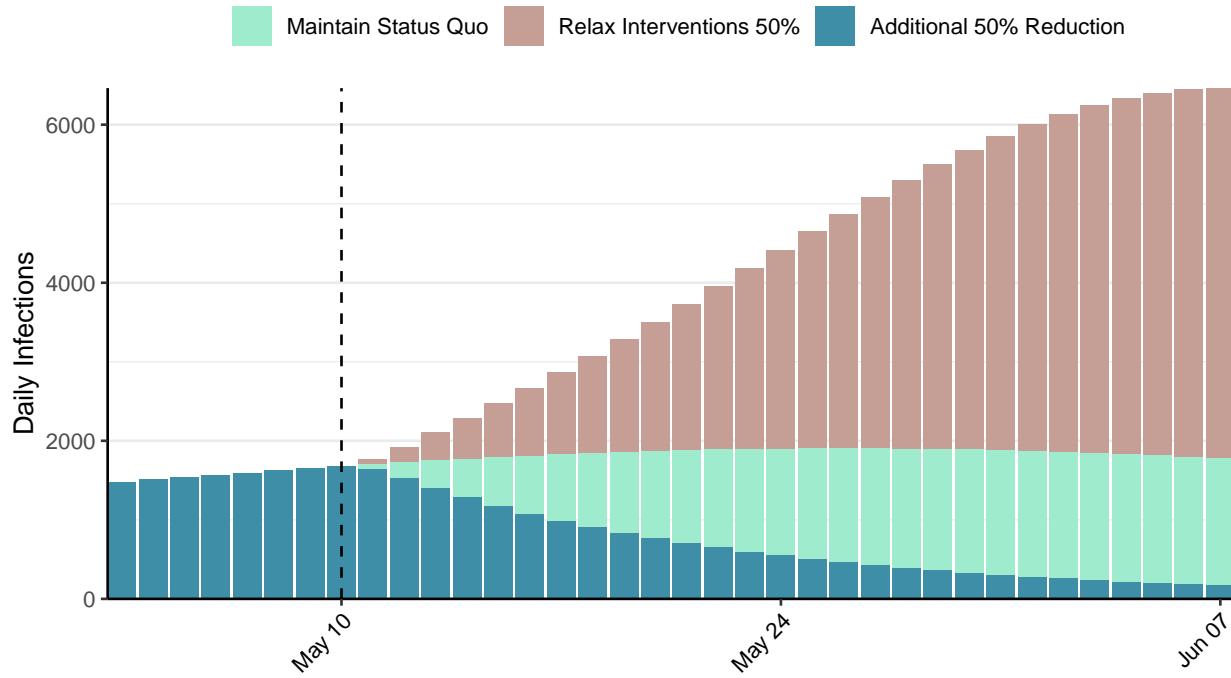


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Eswatini, 2021-05-10

[Download the report for Eswatini, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
18,482	2	671	0	0.56 (95% CI: 0.46-0.71)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

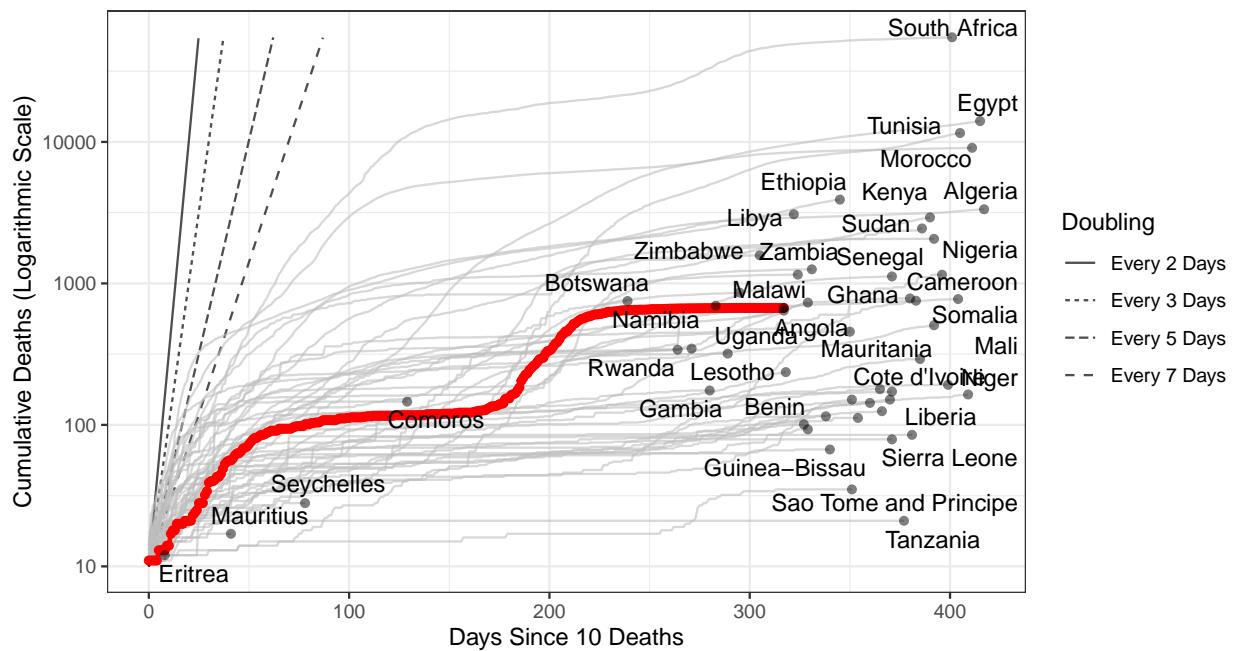


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 105 (95% CI: 96-114) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

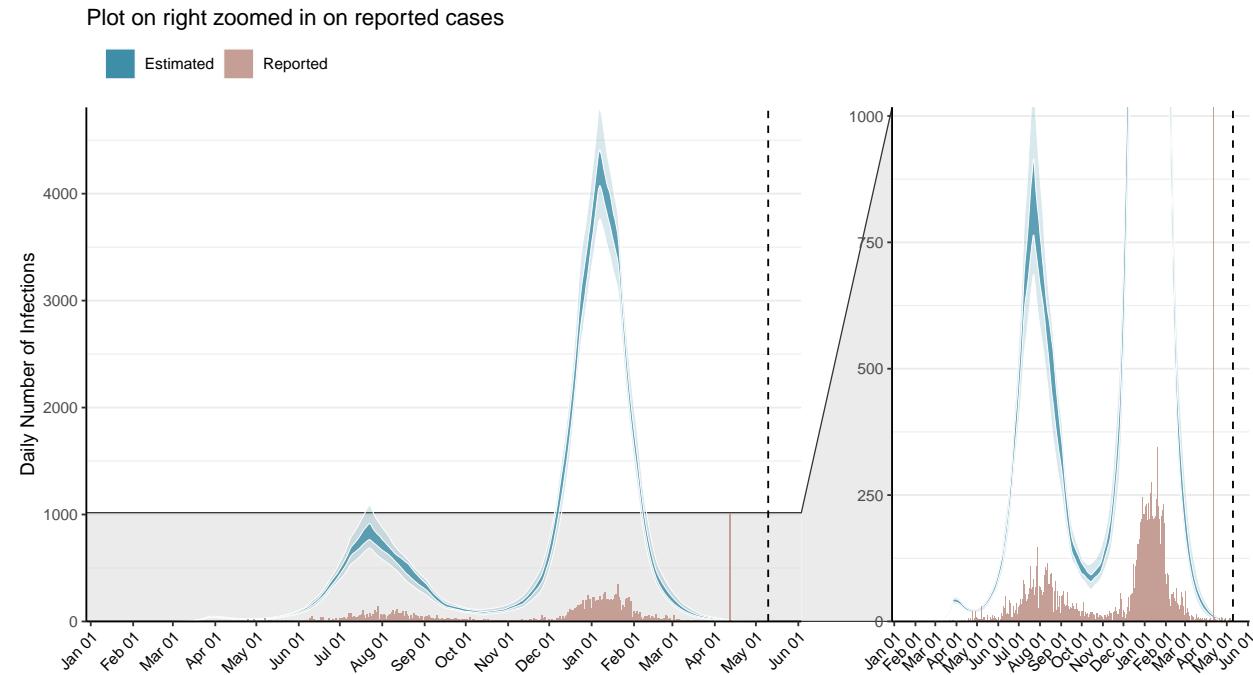
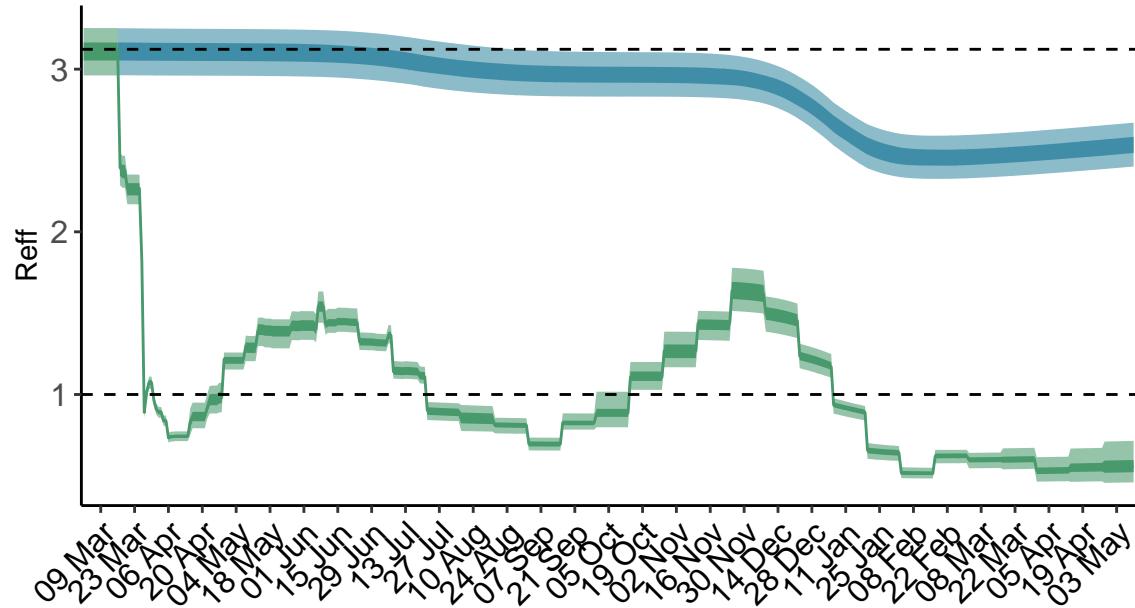


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Eswatini is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information](#).

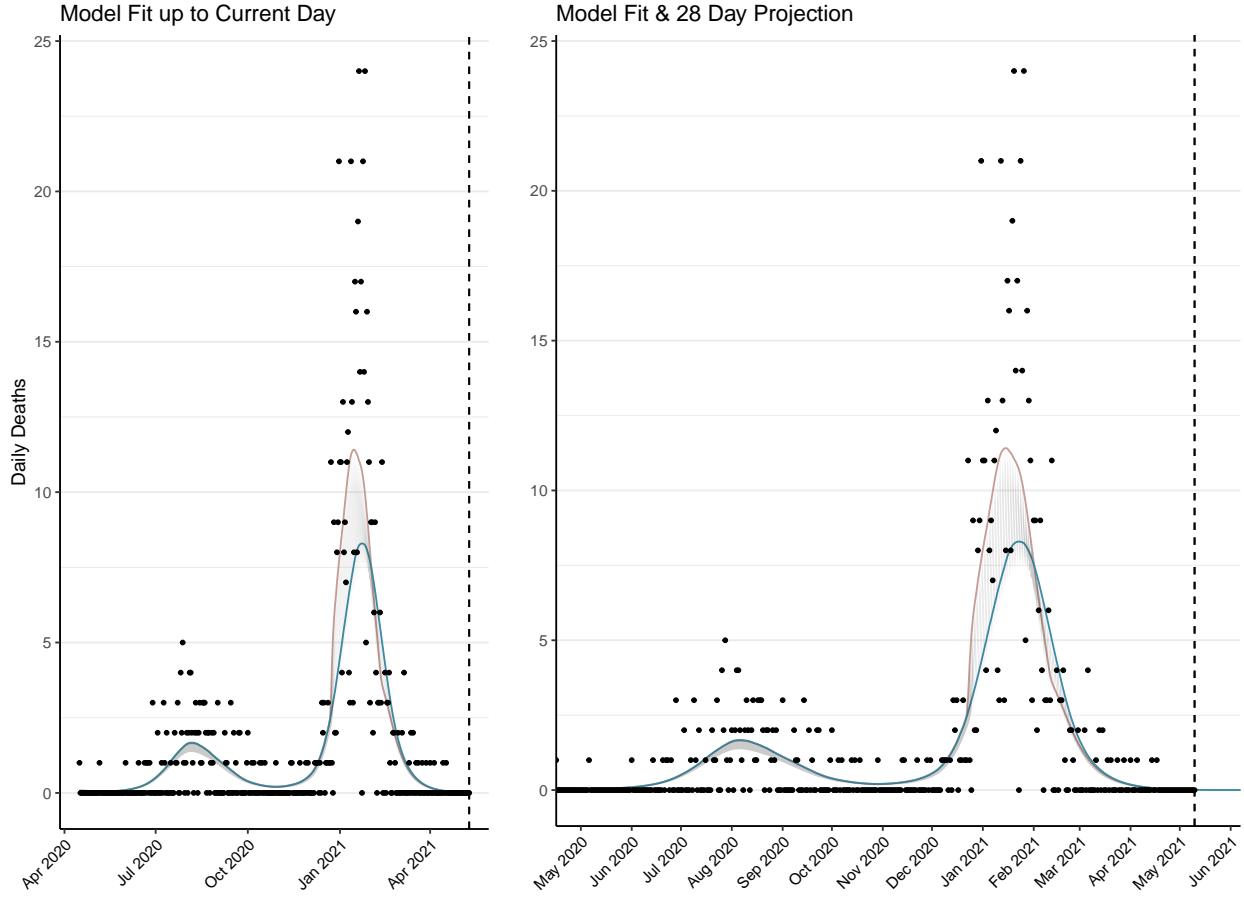


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 0 (95% CI: 0-0) patients requiring treatment with high-pressure oxygen at the current date to 0 (95% CI: 0-0) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 0 (95% CI: 0-0) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

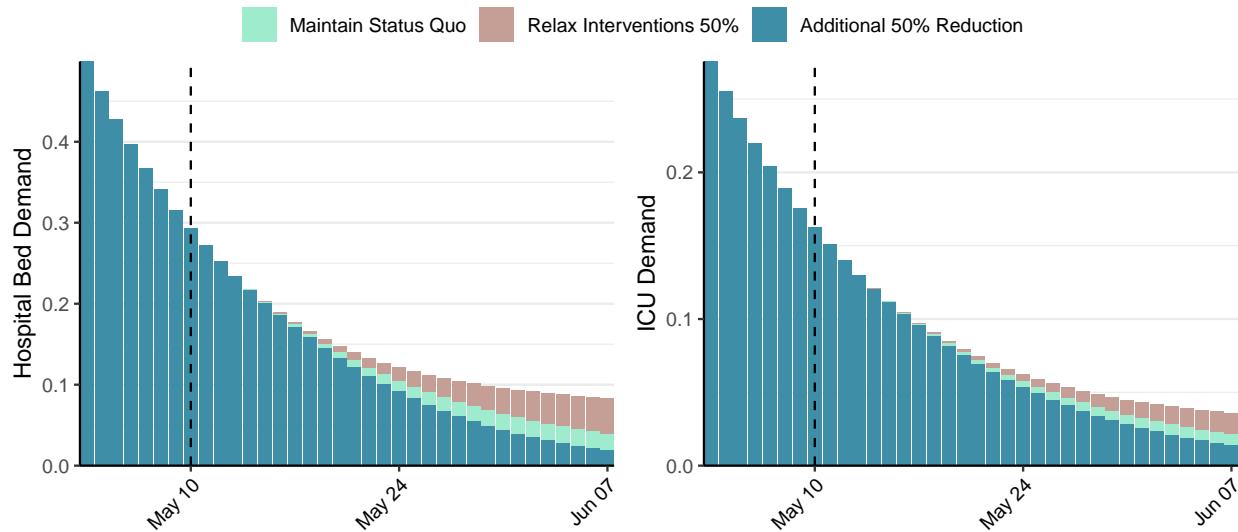


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1 (95% CI: 1-1) at the current date to 0 (95% CI: 0-0) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1 (95% CI: 1-1) at the current date to 1 (95% CI: 1-1) by 2021-06-07.

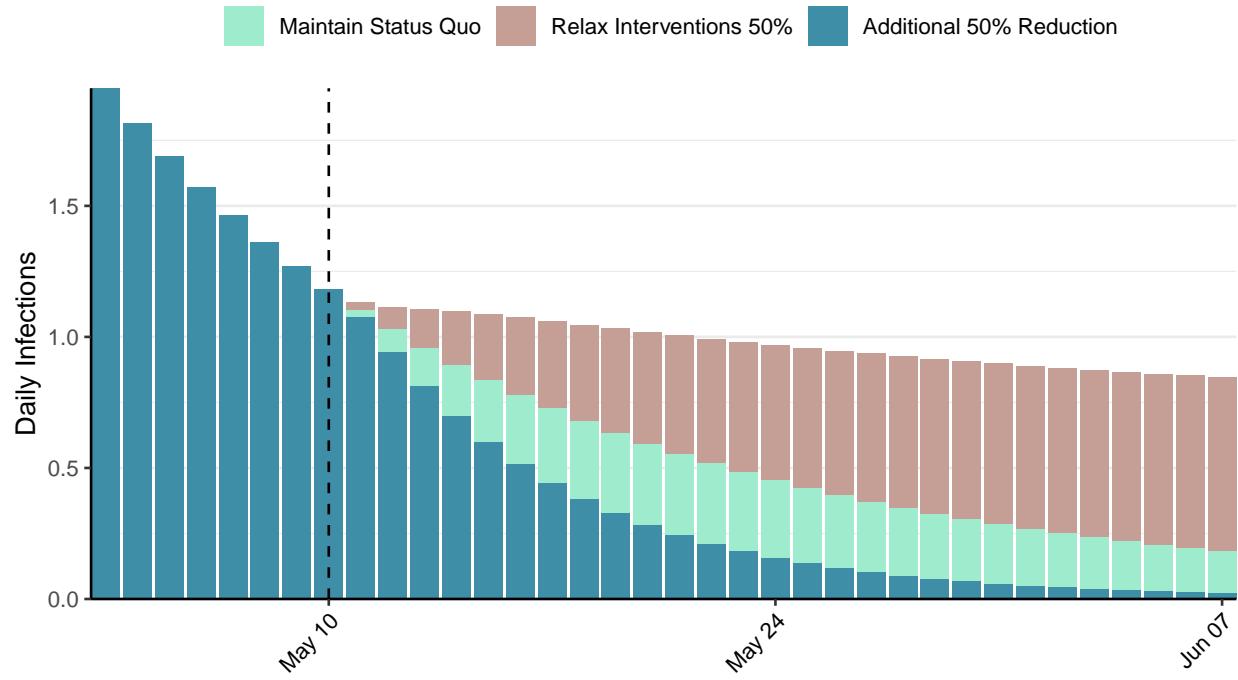


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Syria, 2021-05-10

[Download the report for Syria, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
23,439	60	1,664	7	0.72 (95% CI: 0.61-0.82)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

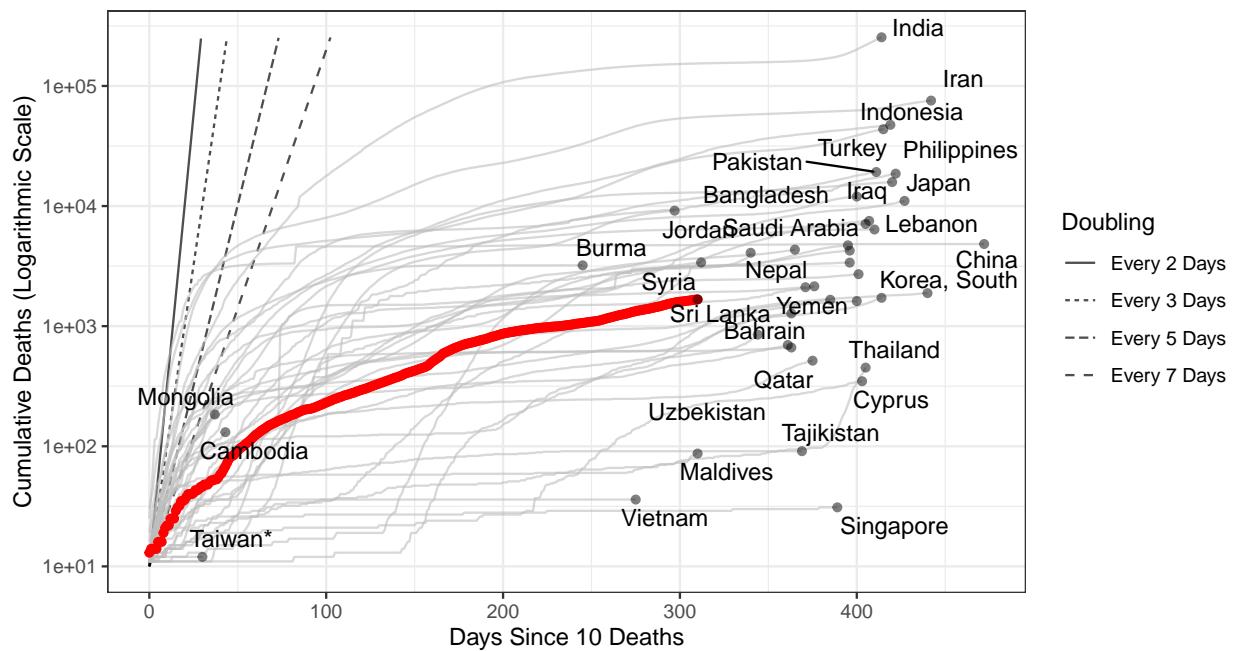


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 98,490 (95% CI: 94,834-102,147) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

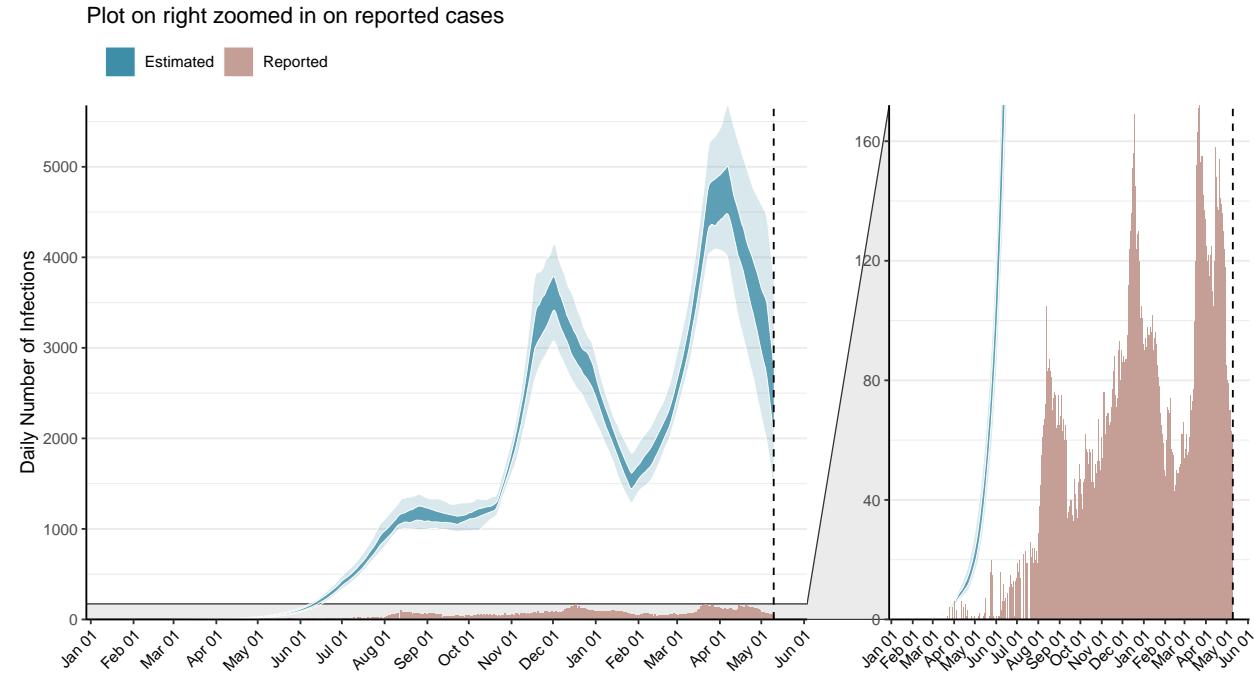


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.

We are aware of under-reporting of deaths in Damascus, Syria. This is not represented in this report, but please see [Report 31](#)

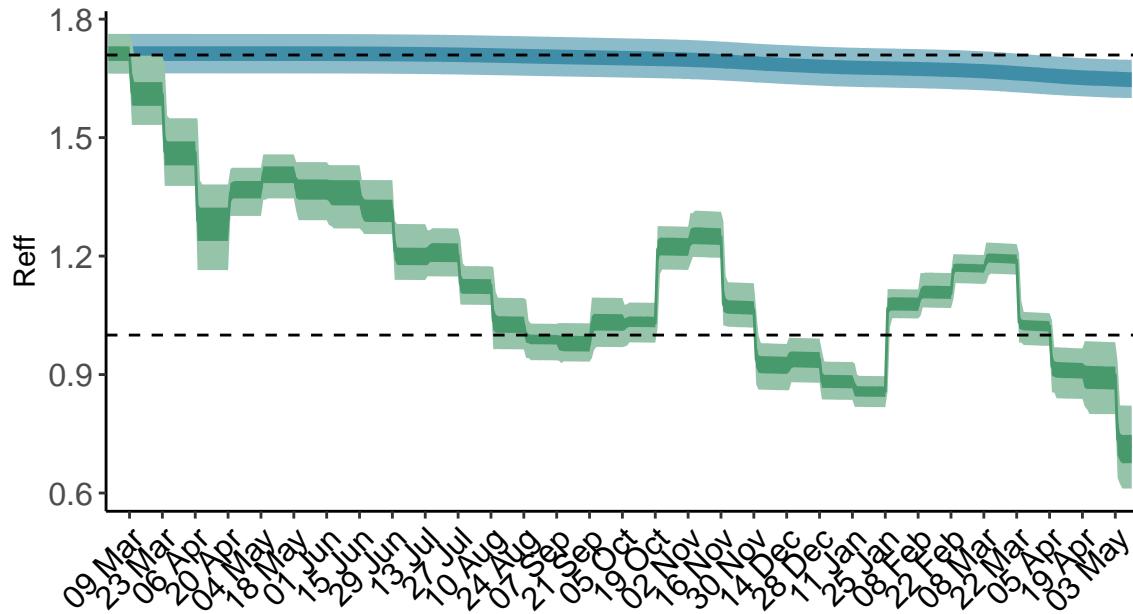


Figure 3: **Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

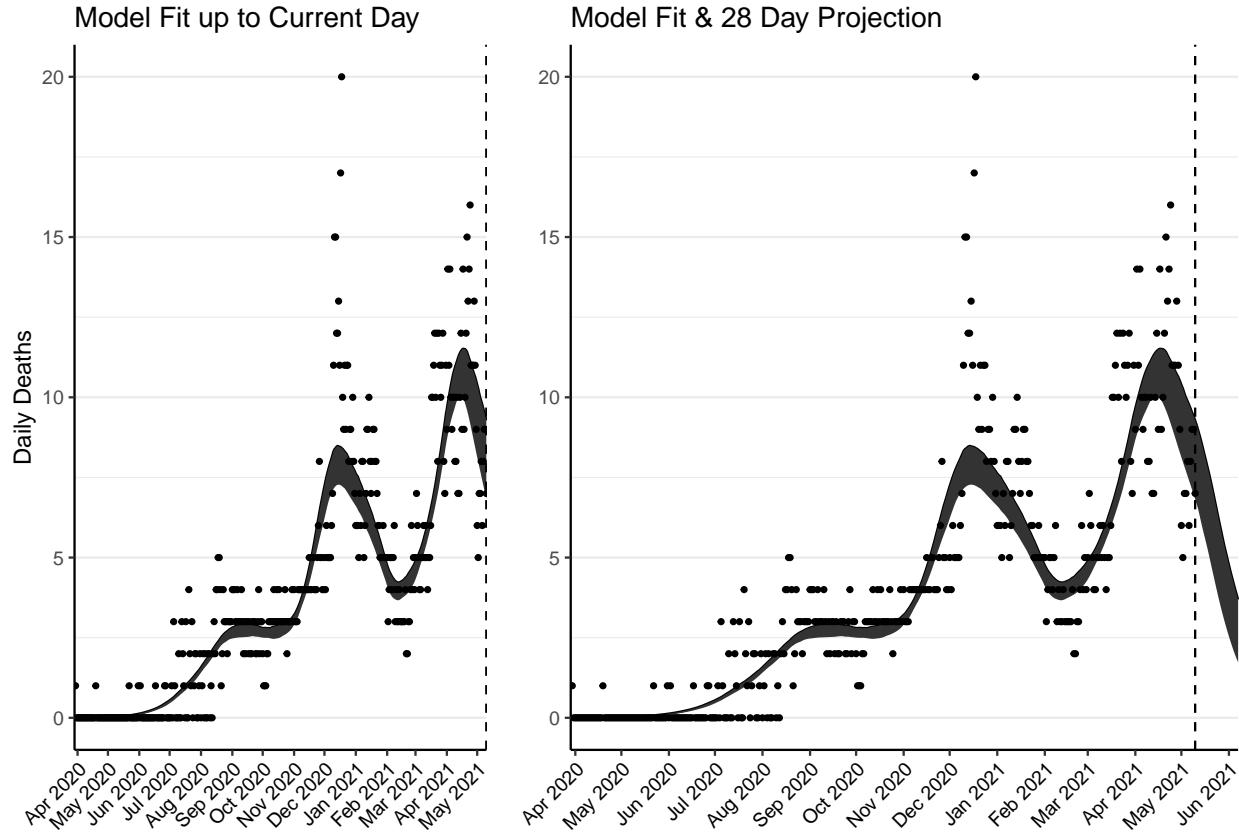


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 328 (95% CI: 315-341) patients requiring treatment with high-pressure oxygen at the current date to 120 (95% CI: 111-130) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 132 (95% CI: 127-136) patients requiring treatment with mechanical ventilation at the current date to 53 (95% CI: 49-57) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

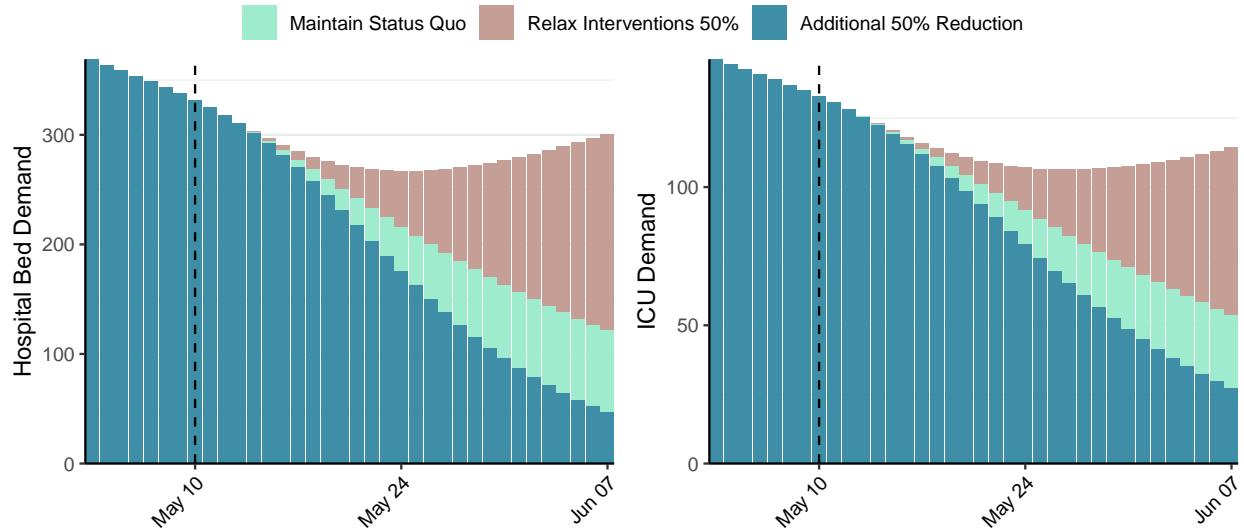
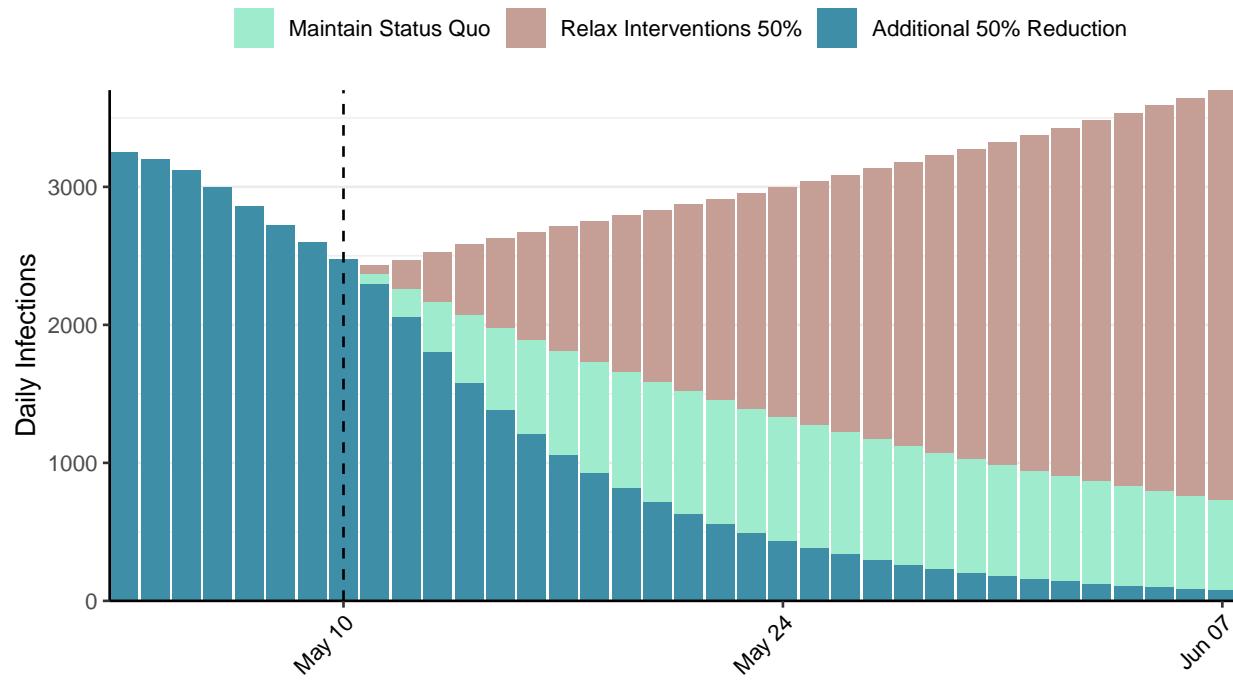


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 2,452 (95% CI: 2,315-2,588) at the current date to 73 (95% CI: 66-80) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 2,452 (95% CI: 2,315-2,588) at the current date to 3,664 (95% CI: 3,246-4,083) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Chad, 2021-05-10

[Download the report for Chad, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
4,882	5	171	0	0.75 (95% CI: 0.62-0.86)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

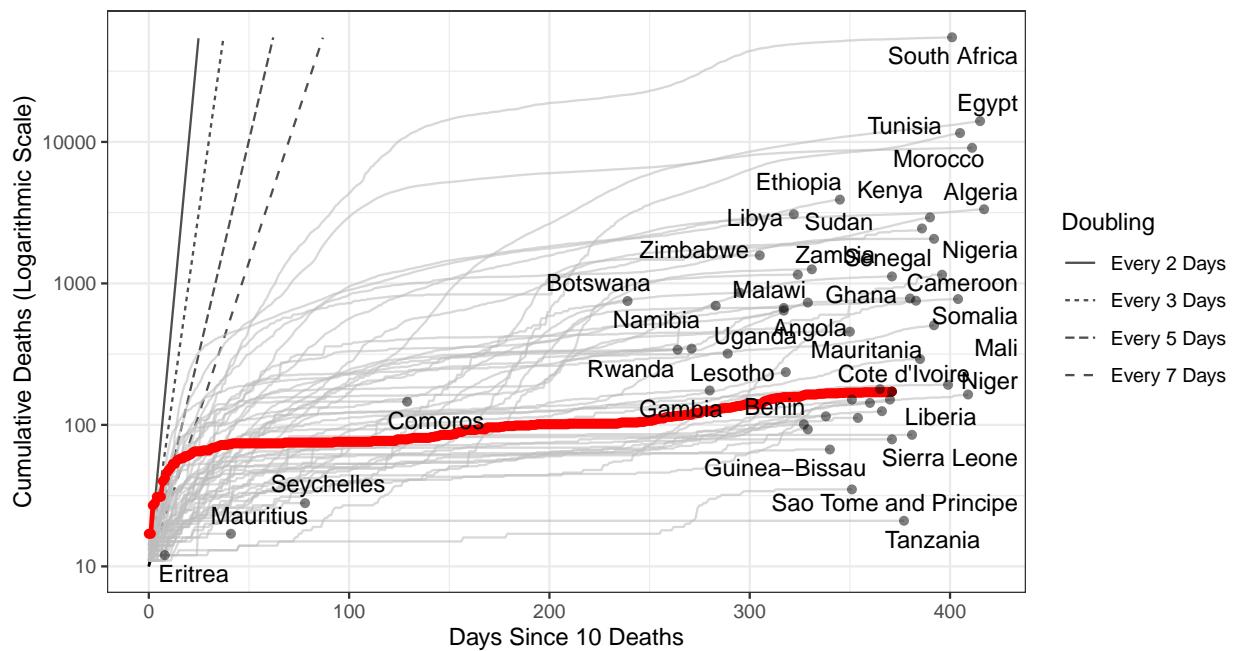


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 1,904 (95% CI: 1,742-2,067) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

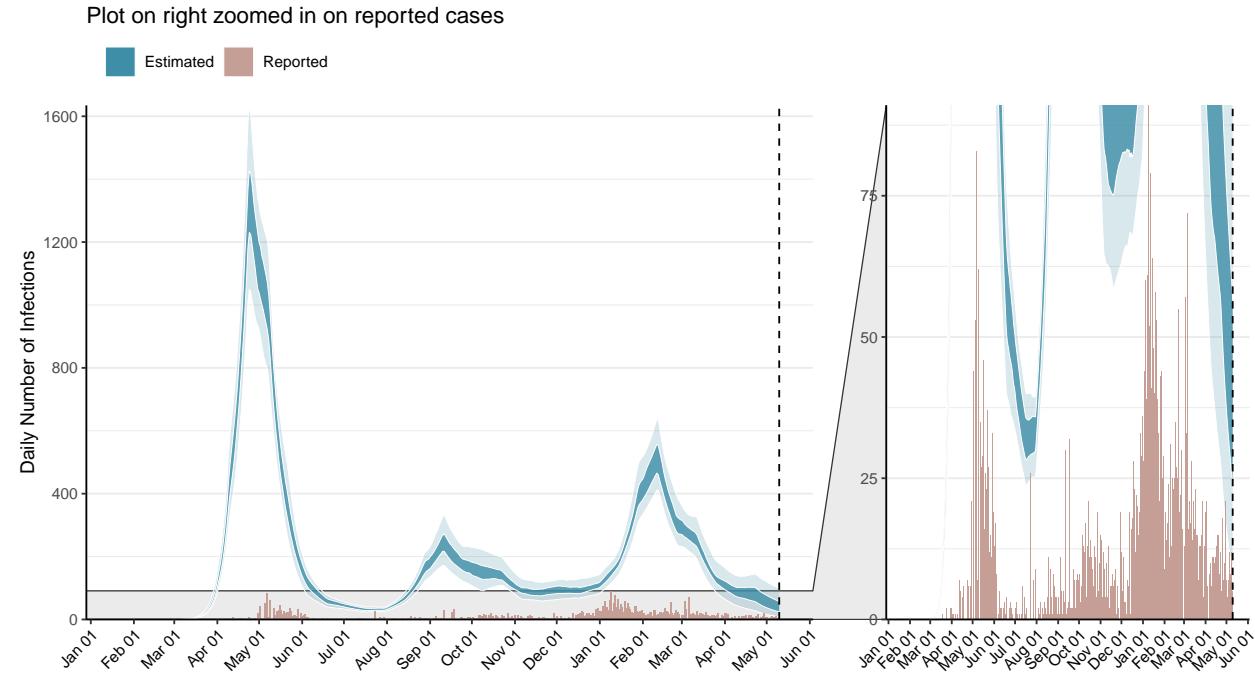
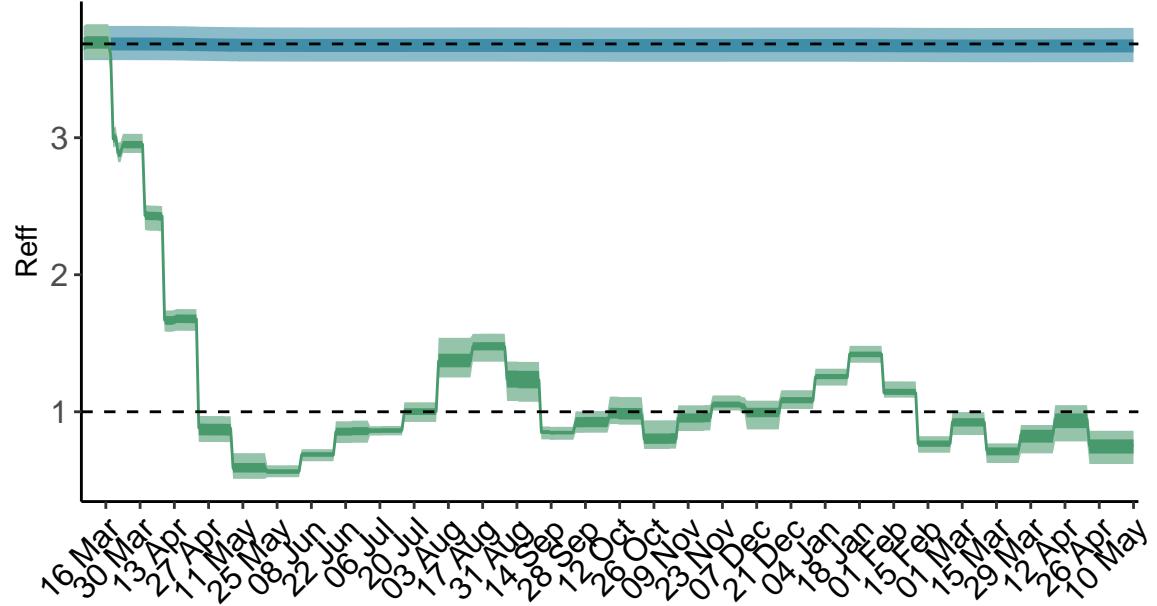


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

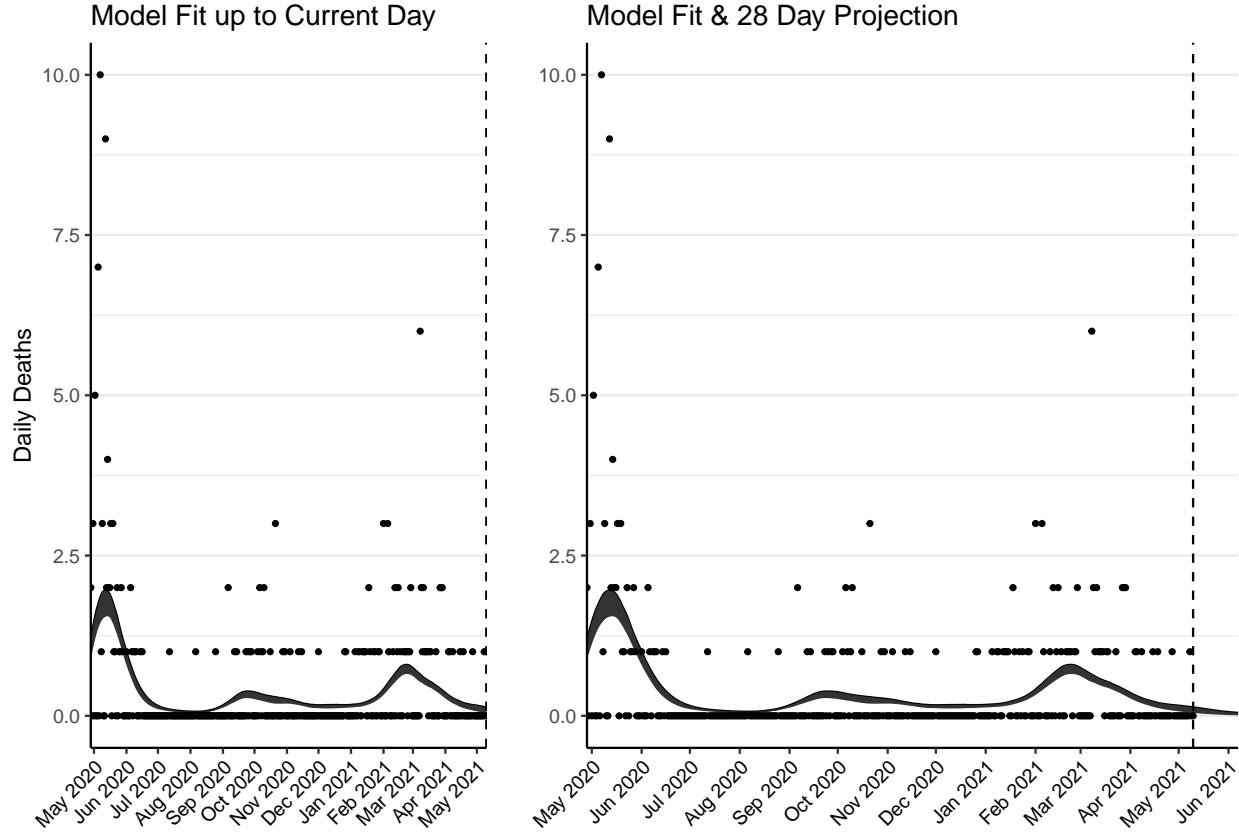


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 5 (95% CI: 4-5) patients requiring treatment with high-pressure oxygen at the current date to 2 (95% CI: 1-2) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 2 (95% CI: 2-2) patients requiring treatment with mechanical ventilation at the current date to 1 (95% CI: 1-1) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

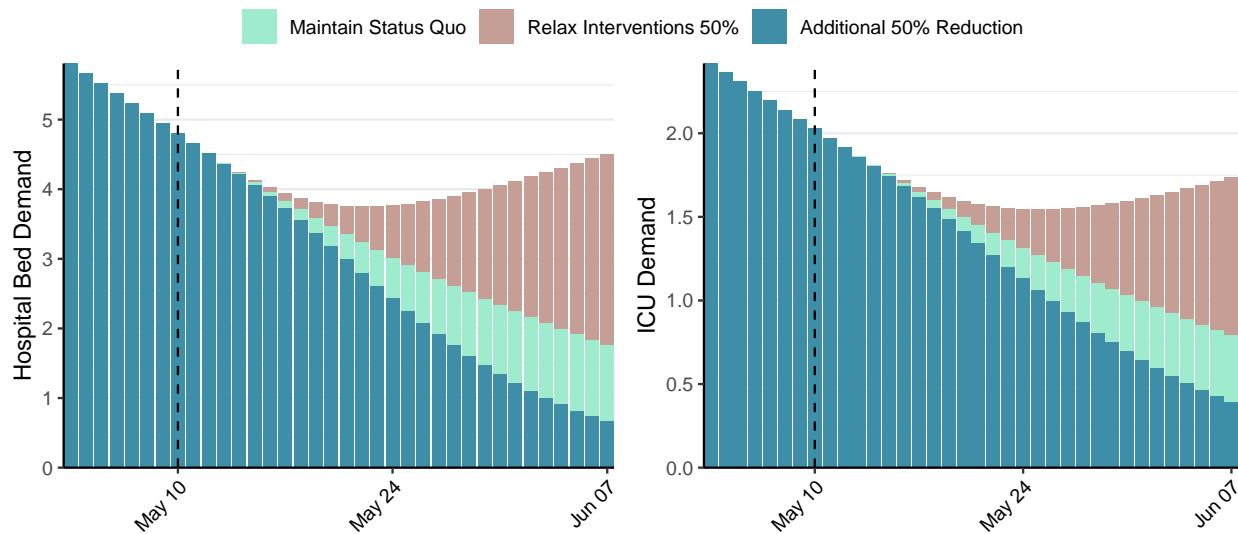


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 43 (95% CI: 38-48) at the current date to 2 (95% CI: 1-2) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 43 (95% CI: 38-48) at the current date to 87 (95% CI: 70-104) by 2021-06-07.

