**Methods**

We used a spatially explicit individual-based model to simulate COVID-19 outbreaks in a population based on the Moria refugee camp (supplementary information S#). The population includes 18,700 individuals each characterised by age, sex, ethnic group, whether they have a pre-existing condition that makes them particularly vulnerable to COVID-19, and by their disease state. Each individual is a member of a household that occupies either an isobox (mean occupancy 10) or a tent (mean occupancy 4). Isoboxes and tents are positioned on a 1 km2 square (i.e., the “camp”) with isoboxes nearer the center and tents nearer the periphery, as in Moria. Households from the same ethnic group are spatially clustered. The camp includes 144 toilets distributed evenly around the camp, and one central food line that forms 3x per day. Each individual has a home range centered on its home, and interacts with others with overlapping home ranges. Individuals interact more frequently with others from the same ethnic group. Individuals visit the toilet nearest their home 3x per day, and a subset of individuals visits the food line each time it forms. COVID-19 can be transmitted from infectious to susceptible individuals within households, during interactions in the home range, at toilet lines, or at food lines.

Individuals begin each simulation in the susceptible state. If an individual is infected with COVID-19, it passes through exposed, pre-symptomatic, and diseased states before recovery (figure S#). The diseased state can be symptomatic or asymptomatic. The length of time individuals spend in each state and the probability that the diseased state is symptomatic are age-dependent and estimated from the literature [1-8]. Individuals in the pre-symptomatic and diseased states are infectious. All individuals can interact at toilets, but individuals with symptoms do not attend food lines or interact in their home ranges. We assume that recovered individuals cannot be re-infected.

The transmission probabilities per interaction for COVID-19 are poorly understood. Therefore, we modelled both low-transmission and high-transmission scenarios based on low-end [9, 10] and high-end [5, 11] estimates from the literature (supplementary information S#). The true transmission probabilities for COVID-19 in Moria are likely to fall somewhere between these extreme cases. How individuals use space and interact with others in Moria or other refugee camps is also poorly understood. Therefore, we modelled both low- and high-movement scenarios, and low- and high interaction scenarios. In the body of this paper we present the low-movement, high-interaction scenario, but our results are qualitatively similar for other scenario combinations (supplementary tables S#-##).

We modelled COVID-19 outbreaks in the absence of interventions (i.e., the baseline case) and in the presence of four plausible interventions: sectoring, PPE, remove-and-isolate, and lockdown. In sectoring, the central food line is eliminated, and the camp is divided into an *n* x *n* grid of sectors. Each sector has its own food line, and the members of each household use only the food line in their sector. The time individuals spend in the food line scales with 1/*n*. Thus, transmission at the food lines is reduced and becomes local rather than global. In PPE, the odds of transmission are reduced by a factor of 0.32 for all interactions outside the household. This simulates the use of personal protective equipment such as facemasks by people in the camp [12]. In remove-and-isolate, individuals with symptoms are detected with some probability *b* on each day. If a symptomatic individual is detected, their entire household is removed from the camp to an isolation facility, and no further transmission from that household to other households can occur. By controlling *b*, we can control the efficiency of the intervention. Finally, in lockdown, individuals are constrained to remain within some radius *rl* of their home. We assume that a proportion *vl* of individuals violates the lockdown. By controlling *rl* and *vl* we can make lockdowns more or less strict. In the body of the paper we report results for interventions where *n* = 16, *d* = 2, *rl* = 10 m, and *vl* = 0.10. We report results for other parameter values in tables (S#-##).

To simulate COVID-19 outbreaks, we moved one randomly selected individual in the population to the exposed state. We iterated the model through discrete timesteps that correspond to days until there were no infected individuals remaining in the population. If fewer than 20 individuals became infected during an outbreak, we recorded that the epidemic had been averted. If the epidemic was not averted, then we recorded the peak infection (i.e, the highest proportion of the population that was infected on any day), the day on which the peak infection occurred, and the total proportion of the population that became infected during the epidemic. For remove-and-isolate interventions, we also recorded the maximum number of individuals in isolation on any day. We conducted 100 simulations for each combination of scenario and intervention that we studied (22,400 total simulations).

