

Stochastic mod sim

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To-dos

Incorporate interventions into transitions, parameters, rates

Vaccination intervention

Simulate vaccine administered to remaining susceptibles after different outbreak scenarios

Fit deterministic version??

Prettyfy some figures

Dates on x axis

Compare scenarios

Show median result of simulations

Model

Base SARS-CoV2 Model

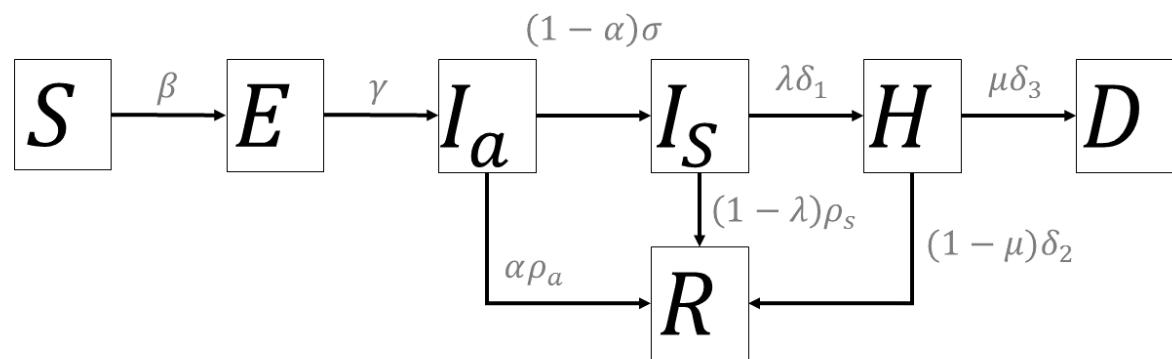


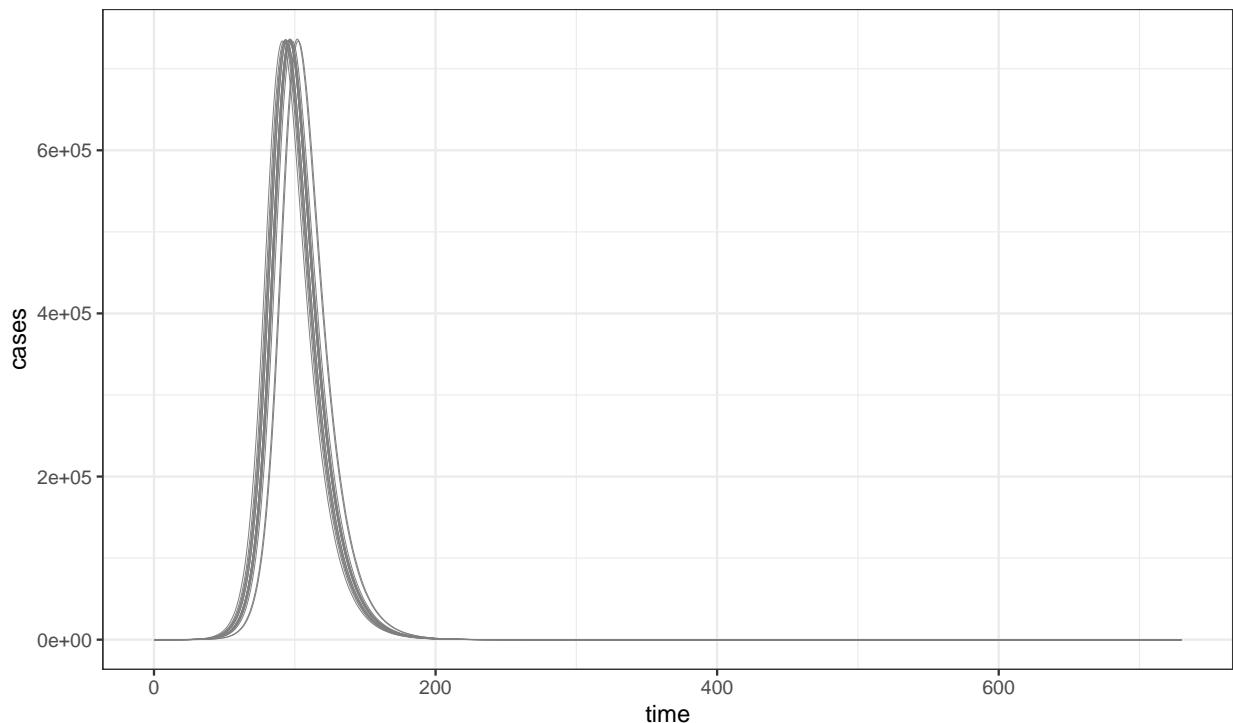
Table 1: Parameter values and descriptions used in the model