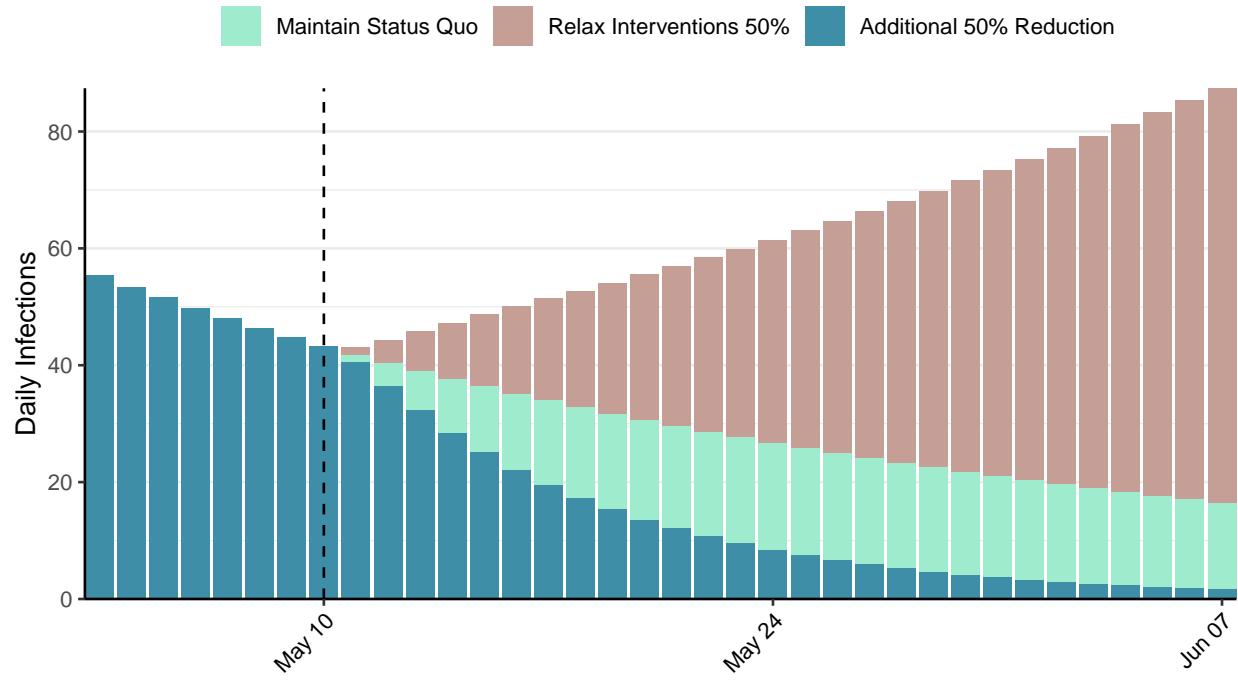


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Togo, 2021-05-10

[Download the report for Togo, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
13,167	13	125	1	0.59 (95% CI: 0.51-0.7)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

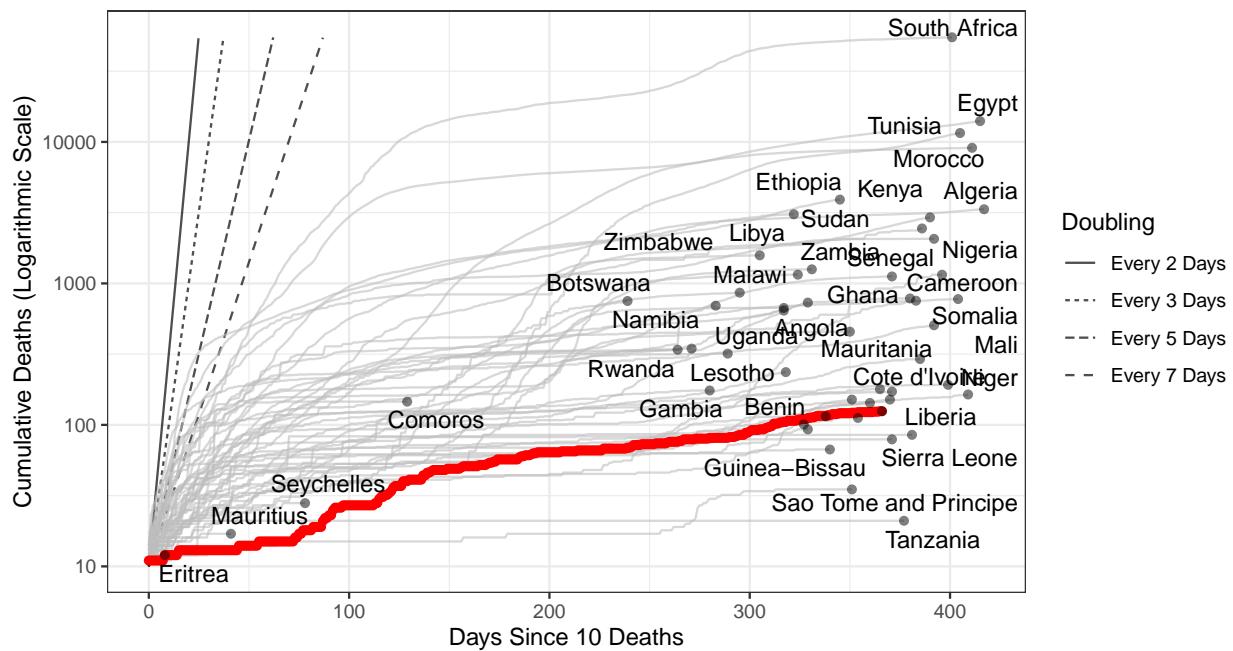


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 3,528 (95% CI: 3,341-3,715) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

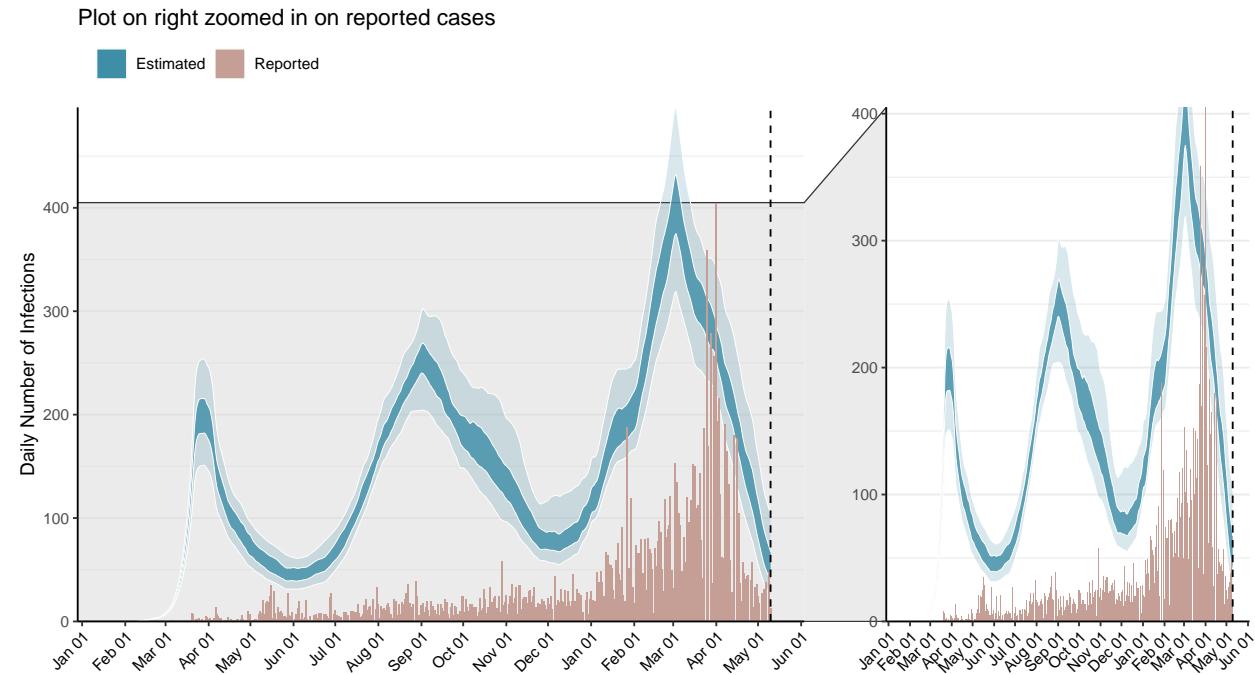
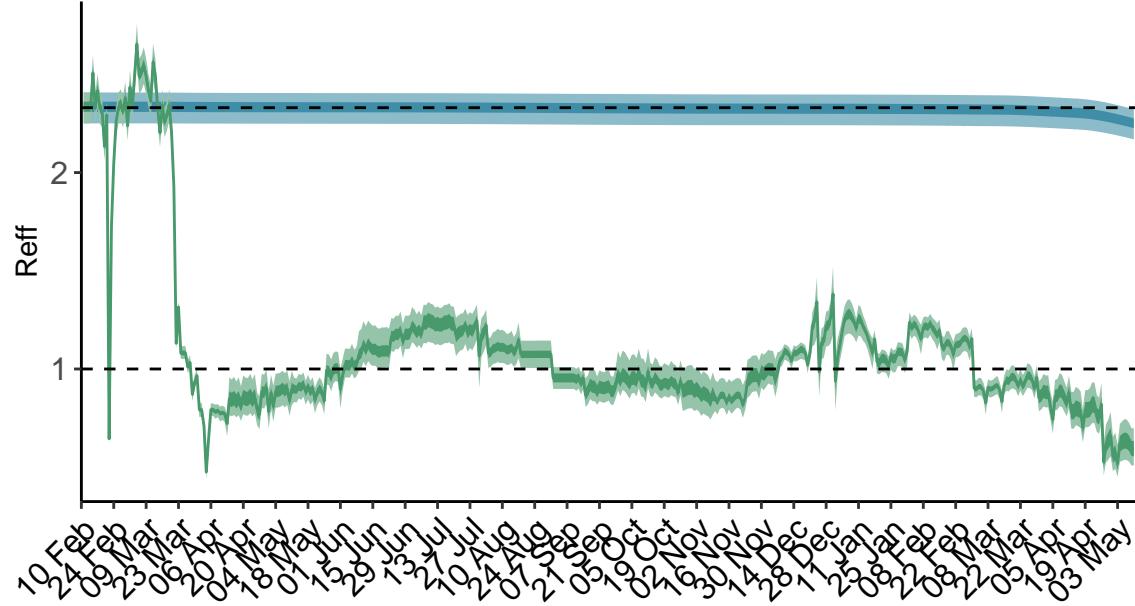


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

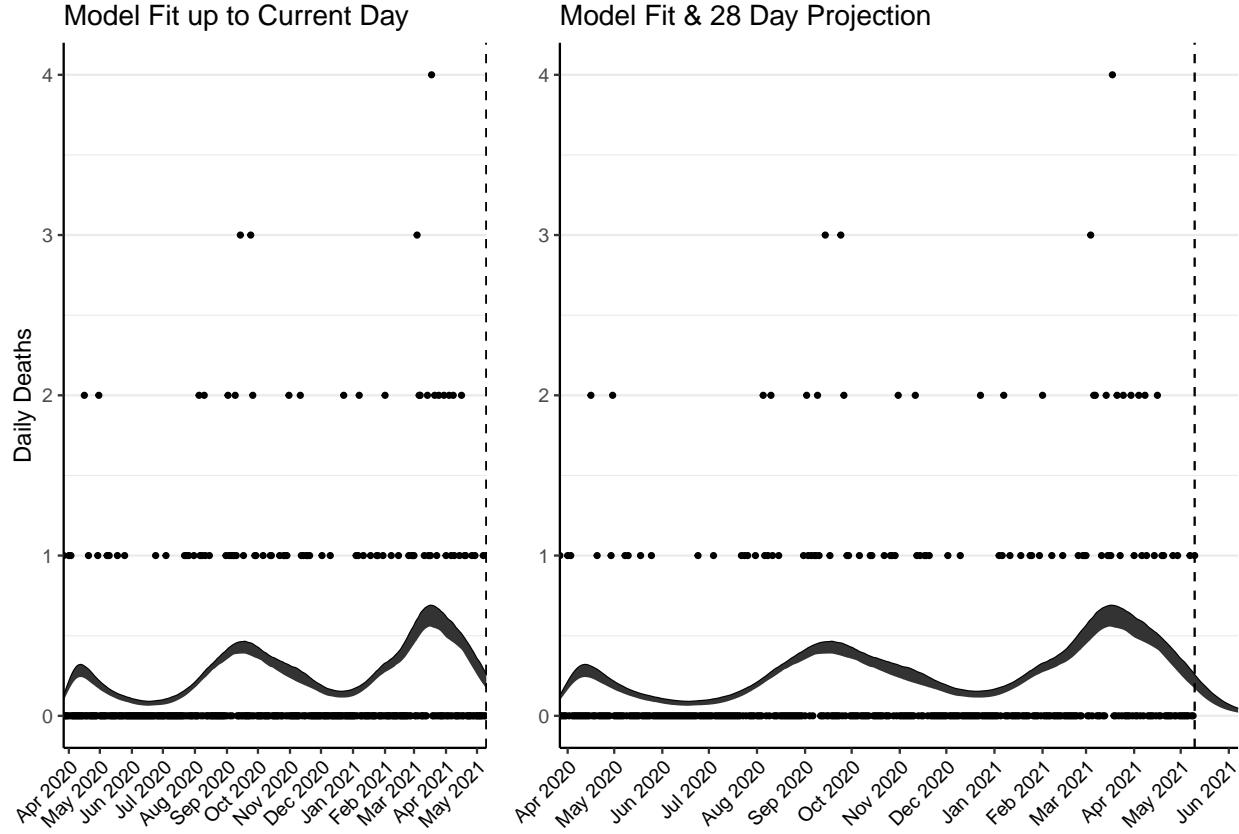


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 9 (95% CI: 8-9) patients requiring treatment with high-pressure oxygen at the current date to 2 (95% CI: 1-2) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 4 (95% CI: 4-4) patients requiring treatment with mechanical ventilation at the current date to 1 (95% CI: 1-1) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

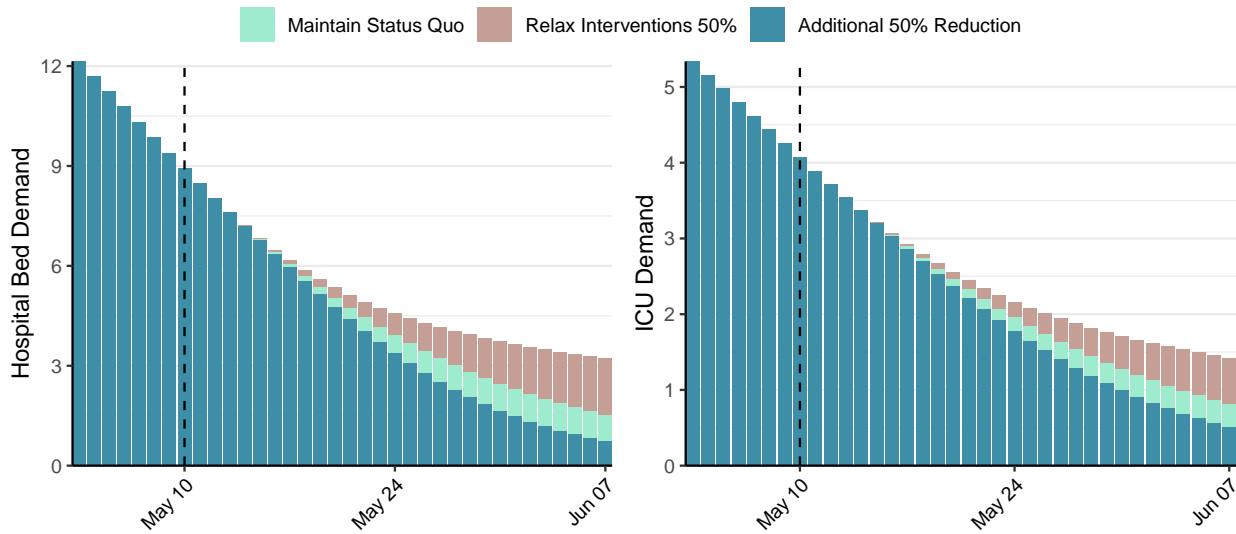
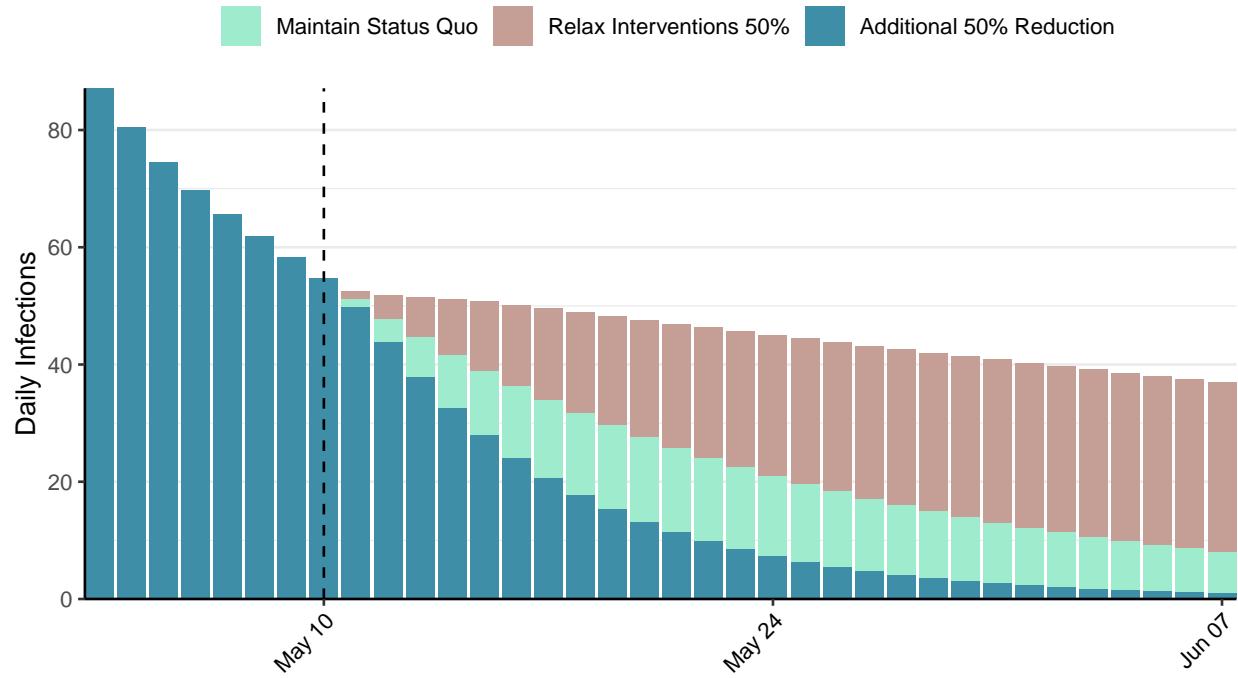


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 54 (95% CI: 50-59) at the current date to 1 (95% CI: 1-1) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 54 (95% CI: 50-59) at the current date to 37 (95% CI: 31-42) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Thailand, 2021-05-10

[Download the report for Thailand, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
85,001	1,630	421	22	1.23 (95% CI: 1.03-1.45)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

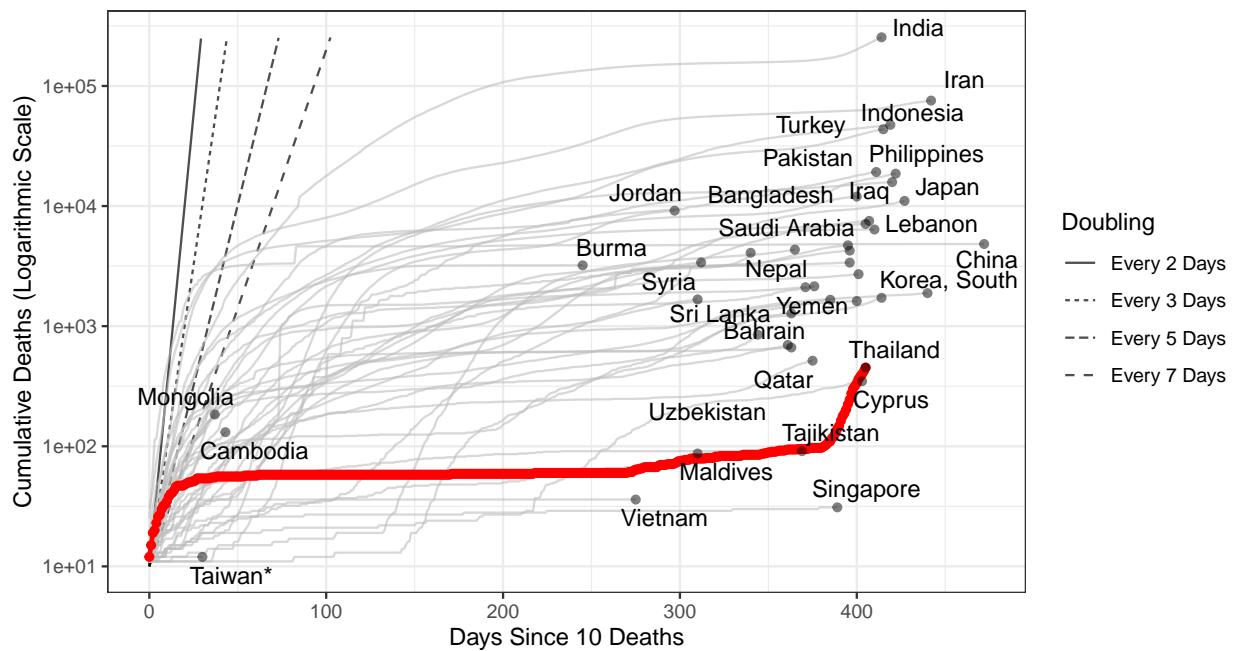


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 167,798 (95% CI: 161,318-174,277) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Thailand has revised their historic reported cases and thus have reported negative cases.**

Plot on right zoomed in on reported cases

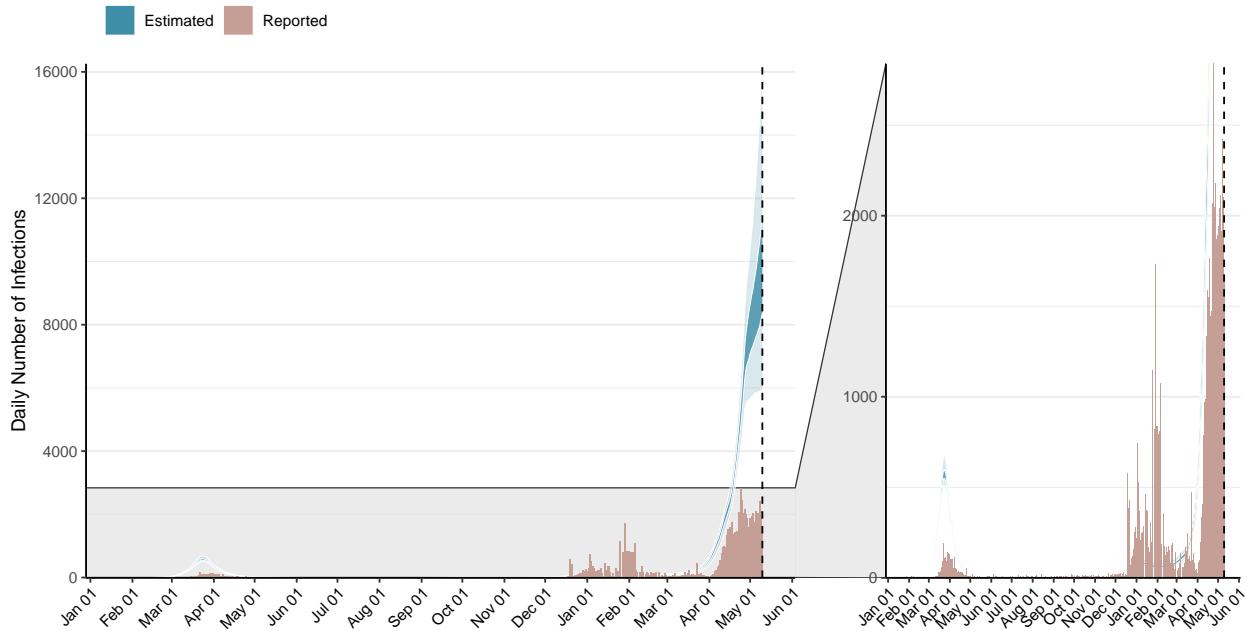
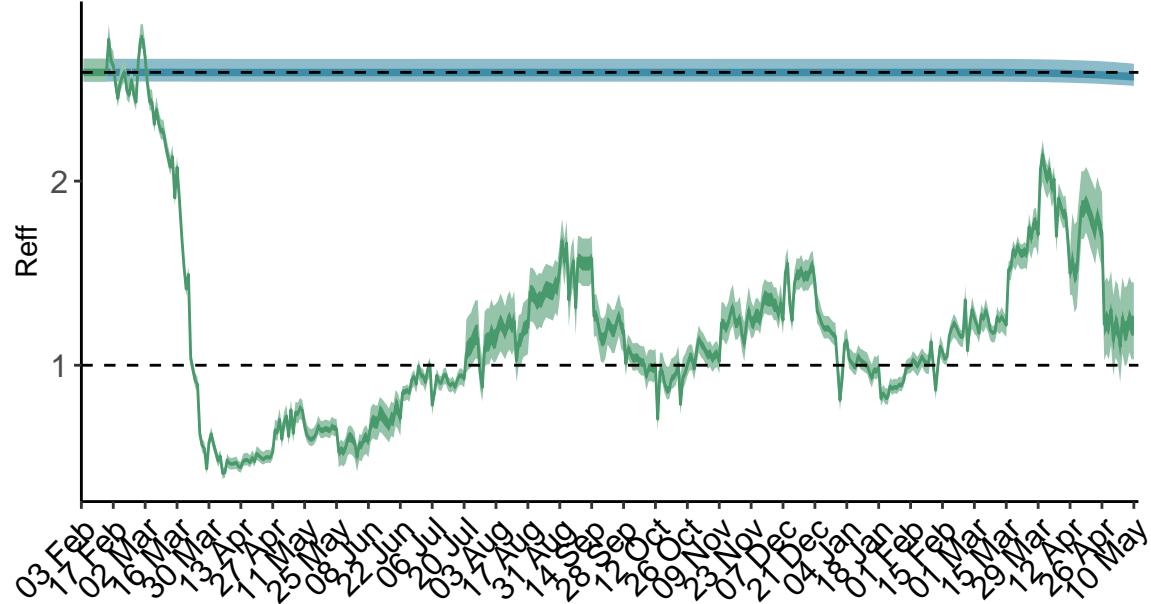


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

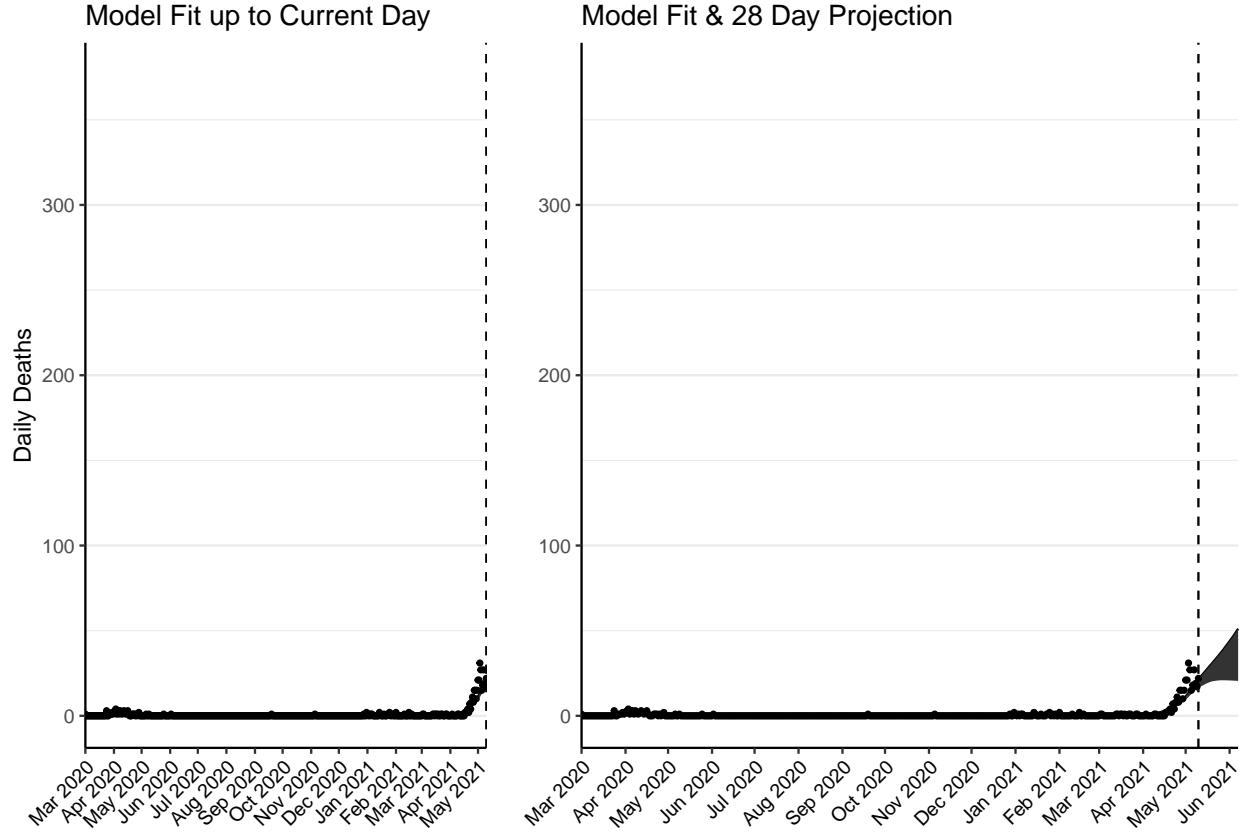


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 928 (95% CI: 892-964) patients requiring treatment with high-pressure oxygen at the current date to 2,390 (95% CI: 2,073-2,706) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 333 (95% CI: 321-345) patients requiring treatment with mechanical ventilation at the current date to 958 (95% CI: 837-1,078) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

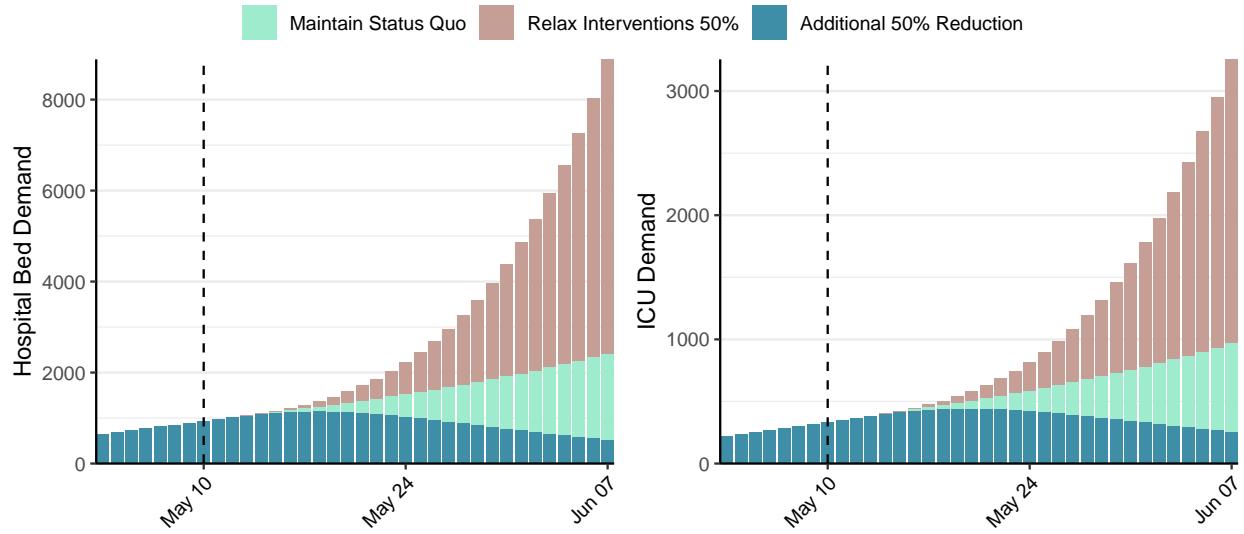
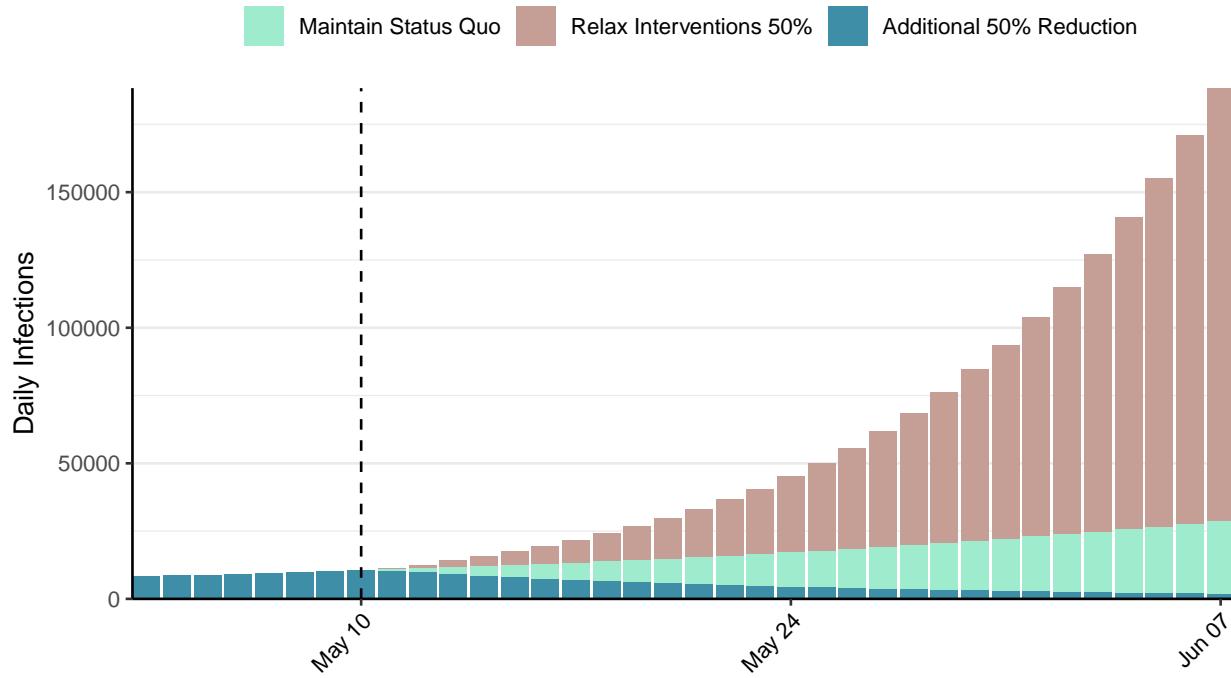


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 10,270 (95% CI: 9,632-10,907) at the current date to 1,811 (95% CI: 1,529-2,093) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 10,270 (95% CI: 9,632-10,907) at the current date to 186,517 (95% CI: 154,152-218,881) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Tajikistan, 2021-05-10

[Download the report for Tajikistan, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
13,308	0	91	0	0.87 (95% CI: 0.48-1.42)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

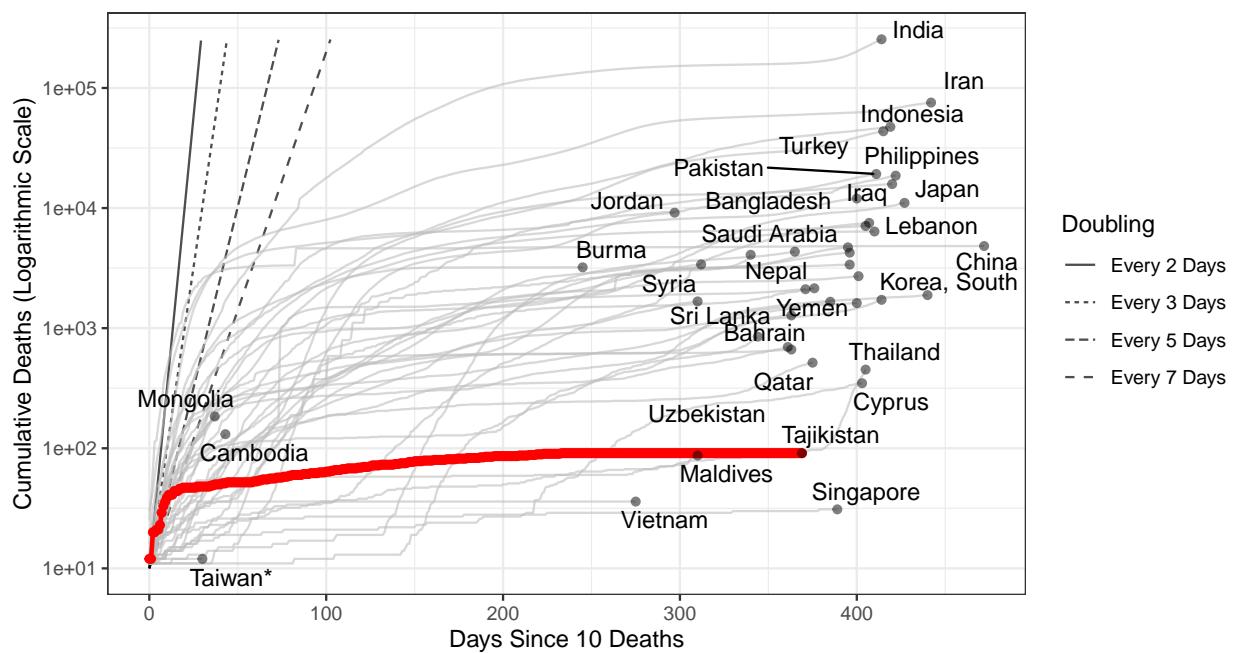


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 5 (95% CI: 1-9) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

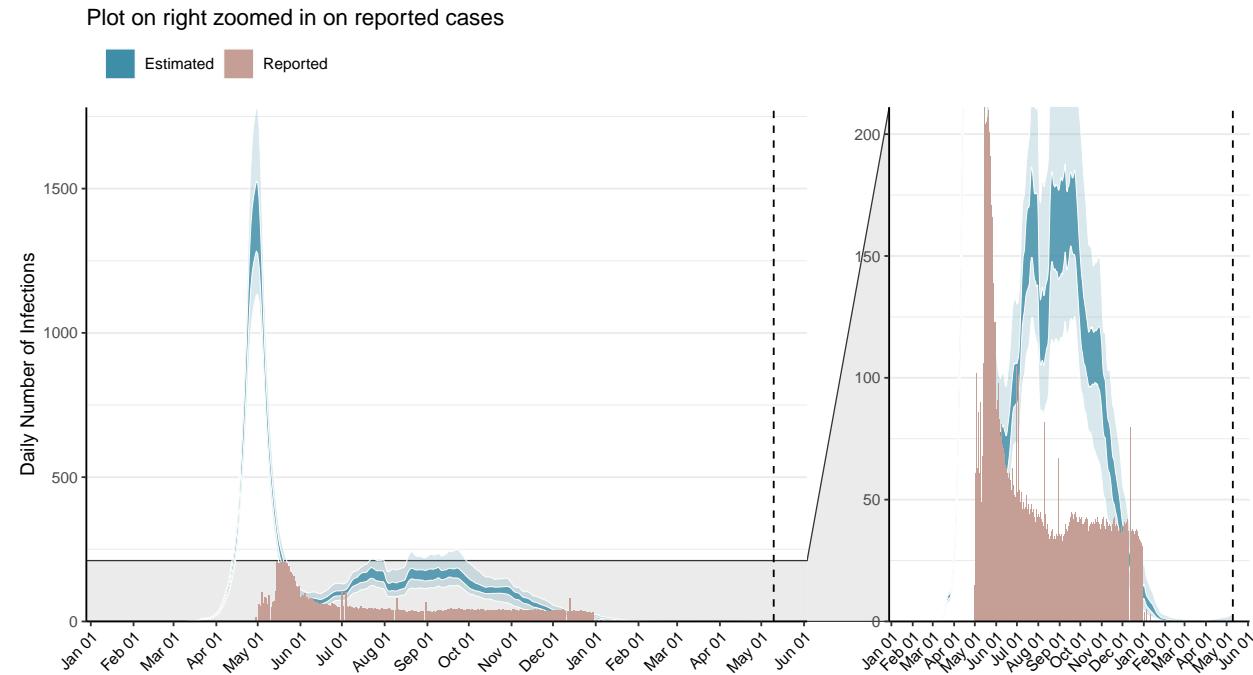
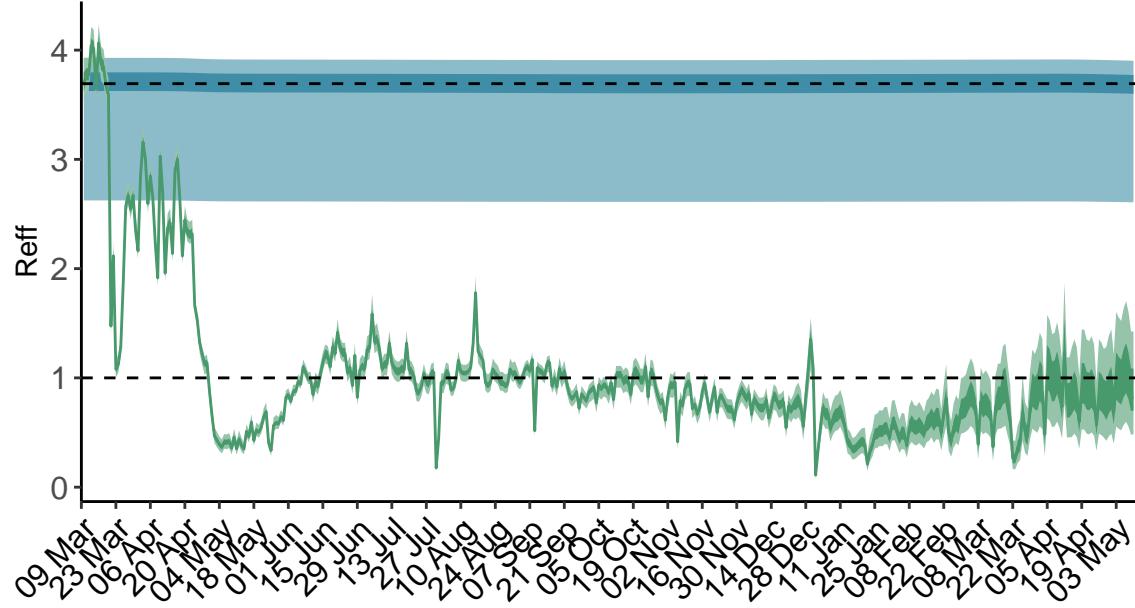


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

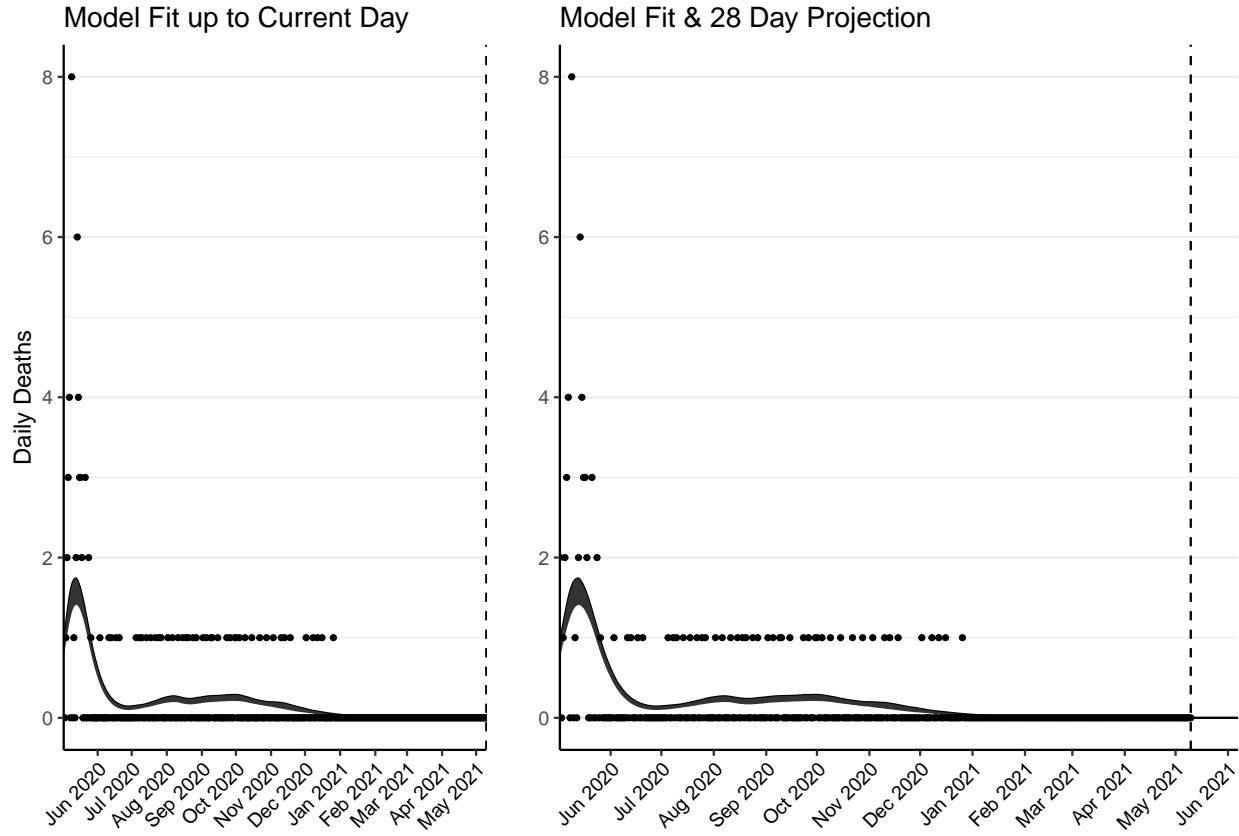


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 0 (95% CI: 0-0) patients requiring treatment with high-pressure oxygen at the current date to 0 (95% CI: 0-0) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 0 (95% CI: 0-0) patients requiring treatment with mechanical ventilation at the current date to 0 (95% CI: 0-0) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

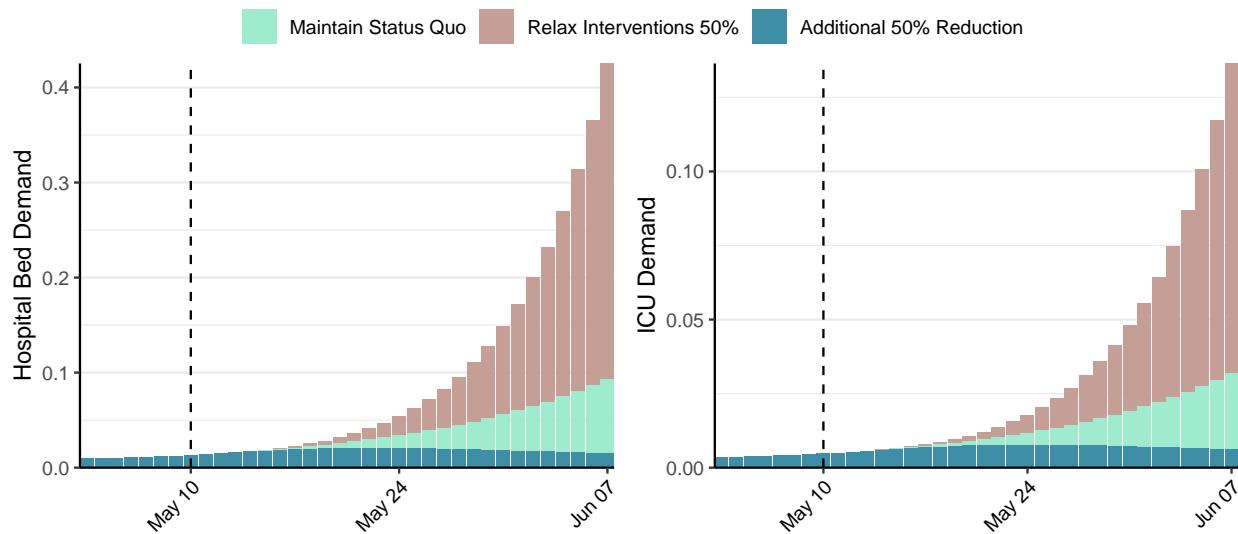


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 0 (95% CI: 0-1) at the current date to 0 (95% CI: 0-0) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 0 (95% CI: 0-1) at the current date to 23 (95% CI: -5-51) by 2021-06-07.