**Results**

In the absence of interventions, the introduction of one COVID-19 case into the model population almost always (≥99%) leads to epidemics in both the low- and high-transmission scenarios (tables R1, S#). In the low-transmission scenario, the expected peak infection includes 67% of the population and occurs 56 days after the index case appears (figure R1A). In the high-transmission scenario, the expected peak infection includes >99% of the population and occurs on day 20 (figure R1B). In total, 98% and >99% of the population become infected in the low- and high-transmission scenarios, respectively (table R1).

Interventions can slow or stop the spread of COVID-19 (figure R1; tables R1, S#-##). Sectoring reduces and delays the peak infection in both the low-transmission (expected peak infection 20% on day 102) and high-transmission (expected peak infection 58% on day 39) scenarios, but most individuals ultimately become infected (low-transmission scenario: total infection 96%, epidemics averted 5%; high-transmission scenario: total infection >99%, epidemics averted <1%). PPE and remove-and-isolate interventions reduce and delay the peak infection in the low transmission scenario (PPE: expected peak infection 31% on day 97, figure R1C; remove-and-isolate: expected peak infection 37% on day 69), but not in the high-transmission scenario (both interventions: expected peak infection ≥97% on day ≤27). Moreover, unlike sectoring, in the low-transmission scenario, PPE and remove-and-isolate interventions reduce the proportion of the population that ultimately becomes infected (PPE: total infection 87%, epidemics averted 16%; remove-and-isolate: total infection 82%, epidemics averted 27%). In contrast to the other interventions, lockdowns have little effect on epidemics (low-transmission scenario: expected peak infection 63% on day 60; high-transmission scenario: expected peak infection >99% on day 21).

The use of PPE can augment the effects of other interventions (figure R1C,D; tables R1, S#-##). In the low-transmission scenario, sectoring combined with PPE use reduces the expected peak infection to 9% on day 180, limits total infection to 77% of the population, and averts 30% of epidemics altogether. In the high-transmission scenario, sectoring combined with PPE use reduces the expected peak infection to 41% of the population on day 53, but >99% of the population eventually becomes infected. In the low-transmission scenario, remove-and-isolate combined with PPE prevents most epidemics (expected peak infection 0.4%, total infection 1.6%, 68% of epidemics averted). However, in the high-transmission scenario, remove-and-isolate combined with PPE is little better than PPE alone. Similarly, in both scenarios, lockdown coupled with PPE is little better than PPE alone.

Sectoring and remove-and-isolate interventions can help control epidemics, but must be implemented early in order to be maximally effective (figure R2; tables S#-##). If PPE is in use but sectoring is not implemented until 1% of the population shows symptoms in the low-transmission scenario, then the expected peak infection increases from 9.0% to 19% and the proportion of epidemics averted drops from 30% to 16%. In the high-transmission scenario, sectoring after the virus is introduced to the population has little effect on the epidemic at all. If remove-and-isolate is not implemented until 1% of the population shows symptoms in the low-transmission scenario, then the expected peak infection increases from 0.4% to 8.6%, the expected total infection increases from 1.6% to 29%, and epidemics averted drops from 68% to 10%. In the high-transmission scenario, remove-and-isolate is not effective even if it is implemented early (figure R1D).

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| --- | --- | --- | --- | --- | --- |
|  |  | without PPE | | with PPE | |
|  | Intervention | Total infections | Epidemics averted | Total infections | Epidemics averted |
| Low transmission | none (baseline) | 0.98 | 0.01 | 0.87 | 0.16 |
| sectoring | 0.96 | 0.05 | 0.77 | 0.30 |
| remove-and-isolate | 0.82 | 0.27 | 0.016 | 0.68 |
| lockdown | 0.98 | 0.03 | 0.87 | 0.09 |
| High transmission | none (baseline) | >0.99 | <0.01 | >0.99 | <0.01 |
| sectoring | >0.99 | <0.01 | >0.99 | <0.01 |
| remove-and-isolate | >0.99 | <0.01 | >0.99 | <0.01 |
| lockdown | >0.99 | <0.01 | >0.99 | <0.01 |

Table 1. Expected total proportion of the population infected and epidemics averted without or with interventions in the low- and high-transmission scenarios.