	Value	Definition
N	2e+06	population size
β	0.5	transmission rate
c_a	1	Relative contact rate between S and Ia
c_s	0.6	Relative contact rate between S and Is
c_h	0.01	Relative contact rate between S and H
γ	0.25	1/serial interval
α	0.32	proportion asymptomatic
σ	0.833	1/(incubation period-serial interval) to model pre-symptomatic transmission
ρ_s	0.071	Recovery rate of symptomatic cases
ρ_a	0.2	Recovery rate of asymptomatic cases
λ	0.1	proportion symptomatic requiring hospitalization
δ_1	0.167	1/time between symptom onset and hospitalization
δ_2	0.083	1/time between hospitalization and recovery
δ_3	0.111	1/time between hospitalization and mortality
μ	0.14	mortality rate of hospitalized cases

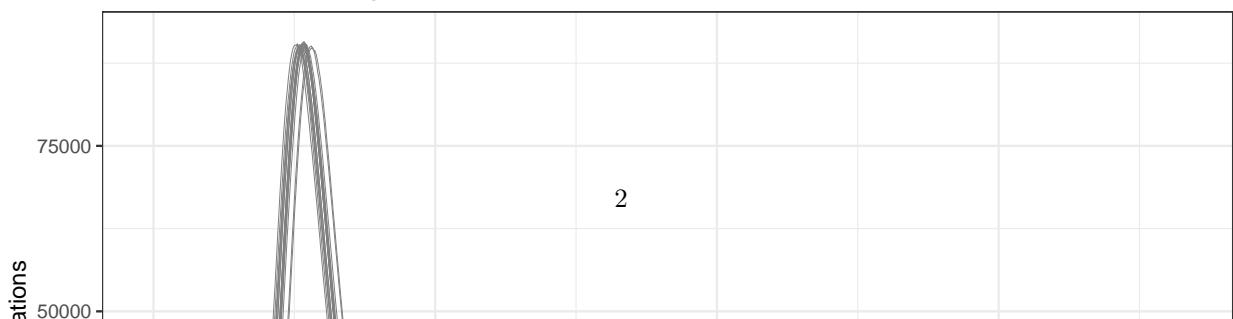
Parameters and setup

Initial simulations in do nothing setting

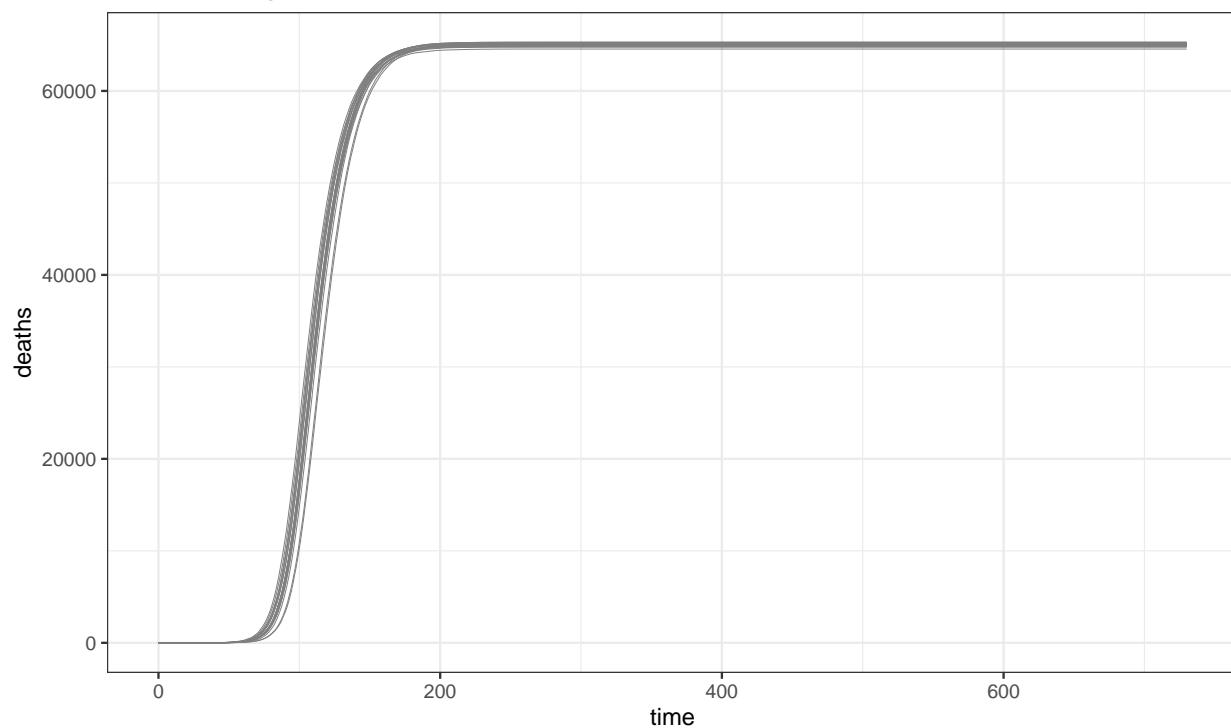
infecteds through time, no interventions