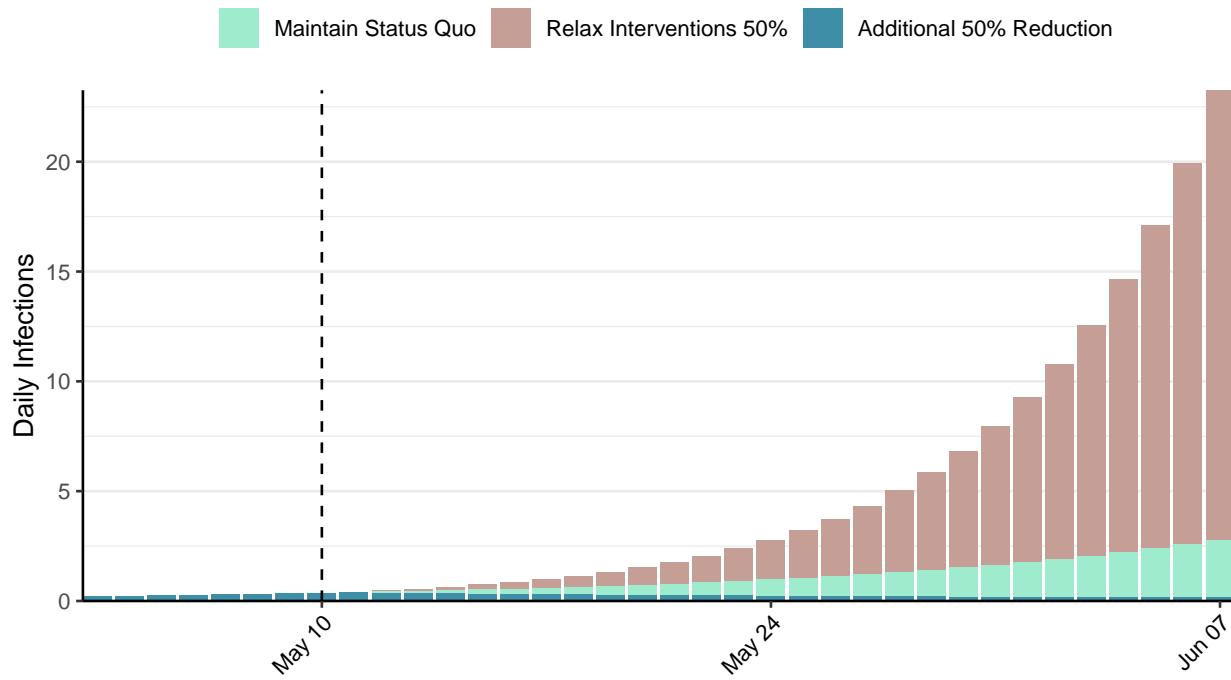


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Timor-Leste, 2021-05-10

[Download the report for Timor-Leste, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
3,353	126	5	1	1.37 (95% CI: 0.85-1.97)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease. **N.B.** Timor-Leste is not shown in the following plot as only 5 deaths have been reported to date

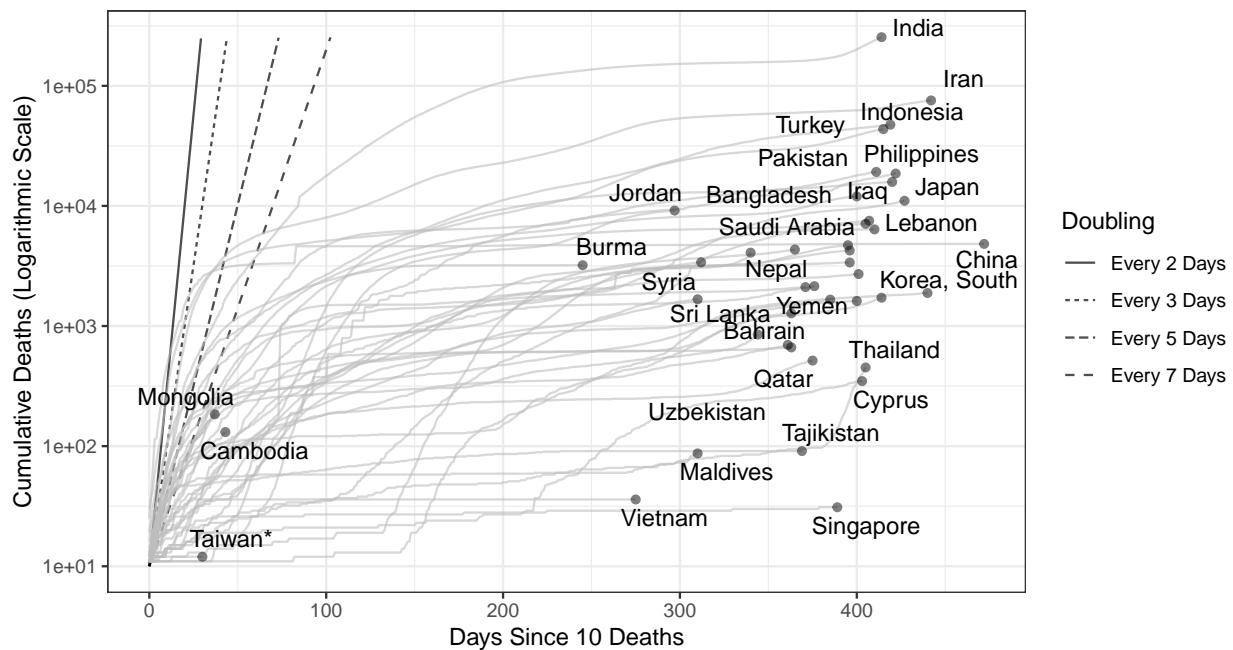


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 4,651 (95% CI: 4,116-5,187) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

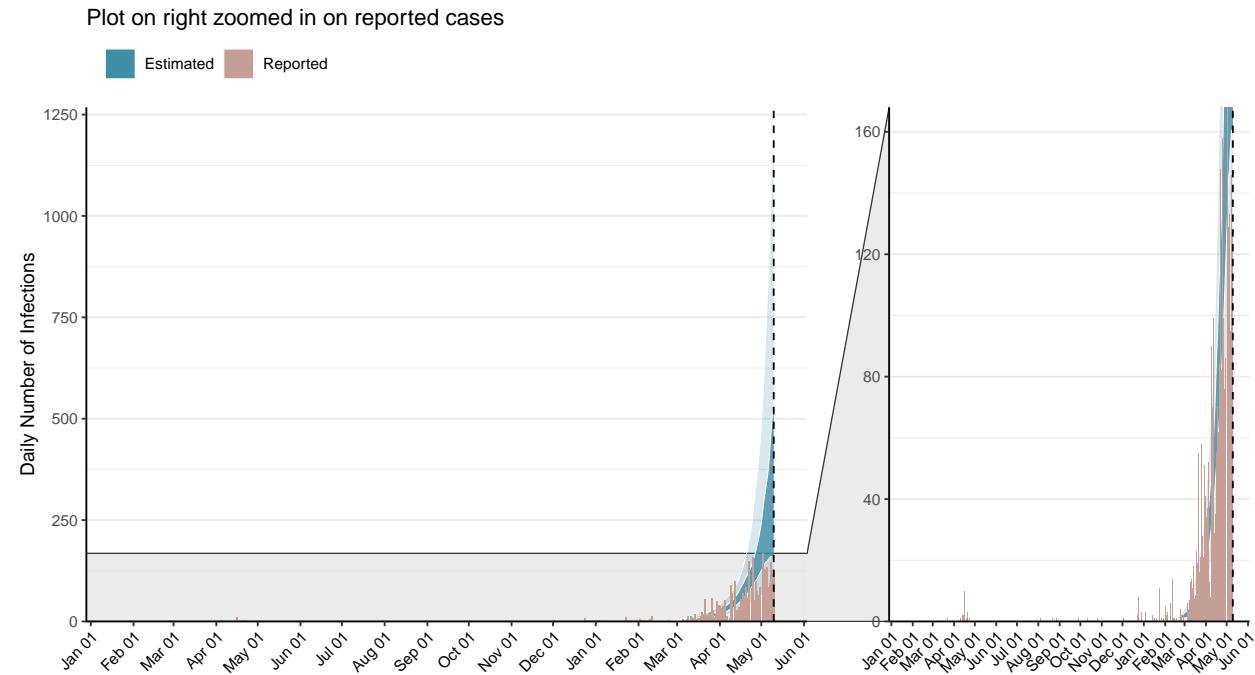
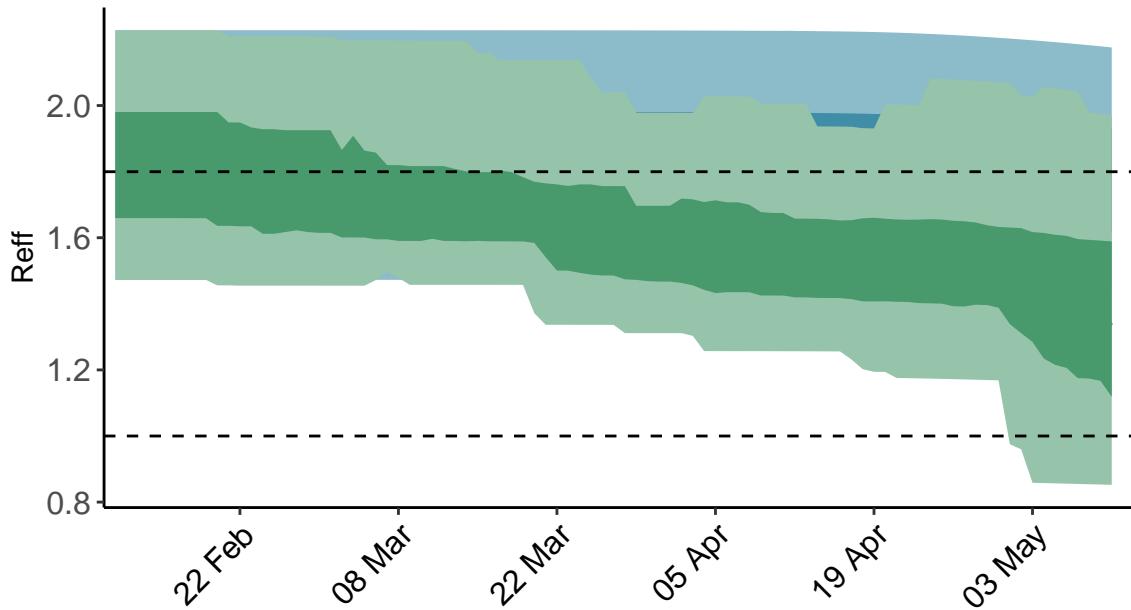


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

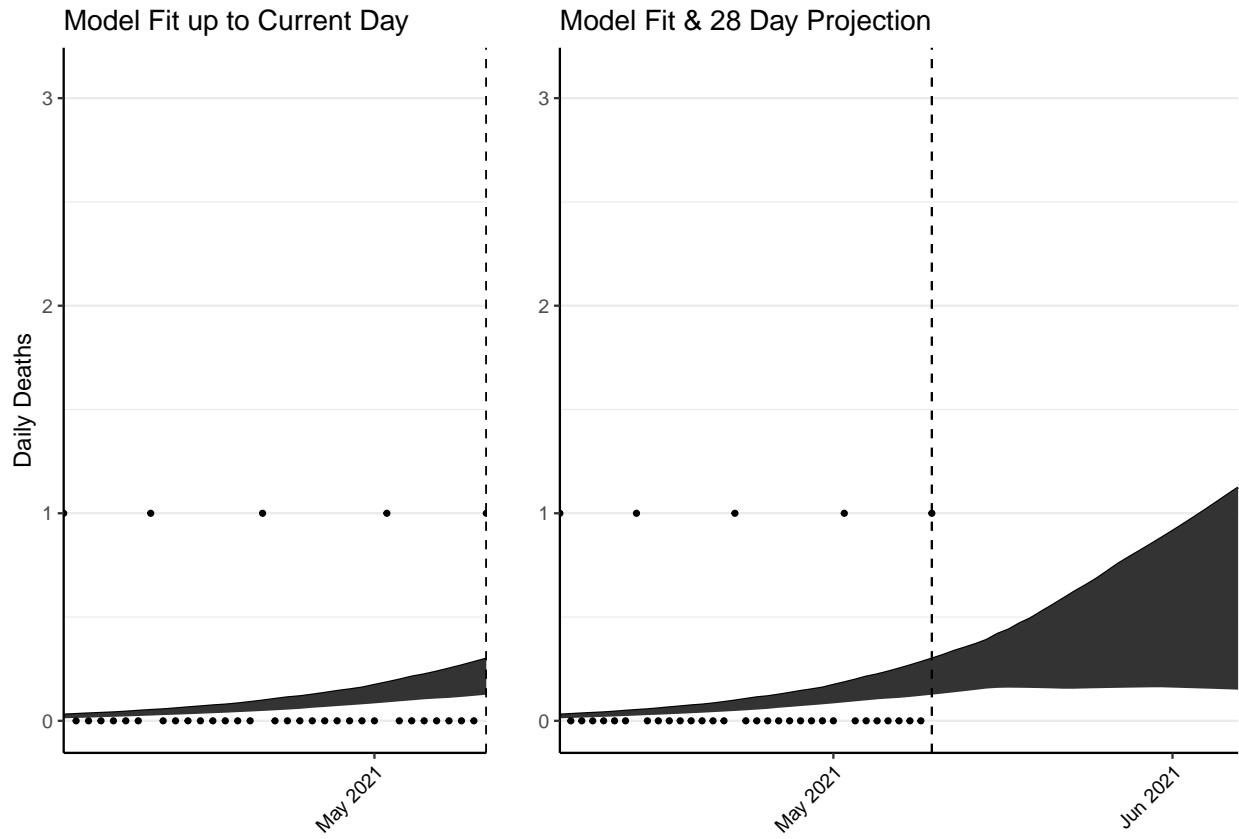


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 18 (95% CI: 16-20) patients requiring treatment with high-pressure oxygen at the current date to 93 (95% CI: 66-121) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 6 (95% CI: 5-7) patients requiring treatment with mechanical ventilation at the current date to 25 (95% CI: 20-30) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

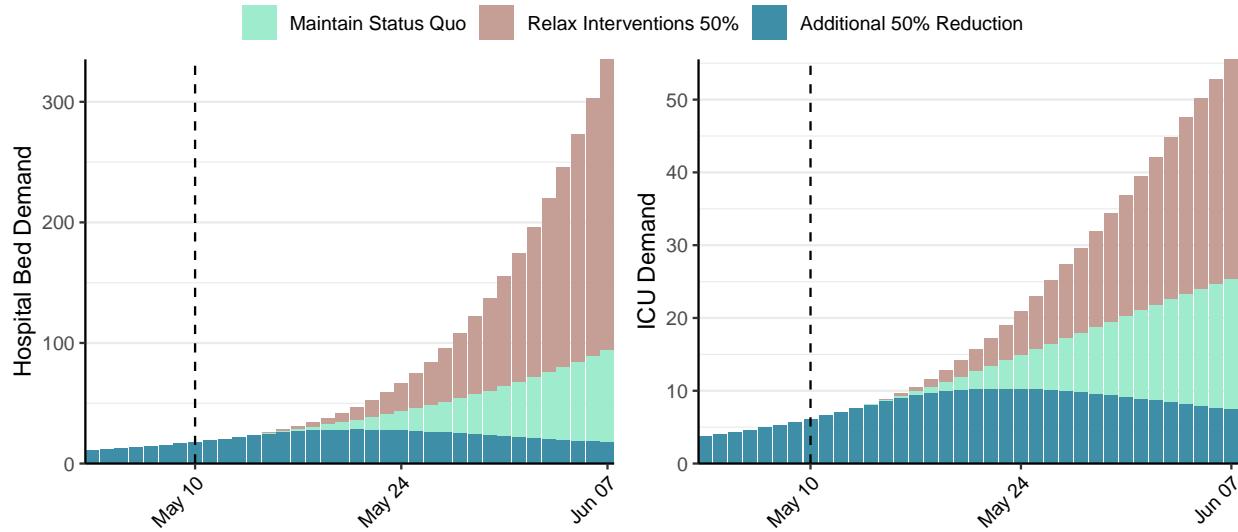


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 368 (95% CI: 310-427) at the current date to 106 (95% CI: 69-144) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 368 (95% CI: 310-427) at the current date to 8,444 (95% CI: 6,244-10,644) by 2021-06-07.

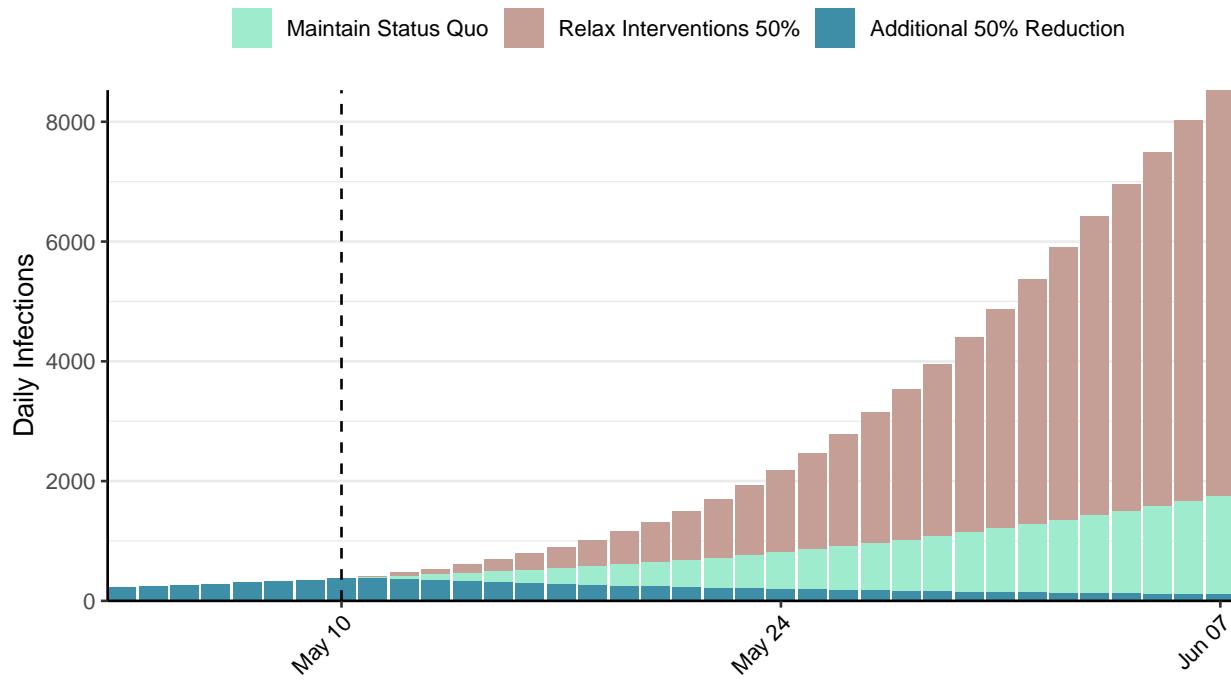


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Tunisia, 2021-05-10

[Download the report for Tunisia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
321,837	1,024	11,468	39	0.78 (95% CI: 0.75-0.8)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

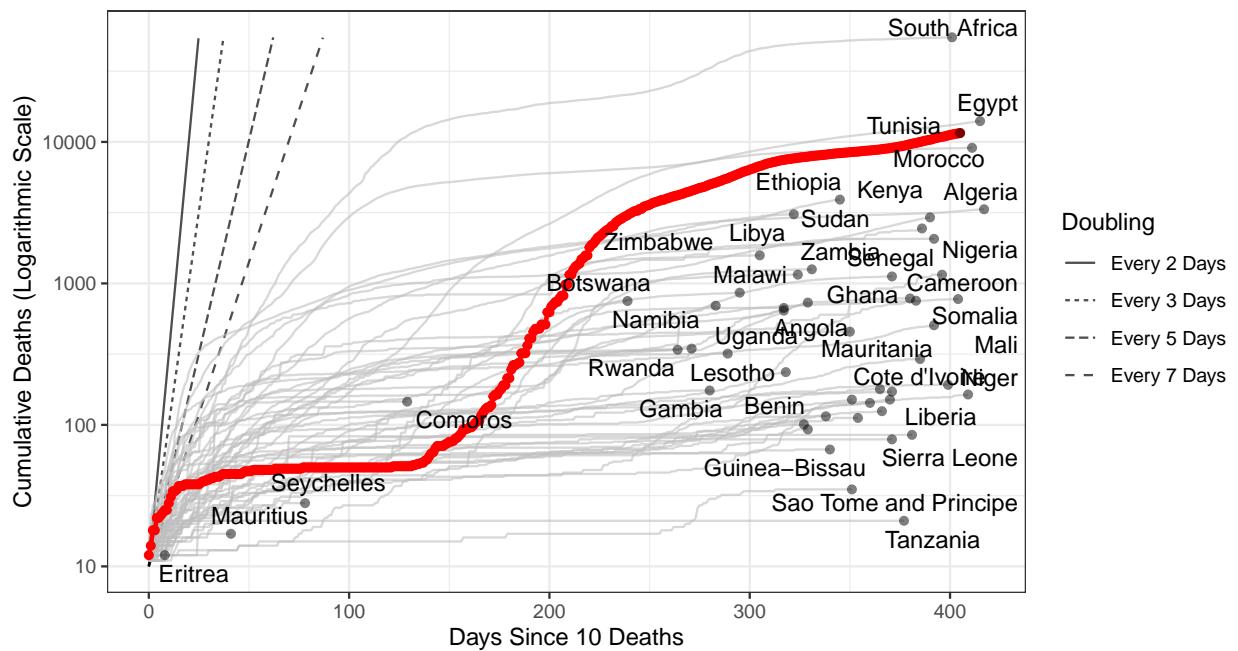


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 500,016 (95% CI: 487,332-512,701) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

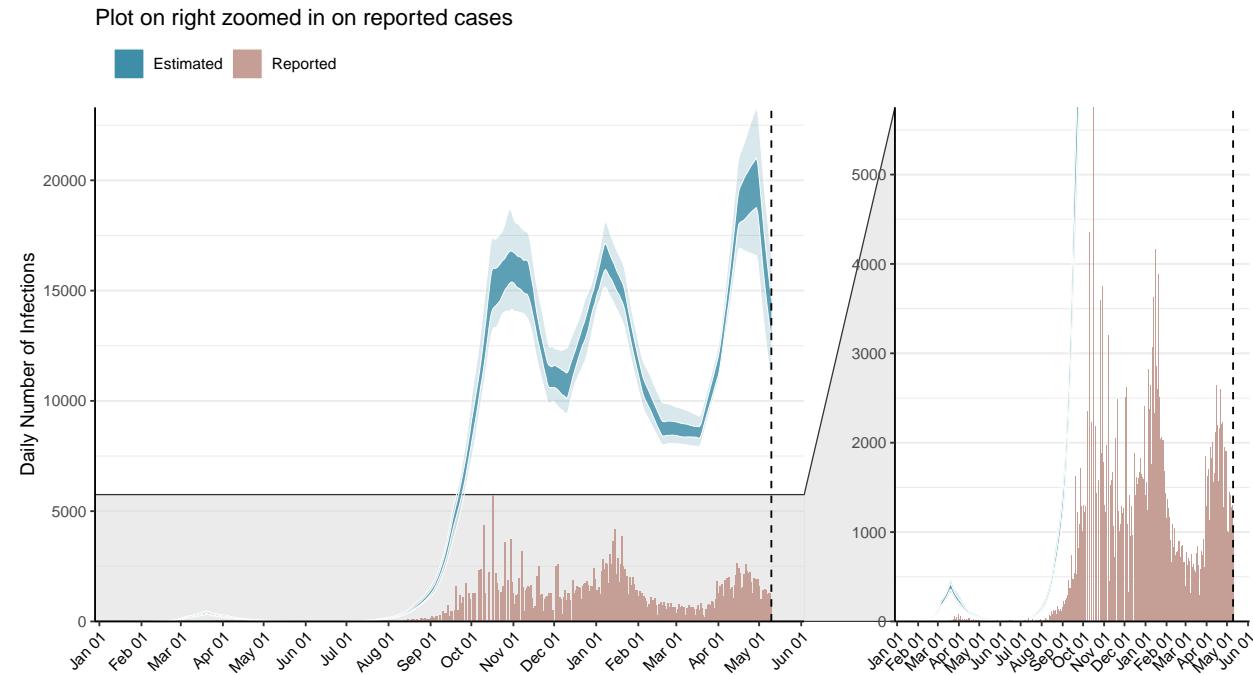
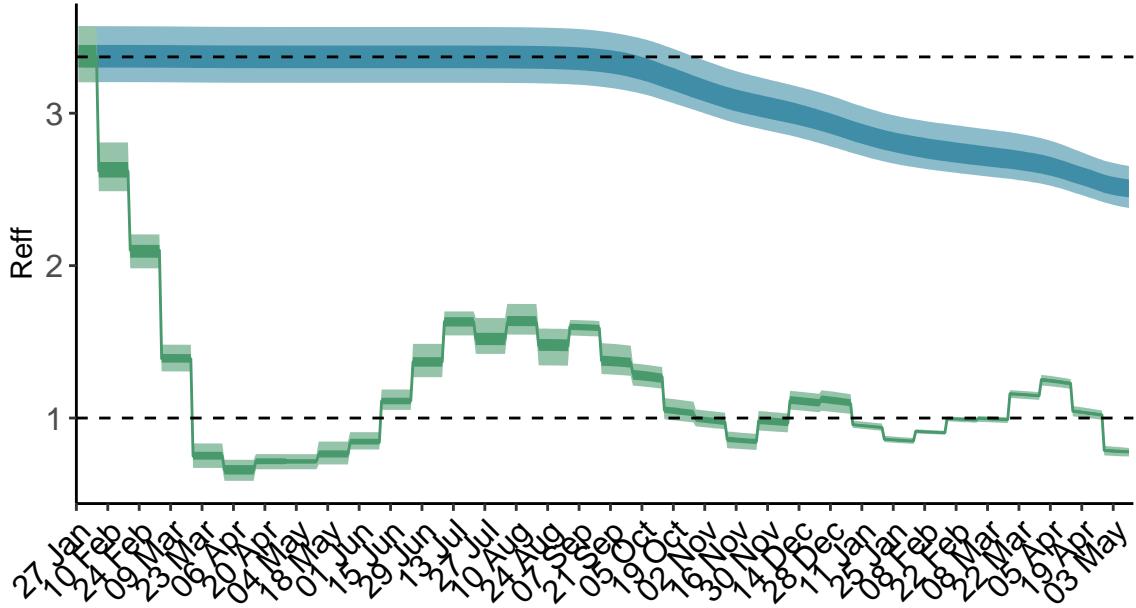


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Tunisia is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

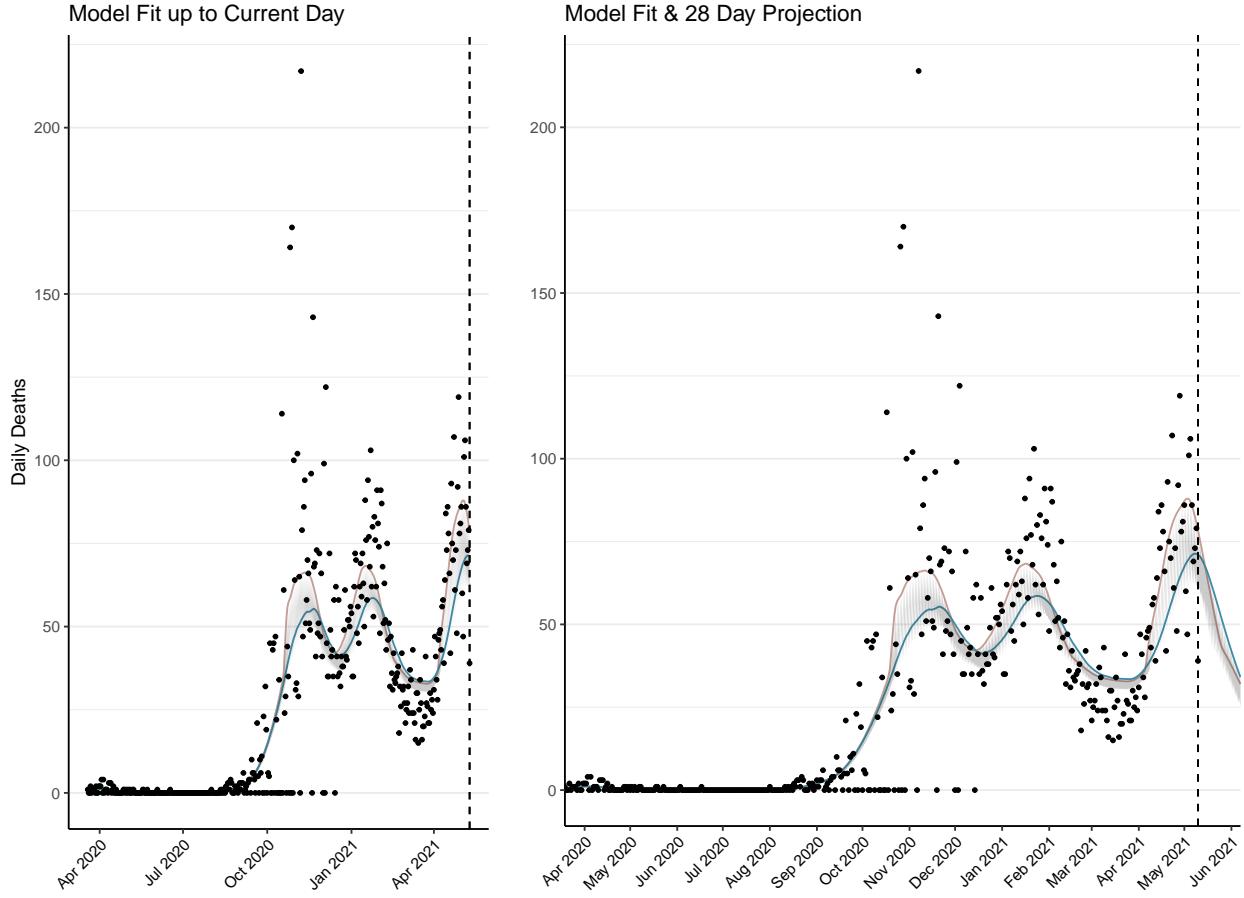


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 2,338 (95% CI: 2,278-2,399) patients requiring treatment with high-pressure oxygen at the current date to 1,023 (95% CI: 989-1,057) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 528 (95% CI: 517-539) patients requiring treatment with mechanical ventilation at the current date to 397 (95% CI: 386-408) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

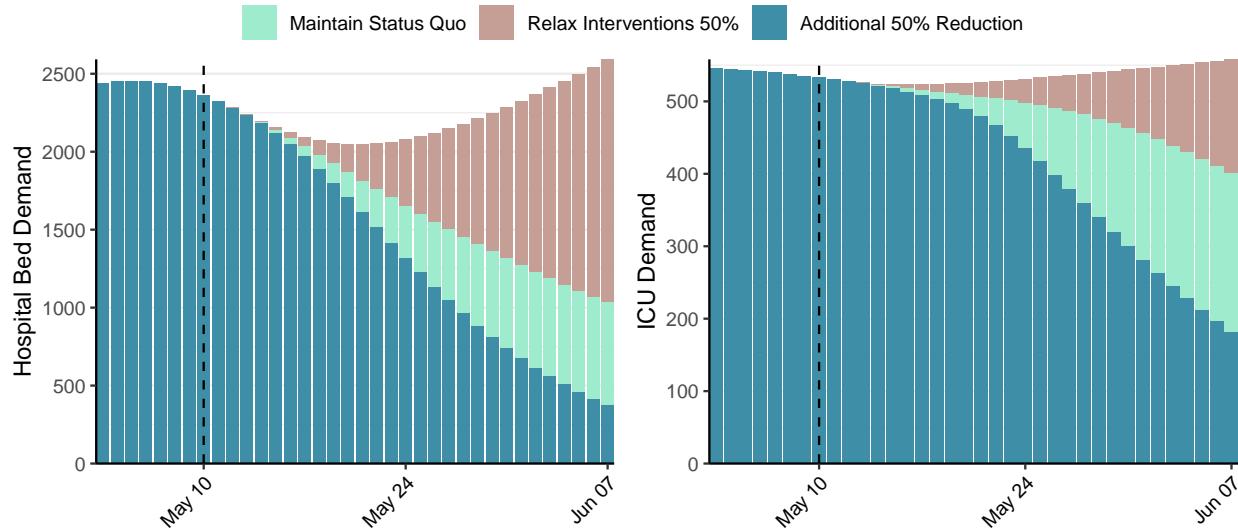


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 13,501 (95% CI: 13,104-13,898) at the current date to 489 (95% CI: 471-507) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 13,501 (95% CI: 13,104-13,898) at the current date to 23,661 (95% CI: 22,775-24,547) by 2021-06-07.

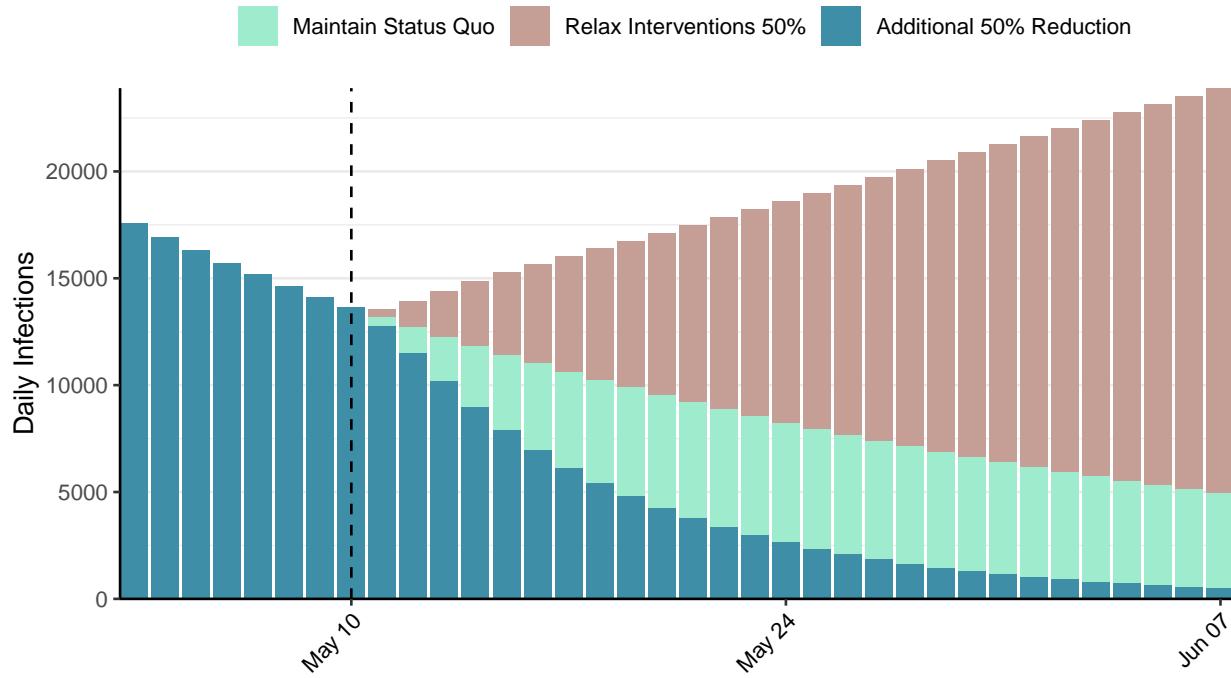


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Turkey, 2021-05-10

[Download the report for Turkey, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
5,059,430	14,497	43,589	278	0.64 (95% CI: 0.59-0.7)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

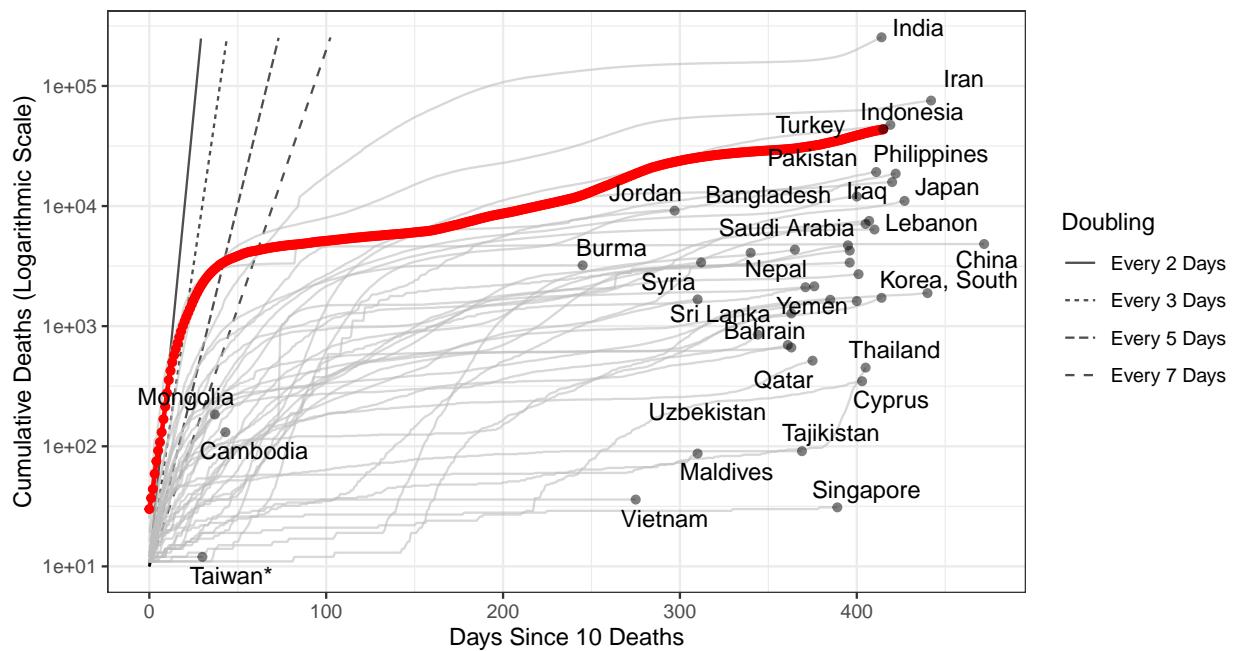


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 6,102,992 (95% CI: 5,980,712-6,225,271) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

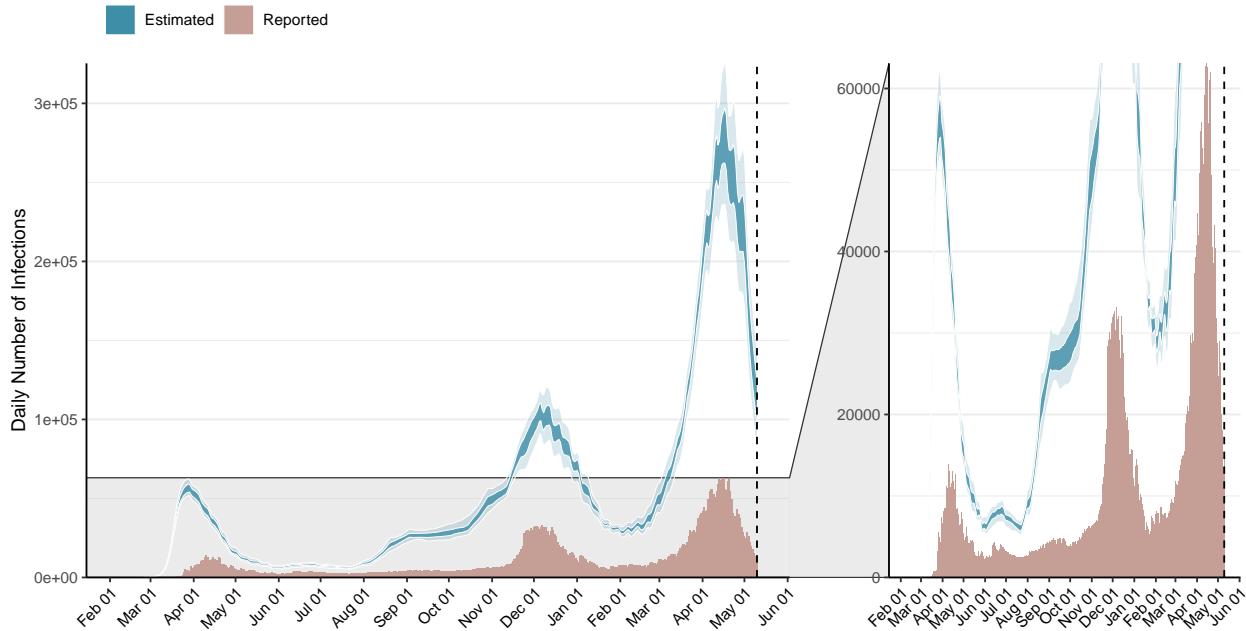
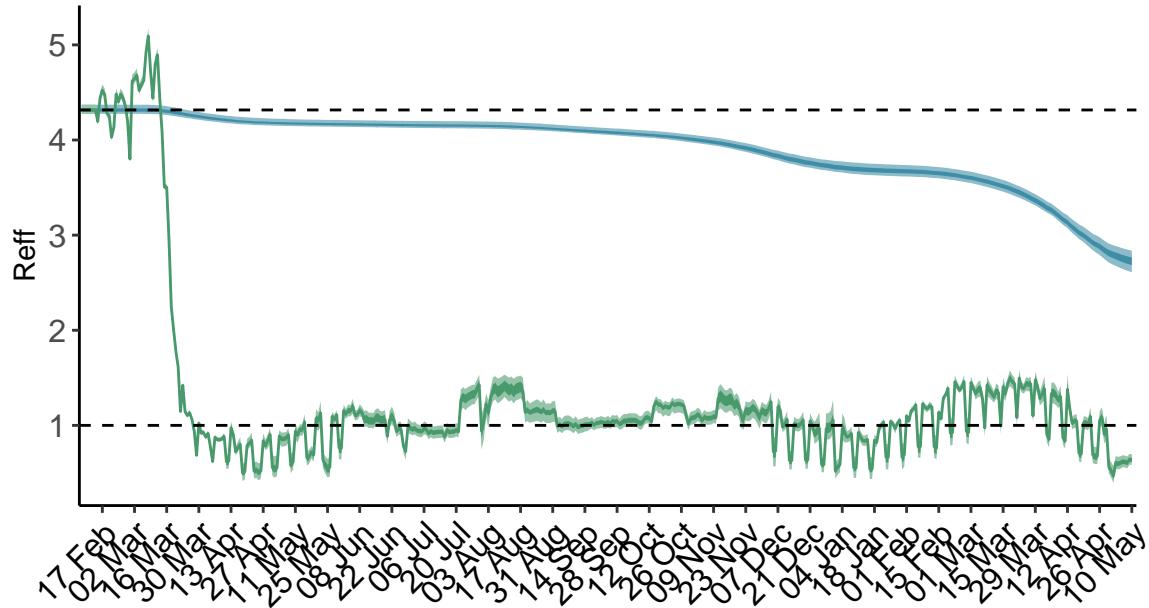


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

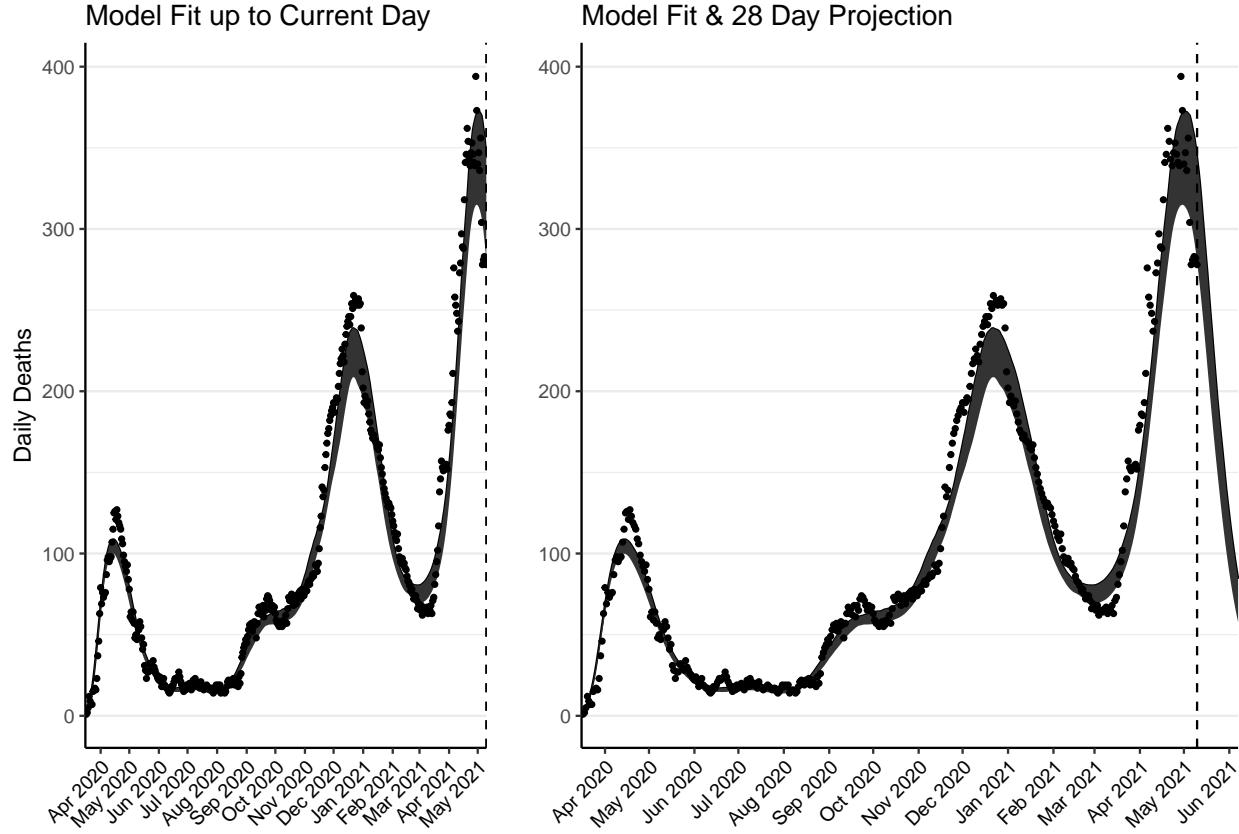


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 14,707 (95% CI: 14,379-15,034) patients requiring treatment with high-pressure oxygen at the current date to 3,076 (95% CI: 2,936-3,217) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 6,401 (95% CI: 6,277-6,525) patients requiring treatment with mechanical ventilation at the current date to 1,626 (95% CI: 1,562-1,691) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B.** These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.