Figure R1. Total infections over time for COVID-19 epidemics with different interventions in populations with low movement, high interaction, and (A,C) low or (B,D) high transmission probabilities. Panels (A,B) show dynamics without PPE, and (C,D) show dynamics with PPE. When transmission probabilities are high (B,D), only sectoring reduces or delays peak infection. When transmission probabilities are sufficiently low (*i.e*., low transmission with PPE, panel C), remove-and-isolate interventions can stop the epidemic.





Figure R2. Total infections over time for COVID-19 epidemics when interventions start before the virus arrives (purple), when 0.1% of the population has symptoms (gold), when 1% of the population has symptoms (red), and in the baseline case with no intervention (blue). In (A,B) intervention is dividing the camp into 16 sectors, and in (C,D) intervention is removing and isolating households of symptomatic individuals on (on average) day 2 of symptoms. (A,C) show the low-transmission and (B,D) show the high transmission scenario. In all cases, a delayed start to the intervention results in higher peak infection. In the high-transmission scenario, even a slightly delayed start eliminates all gains that could be achieved by the intervention.

The tables below (which will go in the supplementary materials) show the effects of interventions or combinations of interventions in 8 scenarios. Low/high transmission (taken from the literature, specifically: transmission probability per day within households 0.0397/0.33; transmission probability to adjacent individuals at food lines 0.0397/0.407; transmission probability to adjacent individuals at toilet lines 0.0067/0.099; transmission probability to individuals met in the camp per meeting 0.006/0.017), low/high movement (small radius 20 m/50 m; large radius 100 m/200 m), and low/high interaction (each person meets 5/20 people per day).