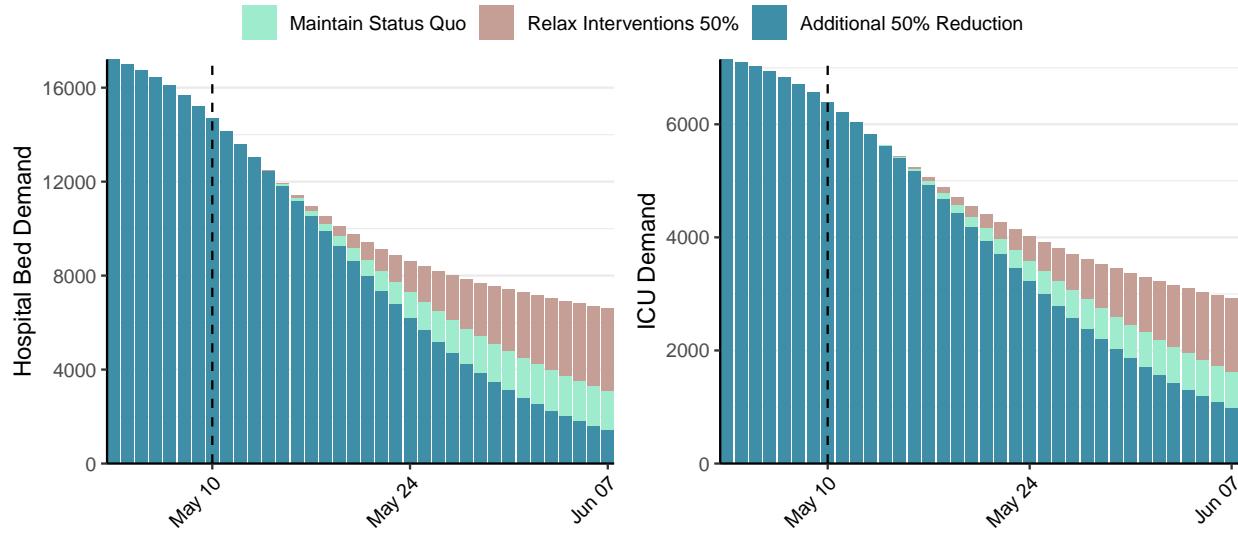
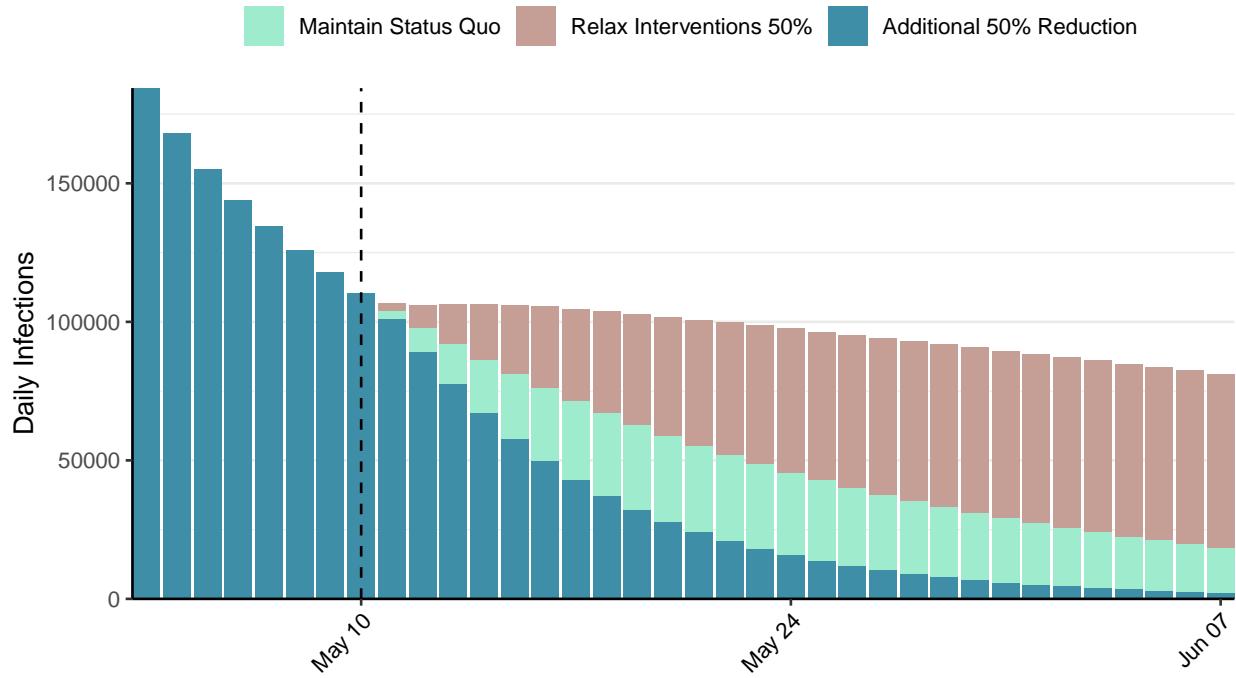


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 110,356 (95% CI: 106,768-113,943) at the current date to 2,138 (95% CI: 2,015-2,261) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 110,356 (95% CI: 106,768-113,943) at the current date to 81,146 (95% CI: 76,007-86,285) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Tanzania, 2021-05-10

[Download the report for Tanzania, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
509	0	21	0	1.17 (95% CI: 0.93-1.38)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

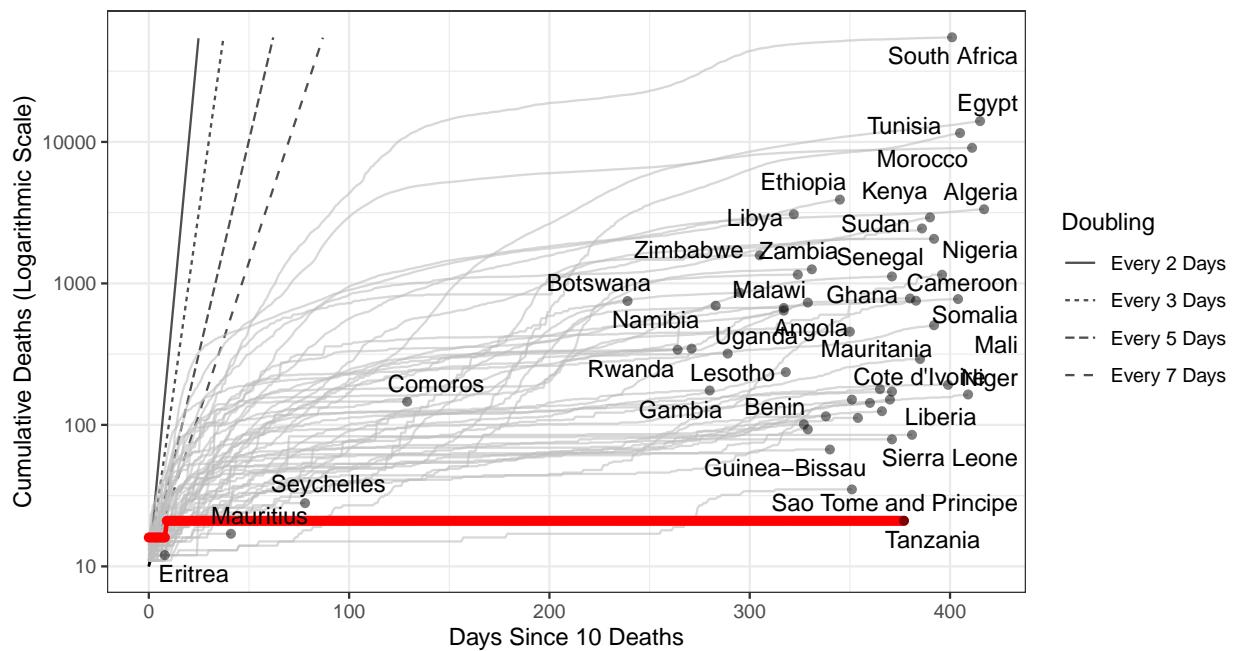


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 407 (95% CI: 345-470) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

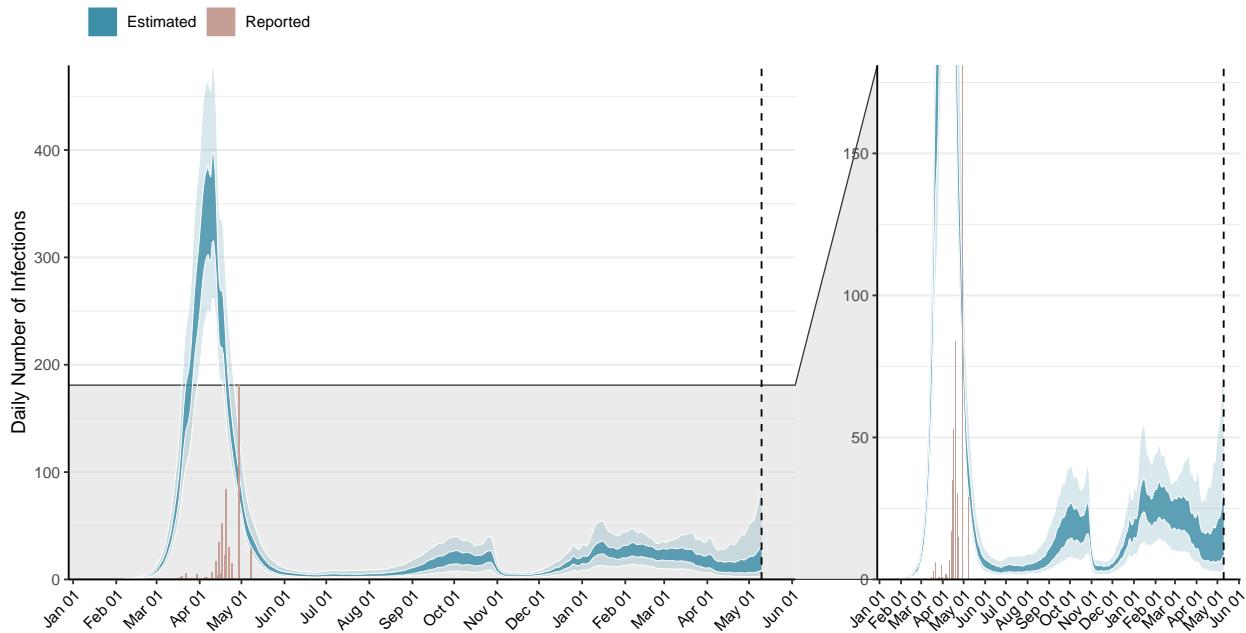
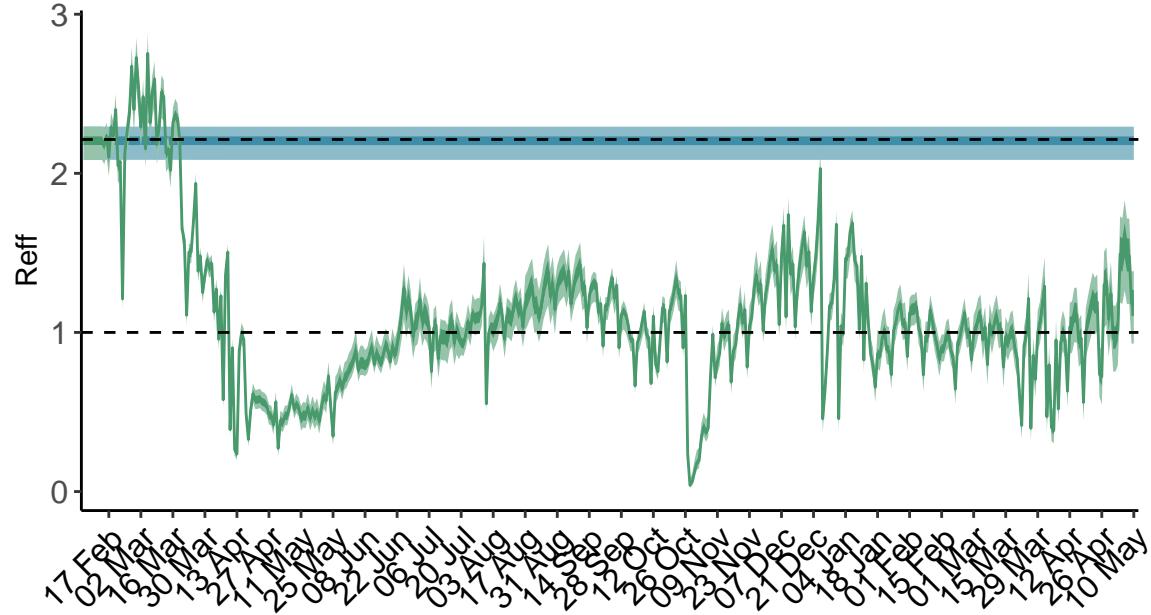


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

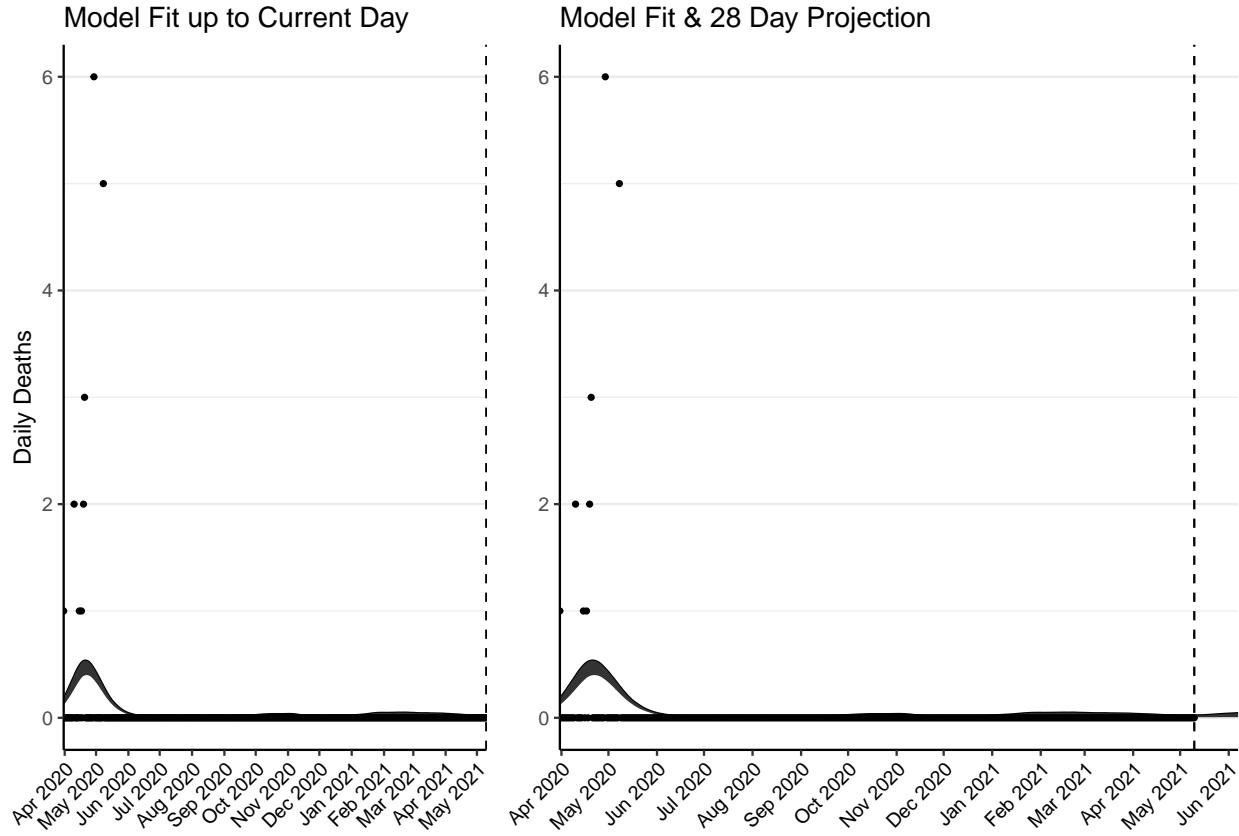


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 1 (95% CI: 1-1) patients requiring treatment with high-pressure oxygen at the current date to 3 (95% CI: 2-4) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 0 (95% CI: 0-0) patients requiring treatment with mechanical ventilation at the current date to 1 (95% CI: 1-1) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

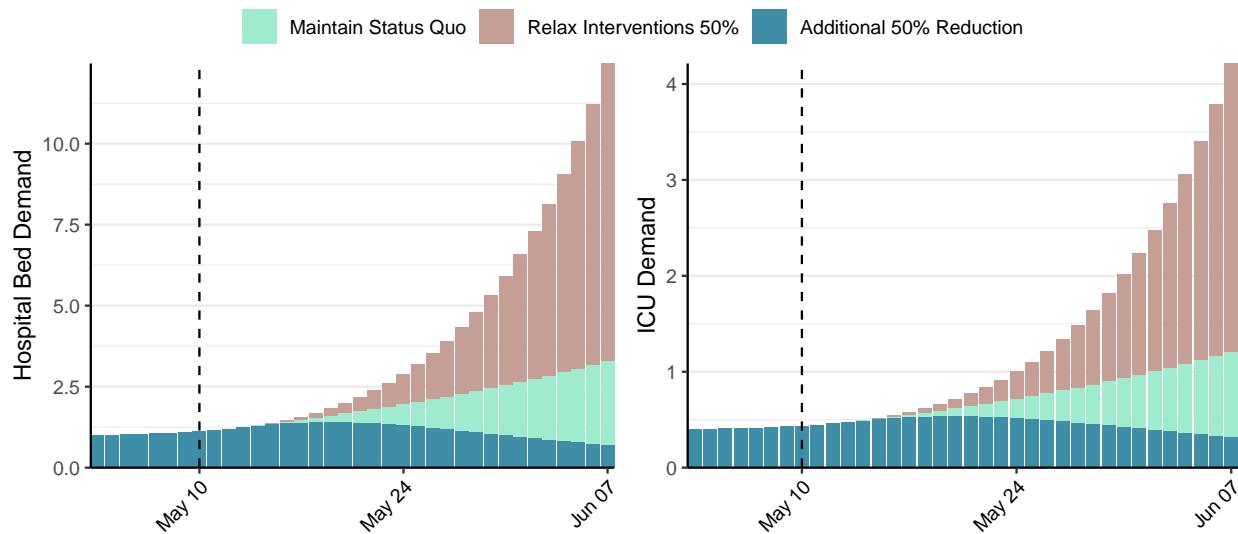


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 23 (95% CI: 19-28) at the current date to 4 (95% CI: 3-5) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 23 (95% CI: 19-28) at the current date to 464 (95% CI: 321-607) by 2021-06-07.

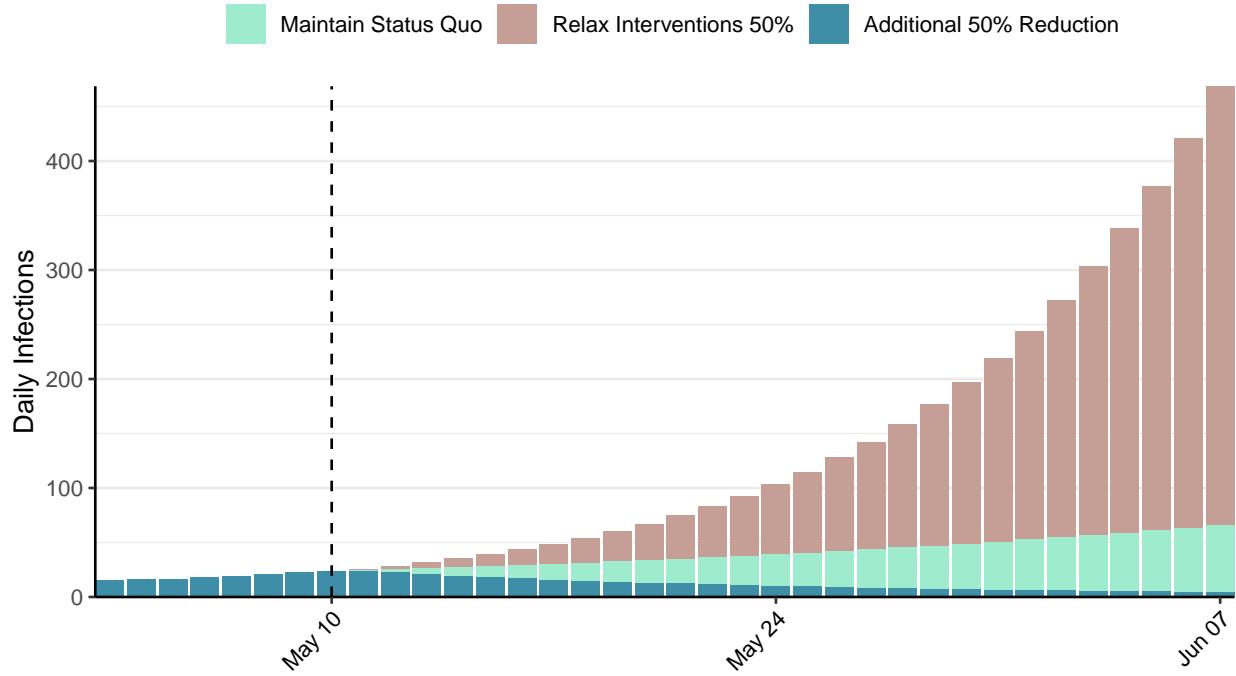


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Uganda, 2021-05-10

[Download the report for Uganda, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
42,384	29	346	0	0.99 (95% CI: 0.88-1.13)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

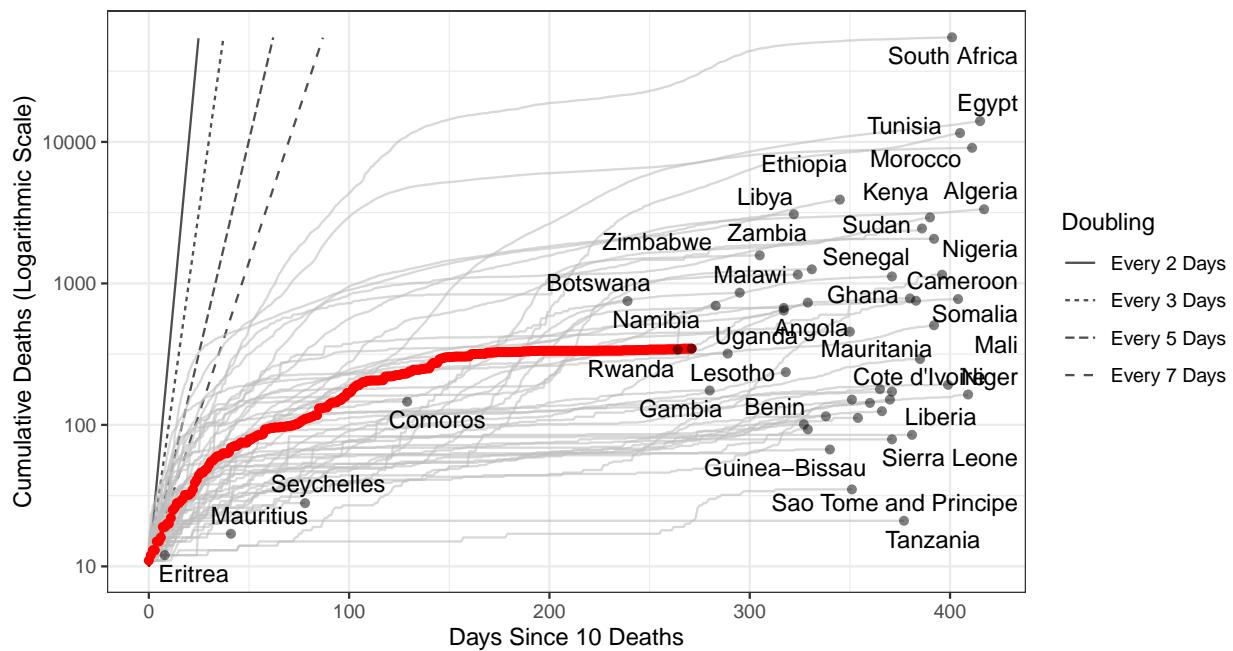


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 7,014 (95% CI: 6,661-7,367) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Uganda has revised their historic reported cases and thus have reported negative cases.**

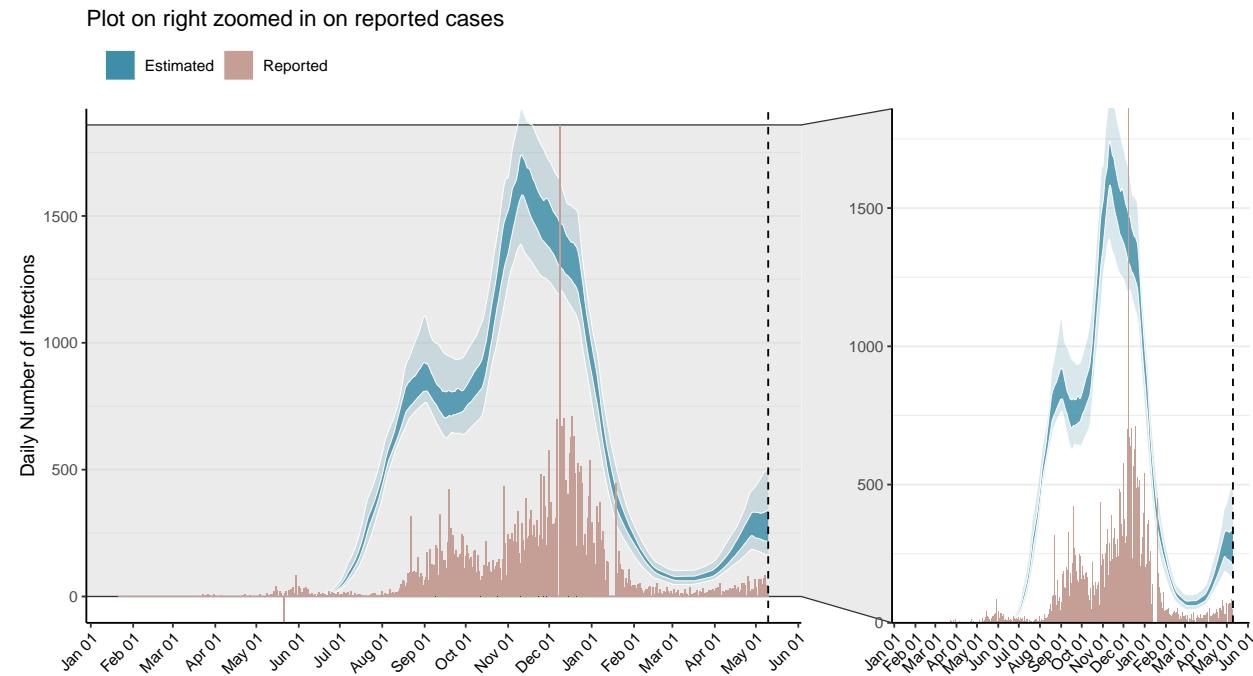
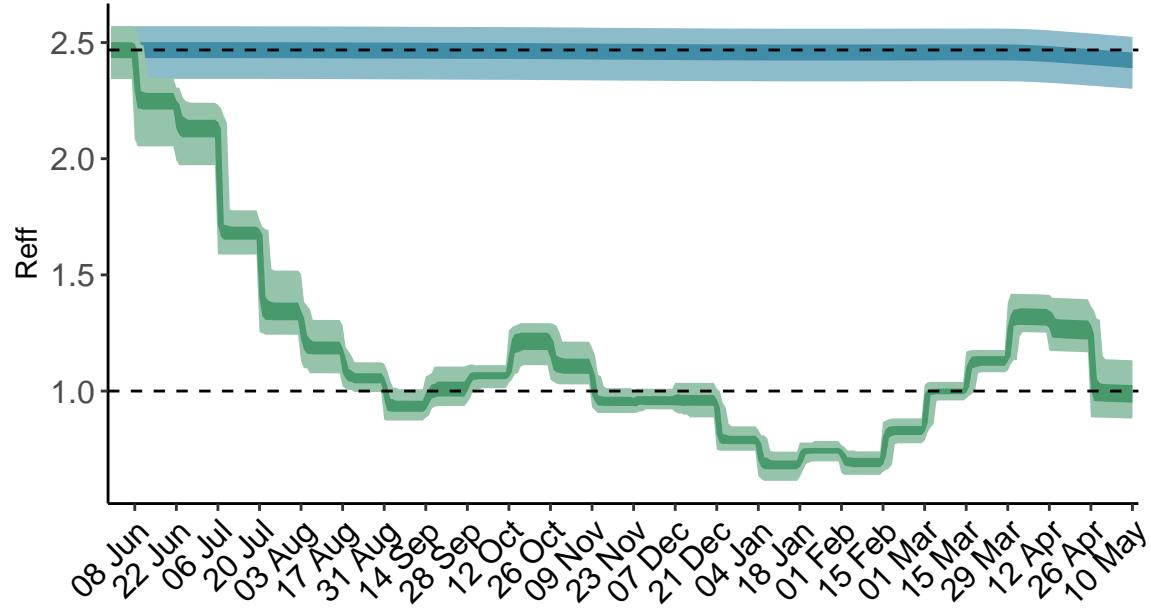


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

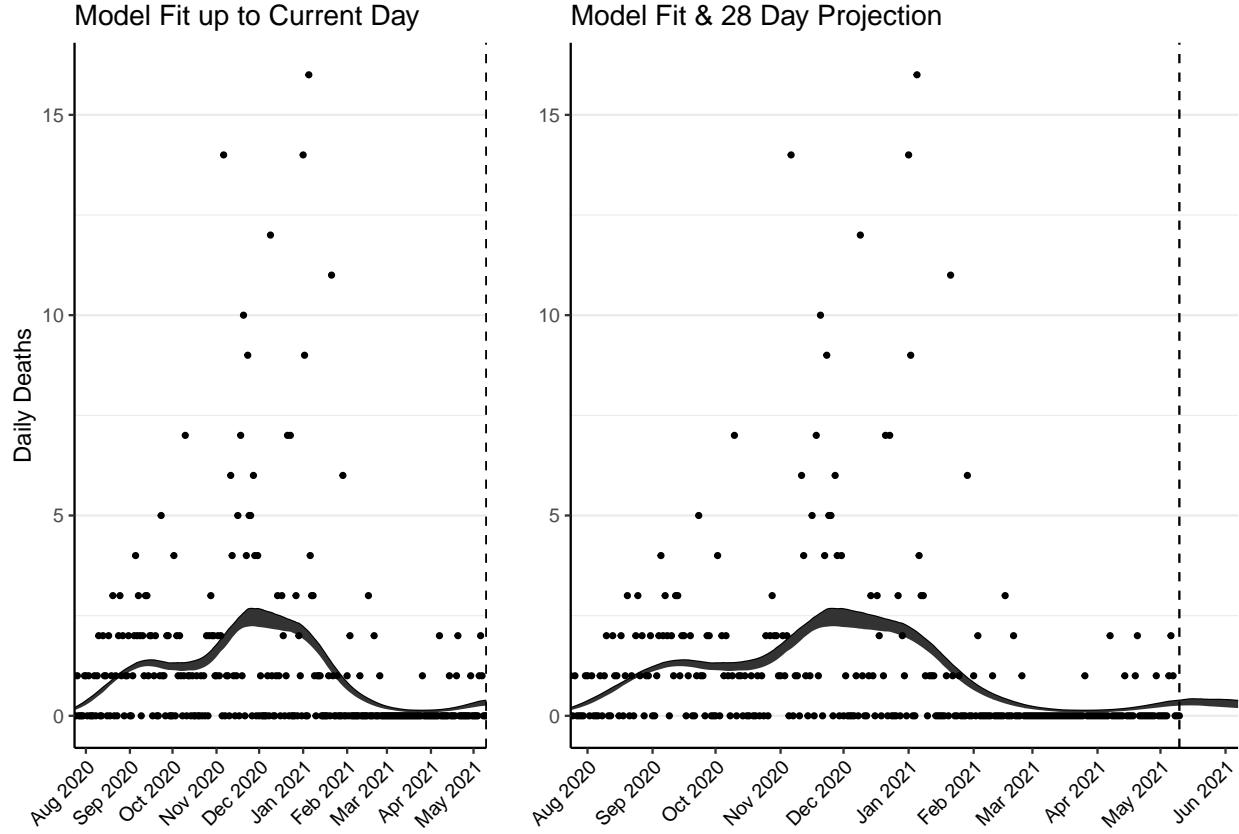


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 17 (95% CI: 17-18) patients requiring treatment with high-pressure oxygen at the current date to 18 (95% CI: 16-19) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 7 (95% CI: 6-7) patients requiring treatment with mechanical ventilation at the current date to 7 (95% CI: 6-8) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

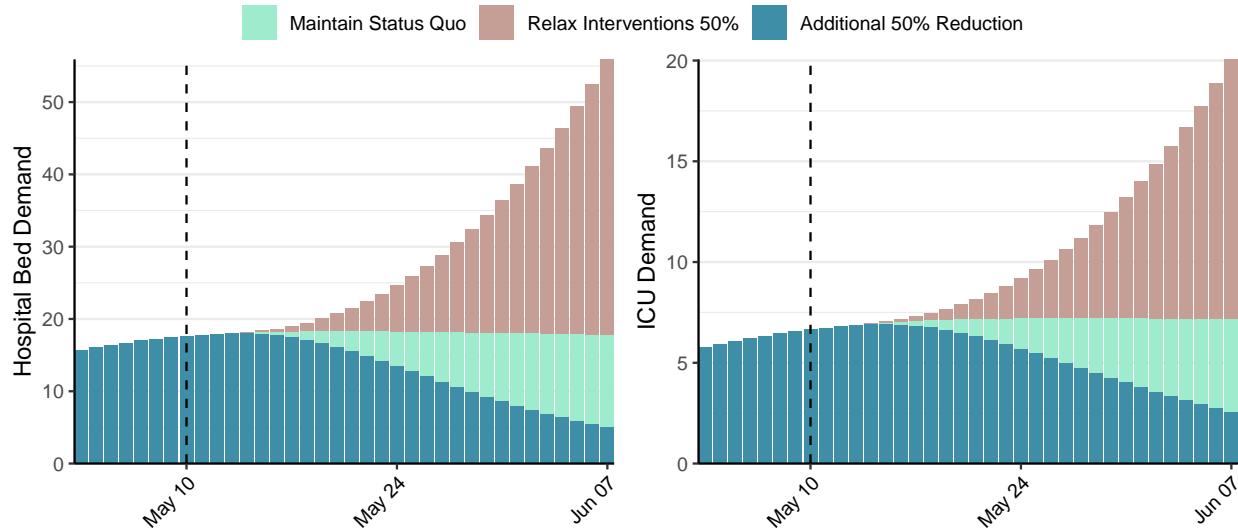


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 287 (95% CI: 268-306) at the current date to 23 (95% CI: 21-26) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 287 (95% CI: 268-306) at the current date to 1,843 (95% CI: 1,609-2,077) by 2021-06-07.

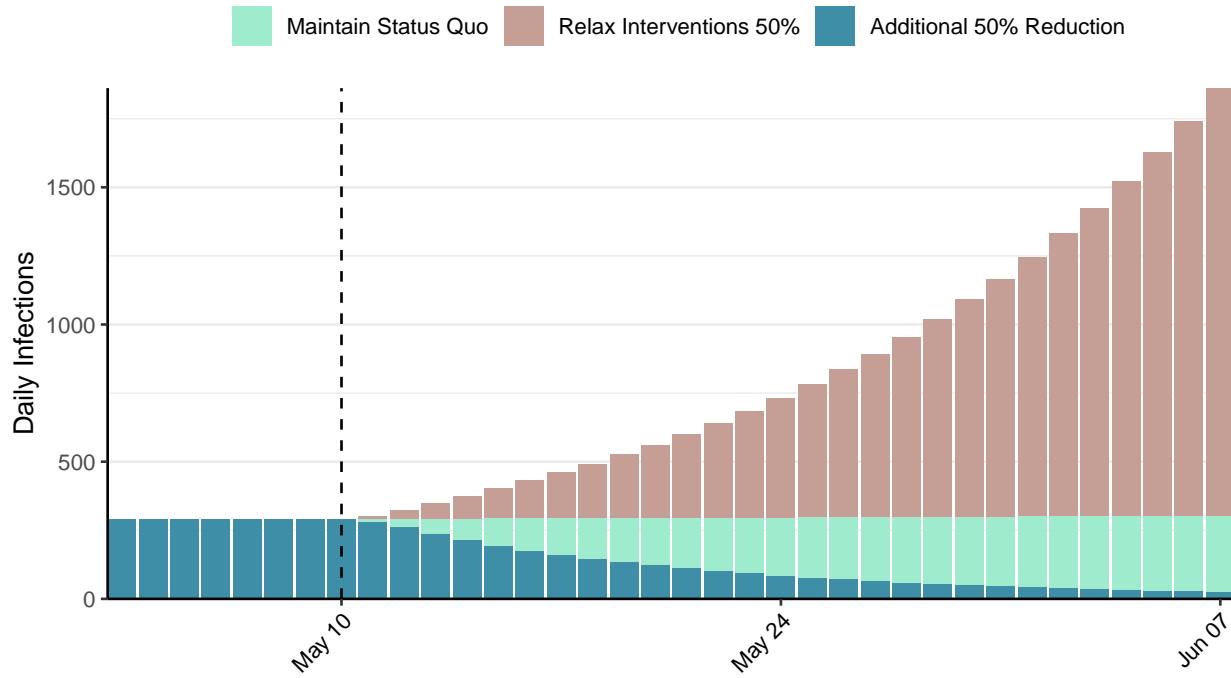


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

## Situation Report for COVID-19: Ukraine, 2021-05-10

[Download the report for Ukraine, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
2,178,095	2,944	48,419	125	0.55 (95% CI: 0.47-0.61)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

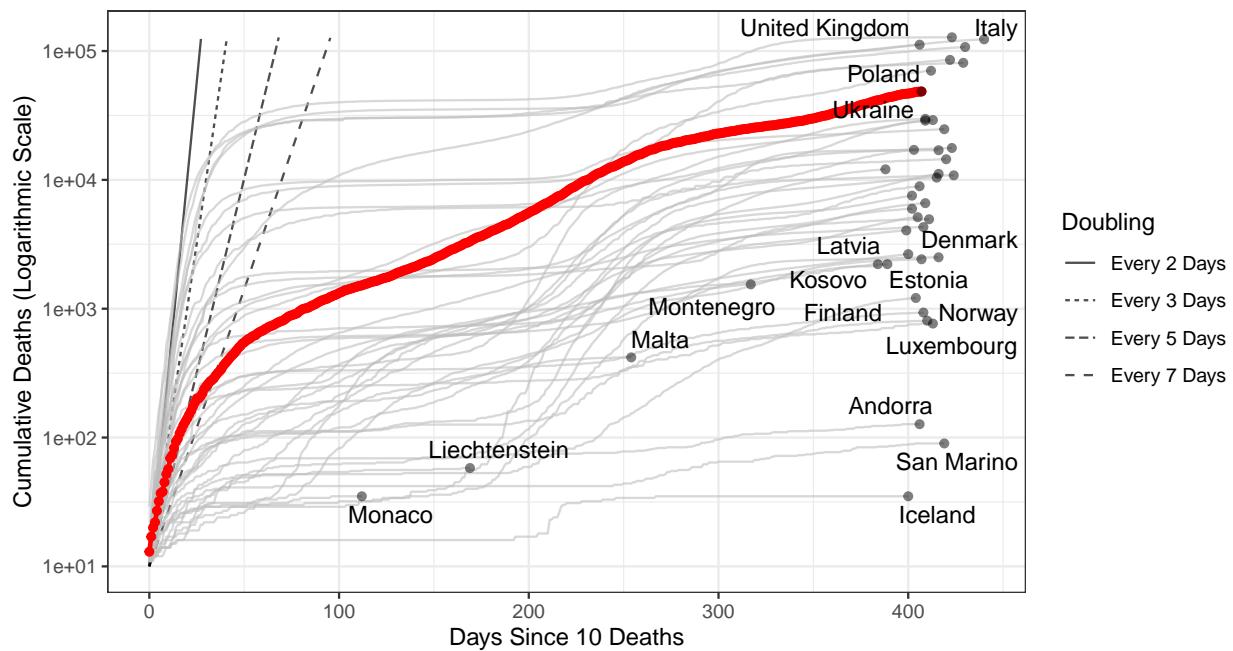


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 1,464,070 (95% CI: 1,421,343–1,506,798) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

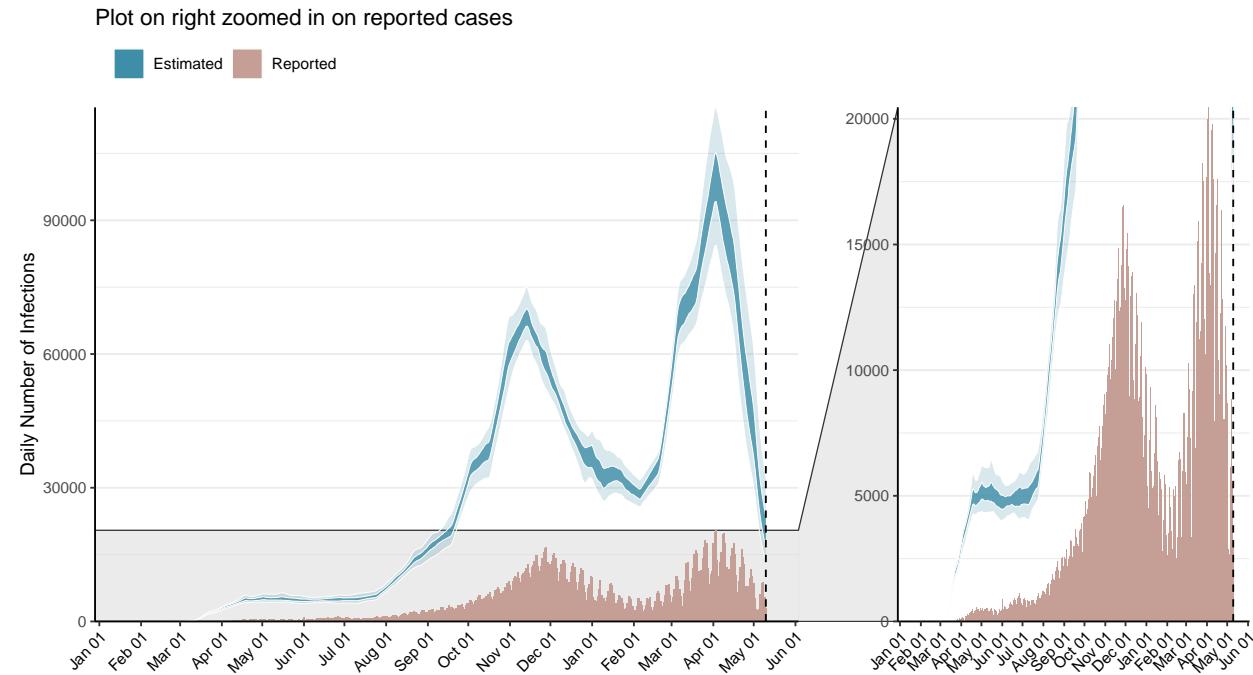
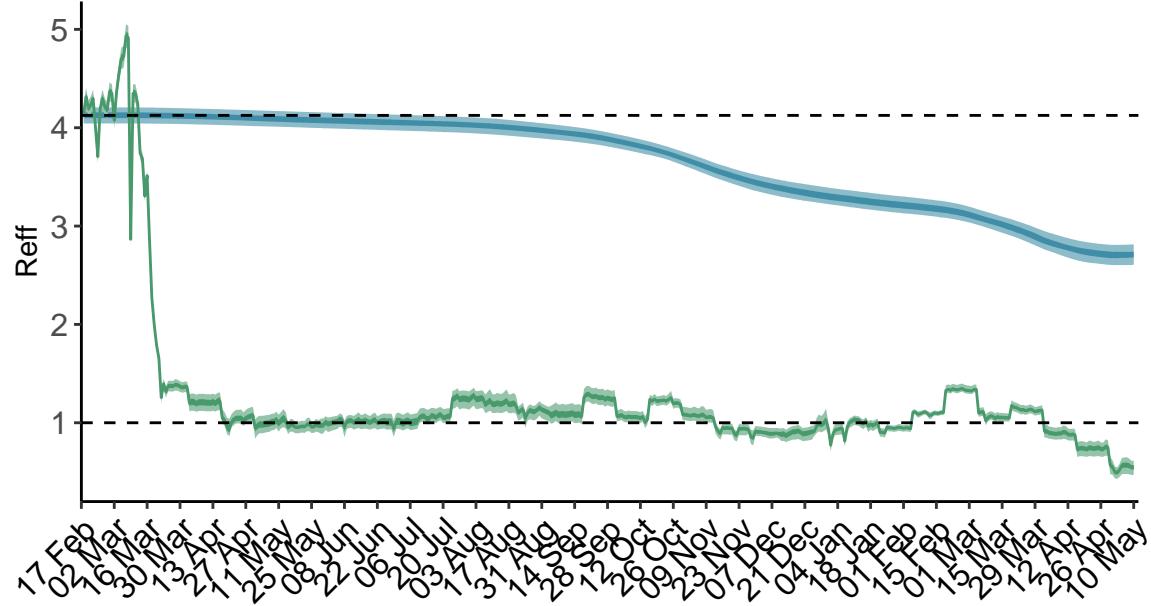


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

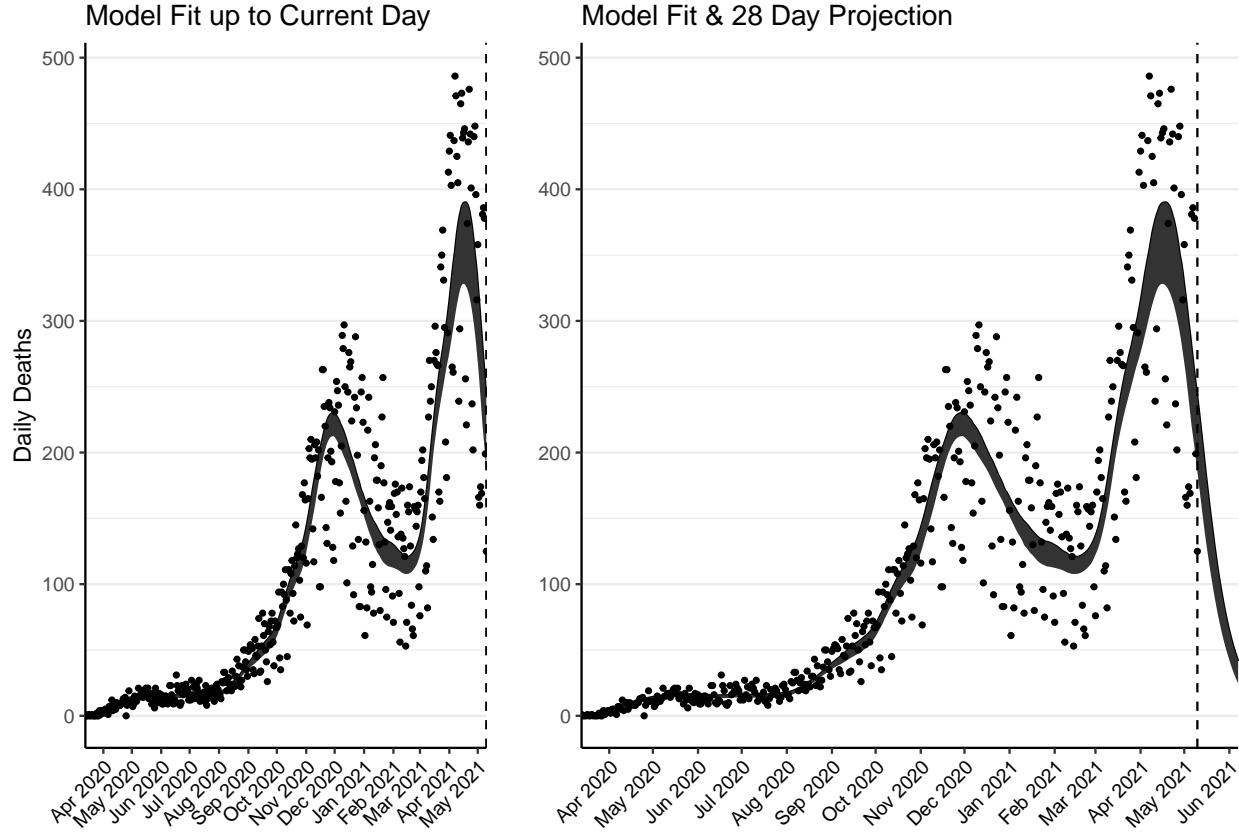


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 7,305 (95% CI: 7,065-7,546) patients requiring treatment with high-pressure oxygen at the current date to 1,087 (95% CI: 1,014-1,160) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 3,025 (95% CI: 2,936-3,114) patients requiring treatment with mechanical ventilation at the current date to 556 (95% CI: 524-589) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

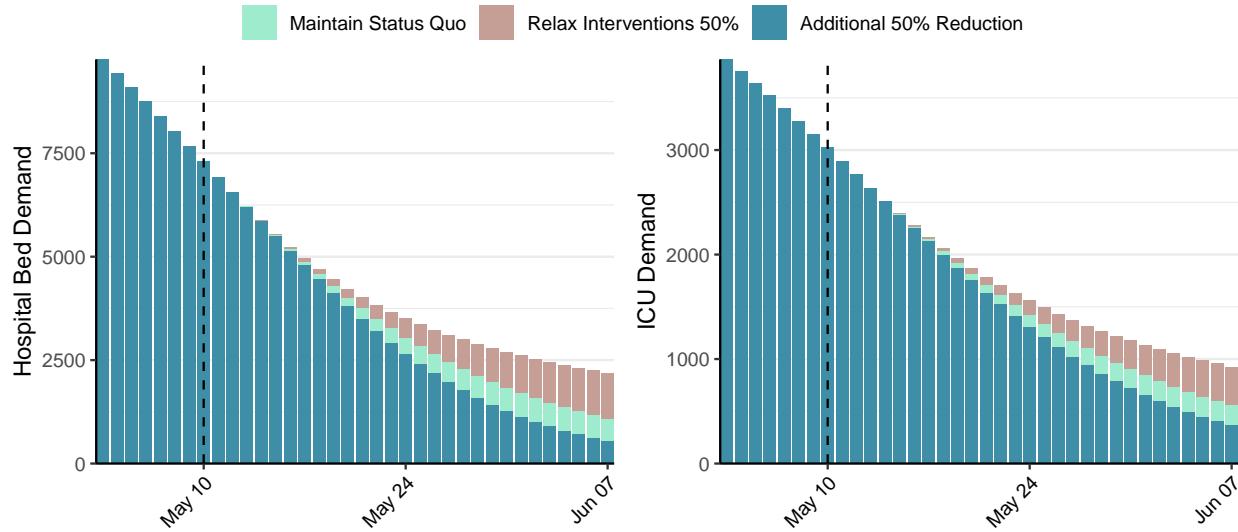
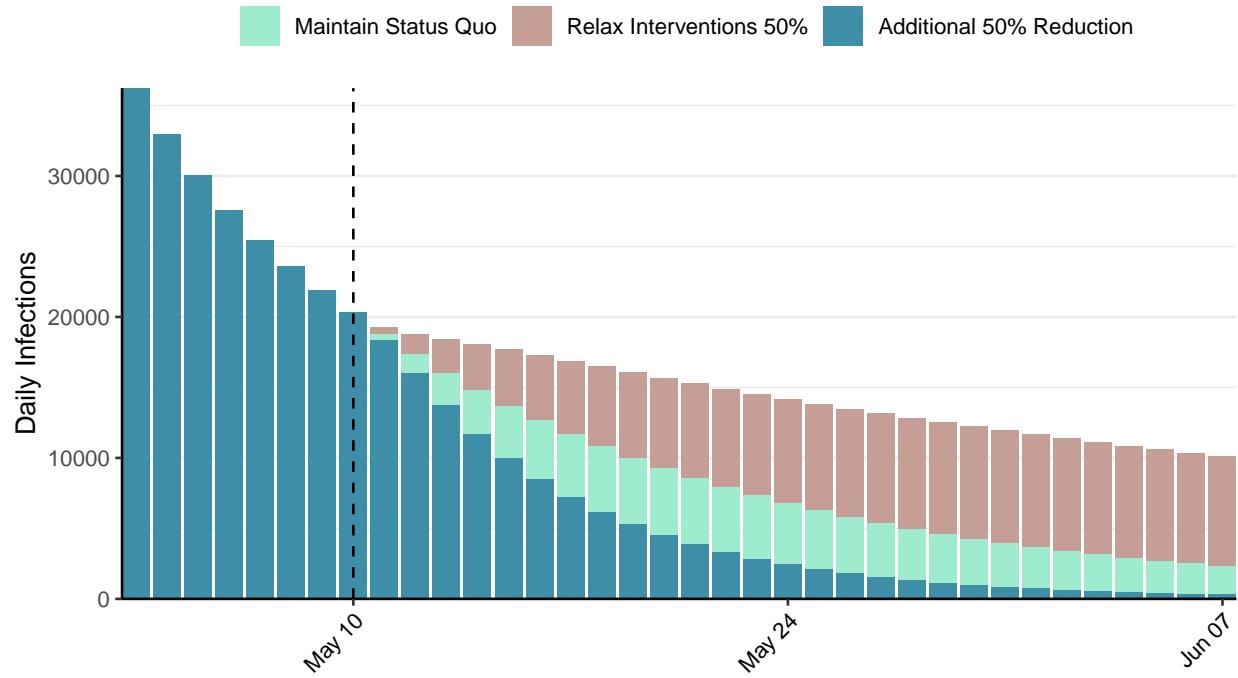


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 20,299 (95% CI: 19,266-21,333) at the current date to 288 (95% CI: 263-312) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 20,299 (95% CI: 19,266-21,333) at the current date to 10,106 (95% CI: 9,108-11,104) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Uruguay, 2021-05-10

[Download the report for Uruguay, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
222,870	2,187	3,171	49	0.76 (95% CI: 0.74-0.78)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

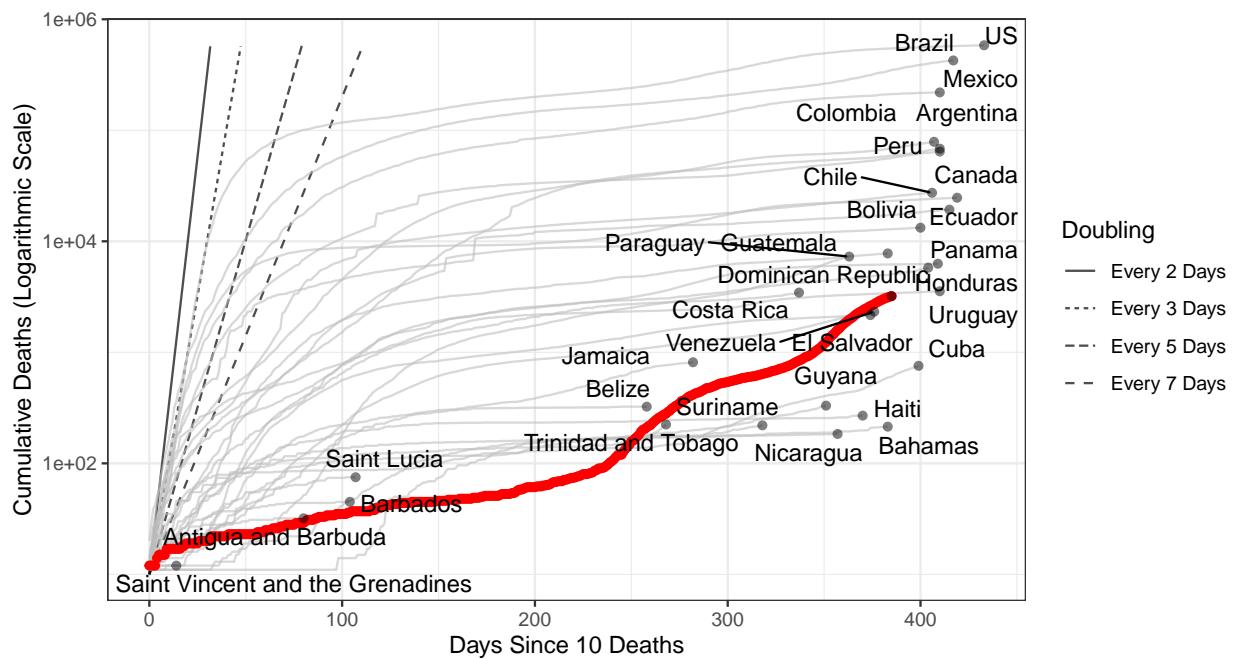


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 563,121 (95% CI: 549,996–576,246) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Uruguay has revised their historic reported cases and thus have reported negative cases.**

Plot on right zoomed in on reported cases

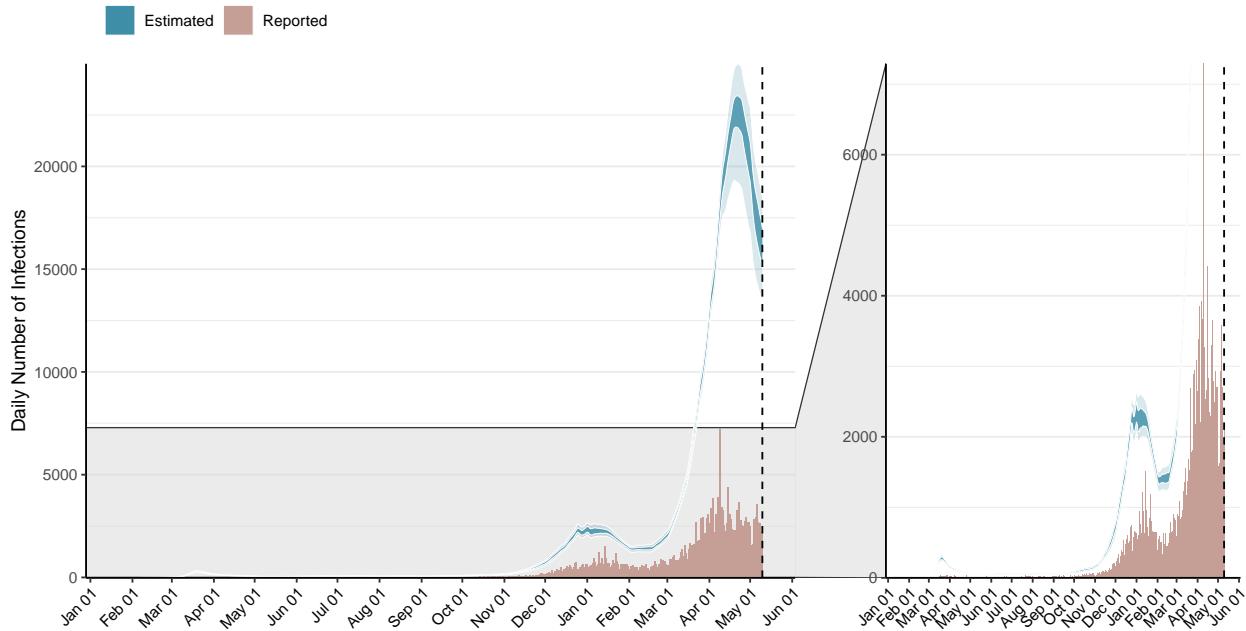
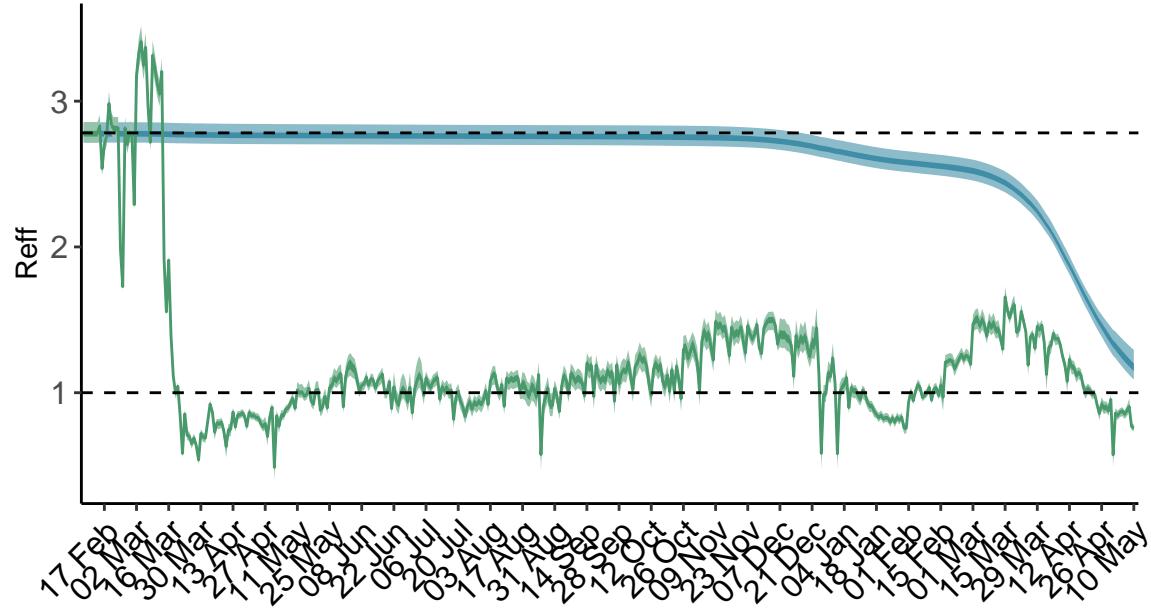


Figure 2: Daily number of infections estimated by fitting to the current total of deaths. Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Uruguay is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

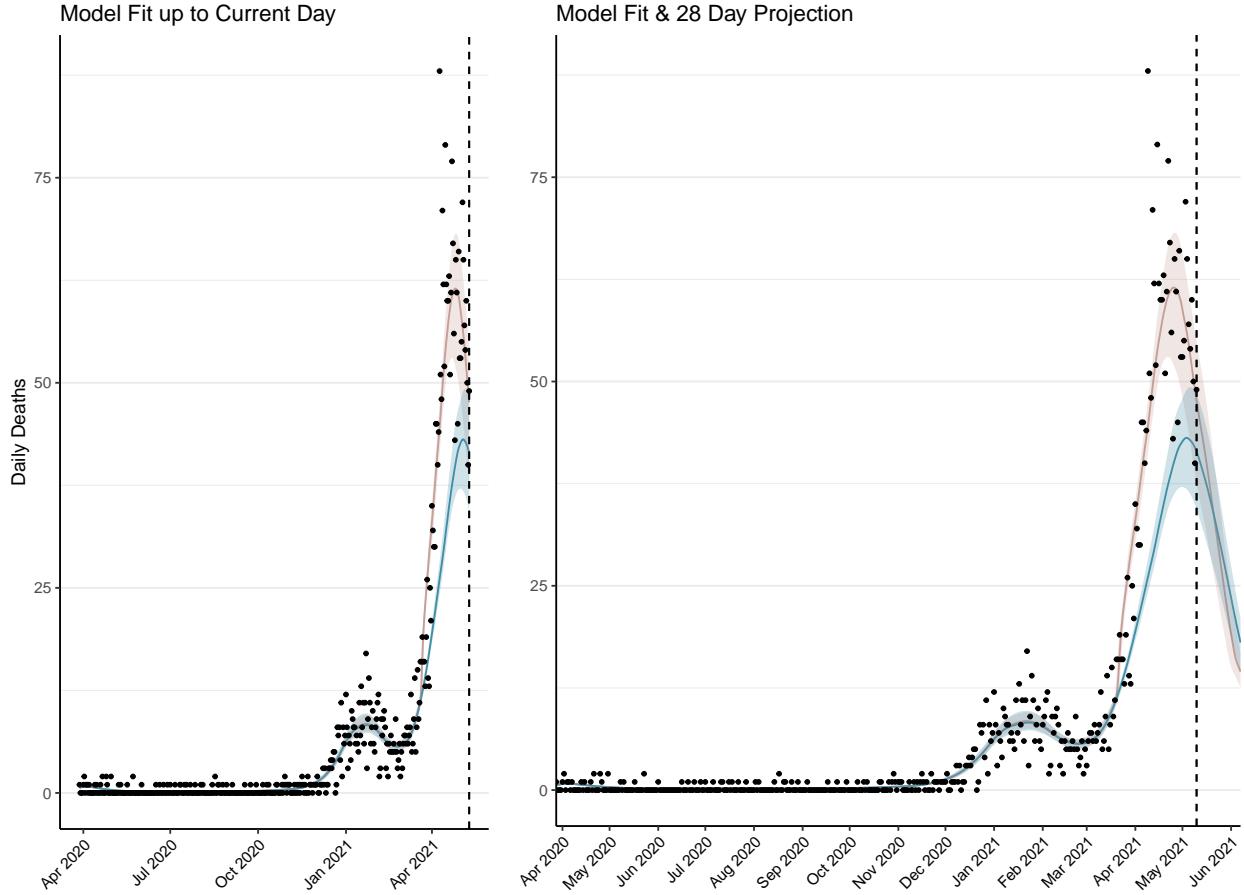


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 1,445 (95% CI: 1,409-1,480) patients requiring treatment with high-pressure oxygen at the current date to 534 (95% CI: 519-549) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 169 (95% CI: 165-172) patients requiring treatment with mechanical ventilation at the current date to 131 (95% CI: 128-133) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

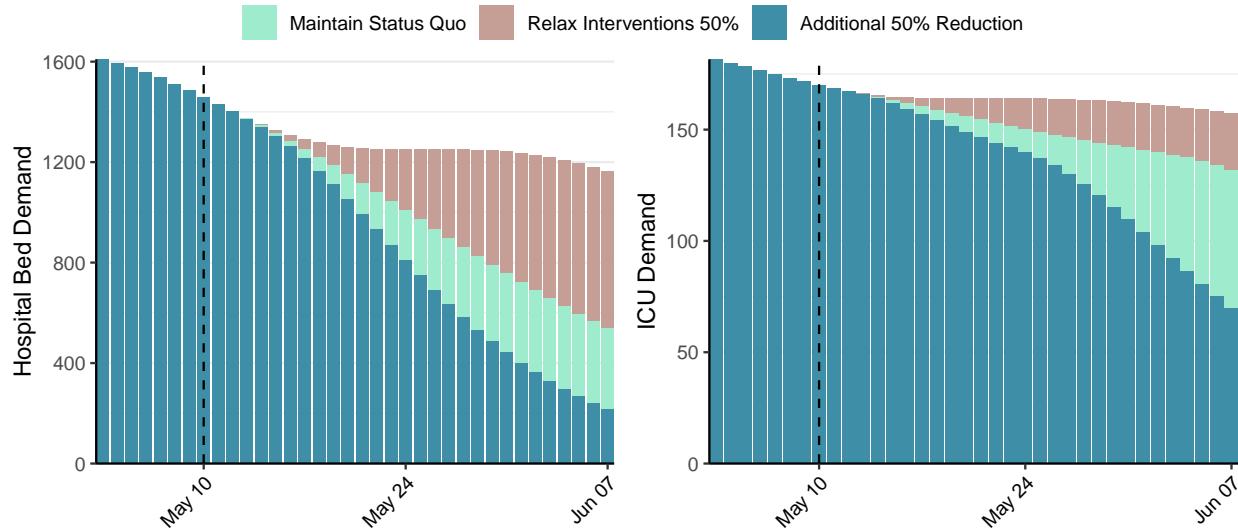
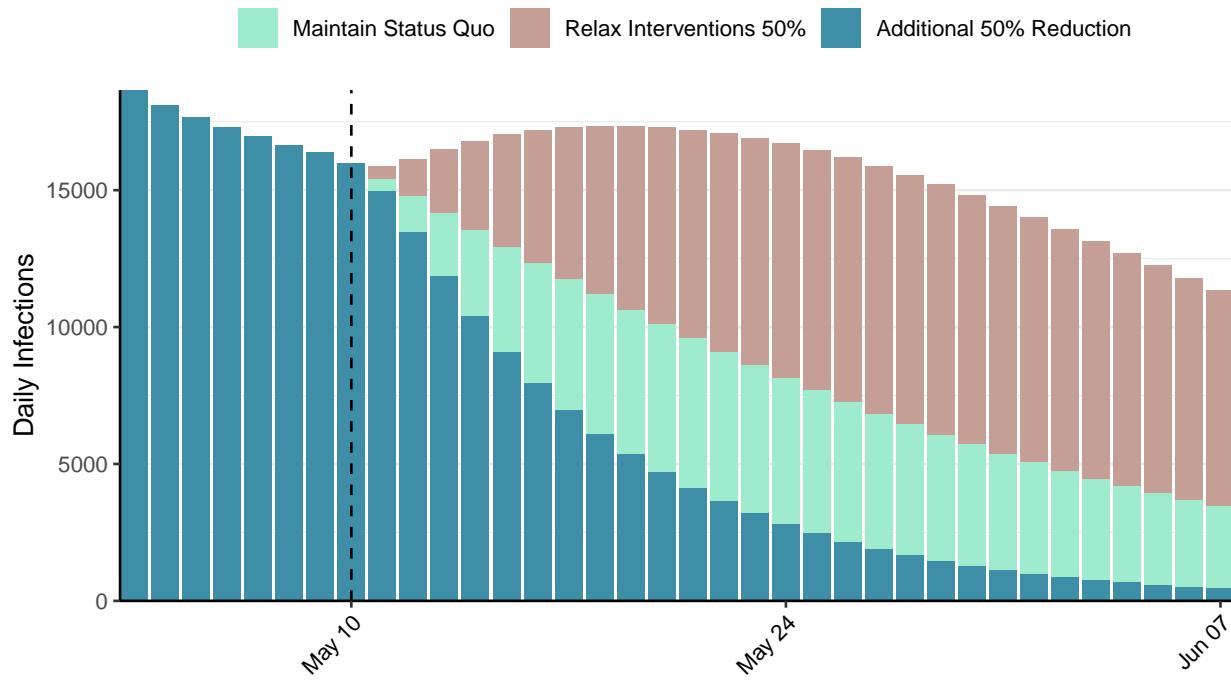


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 15,814 (95% CI: 15,403-16,224) at the current date to 438 (95% CI: 425-450) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 15,814 (95% CI: 15,403-16,224) at the current date to 11,223 (95% CI: 10,963-11,482) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Uzbekistan, 2021-05-10

[Download the report for Uzbekistan, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
94,759	362	662	0	1.27 (95% CI: 1.16-1.36)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

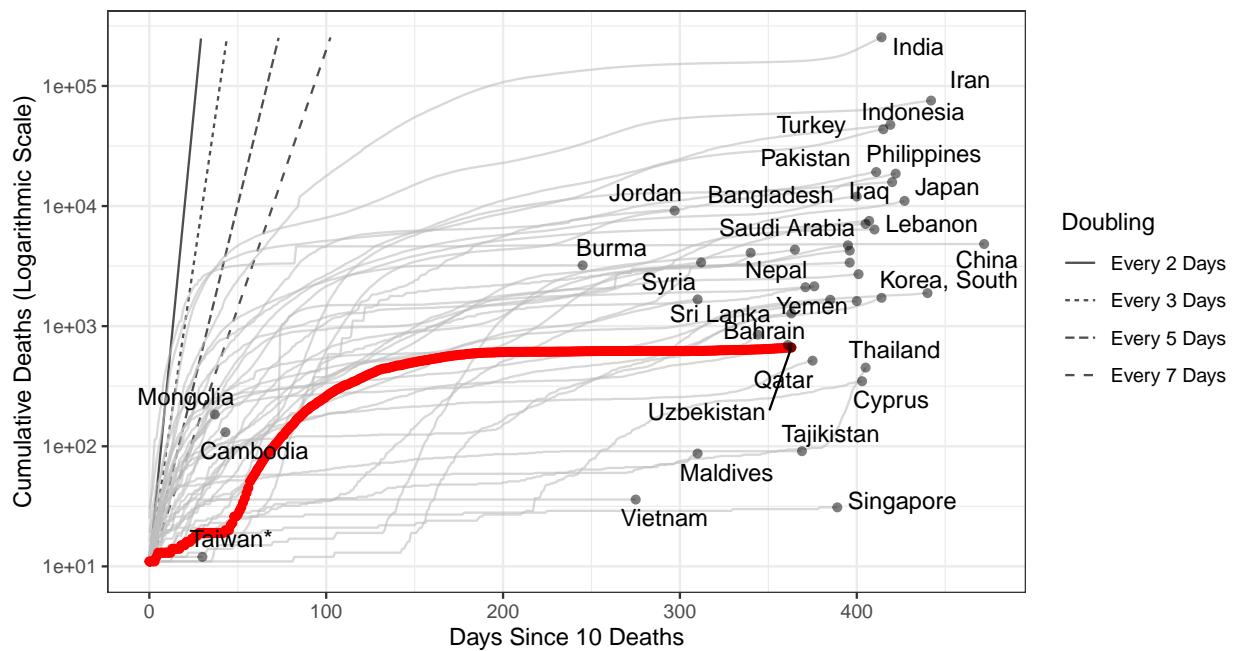


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 25,323 (95% CI: 24,172-26,473) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

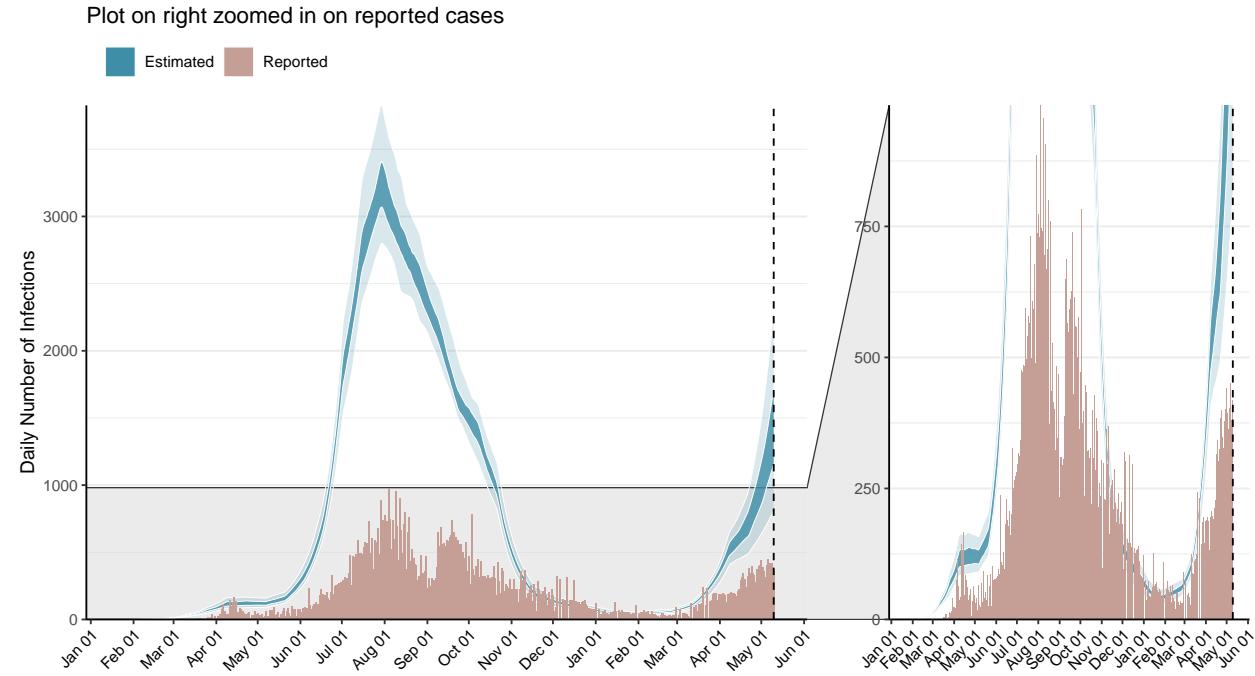
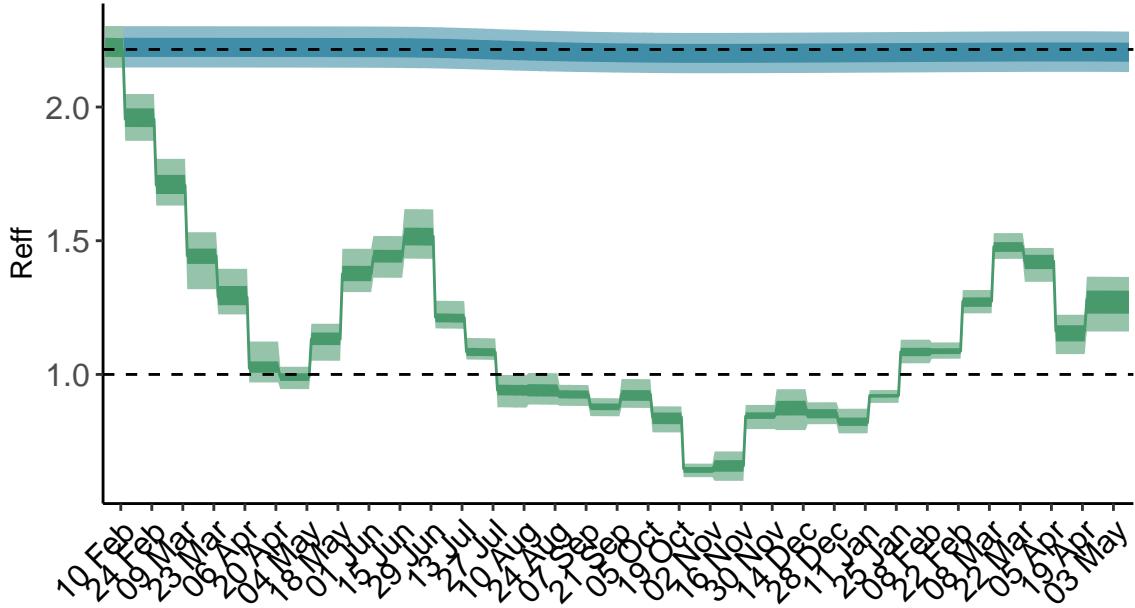


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

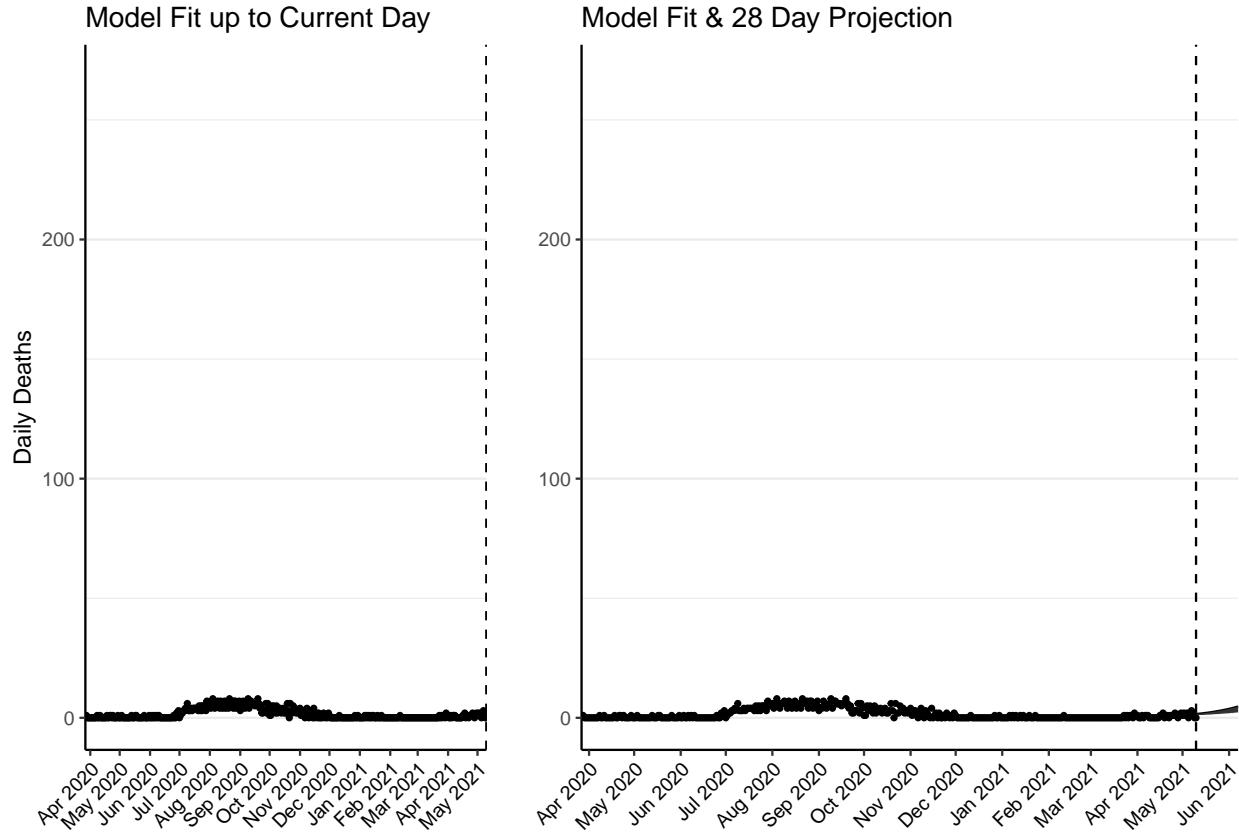


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 77 (95% CI: 73-81) patients requiring treatment with high-pressure oxygen at the current date to 227 (95% CI: 209-245) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 28 (95% CI: 27-29) patients requiring treatment with mechanical ventilation at the current date to 82 (95% CI: 76-88) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

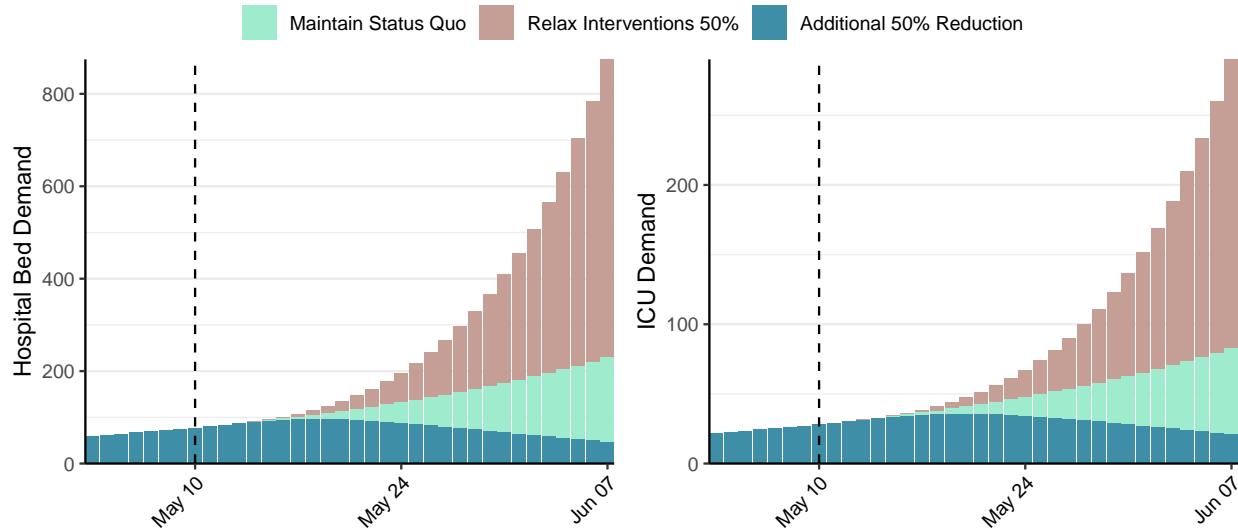


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 1,429 (95% CI: 1,347-1,511) at the current date to 267 (95% CI: 245-290) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 1,429 (95% CI: 1,347-1,511) at the current date to 30,123 (95% CI: 27,291-32,956) by 2021-06-07.