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Interventions | Transmission | Movement | Interaction | Peak proportion infected | Time to peak infection | Total proportion infected | Proportion epidemics averted | Peak population in isolation |
| Baseline | Low | Low | Low | 0.57 | 65 | 0.97 | 0.09 |  |
| High | 0.67 | 56 | 0.98 | 0.01 |  |
| High | Low | 0.58 | 66 | 0.97 | 0.07 |  |
| High | 0.68 | 56 | 0.98 | 0.02 |  |
| High | Low | Low | >0.99 | 21 | >0.99 | <0.01 |  |
| High | >0.99 | 20 | >0.99 | <0.01 |  |
| High | Low | >0.99 | 21 | >0.99 | <0.01 |  |
| High | >0.99 | 20 | >0.99 | <0.01 |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Interventions | Transmission | Movement | Interaction | Peak proportion infected | Time to peak infection | Total proportion infected | Proportion epidemics averted | Peak population in isolation |
| with PPE | Low | Low | Low | 0.23 | 123 | 0.80 | 0.22 |  |
| High | 0.31 | 97 | 0.87 | 0.16 |  |
| High | Low | 0.23 | 121 | 0.80 | 0.17 |  |
| High | 0.32 | 95 | 0.87 | 0.25 |  |
| High | Low | Low | 0.97 | 27 | >0.99 | <0.01 |  |
| High | 0.97 | 27 | >0.99 | <0.01 |  |
| High | Low | 0.97 | 28 | >0.99 | <0.01 |  |
| High | 0.97 | 27 | >0.99 | <0.01 |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Interventions | Transmission | Movement | Interaction | Peak proportion infected | Time to peak infection | Total proportion infected | Proportion epidemics averted | Peak population in isolation |
| 4 sectors | Low | Low | Low | 0.26 | 104 | 0.94 | 0.05 |  |
| High | 0.35 | 78 | 0.97 | 0.12 |  |
| High | Low | 0.31 | 91 | 0.94 | 0.07 |  |
| High | 0.44 | 68 | 0.97 | 0.06 |  |
| High | Low | Low | 0.74 | 33 | >0.99 | <0.01 |  |
| High | 0.83 | 30 | >0.99 | <0.01 |  |
| High | Low | 0.82 | 31 | >0.99 | <0.01 |  |
| High | 0.91 | 27 | >0.99 | <0.01 |  |
|  |  |  |  |  |  |  |  |  |
| 16 sectors | Low | Low | Low | 0.14 | 139 | 0.91 | 0.08 |  |
| High | 0.20 | 102 | 0.96 | 0.05 |  |
| High | Low | 0.19 | 110 | 0.91 | 0.09 |  |
| High | 0.30 | 77 | 0.96 | 0.04 |  |
| High | Low | Low | 0.48 | 46 | >0.99 | <0.01 |  |
| High | 0.58 | 39 | >0.99 | <0.01 |  |
| High | Low | 0.58 | 40 | >0.99 | <0.01 |  |
| High | 0.73 | 34 | >0.99 | <0.01 |  |
|  |  |  |  |  |  |  |  |  |
| 144 sectors | Low | Low | Low | 0.08 | 218 | 0.88 | 0.13 |  |
| High | 0.16 | 117 | 0.95 | 0.07 |  |
| High | Low | 0.14 | 137 | 0.88 | 0.09 |  |
| High | 0.28 | 81 | 0.95 | 0.10 |  |
| High | Low | Low | 0.28 | 70 | >0.99 | <0.01 |  |
| High | 0.39 | 52 | >0.99 | <0.01 |  |
| High | Low | 0.47 | 49 | >0.99 | <0.01 |  |
| High | 0.64 | 37 | >0.99 | <0.01 |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Interventions | Transmission | Movement | Interaction | Peak proportion infected | Time to peak infection | Total proportion infected | Proportion epidemics averted | Peak population in isolation |