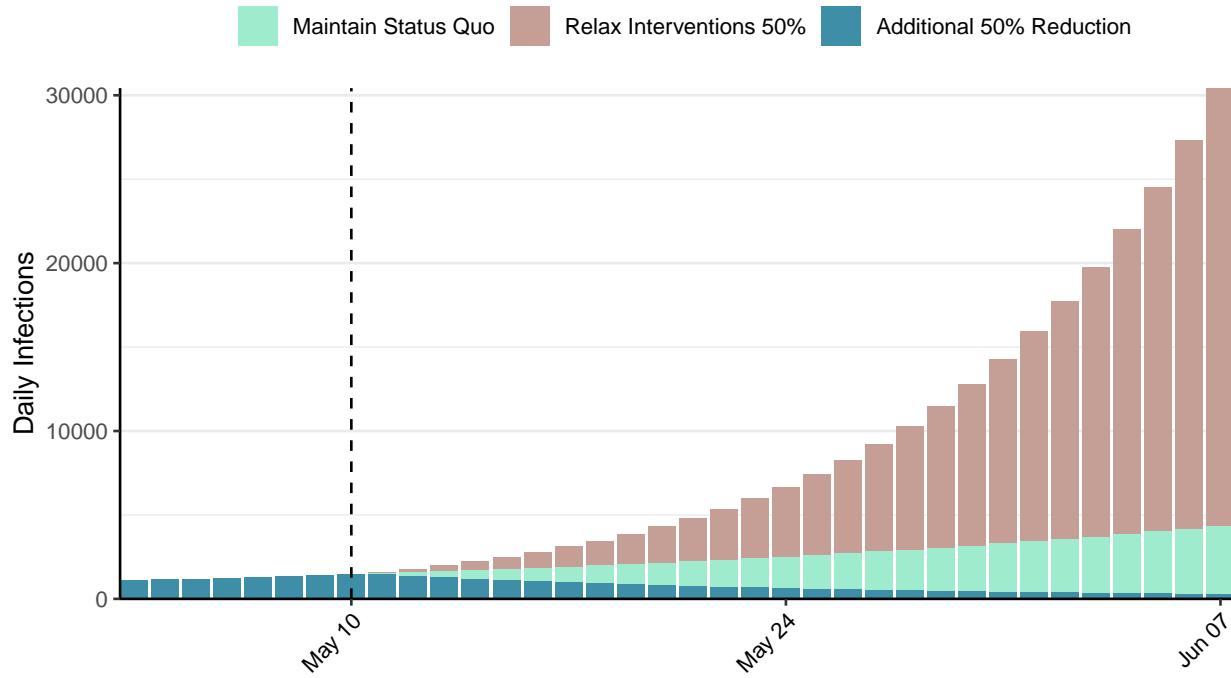


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: St. Vincent and the Grenadines, 2021-05-10

[Download the report for St. Vincent and the Grenadines, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
1,922	10	12	0	0.98 (95% CI: 0.66-1.53)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

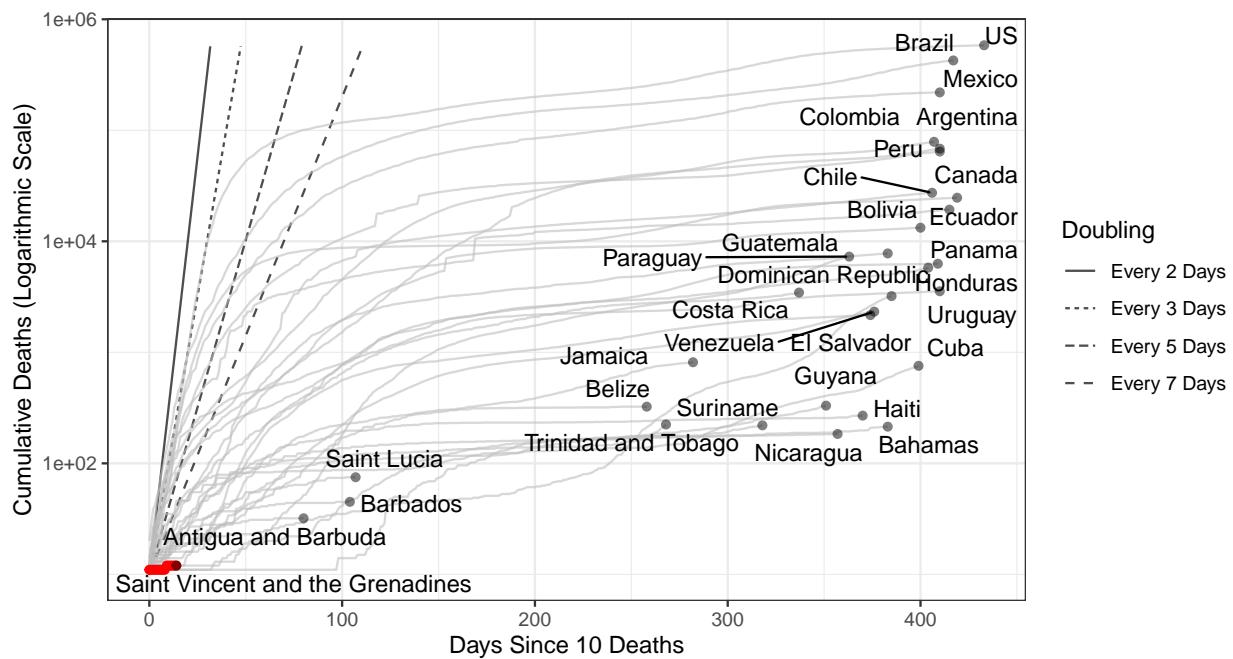


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 581 (95% CI: 496-666) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

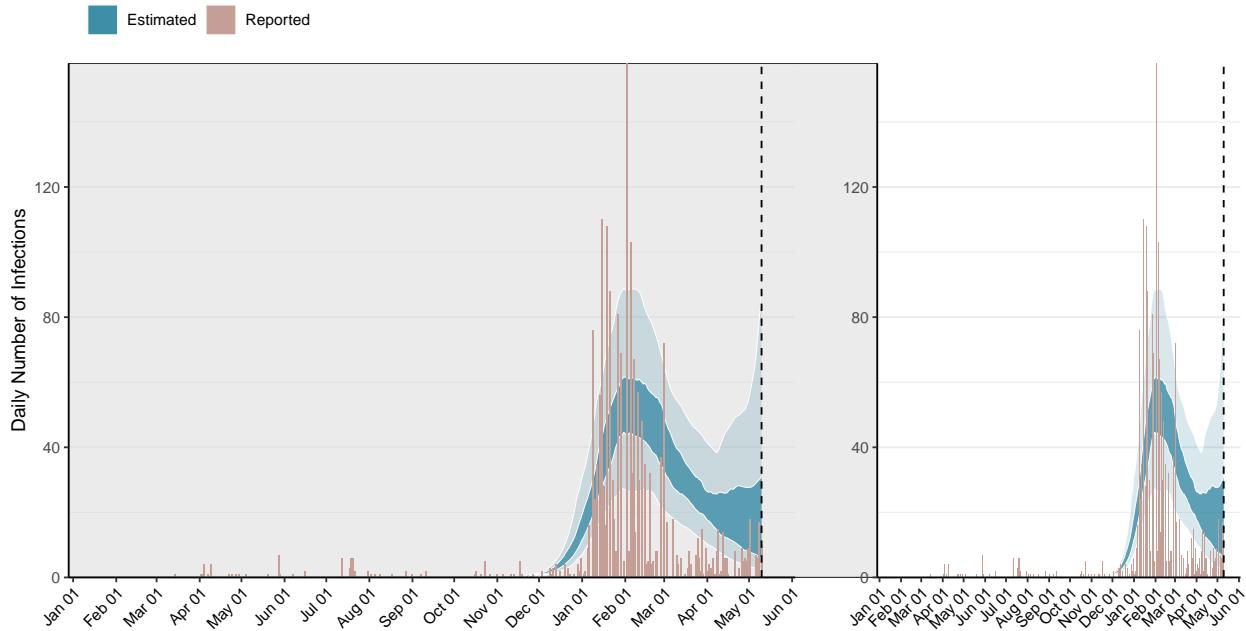
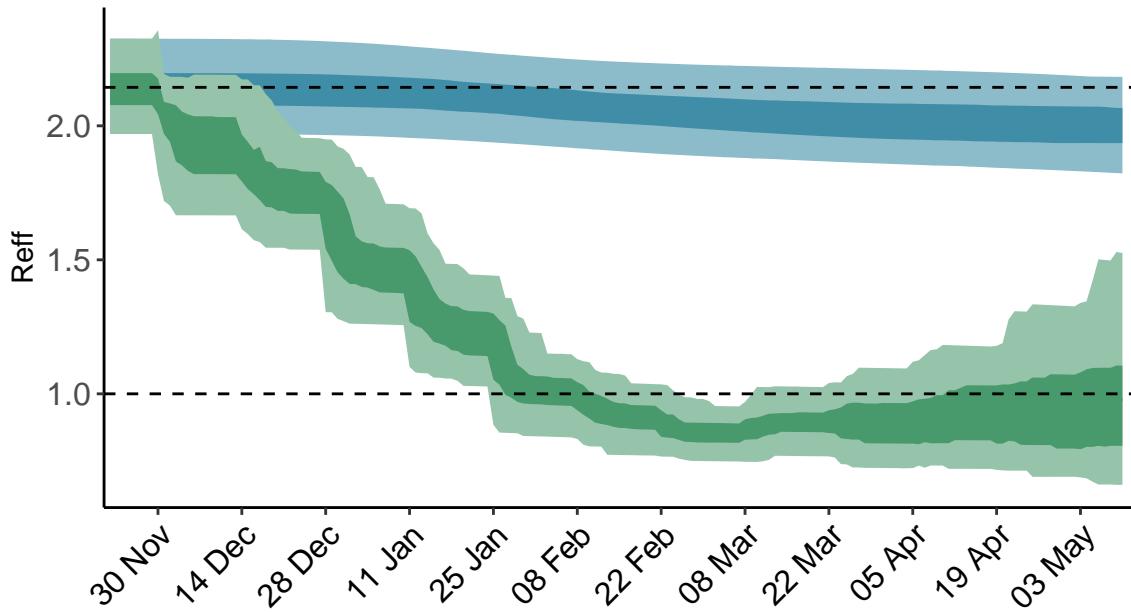


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

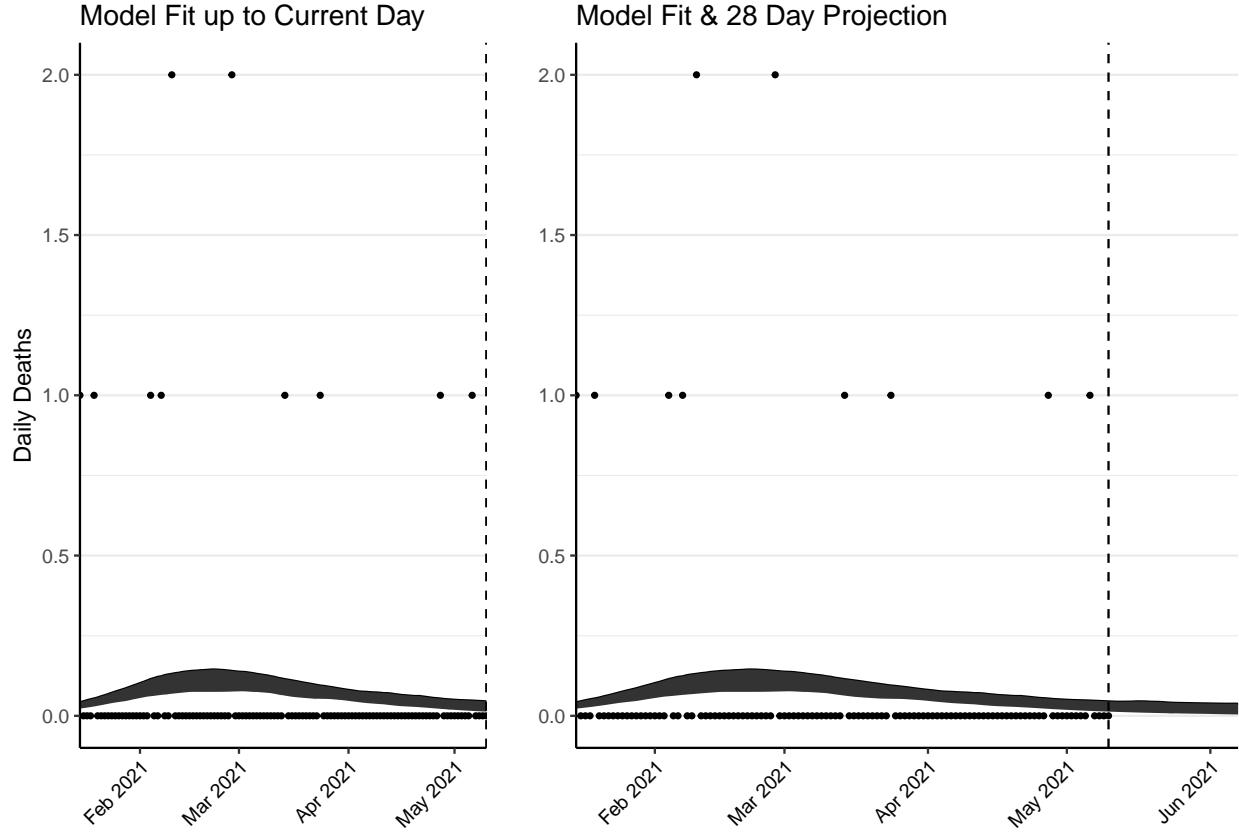


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 2 (95% CI: 2-2) patients requiring treatment with high-pressure oxygen at the current date to 4 (95% CI: 3-6) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1 (95% CI: 1-1) patients requiring treatment with mechanical ventilation at the current date to 1 (95% CI: 1-2) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

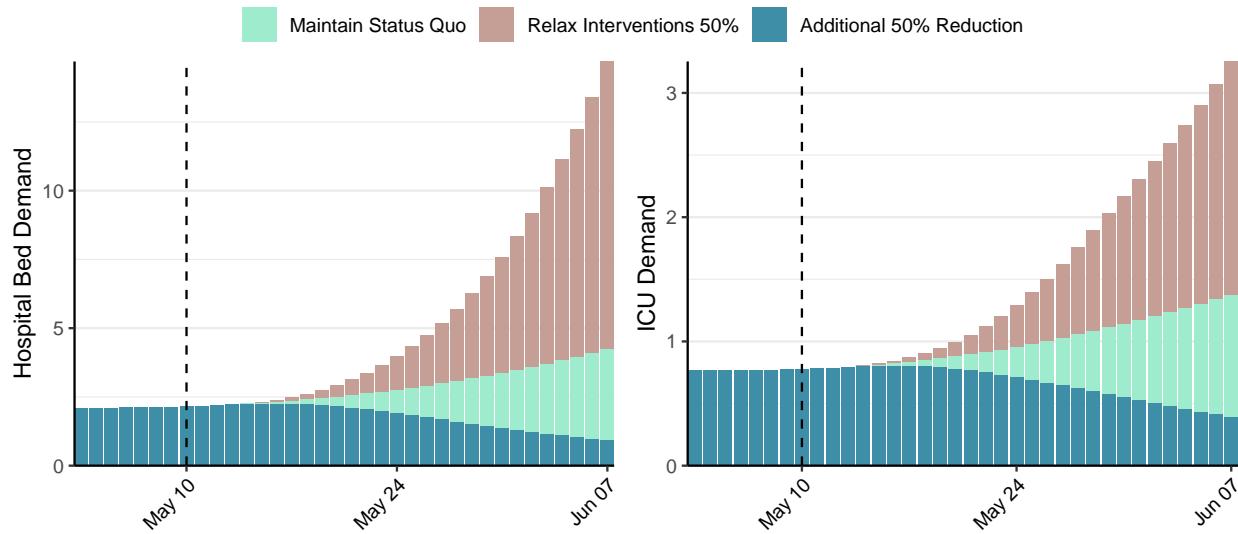


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 24 (95% CI: 19-29) at the current date to 4 (95% CI: 2-5) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 24 (95% CI: 19-29) at the current date to 296 (95% CI: 190-402) by 2021-06-07.

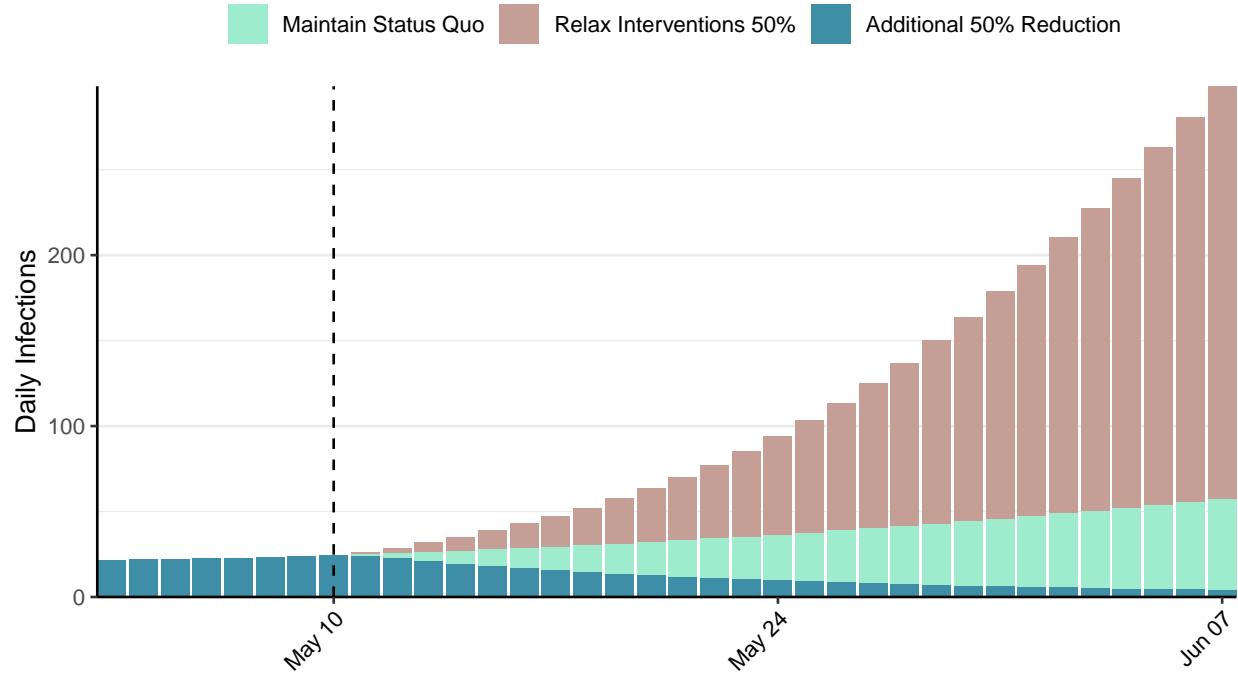


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](#) - <https://covidsim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Venezuela, 2021-05-10

[Download the report for Venezuela, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
209,162	1,292	2,310	13	0.87 (95% CI: 0.81-0.94)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

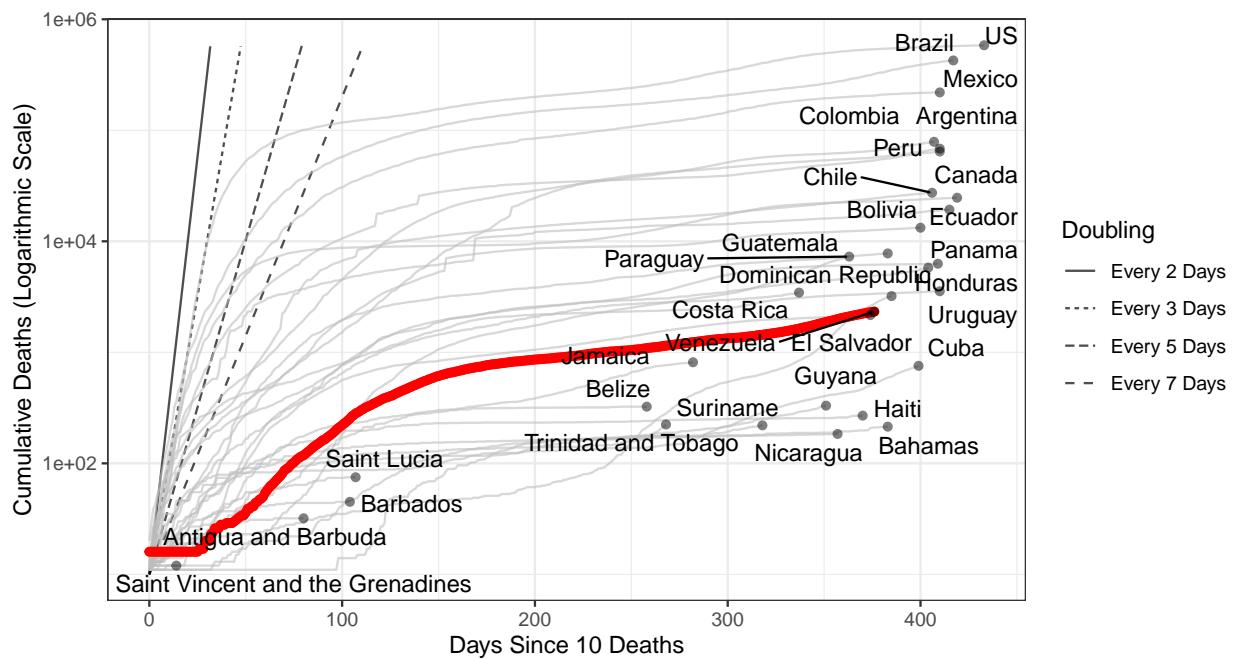


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 270,042 (95% CI: 261,570-278,515) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

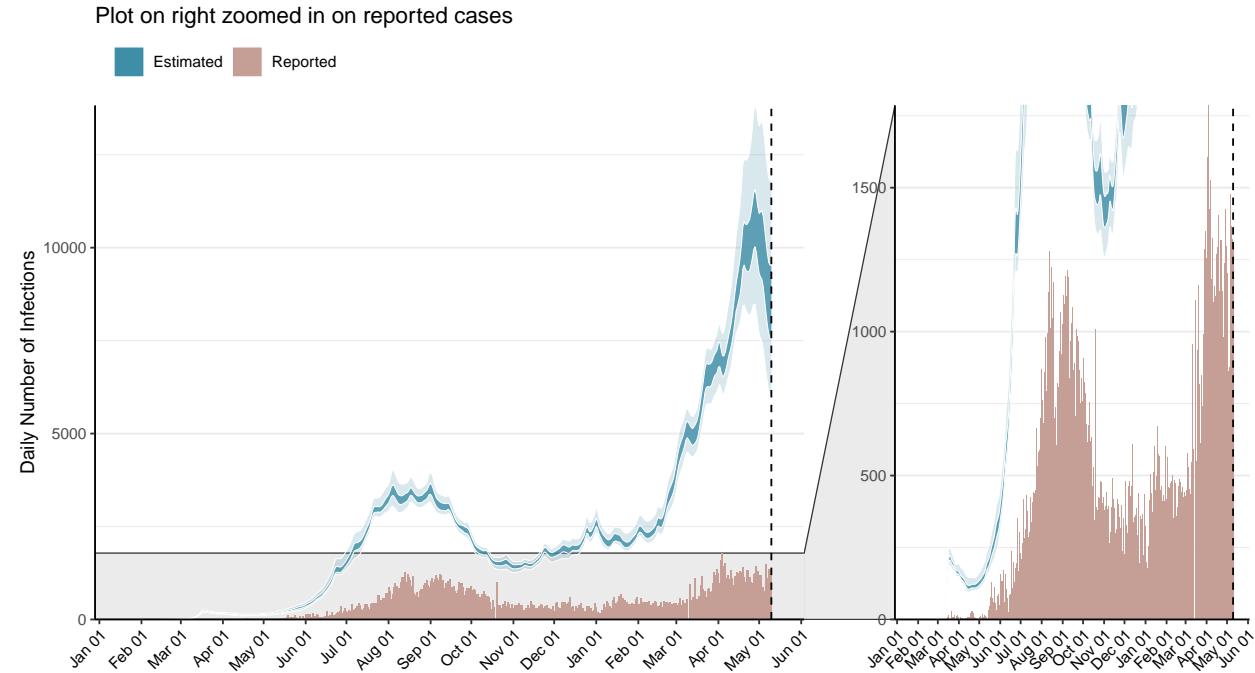
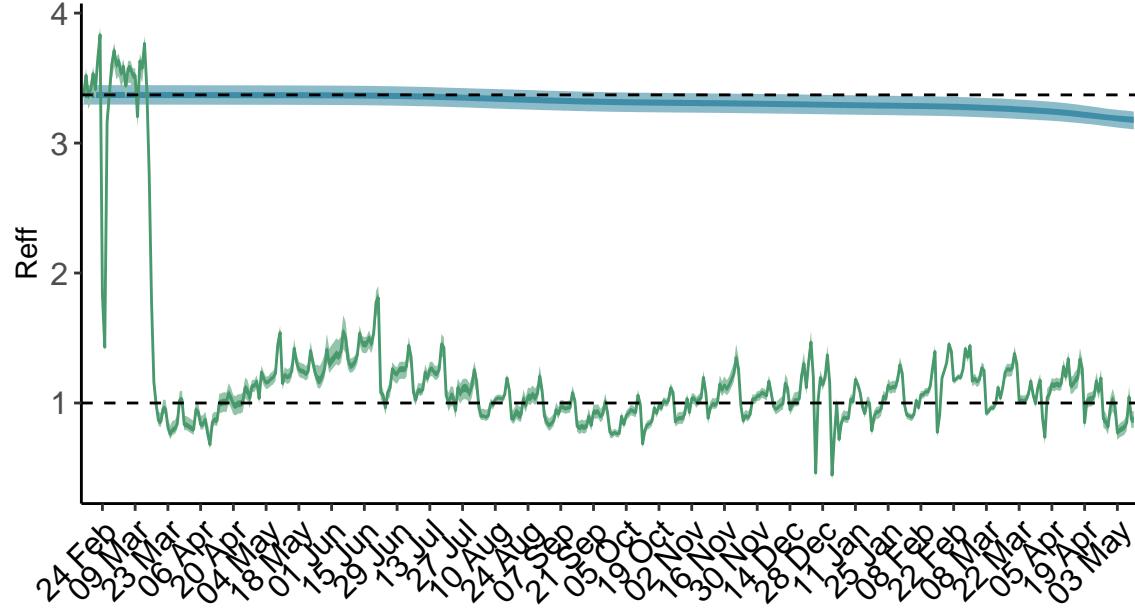


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

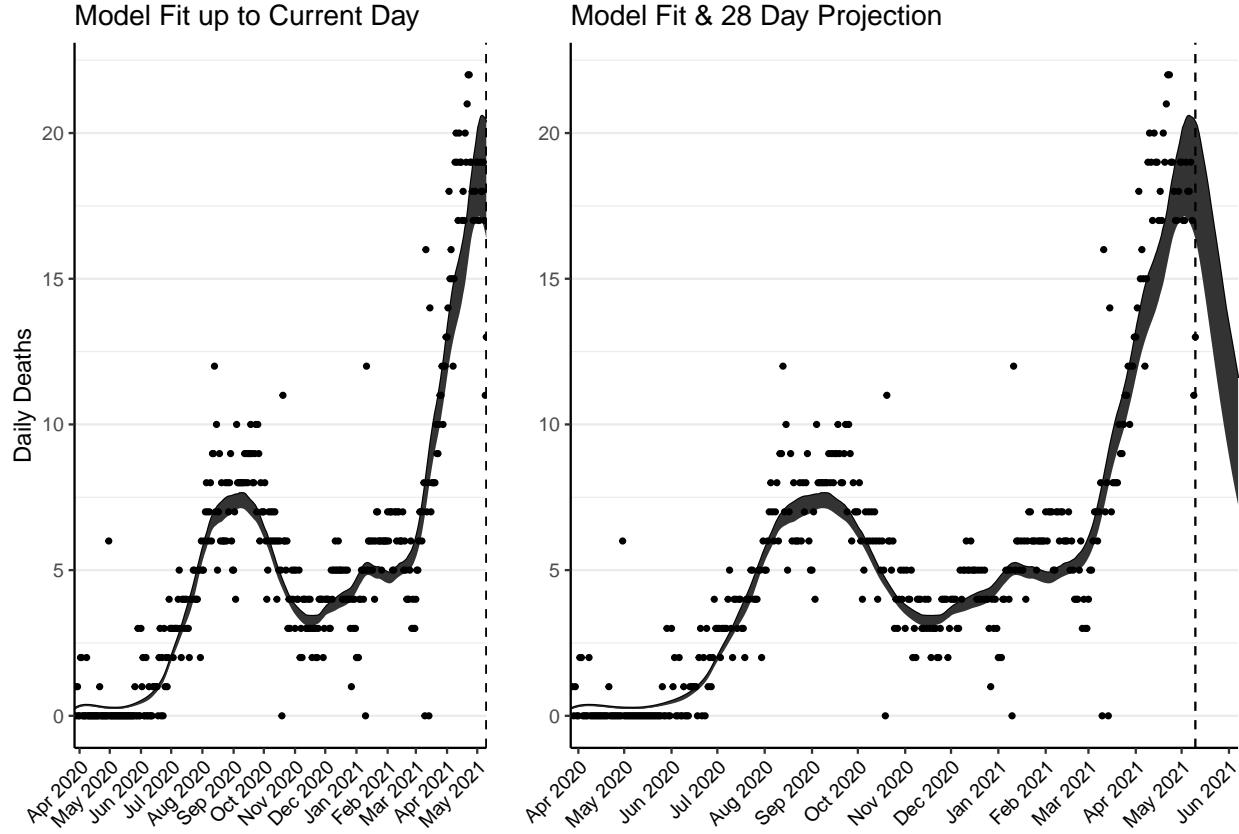


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 786 (95% CI: 761-812) patients requiring treatment with high-pressure oxygen at the current date to 452 (95% CI: 427-477) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 309 (95% CI: 300-319) patients requiring treatment with mechanical ventilation at the current date to 204 (95% CI: 193-215) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

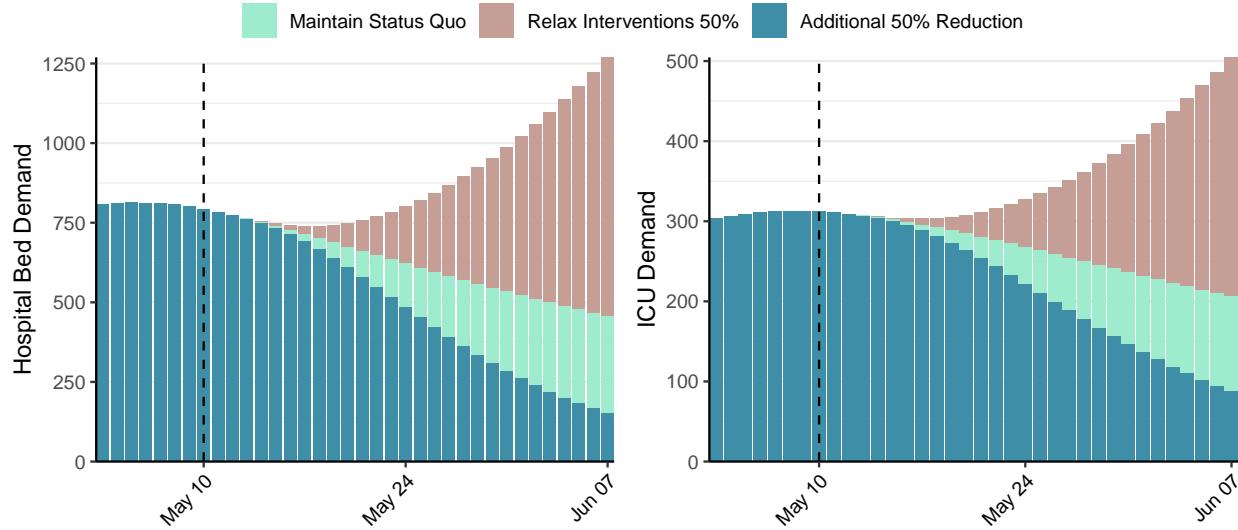


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 8,532 (95% CI: 8,173-8,891) at the current date to 439 (95% CI: 411-466) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 8,532 (95% CI: 8,173-8,891) at the current date to 26,998 (95% CI: 25,100-28,896) by 2021-06-07.

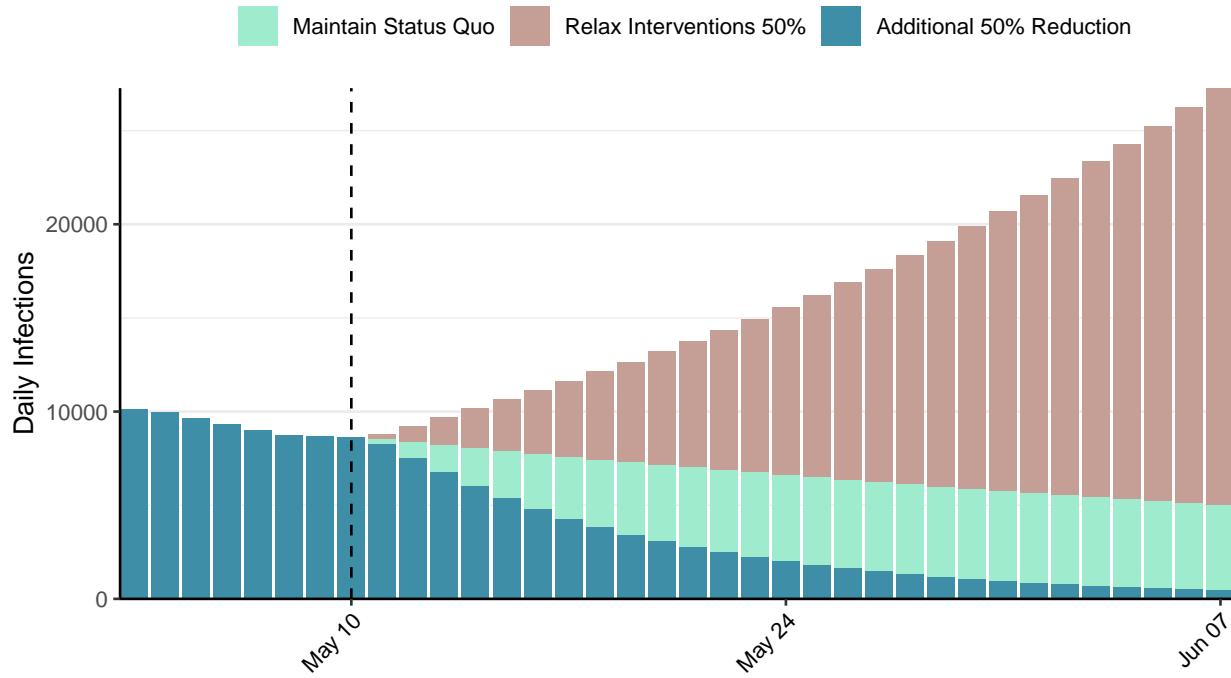


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Vietnam, 2021-05-10

[Download the report for Vietnam, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
3,489	77	36	0	1.46 (95% CI: 1.17-1.73)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

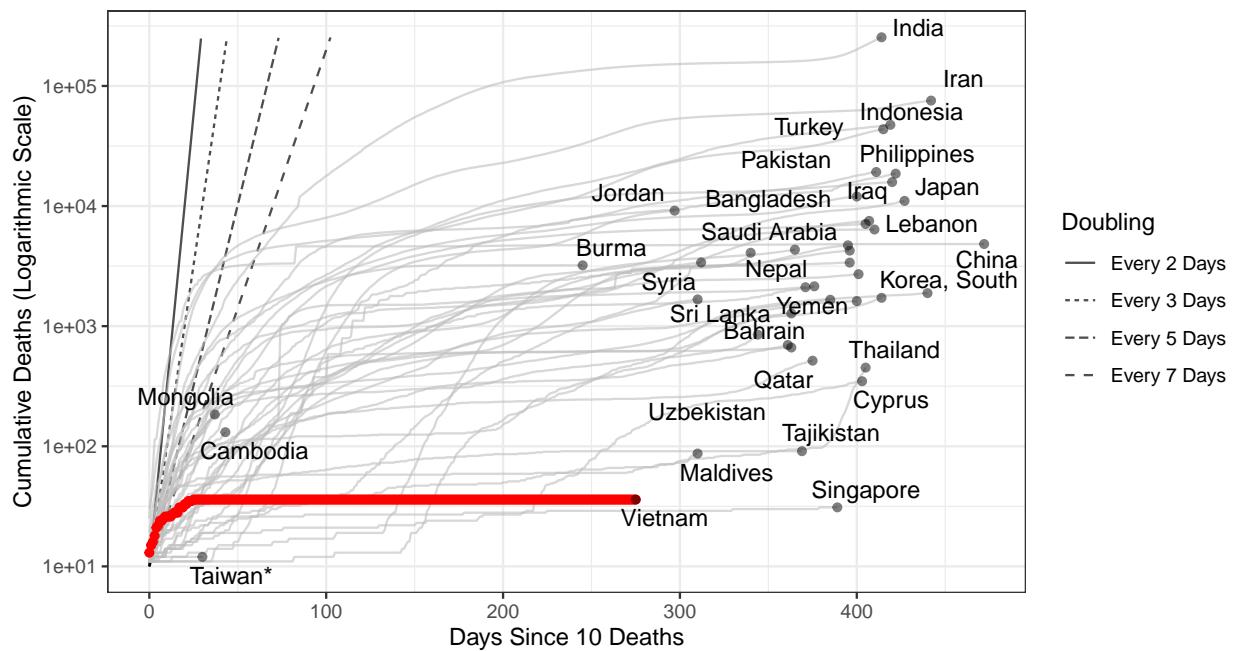


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 727 (95% CI: 600-854) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

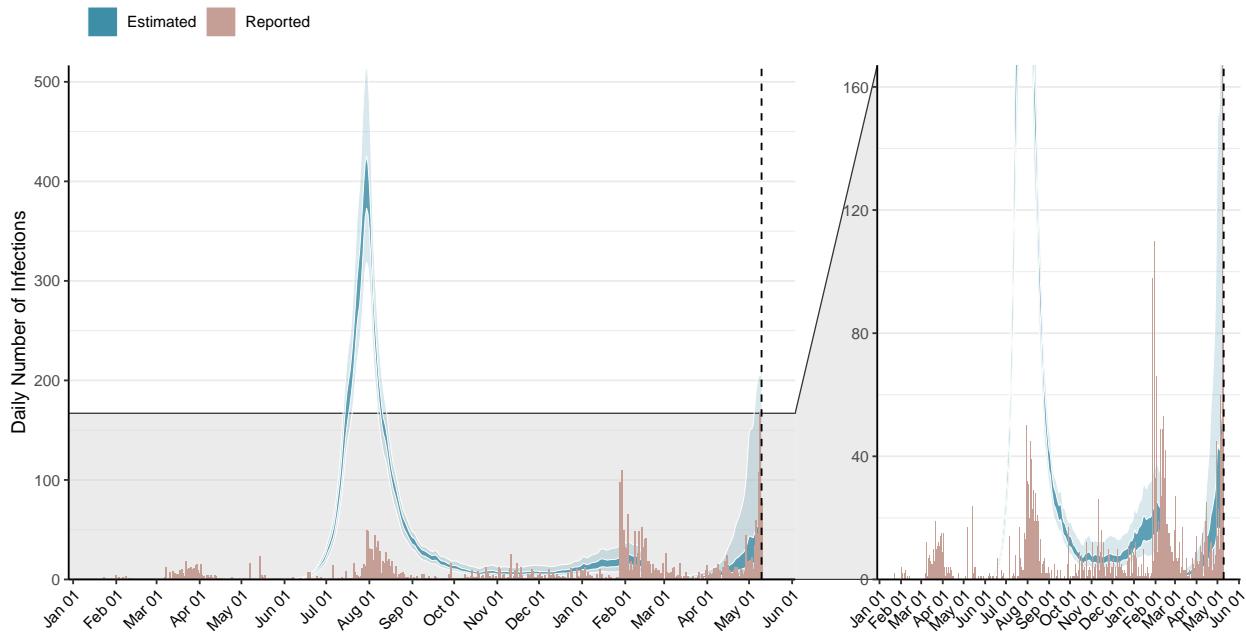
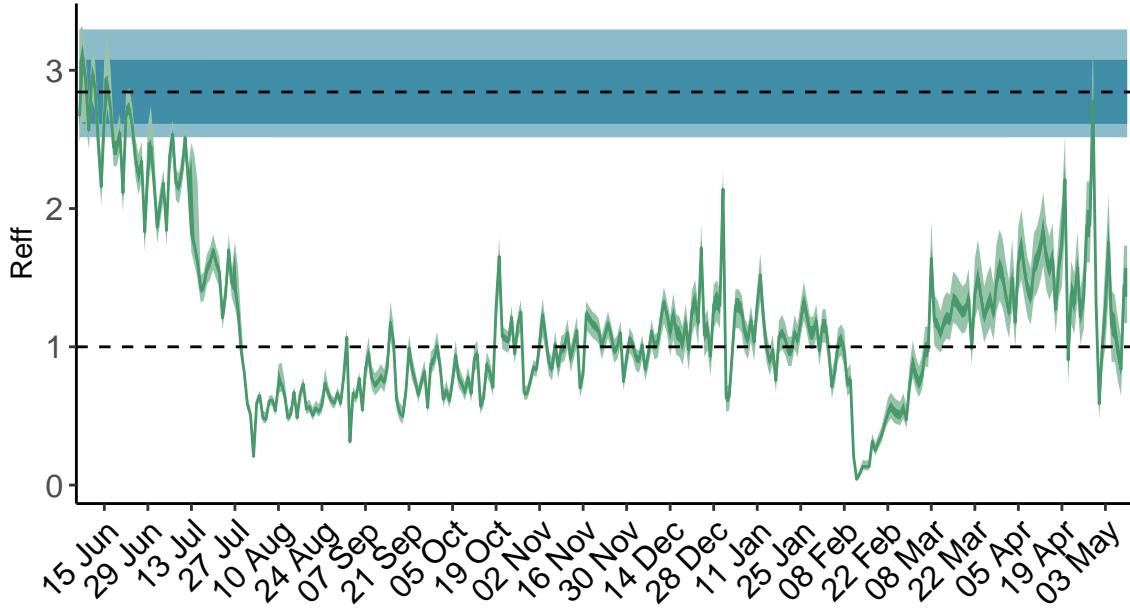


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Vietnam is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

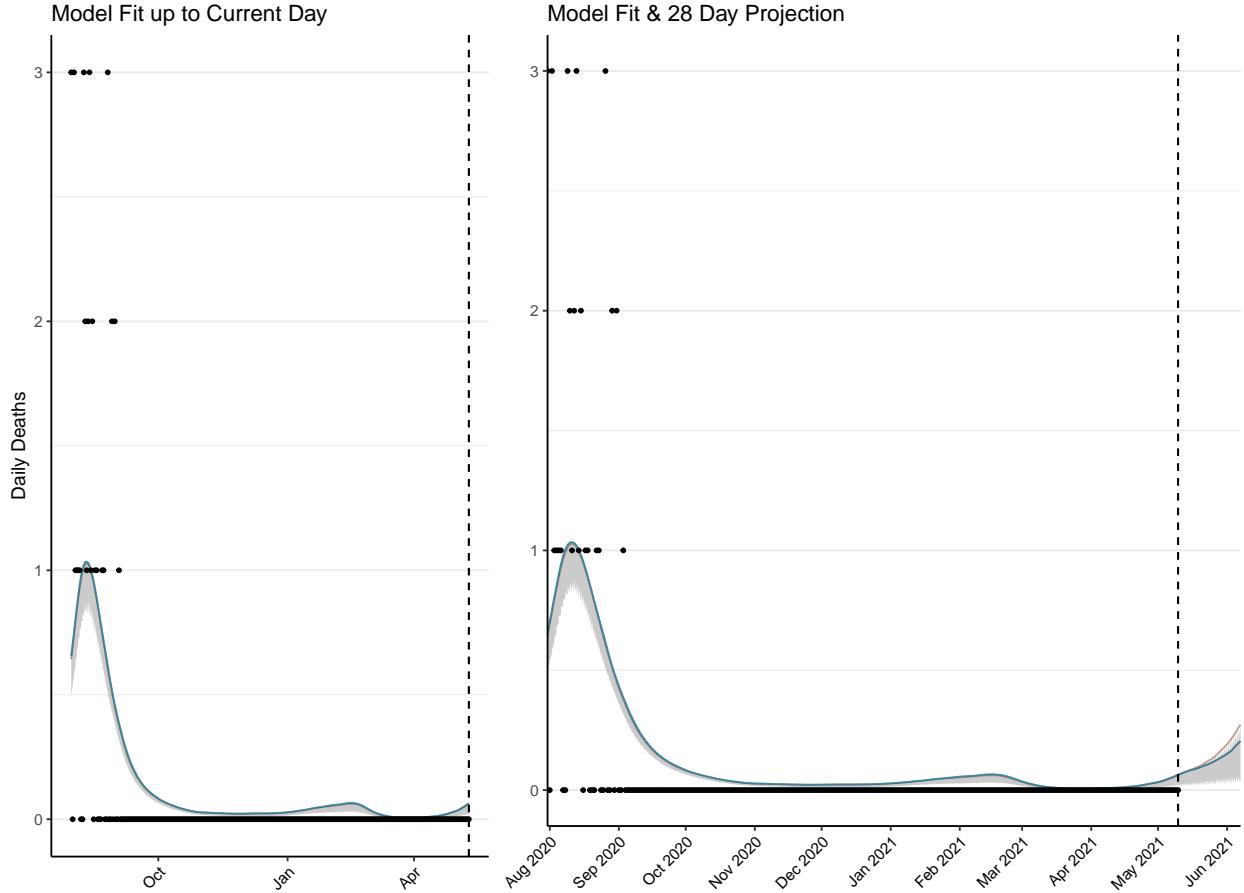


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 4 (95% CI: 3-4) patients requiring treatment with high-pressure oxygen at the current date to 22 (95% CI: 16-29) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 1 (95% CI: 1-1) patients requiring treatment with mechanical ventilation at the current date to 8 (95% CI: 5-10) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

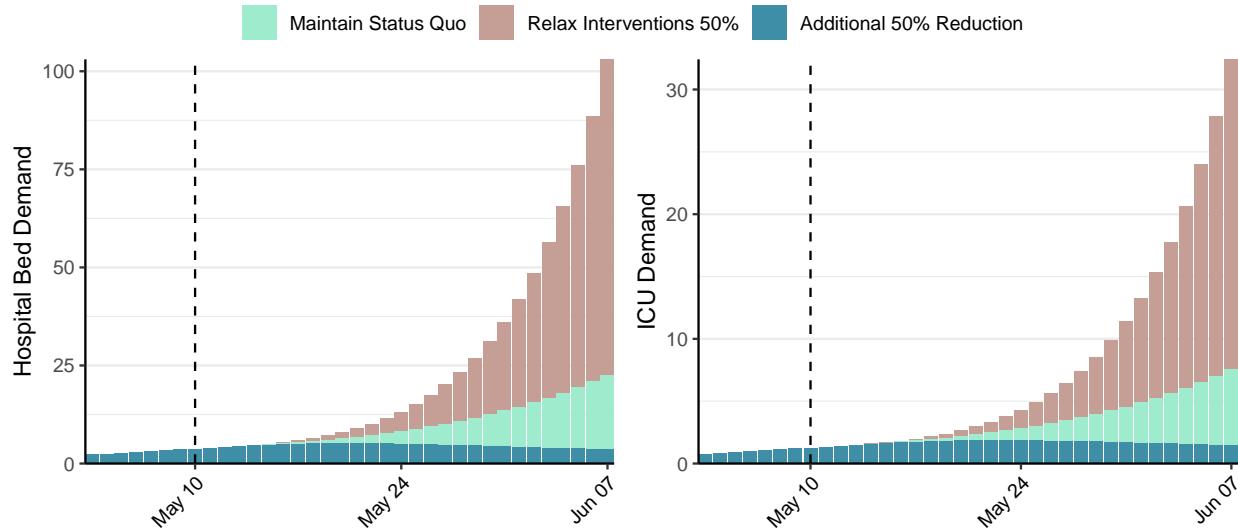


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 47 (95% CI: 37-56) at the current date to 19 (95% CI: 13-24) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 47 (95% CI: 37-56) at the current date to 3,117 (95% CI: 1,991-4,243) by 2021-06-07.

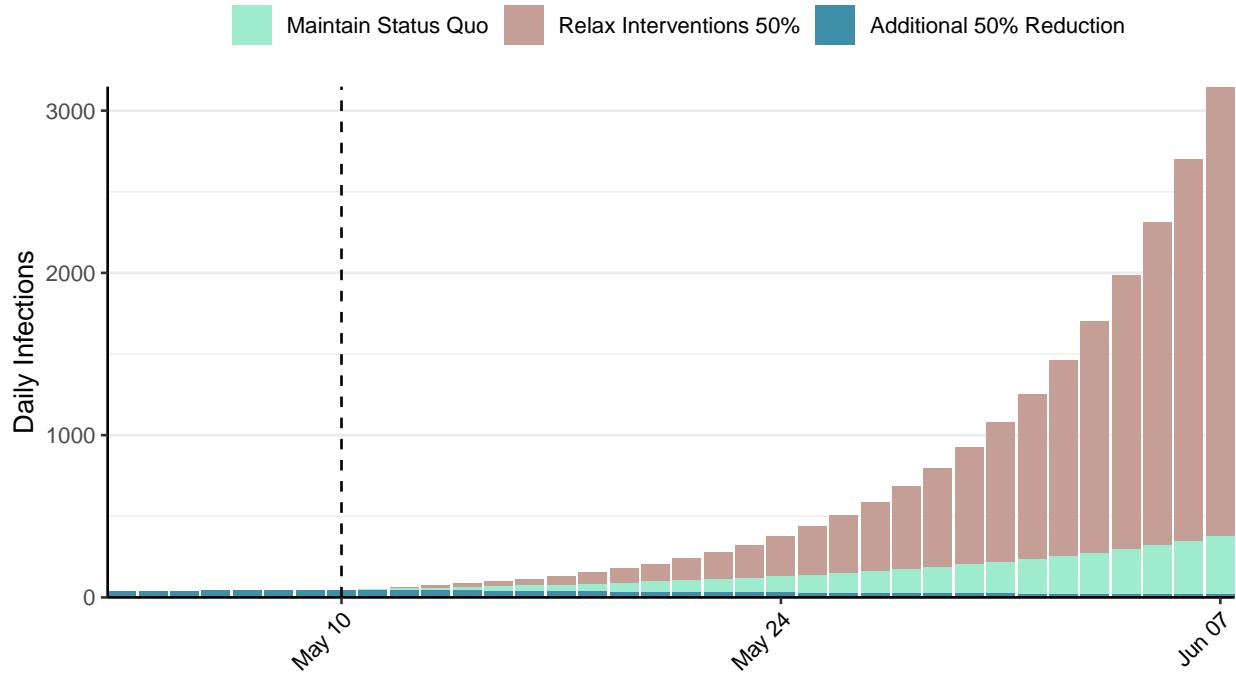


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Vanuatu, 2021-05-10

[Download the report for Vanuatu, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
4	0	1	0	2.06 (95% CI: 1.4-3.25)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease. **N.B.** Vanuatu is not shown in the following plot as only 1 deaths have been reported to date

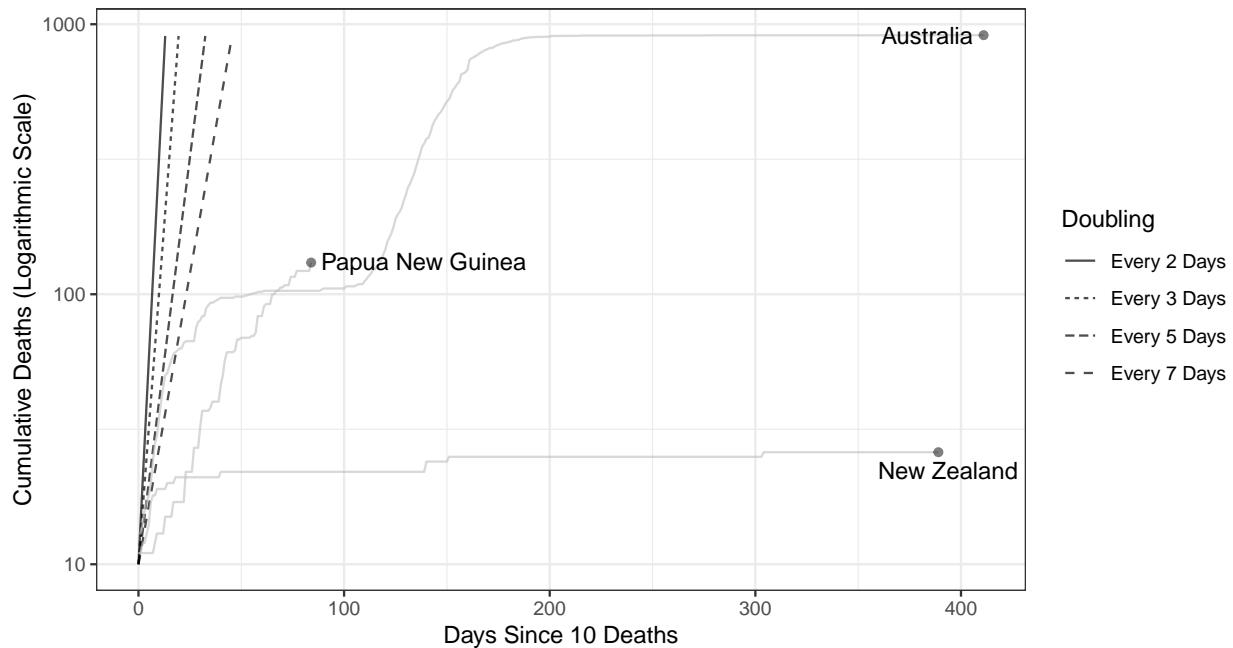


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 2,489 (95% CI: 2,029-2,949) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

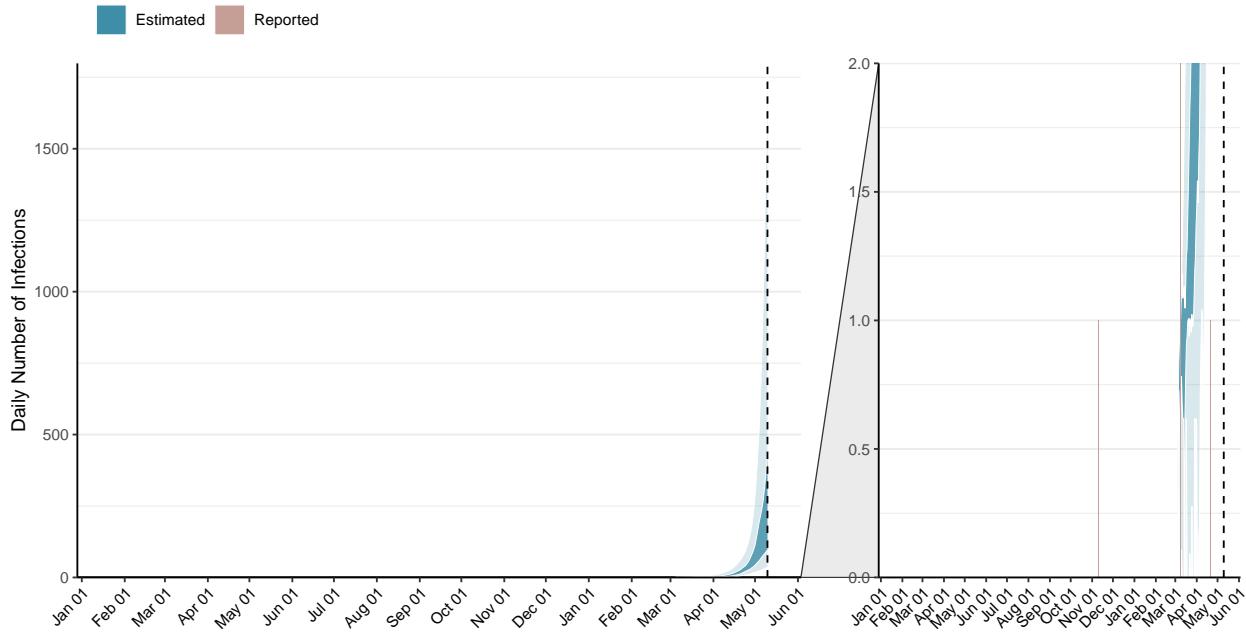
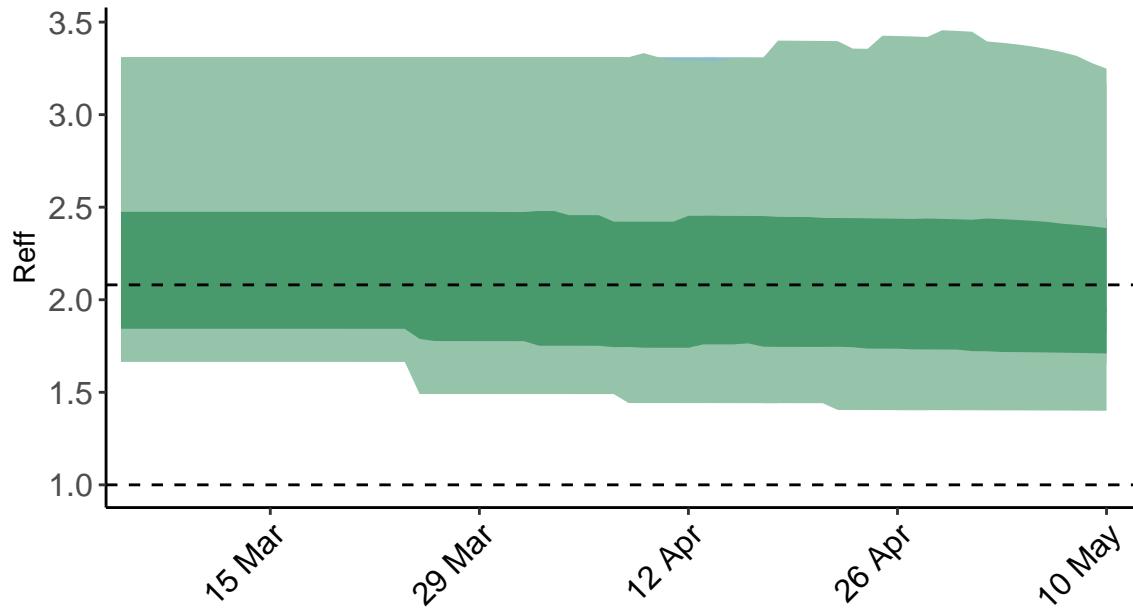


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. Vanuatu is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

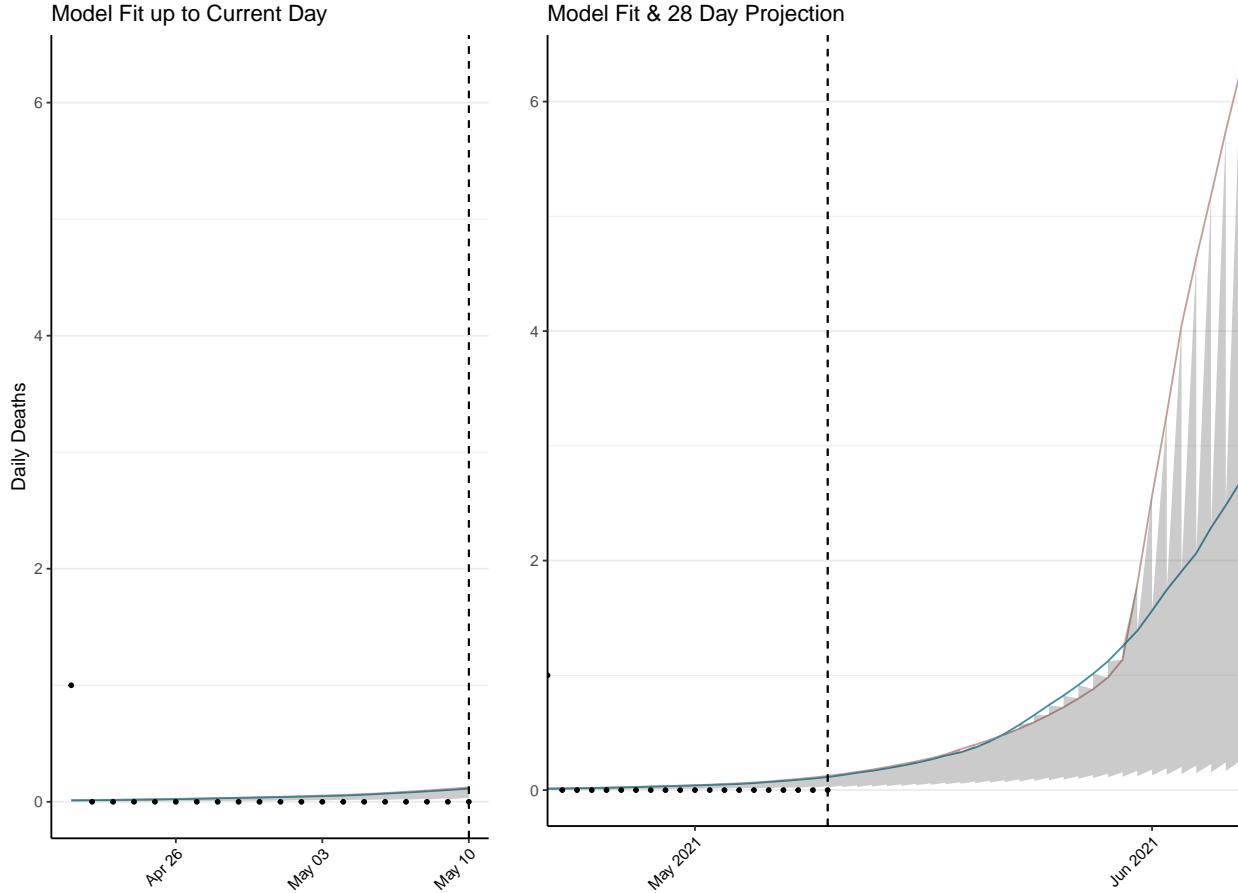


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 9 (95% CI: 8-11) patients requiring treatment with high-pressure oxygen at the current date to 247 (95% CI: 194-300) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 3 (95% CI: 2-3) patients requiring treatment with mechanical ventilation at the current date to 27 (95% CI: 24-30) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

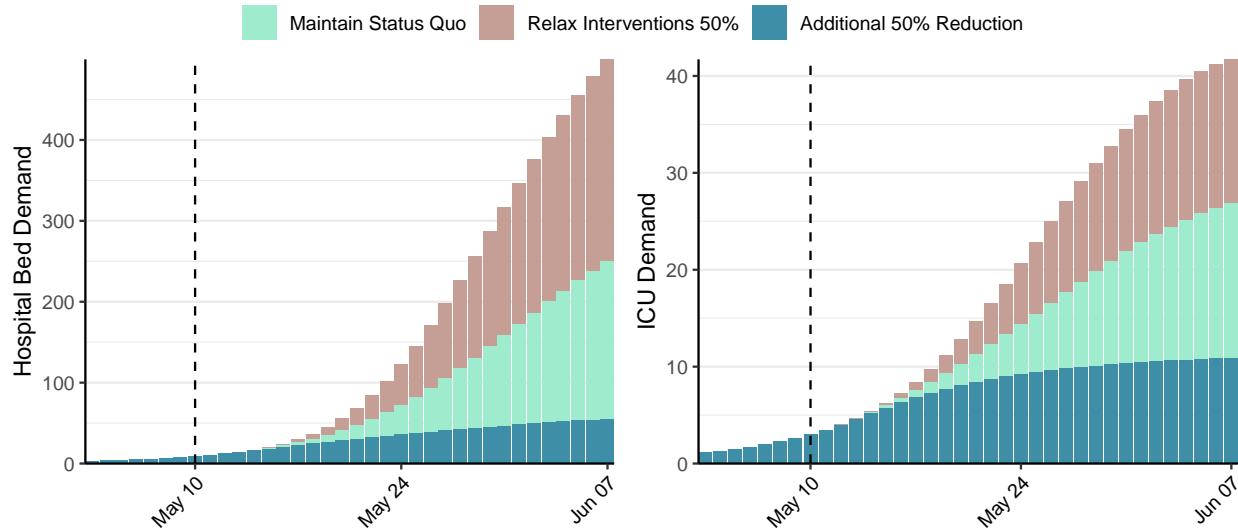


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 345 (95% CI: 261-429) at the current date to 658 (95% CI: 430-886) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 345 (95% CI: 261-429) at the current date to 7,341 (95% CI: 6,571-8,110) by 2021-06-07.

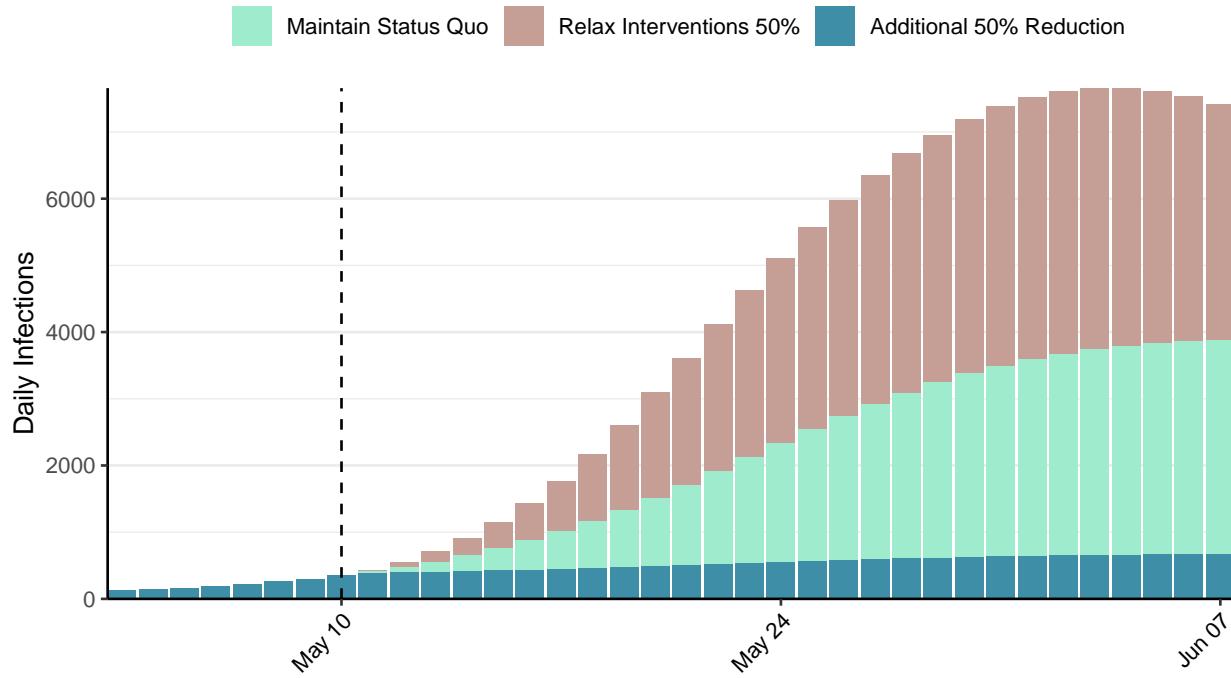


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Yemen, 2021-05-10

[Download the report for Yemen, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
6,485	3	1,275	4	0.49 (95% CI: 0.44-0.56)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

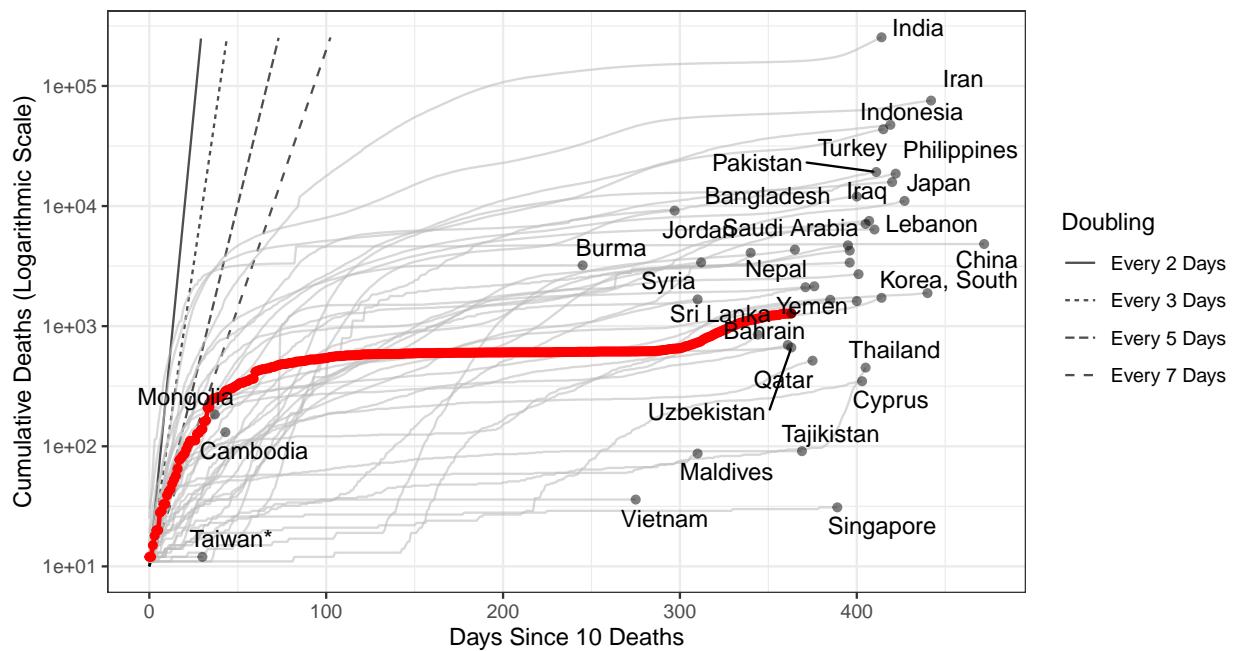


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 63,705 (95% CI: 61,365-66,046) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Yemen has revised their historic reported cases and thus have reported negative cases.**

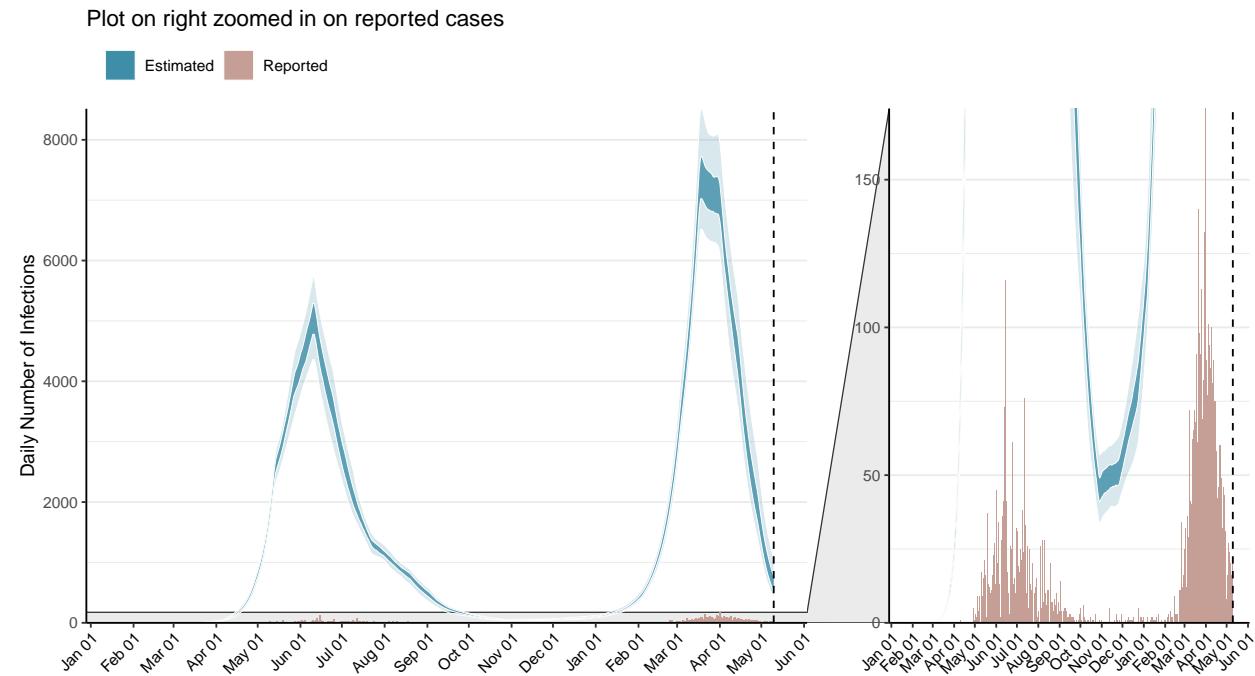
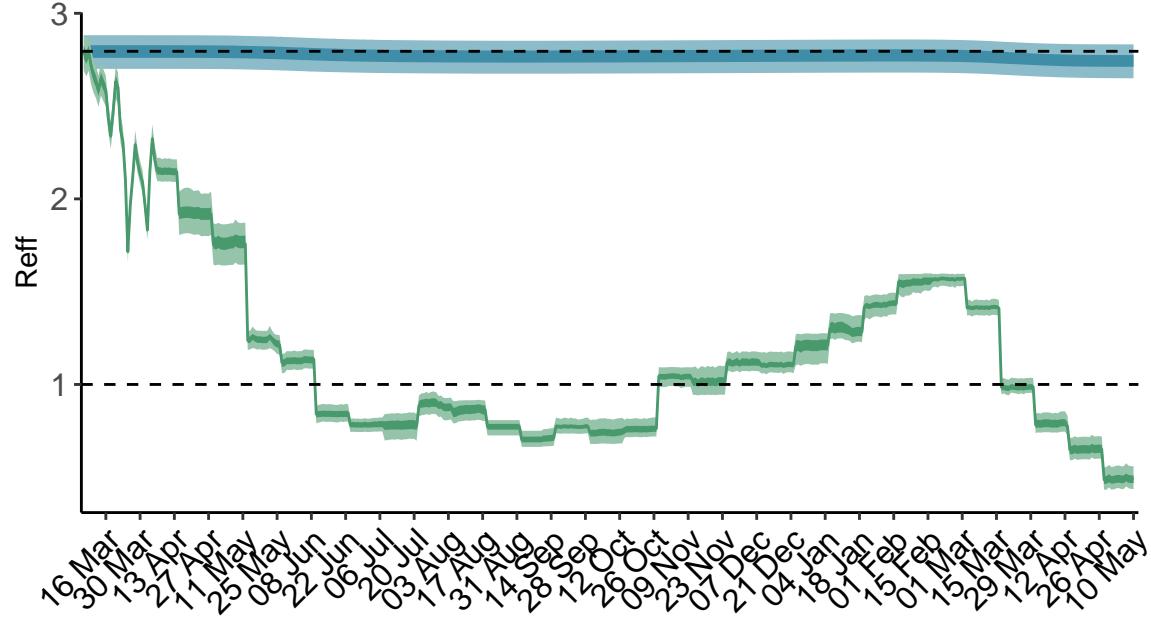


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

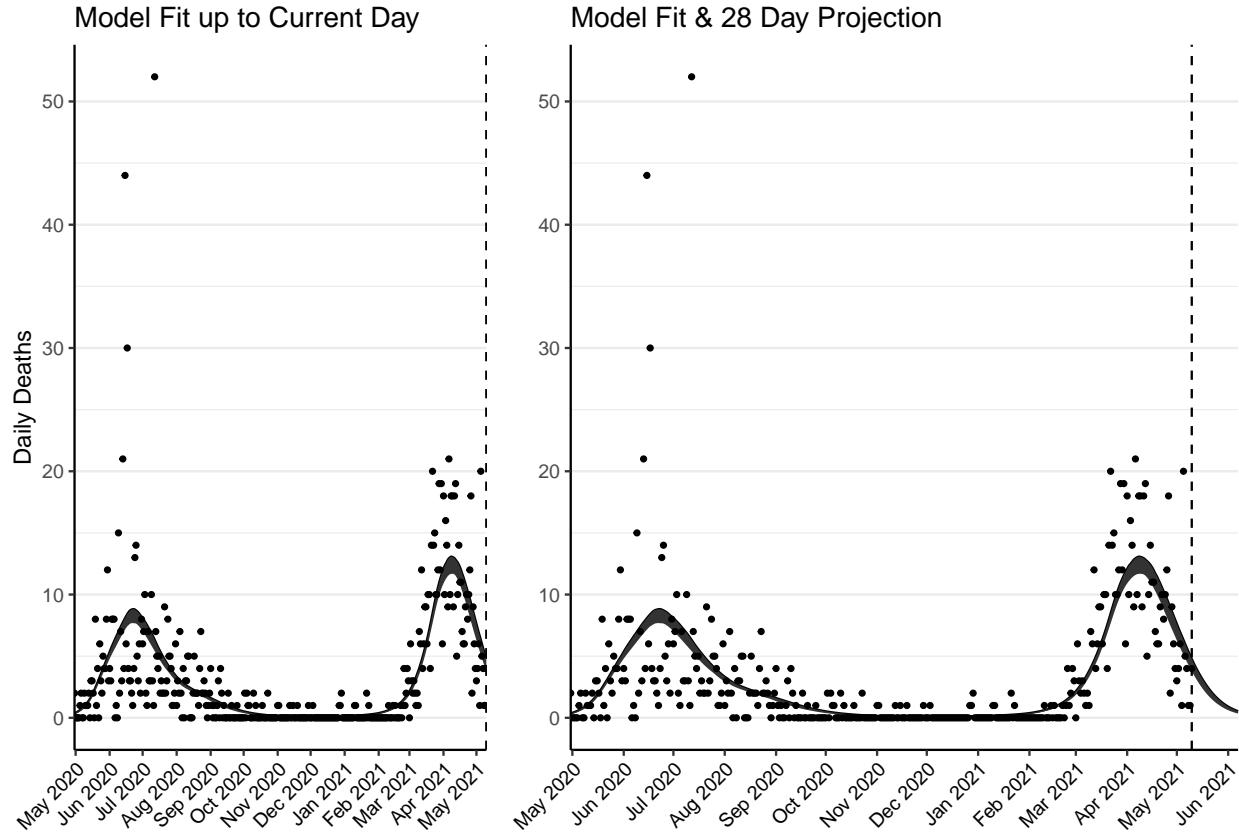


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 154 (95% CI: 148-160) patients requiring treatment with high-pressure oxygen at the current date to 16 (95% CI: 15-17) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 73 (95% CI: 70-75) patients requiring treatment with mechanical ventilation at the current date to 9 (95% CI: 9-10) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

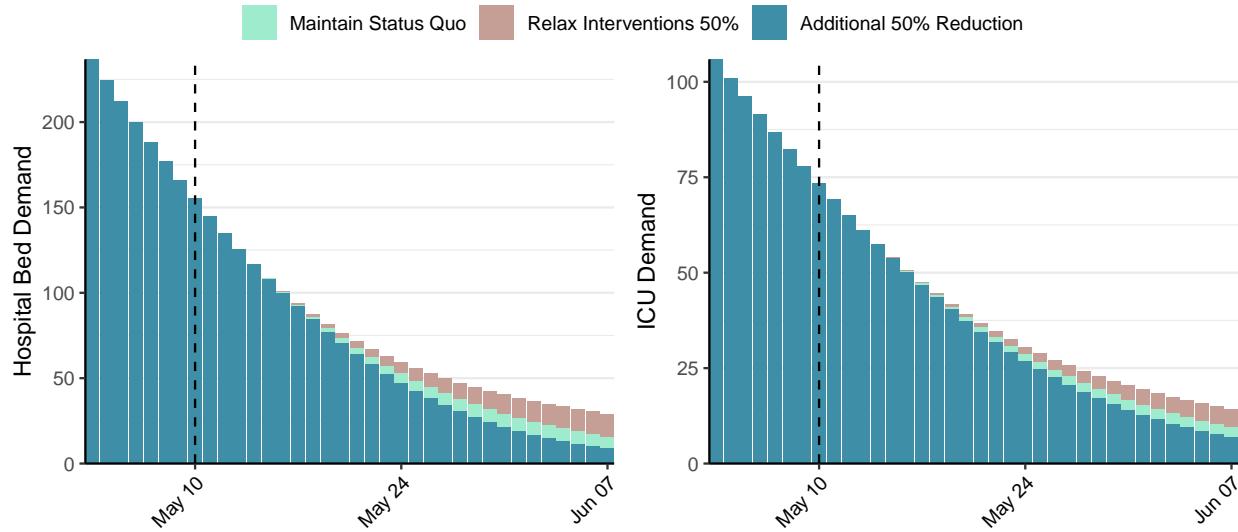
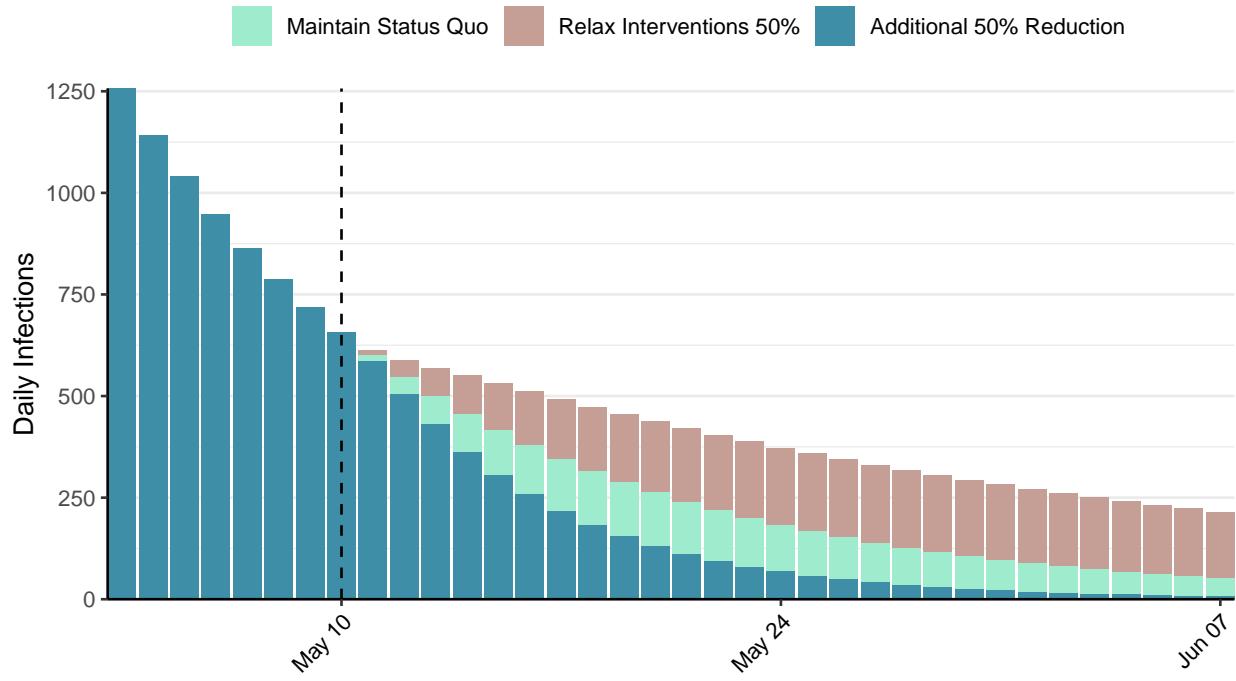


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 650 (95% CI: 612-688) at the current date to 7 (95% CI: 6-7) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 650 (95% CI: 612-688) at the current date to 213 (95% CI: 189-236) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: South Africa, 2021-05-10

[Download the report for South Africa, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
1,597,724	1,129	54,825	90	1.16 (95% CI: 1.04-1.28)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

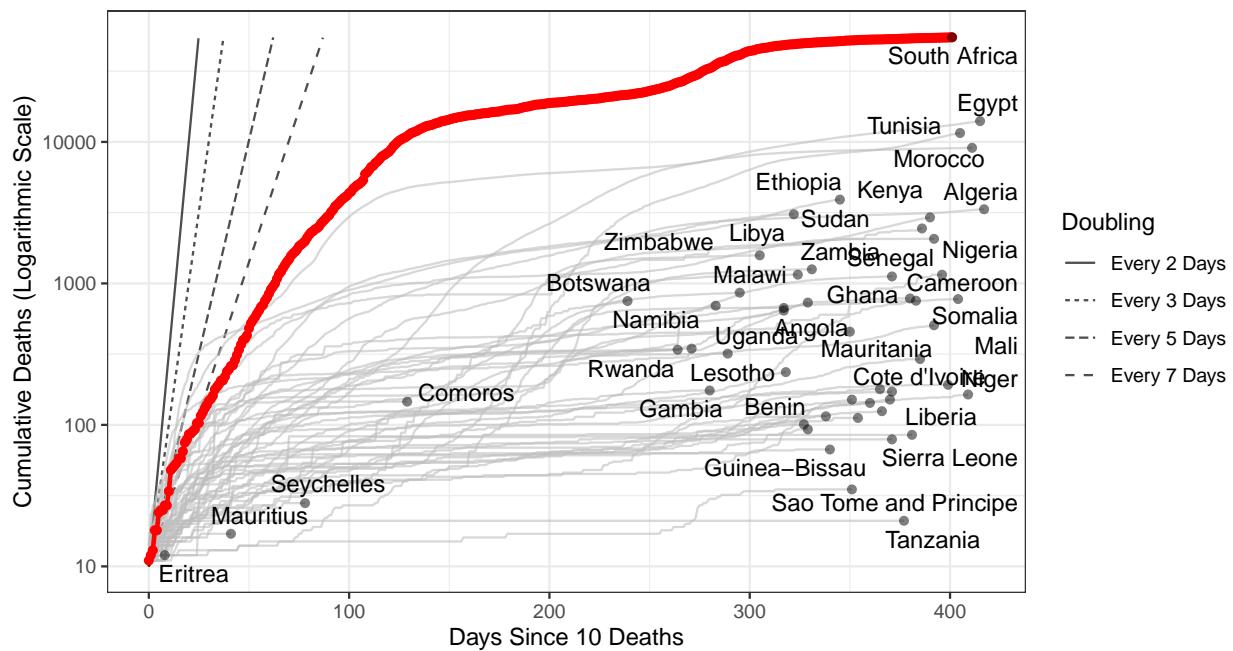


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 587,373 (95% CI: 563,102-611,645) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

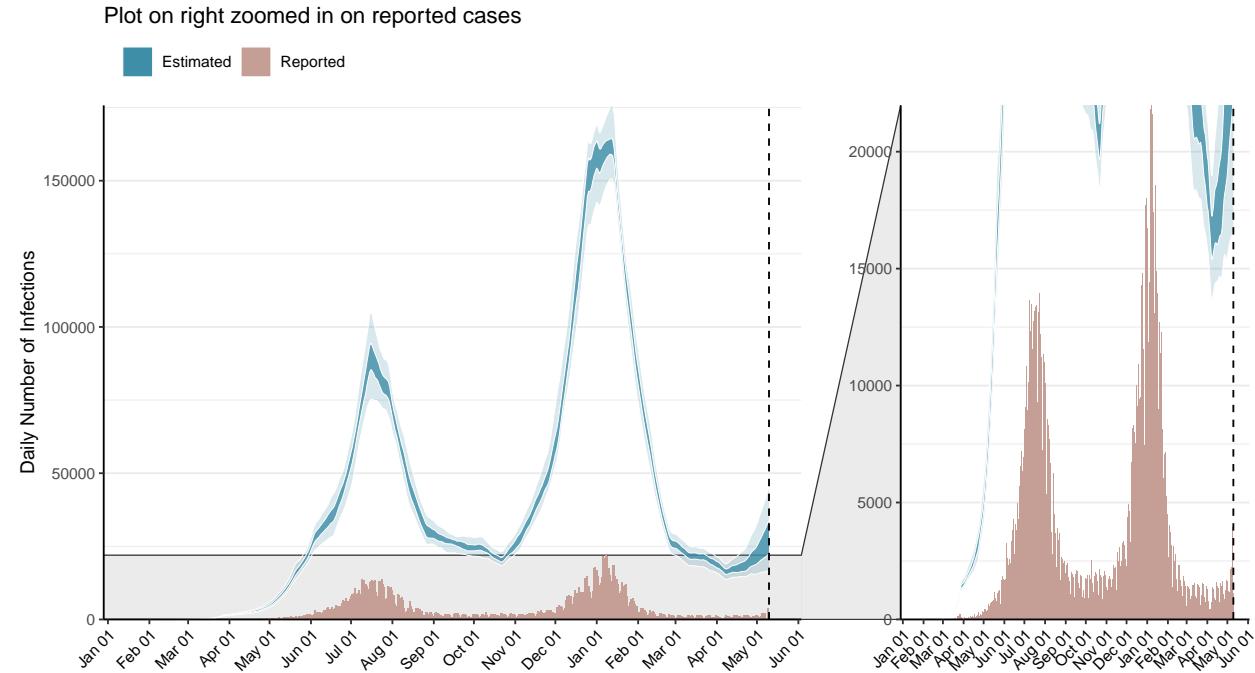
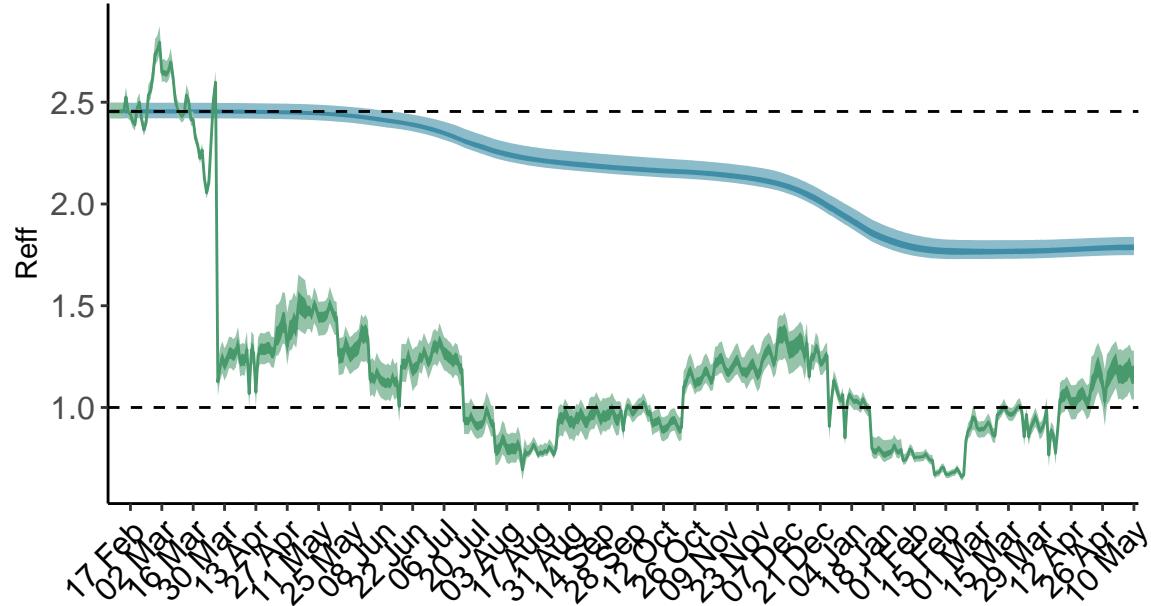


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days. **N.B. South Africa is forecast to be close to or surpassing our best estimates for healthcare capacity in the next 28 days.** Estimates of deaths in the next 28 days may be inaccurate due to our working assumptions for mortality in individuals who do not receive appropriate treatment. [See our methods for more information.](#)