| Remove and isolate on ~day 4 | Low | Low | Low | 0.31 | 86 | 0.84 | 0.28 | 0.43 |
| High | 0.45 | 65 | 0.88 | 0.21 | 0.58 |
| High | Low | 0.30 | 82 | 0.80 | 0.30 | 0.42 |
| High | 0.47 | 63 | 0.90 | 0.12 | 0.60 |
| High | Low | Low | >0.99 | 22 | >0.99 | <0.01 | 0.95 |
| High | >0.99 | 21 | >0.99 | 0.01 | 0.95 |
| High | Low | >0.99 | 22 | >0.99 | <0.01 | 0.95 |
| High | >0.99 | 21 | >0.99 | <0.01 | 0.95 |
|  |  |  |  |  |  |  |  |  |
| Remove and isolate on ~day 2 | Low | Low | Low | 0.21 | 92 | 0.70 | 0.45 | 0.33 |
| High | 0.37 | 69 | 0.82 | 0.27 | 0.54 |
| High | Low | 0.23 | 92 | 0.75 | 0.43 | 0.36 |
| High | 0.40 | 68 | 0.86 | 0.24 | 0.58 |
| High | Low | Low | >0.99 | 22 | >0.99 | <0.01 | 0.97 |
| High | >0.99 | 21 | >0.99 | <0.01 | 0.97 |
| High | Low | >0.99 | 22 | >0.99 | <0.01 | 0.97 |
| High | >0.99 | 21 | >0.99 | <0.01 | 0.97 |
|  |  |  |  |  |  |  |  |  |
| Remove and isolate on ~day 1 | Low | Low | Low | 0.16 | 99 | 0.64 | 0.41 | 0.27 |
| High | 0.32 | 69 | 0.76 | 0.41 | 0.49 |
| High | Low | 0.16 | 96 | 0.62 | 0.47 | 0.27 |
| High | 0.34 | 69 | 0.80 | 0.33 | 0.52 |
| High | Low | Low | >0.99 | 22 | >0.99 | <0.01 | 0.97 |
| High | >0.99 | 21 | >0.99 | <0.01 | 0.98 |
| High | Low | >0.99 | 22 | >0.99 | <0.01 | 0.97 |
| High | >0.99 | 21 | >0.99 | <0.01 | 0.98 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Interventions | Transmission | Movement | Interaction | Peak proportion infected | Time to peak infection | Total proportion infected | Proportion epidemics averted | Peak population in isolation |
| Loose lockdown | Low | Low | Low | 0.58 | 66 | 0.97 | 0.01 |  |
| High | 0.67 | 57 | 0.99 | 0.02 |  |
| High | Low | 0.58 | 65 | 0.97 | 0.09 |  |
| High | 0.69 | 55 | 0.99 | 0.04 |  |
| High | Low | Low | >0.99 | 21 | >0.99 | <0.01 |  |
| High | >0.99 | 20 | >0.99 | <0.01 |  |
| High | Low | >0.99 | 21 | >0.99 | <0.01 |  |
| High | >0.99 | 20 | >0.99 | <0.01 |  |
|  |  |  |  |  |  |  |  |  |
| Moderate lockdown | Low | Low | Low | 0.57 | 66 | 0.97 | 0.04 |  |
| High | 0.66 | 58 | 0.98 | 0.03 |  |
| High | Low | 0.58 | 65 | 0.97 | 0.04 |  |
| High | 0.68 | 56 | 0.99 | 0.01 |  |
| High | Low | Low | >0.99 | 21 | >0.99 | <0.01 |  |
| High | >0.99 | 21 | >0.99 | <0.01 |  |
| High | Low | >0.99 | 21 | >0.99 | <0.01 |  |
| High | >0.99 | 20 | >0.99 | <0.01 |  |
|  |  |  |  |  |  |  |  |  |
| Tight lockdown | Low | Low | Low | 0.57 | 67 | 0.97 | 0.03 |  |
| High | 0.63 | 60 | 0.98 | 0.05 |  |
| High | Low | 0.57 | 68 | 0.97 | 0.04 |  |
| High | 0.64 | 60 | 0.98 | 0.01 |  |
| High | Low | Low | >0.99 | 21 | >0.99 | <0.01 |  |
| High | >0.99 | 21 | >0.99 | <0.01 |  |
| High | Low | >0.99 | 21 | >0.99 | <0.01 |  |
| High | >0.99 | 20 | >0.99 | <0.01 |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Interventions | Transmission | Movement | Interaction | Peak proportion infected | Time to peak infection | Total proportion infected | Proportion epidemics averted | Peak population in isolation |
| 4 sectors with PPE | Low | Low | Low | 0.074 | 226 | 0.68 | 0.42 |  |
| High | 0.14 | 147 | 0.82 | 0.24 |  |
| High | Low | 0.099 | 181 | 0.68 | 0.30 |  |
| High | 0.19 | 119 | 0.82 | 0.24 |  |
| High | Low | Low | 0.57 | 45 | >0.99 | <0.01 |  |
| High | 0.67 | 39 | >0.99 | <0.01 |  |
| High | Low | 0.65 | 42 | >0.99 | <0.01 |  |
| High | 0.75 | 36 | >0.99 | <0.01 |  |
|  |  |  |  |  |  |  |  |  |
| 16 sectors with PPE | Low | Low | Low | 0.034 | 280 | 0.45 | 0.40 |  |
| High | 0.090 | 180 | 0.77 | 0.30 |  |
| High | Low | 0.051 | 225 | 0.52 | 0.41 |  |
| High | 0.13 | 133 | 0.78 | 0.23 |  |
| High | Low | Low | 0.33 | 67 | >0.99 | <0.01 |  |
| High | 0.41 | 53 | >0.99 | <0.01 |  |
| High | Low | 0.42 | 57 | >0.99 | <0.01 |  |
| High | 0.53 | 44 | >0.99 | <0.01 |  |
|  |  |  |  |  |  |  |  |  |
| 144 sectors with PPE | Low | Low | Low | 0.009 | 209 | 0.13 | 0.61 |  |
| High | 0.060 | 224 | 0.69 | 0.23 |  |
| High | Low | 0.029 | 230 | 0.34 | 0.61 |  |
| High | 0.12 | 143 | 0.73 | 0.34 |  |
| High | Low | Low | 0.17 | 113 | >0.99 | 0.01 |  |
| High | 0.25 | 78 | >0.99 | <0.01 |  |
| High | Low | 0.30 | 72 | >0.99 | <0.01 |  |
| High | 0.44 | 52 | >0.99 | <0.01 |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Interventions | Transmission | Movement | Interaction | Peak proportion infected | Time to peak infection | Total proportion infected | Proportion epidemics averted | Peak population in isolation |
| Remove and isolate on ~day 4 with PPE | Low | Low | Low | 0.002 | 42 | 0.006 | 0.75 | 0.003 |
| High | 0.013 | 102 | 0.12 | 0.59 | 0.021 |
| High | Low | 0.002 | 38 | 0.006 | 0.70 | 0.003 |
| High | 0.018 | 124 | 0.16 | 0.67 | 0.027 |
| High | Low | Low | 0.96 | 29 | >0.99 | 0.02 | 0.91 |
| High | 0.96 | 28 | >0.99 | <0.01 | 0.92 |
| High | Low | 0.96 | 29 | >0.99 | <0.01 | 0.91 |
| High | 0.96 | 28 | >0.99 | 0.03 | 0.92 |
|  |  |  |  |  |  |  |  |  |
| Remove and isolate on ~day 2 with PPE | Low | Low | Low | 0.002 | 38 | 0.004 | 0.84 | 0.003 |
| High | 0.004 | 46 | 0.016 | 0.68 | 0.006 |
| High | Low | 0.002 | 35 | 0.005 | 0.86 | 0.003 |
| High | 0.005 | 60 | 0.024 | 0.67 | 0.008 |
| High | Low | Low | 0.95 | 30 | >0.99 | 0.04 | 0.94 |
| High | 0.96 | 29 | >0.99 | <0.01 | 0.94 |
| High | Low | 0.95 | 30 | >0.99 | 0.03 | 0.94 |
| High | 0.96 | 28 | >0.99 | 0.02 | 0.94 |
|  |  |  |  |  |  |  |  |  |
| Remove and isolate on ~day 1 with PPE | Low | Low | Low | 0.002 | 29 | 0.004 | 0.87 | 0.003 |
| High | 0.003 | 48 | 0.010 | 0.78 | 0.005 |
| High | Low | 0.002 | 27 | 0.003 | 0.89 | 0.002 |
| High | 0.002 | 33 | 0.005 | 0.82 | 0.003 |
| High | Low | Low | 0.94 | 31 | >0.99 | 0.01 | 0.94 |
| High | 0.95 | 30 | >0.99 | 0.02 | 0.95 |
| High | Low | 0.94 | 31 | >0.99 | 0.01 | 0.94 |