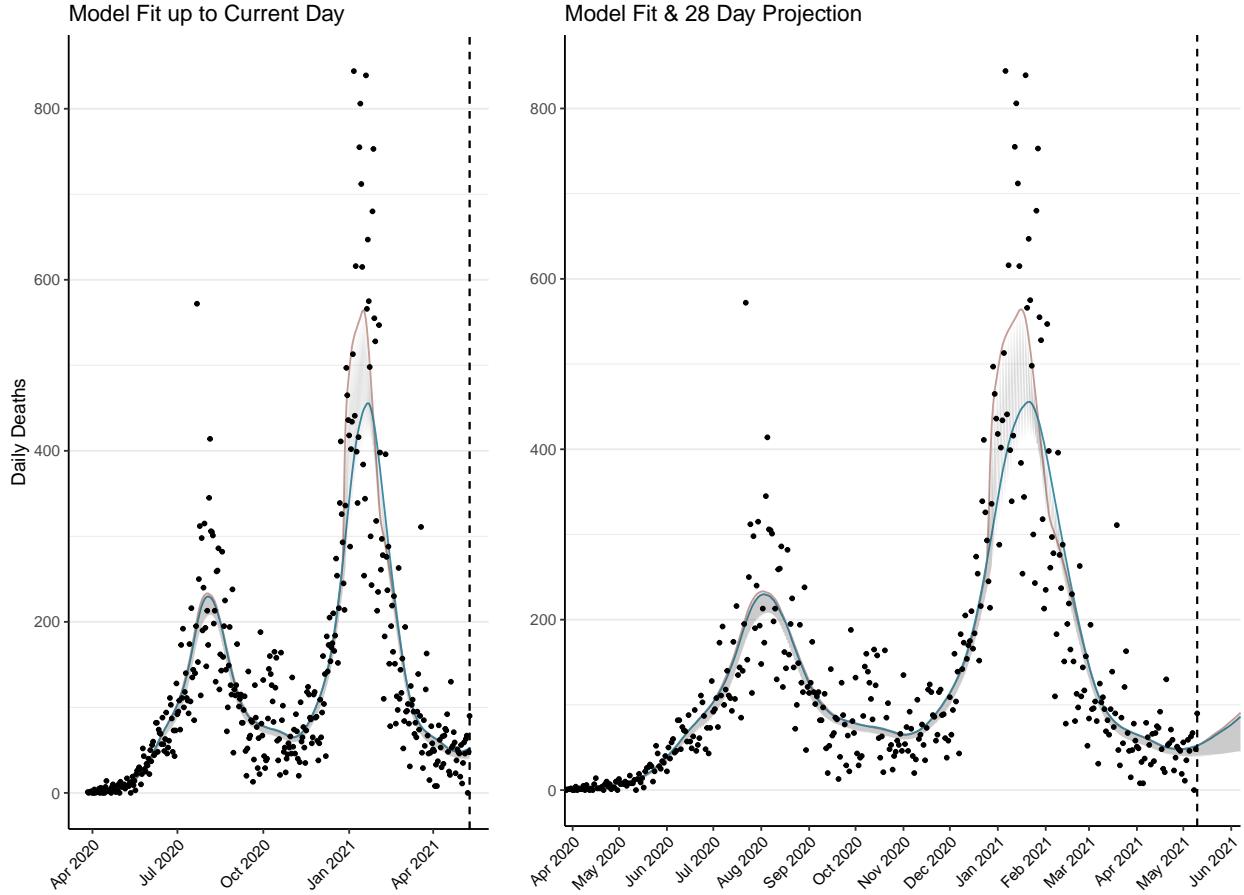


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days. The forecasted deaths in blue assumes healthcare capacity has been surged to ensure sufficient supply of ICU and hospital beds. The red curve assumes no surging in healthcare capacity and subsequently projects increased deaths.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 2,288 (95% CI: 2,190-2,386) patients requiring treatment with high-pressure oxygen at the current date to 4,316 (95% CI: 3,965-4,667) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 920 (95% CI: 883-957) patients requiring treatment with mechanical ventilation at the current date to 1,753 (95% CI: 1,615-1,891) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

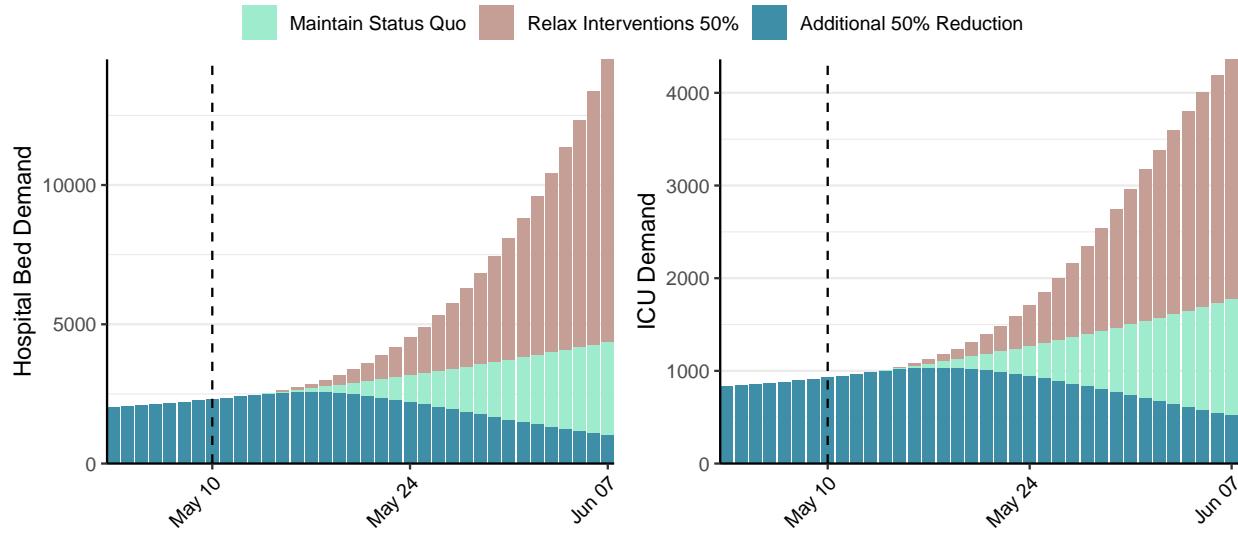
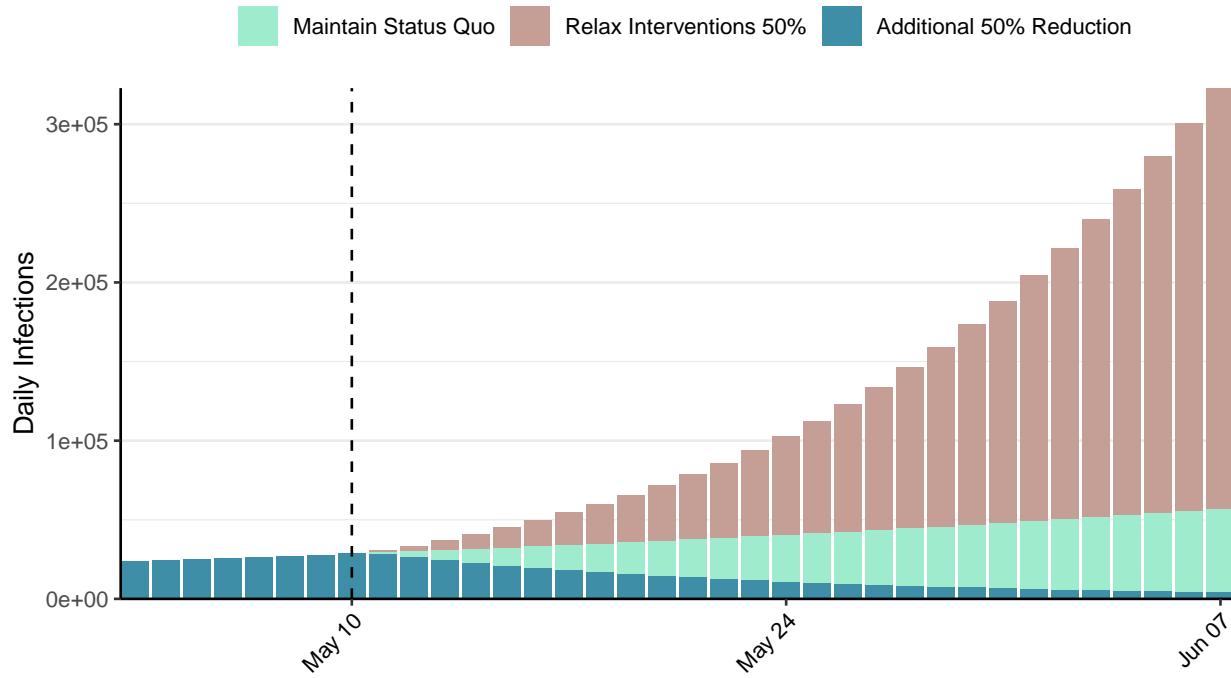


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 28,206 (95% CI: 26,581-29,830) at the current date to 3,968 (95% CI: 3,611-4,325) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 28,206 (95% CI: 26,581-29,830) at the current date to 319,613 (95% CI: 291,994-347,232) by 2021-06-07.



**Figure 6: Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Zambia, 2021-05-10

[Download the report for Zambia, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
92,112	20	1,257	0	0.98 (95% CI: 0.83-1.14)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

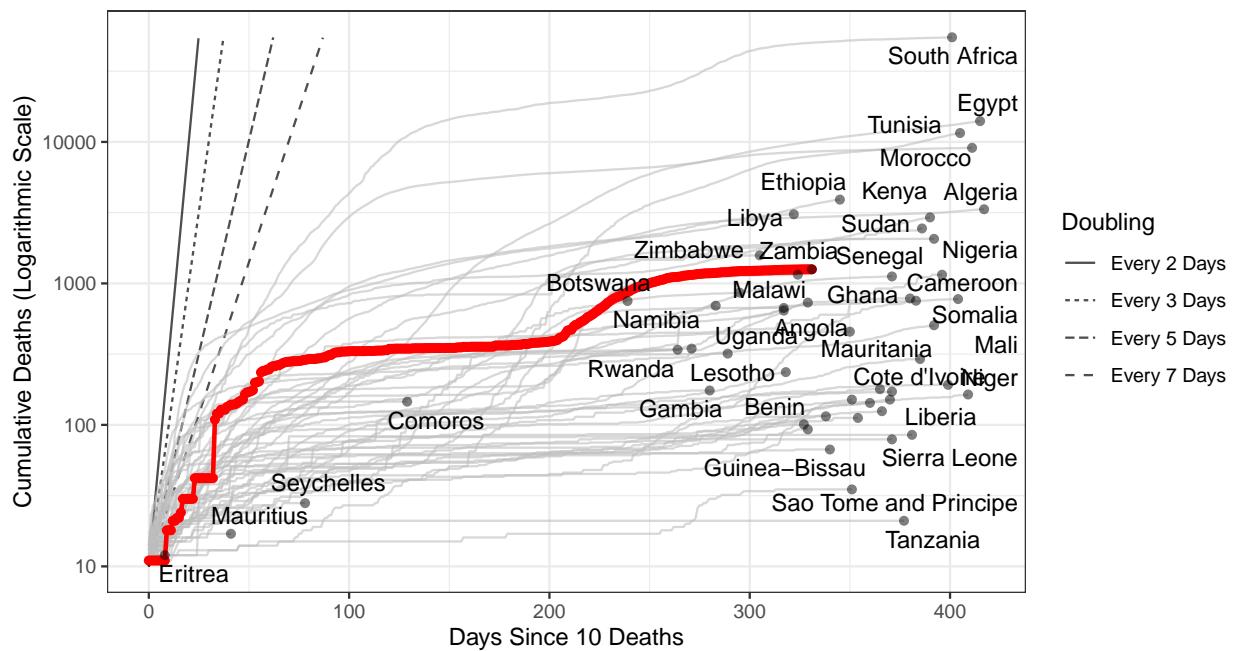


Figure 1: Cumulative Deaths since 10 deaths. Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 11,519 (95% CI: 10,978-12,061) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match).

Plot on right zoomed in on reported cases

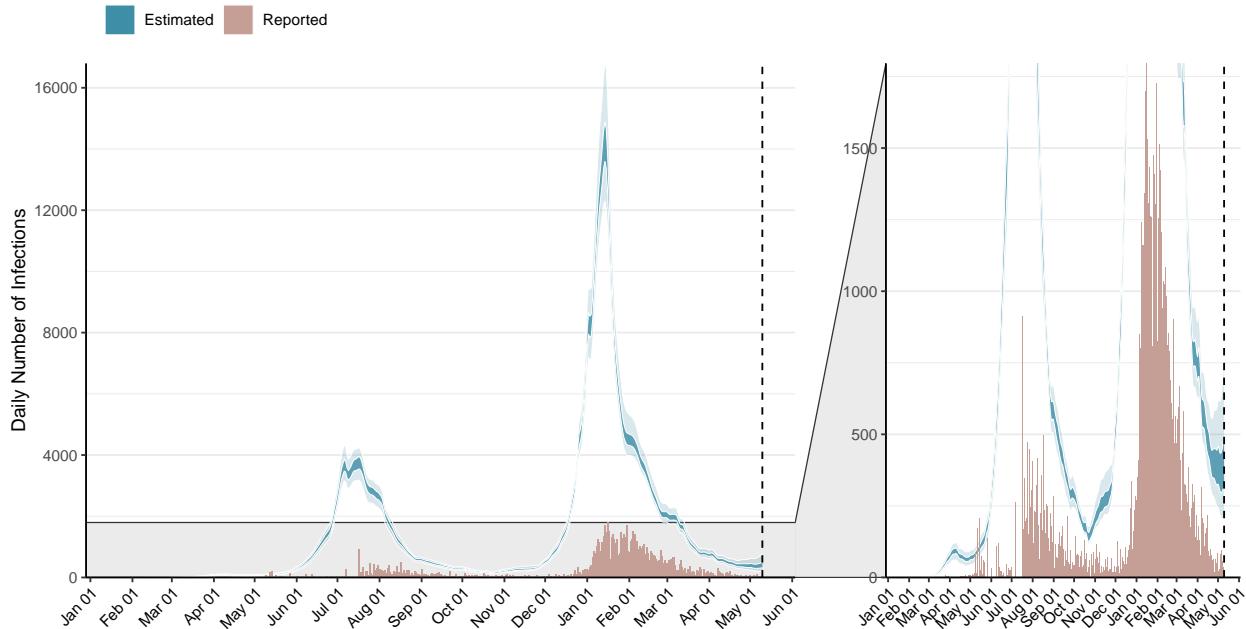
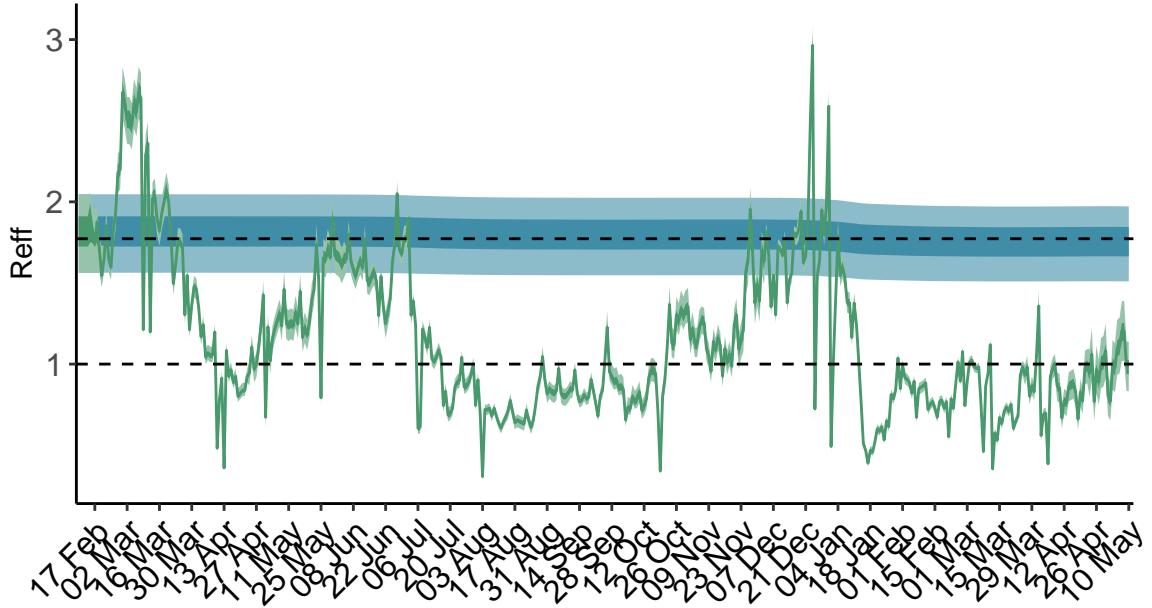


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in **blue** shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

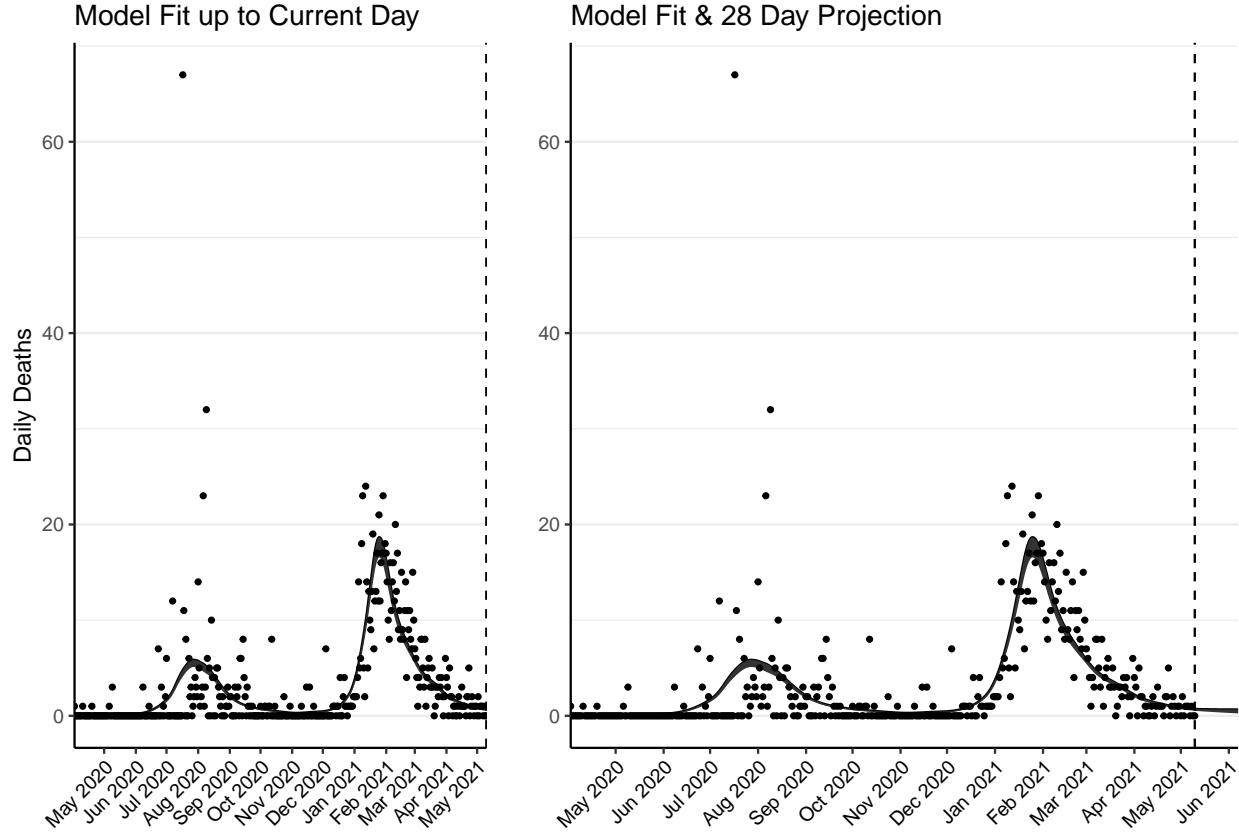


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 29 (95% CI: 27-30) patients requiring treatment with high-pressure oxygen at the current date to 30 (95% CI: 27-34) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 12 (95% CI: 11-12) patients requiring treatment with mechanical ventilation at the current date to 12 (95% CI: 11-13) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

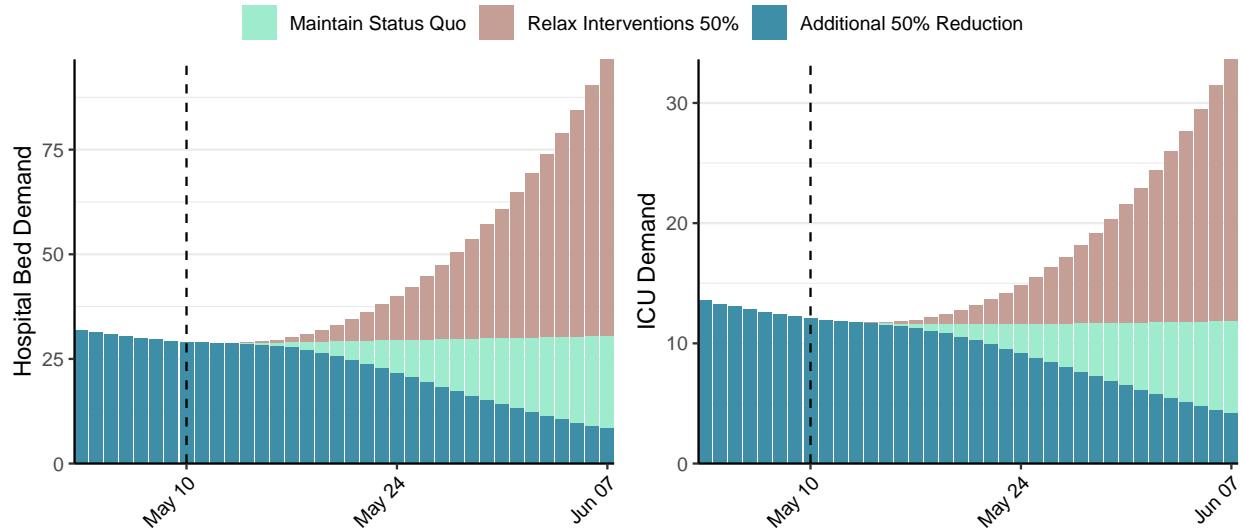


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 411 (95% CI: 381-442) at the current date to 34 (95% CI: 30-38) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 411 (95% CI: 381-442) at the current date to 2,686 (95% CI: 2,283-3,089) by 2021-06-07.

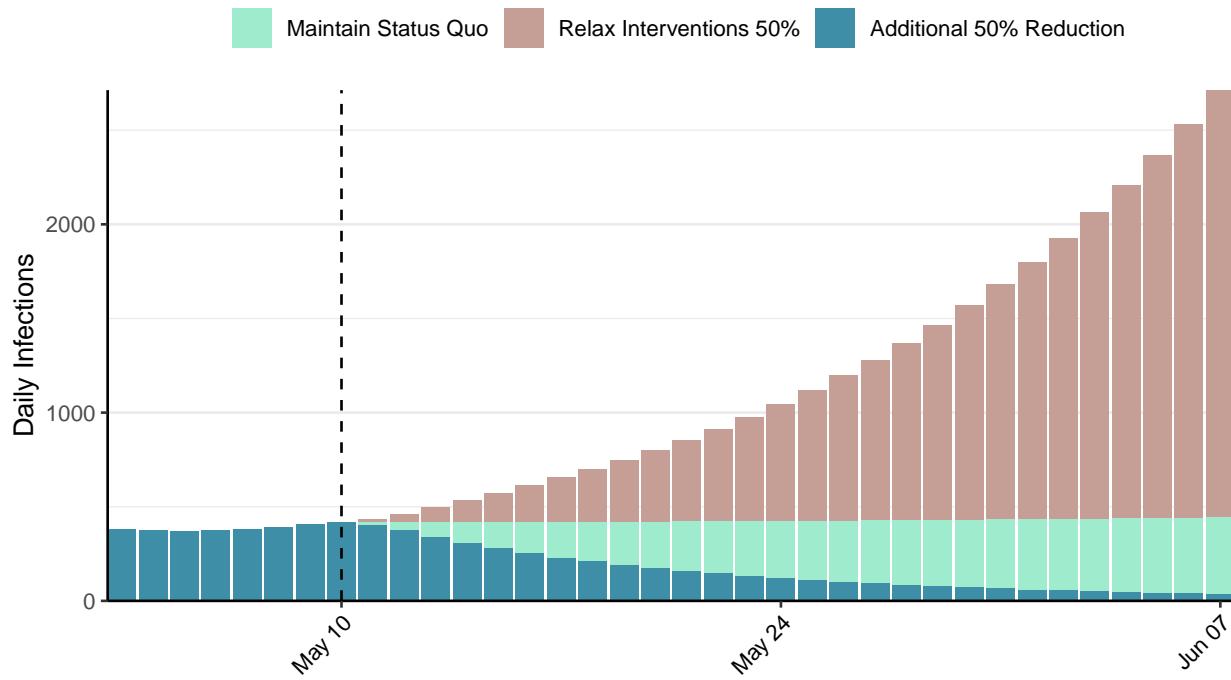


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.

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## Situation Report for COVID-19: Zimbabwe, 2021-05-10

[Download the report for Zimbabwe, 2021-05-10 here.](#) This report uses data from COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. These data are updated daily and whilst there may be a short delay, they are generally consistent with Ministry reports. These data are then used to back-calculate an ‘inferred number of COVID-19 infections’ using mathematical modelling techniques (see [Report 12](#) for further details) to estimate the number of people that have been infected and to make short-term projections for future healthcare needs.

### Epidemiological Situation

Total Reported Cases	New Reported Cases	Total Reported Deaths	New Reported Deaths	Estimated $R_{eff}$
38,433	14	1,576	0	1.07 (95% CI: 0.97-1.16)

The figure below shows the cumulative reported deaths as a function of the time since the 10th death was reported. Dashed lines show the expected trajectory for different doubling times of the epidemic. For example, with a doubling time of 3 days, if there are currently a total of 20 deaths reported, we would expect there to be 40 deaths in total reported in 3 days-time, 80 deaths in 6 days-time, 160 deaths in 9 days-time etc. For most epidemics, in the absence of interventions, we expect a doubling time of 3-4 days for this disease.

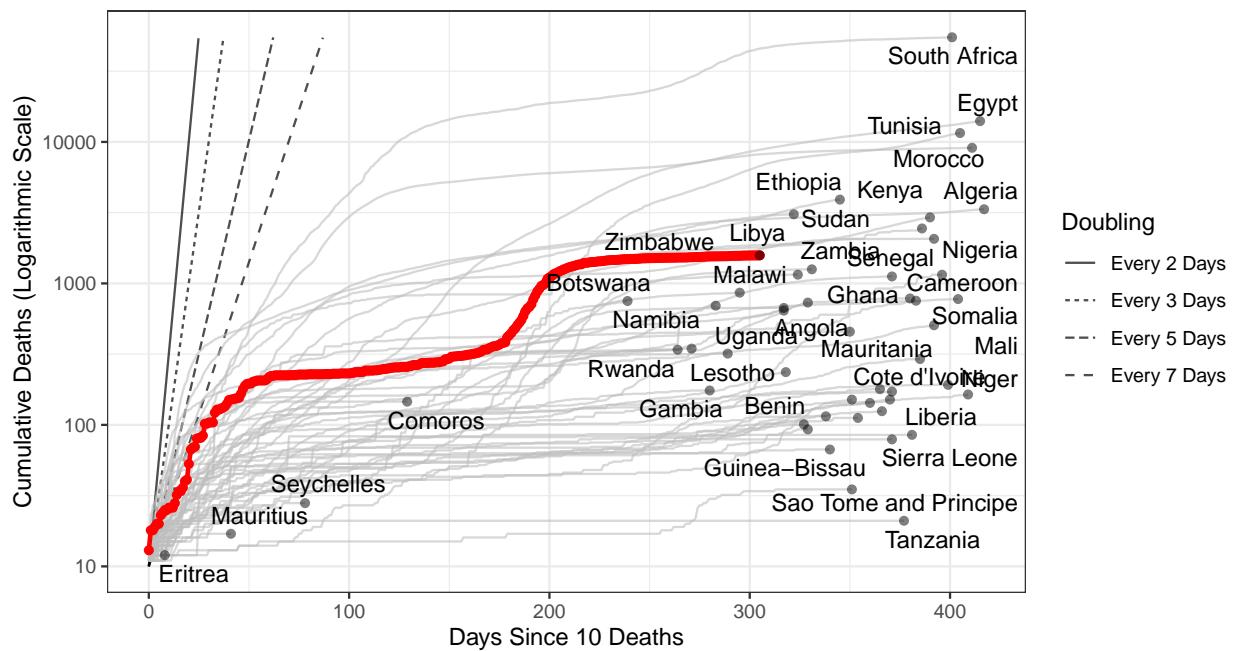


Figure 1: **Cumulative Deaths since 10 deaths.** Country not shown if fewer than 10 deaths.

## COVID-19 Transmission Modelling

The figure below shows the estimated number of people infected over the past 4 weeks. The bar charts show, for comparison, the number of reported cases. We estimate that there has been a total of 15,800 (95% CI: 15,184-16,416) infections over the past 4 weeks. The right-hand plot shows these data on a different scale as the estimated infections are likely to be much larger than the reported cases. **Importantly**, the estimated infections includes both asymptomatic and mild cases that would not necessarily be identified through surveillance. Consequently, the estimated infections are likely to be significantly higher than the reported cases in all countries (see our [FAQ](#) for further explanation of these differences and why the reported cases and estimated infections are unlikely to match). **N.B. Zimbabwe has revised their historic reported cases and thus have reported negative cases.**

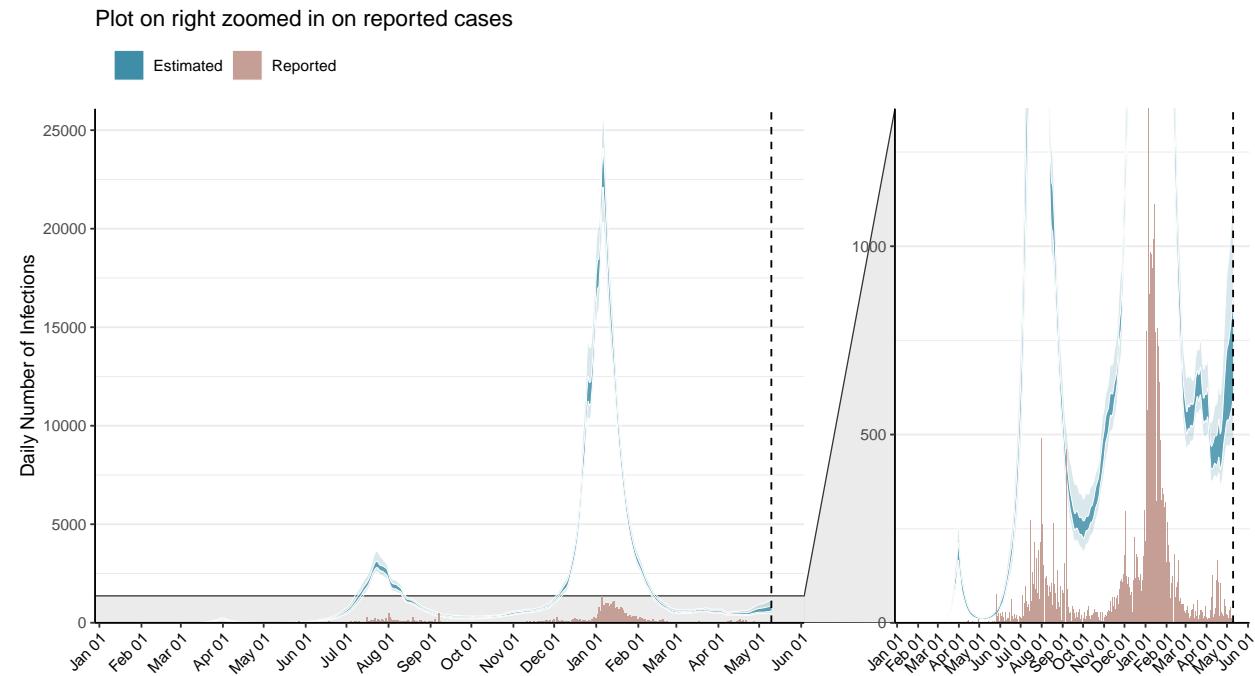
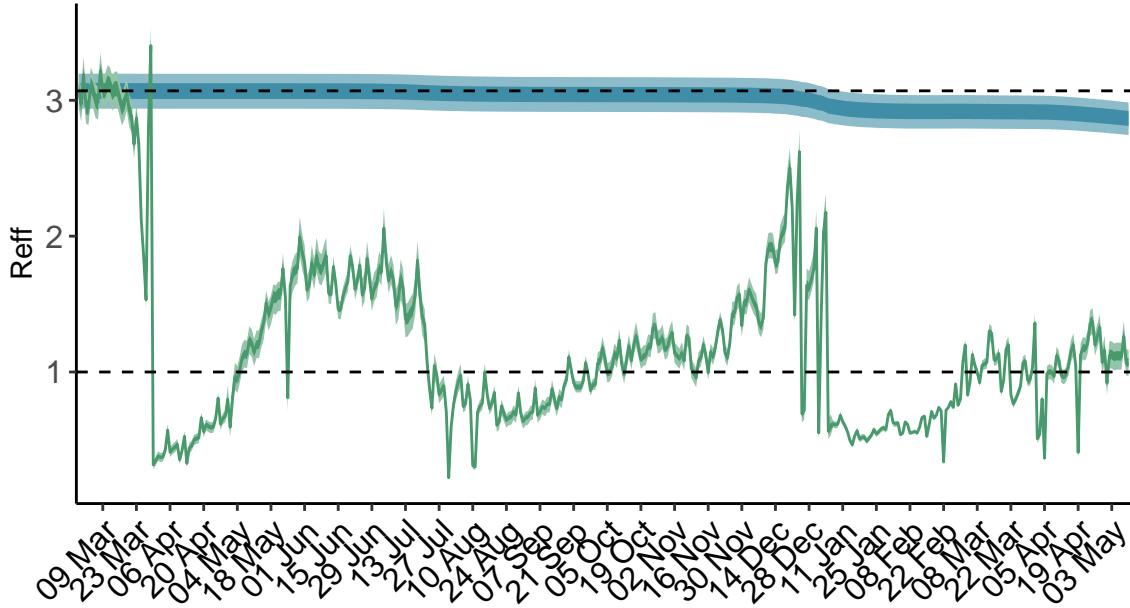


Figure 2: **Daily number of infections estimated by fitting to the current total of deaths.** Reported cases are shown in red. Model estimated infections are shown in blue (dark blue 50% interquartile range, light blue 95% quantile). The dashed line shows the current day.

By fitting to the time series of deaths, we are able to estimate a time-varying reproduction number,  $R_{eff}$ .  $R_{eff}$  is the average number of secondary infections caused by a single infected person at a given time. If  $R_{eff}$  is above 1, the rate of transmission is increasing and the number of new infections is increasing.  $R_{eff}$  is assumed to change in relation to mobility fall in proportion. When fitting our model we assume that 100% of COVID-19 related deaths have been reported (please see our [FAQ](#) section for more information about this assumption). Additionally, we assume that infection with COVID-19 leads to protective immunity that does not wane within the time scales considered in these analyses.



**Figure 3: Time-varying effective reproduction number,  $R_{eff}$ .**  $R_{eff}$  (green) is the average number of secondary infections caused by a single infected person at time equal to  $t$ . A horizontal dashed line is shown at  $R_{eff} = 1$ .  $R_{eff} < 1$  indicates a slowing epidemic in which new infections are not increasing.  $R_{eff} > 1$  indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI. The curve in blue shows the predicted decrease in  $R_{eff}$  due to increasing immunity in the population resulting from people being infected by COVID-19. Dark blue shows the 50% CI and light blue shows the 95% CI. Individuals infected with COVID-19 are assumed to remain immune within our analysis. The upper horizontal dashed line shows the value of  $R_{eff}$  at the beginning of the epidemic, highlighting the impact of immunity on transmission.

Using the model fit, we can forecast the expected trajectory for cumulative deaths assuming the transmission level, represented by the final Rt value stays the same over the next 28 days.

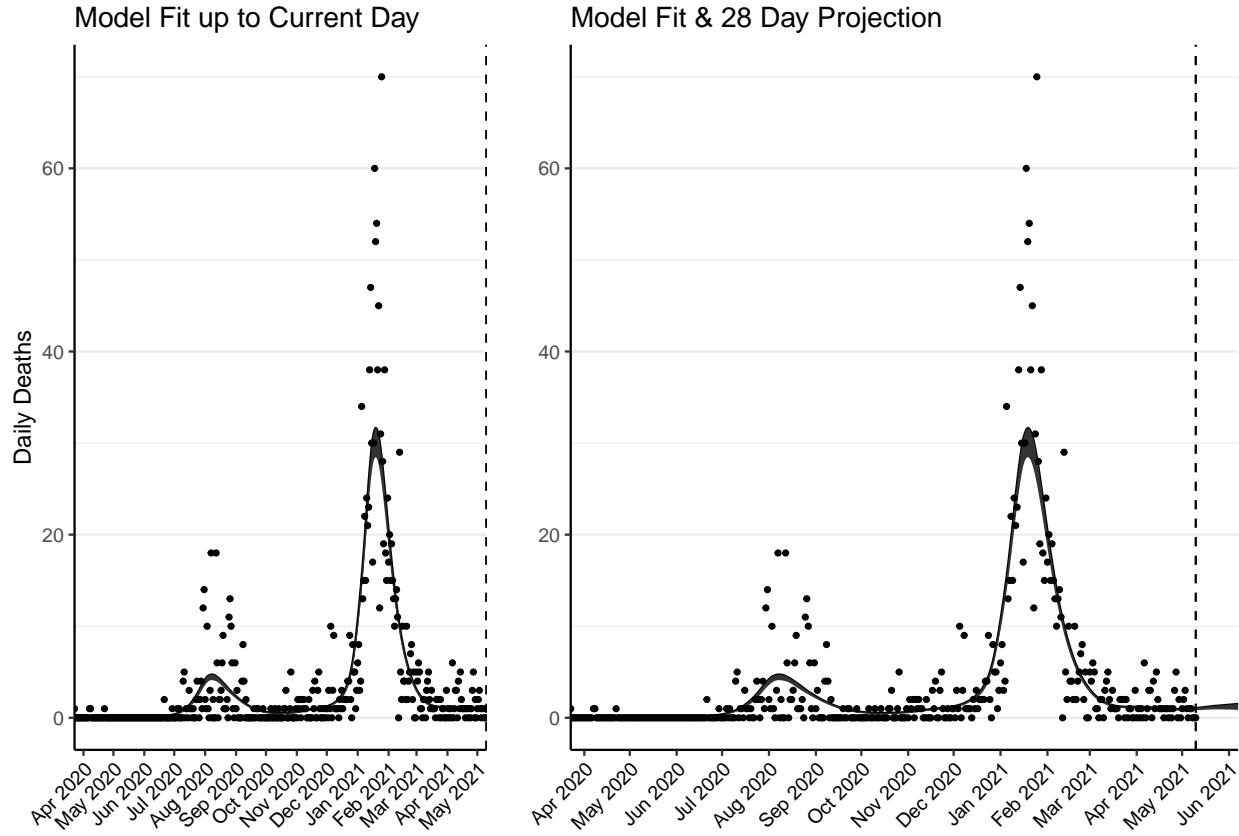


Figure 4: **Estimated daily deaths.** Projected deaths assuming the current level of interventions are maintained are shown in red (median and 95% quantile). Reported deaths are plotted in black. The plot on the left is focussed on the model fit prior to today, while the plot on the right forecasts the next 28 days.

## Short-term Epidemic Scenarios

We make the following short-term projections of healthcare demand and new infections under the following three scenarios:

- **Scenario 1.** The epidemic continues to grow at the current rate.
- **Scenario 2.** Countries will further scale up interventions (either increasing current strategies or implementing new interventions) leading to a further 50% reduction in transmission.
- **Scenario 3.** Countries will relax current interventions by 50%

**N.B.** These scenarios currently assume that the impact of mobility on transmission will remain the same in the future as it has in the past. We are working to extend methods to estimate the impact of increases in mobility on transmission as lockdown and interventions are reversed. Consequently, projection are likely to represent an upper estimate of the healthcare demand and case load for each scenario

We estimate that over the next 4 weeks demand for hospital beds will change from 45 (95% CI: 44-47) patients requiring treatment with high-pressure oxygen at the current date to 66 (95% CI: 61-71) hospital beds being required on 2021-06-07 if no further interventions are introduced (Scenario 1). Similarly, we estimate that over the next 4 weeks demand for critical care (ICU) beds will change from 17 (95% CI: 16-18) patients requiring treatment with mechanical ventilation at the current date to 25 (95% CI: 23-27) by 2021-06-07. These projections assume that approximately 5% of all infections will require treatment with high-pressure oxygen and that approximately 30% of hospitalised cases will require treatment with mechanical ventilation (based on analysis of ongoing epidemics in Europe). **N.B. These scenarios are unlikely to show significant differences for the first week since there is a delay of approximately 10 days between infection and hospital admission. Consequently, the effectiveness of a change in policy is likely to be better captured by hospital admission data approximately 2 weeks after the policy change is implemented.**

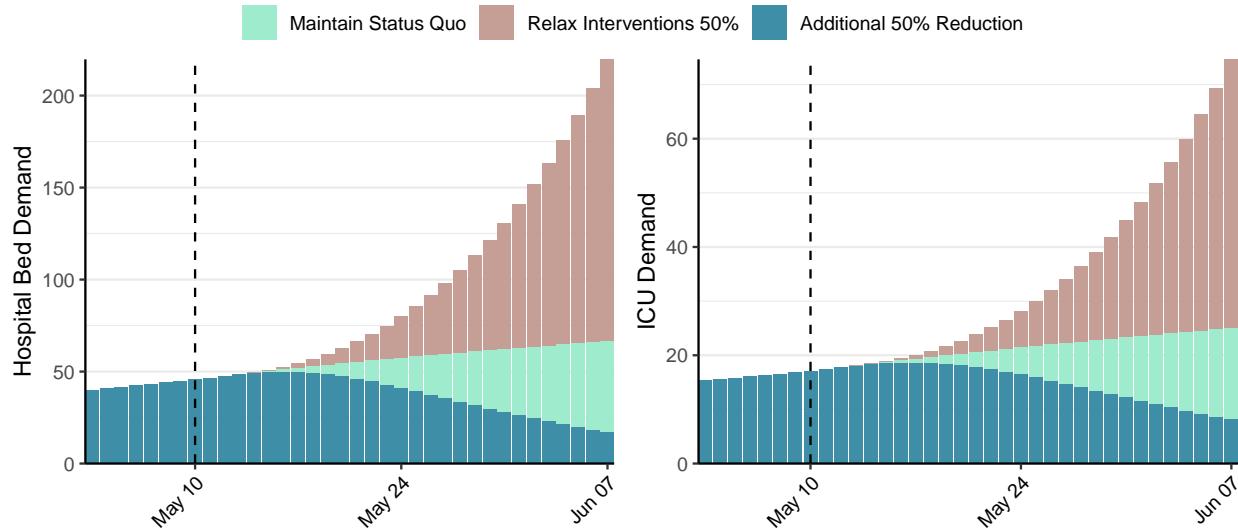


Figure 5: **Healthcare demands in the next 28 days.** Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

The impact of each scenario has a more immediate effect on the daily number of infections. The figure below shows the impact of each scenario on the estimated daily incidence of new infections. If interventions are scaled up (Scenario 2), the daily number of infections will change from 738 (95% CI: 700-776) at the current date to 73 (95% CI: 67-79) by 2021-06-07. If current interventions were relaxed by 50%, we estimate the daily number of infections will change from 738 (95% CI: 700-776) at the current date to 6,205 (95% CI: 5,622-6,788) by 2021-06-07.

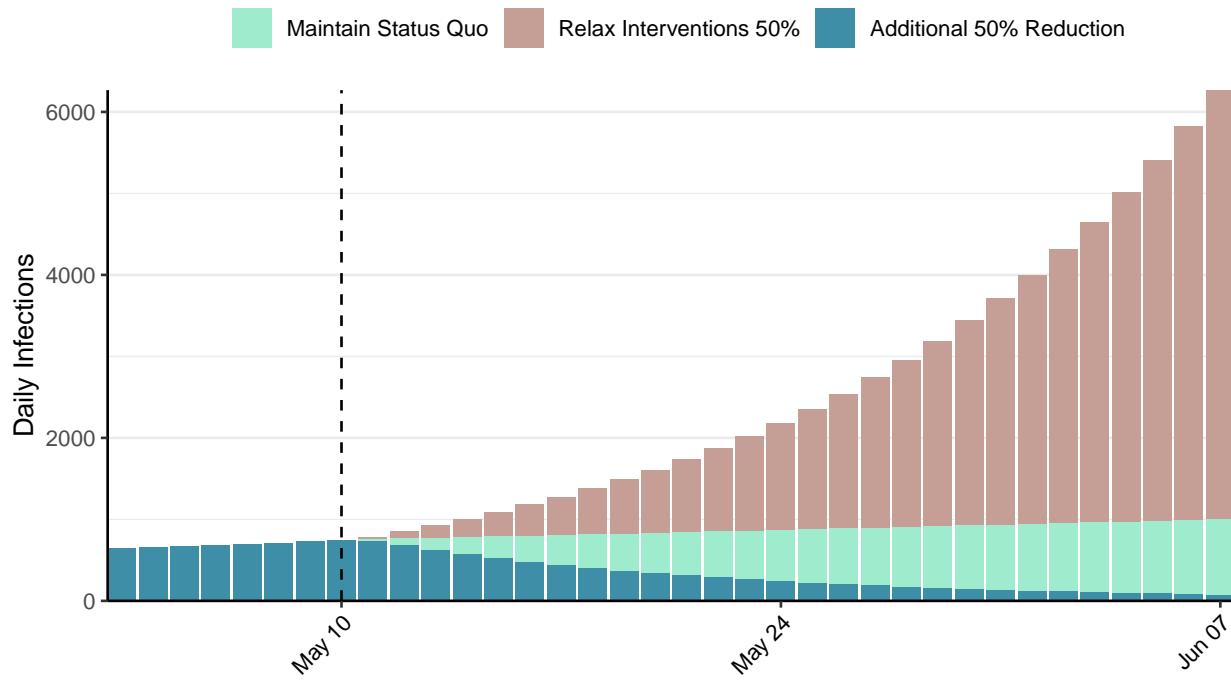


Figure 6: **Daily number of infections estimated by fitting to deaths.** Projected infections for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

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To explore different scenarios, we recommend using our [COVID-19 Scenario Analysis Tool](https://covid19sim.org/) - <https://covid19sim.org/>, which can be used to simulate different intervention scenarios and explore the long term impact on healthcare demand.