| High | 0.95 | 30 | >0.99 | 0.01 | 0.95 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Interventions | Transmission | Movement | Interaction | Peak proportion infected | Time to peak infection | Total proportion infected | Proportion epidemics averted | Peak population in isolation |
| Loose lockdown with PPE | Low | Low | Low | 0.22 | 122 | 0.80 | 0.26 |  |
| High | 0.31 | 98 | 0.88 | 0.12 |  |
| High | Low | 0.23 | 124 | 0.81 | 0.19 |  |
| High | 0.33 | 96 | 0.89 | 0.13 |  |
| High | Low | Low | 0.97 | 27 | >0.99 | <0.01 |  |
| High | 0.97 | 27 | >0.99 | <0.01 |  |
| High | Low | 0.97 | 27 | >0.99 | <0.01 |  |
| High | 0.97 | 27 | >0.99 | <0.01 |  |
|  |  |  |  |  |  |  |  |  |
| Moderate lockdown with PPE | Low | Low | Low | 0.22 | 123 | 0.81 | 0.23 |  |
| High | 0.30 | 104 | 0.87 | 0.09 |  |
| High | Low | 0.23 | 119 | 0.81 | 0.19 |  |
| High | 0.31 | 101 | 0.89 | 0.11 |  |
| High | Low | Low | 0.97 | 27 | >0.99 | <0.01 |  |
| High | 0.97 | 27 | >0.99 | <0.01 |  |
| High | Low | 0.97 | 27 | >0.99 | <0.01 |  |
| High | 0.97 | 27 | >0.99 | <0.01 |  |
|  |  |  |  |  |  |  |  |  |
| Tight lockdown with PPE | Low | Low | Low | 0.22 | 132 | 0.80 | 0.19 |  |
| High | 0.27 | 116 | 0.85 | 0.21 |  |
| High | Low | 0.22 | 127 | 0.81 | 0.18 |  |
| High | 0.27 | 113 | 0.86 | 0.16 |  |
| High | Low | Low | 0.97 | 27 | >0.99 | <0.01 |  |
| High | 0.97 | 27 | >0.99 | <0.01 |  |
| High | Low | 0.97 | 27 | >0.99 | <0.01 |  |
| High | 0.97 | 27 | >0.99 | <0.01 |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Interventions | Transmission | Movement | Interaction | Peak proportion infected | Time to peak infection | Total proportion infected | Proportion epidemics averted | Peak population in isolation |
| PPE with 16 sectors imposed when 1% of population is symptomatic | Low | Low | Low | 0.10 | 125 | 0.56 | 0.25 |  |
| High | 0.19 | 98 | 0.78 | 0.16 |  |
| High | Low | 0.11 | 120 | 0.58 | 0.26 |  |
| High | 0.21 | 98 | 0.78 | 0.15 |  |
| High | Low | Low | 0.92 | 29 | >0.99 | <0.01 |  |
| High | 0.94 | 28 | >0.99 | <0.01 |  |
| High | Low | 0.92 | 29 | >0.99 | <0.01 |  |
| High | 0.94 | 28 | >0.99 | <0.01 |  |
|  |  |  |  |  |  |  |  |  |
| PPE with 16 sectors imposed when 0.1% of population is symptomatic | Low | Low | Low | 0.052 | 165 | 0.51 | 0.14 |  |
| High | 0.13 | 119 | 0.77 | 0.25 |  |
| High | Low | 0.069 | 147 | 0.55 | 0.26 |  |
| High | 0.17 | 102 | 0.78 | 0.19 |  |
| High | Low | Low | 0.87 | 31 | >0.99 | <0.01 |  |
| High | 0.90 | 30 | >0.99 | <0.01 |  |
| High | Low | 0.87 | 31 | >0.99 | <0.01 |  |
| High | 0.90 | 30 | >0.99 | <0.01 |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Interventions | Transmission | Movement | Interaction | Peak proportion infected | Time to peak infection | Total proportion infected | Proportion epidemics averted | Peak population in isolation |
| PPE with remove and isolate on ~day 2 starting when 1% of population is symptomatic | Low | Low | Low | 0.060 | 93 | 0.17 | 0.25 | 0.091 |
| High | 0.086 | 80 | 0.29 | 0.10 | 0.13 |
| High | Low | 0.061 | 91 | 0.17 | 0.21 | 0.094 |
| High | 0.097 | 79 | 0.33 | 0.22 | 0.15 |
| High | Low | Low | 0.96 | 28 | >0.99 | <0.01 | 0.94 |
| High | 0.97 | 27 | >0.99 | <0.01 | 0.95 |
| High | Low | 0.96 | 28 | >0.99 | <0.01 | 0.94 |
| High | 0.97 | 27 | >0.99 | <0.01 | 0.95 |
|  |  |  |  |  |  |  |  |  |
| PPE with remove and isolate on ~day 2 starting when 0.1% population is symptomatic | Low | Low | Low | 0.007 | 66 | 0.021 | 0.23 | 0.012 |
| High | 0.013 | 67 | 0.066 | 0.19 | 0.021 |
| High | Low | 0.007 | 61 | 0.022 | 0.22 | 0.012 |
| High | 0.017 | 85 | 0.10 | 0.18 | 0.027 |
| High | Low | Low | 0.95 | 29 | >0.99 | <0.01 | 0.94 |
| High | 0.96 | 28 | >0.99 | <0.01 | 0.94 |
| High | Low | 0.95 | 28 | >0.99 | <0.01 | 0.94 |
| High | 0.96 | 28 | >0.99 | <0.01 | 0.94 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Interventions | Transmission | Movement | Interaction | Peak proportion infected | Time to peak infection | Total proportion infected | Proportion epidemics averted | Peak population in isolation |
| PPE, sectoring, remove-and-isolate | Low | Low | Low | 0.001 | 23 | 0.002 | 0.93 | 0.002 |
| High | 0.002 | 45 | 0.006 | 0.89 | 0.004 |
| High | Low | 0.001 | 21 | 0.002 | 0.94 | 0.002 |
| High | 0.002 | 28 | 0.004 | 0.88 | 0.003 |
| High | Low | Low | 0.26 | 80 | >0.99 | 0.07 | 0.30 |
| High | 0.34 | 63 | >0.99 | 0.02 | 0.39 |
| High | Low | 0.33 | 70 | >0.99 | 0.07 | 0.38 |
| High | 0.47 | 49 | >0.99 | 0.01 | 0.53 |
|  |  |  |  |  |  |  |  |  |
| PPE, sectoring, lockdown | Low | Low | Low | 0.019 | 284 | 0.27 | 0.50 |  |
| High | 0.060 | 239 | 0.75 | 0.22 |  |
| High | Low | 0.030 | 291 | 0.42 | 0.48 |  |
| High | 0.083 | 181 | 0.77 | 0.23 |  |
| High | Low | Low | 0.28 | 77 | >0.99 | 0.07 |  |
| High | 0.35 | 63 | >0.99 | 0.02 |  |
| High | Low | 0.33 | 68 | >0.99 | 0.07 |  |
| High | 0.42 | 56 | >0.99 | 0.01 |  |
|  |  |  |  |  |  |  |  |  |
| PPE, remove-and-isolate, lockdown | Low | Low | Low | 0.002 | 35 | 0.004 | 0.79 | 0.003 |
| High | 0.004 | 53 | 0.017 | 0.72 | 0.006 |
| High | Low | 0.002 | 30 | 0.004 | 0.81 | 0.003 |
| High | 0.003 | 50 | 0.015 | 0.72 | 0.005 |
| High | Low | Low | 0.95 | 30 | >0.99 | 0.03 | 0.94 |
| High | 0.96 | 29 | >0.99 | 0.03 | 0.94 |
| High | Low | 0.95 | 29 | >0.99 | <0.01 | 0.94 |
| High | 0.96 | 28 | >0.99 | 0.03 | 0.94 |
|  |  |  |  |  |  |  |  |  |
| PPE, sectoring, remove-and-isolate, lockdown | Low | Low | Low | 0.001 | 23 | 0.002 | 0.91 | 0.002 |
| High | 0.002 | 38 | 0.004 | 0.88 | 0.002 |
| High | Low | 0.002 | 32 | 0.004 | 0.95 | 0.003 |
| High | 0.002 | 30 | 0.003 | 0.87 | 0.002 |
| High | Low | Low | 0.17 | 103 | 0.88 | 0.05 | 0.19 |
| High | 0.27 | 77 | >0.99 | 0.04 | 0.31 |
| High | Low | 0.25 | 88 | >0.99 | 0.09 | 0.28 |
| High | 0.34 | 64 | 0.99 | 0.06 | 0.39 |