hospitalizations through time, no interventions



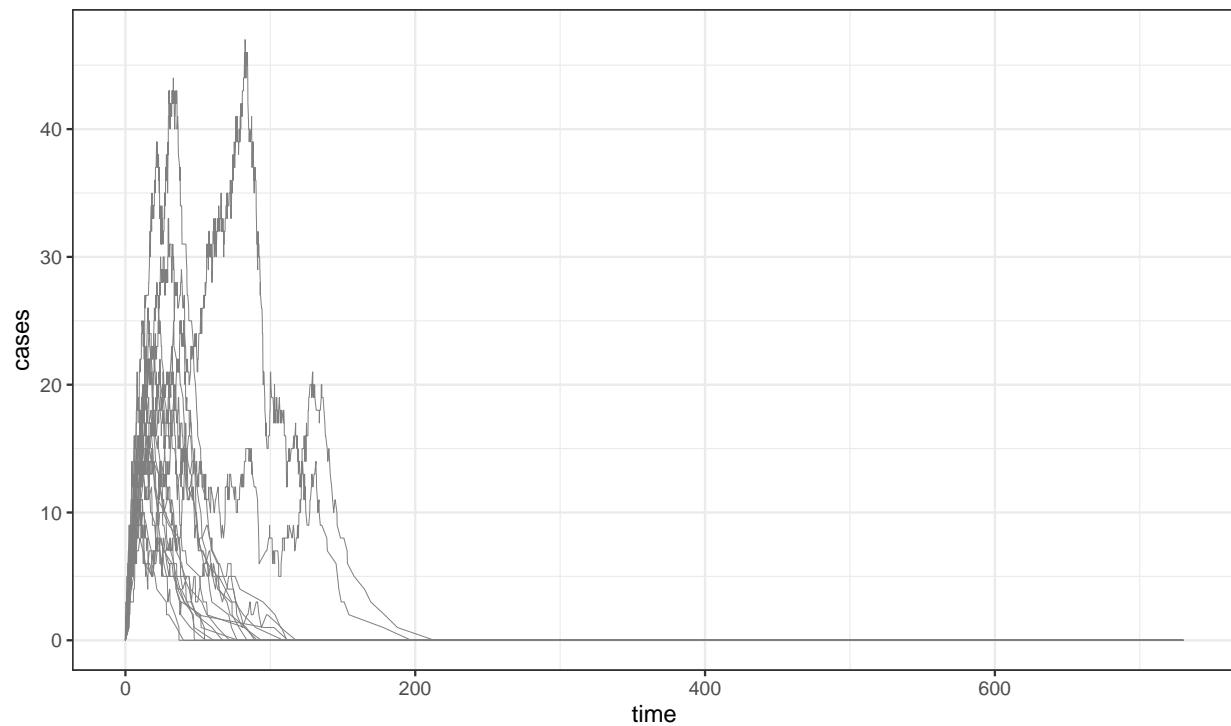
deaths through time, no interventions



Model checks

Is asymptomatic transmission alone enough to sustain transmission?

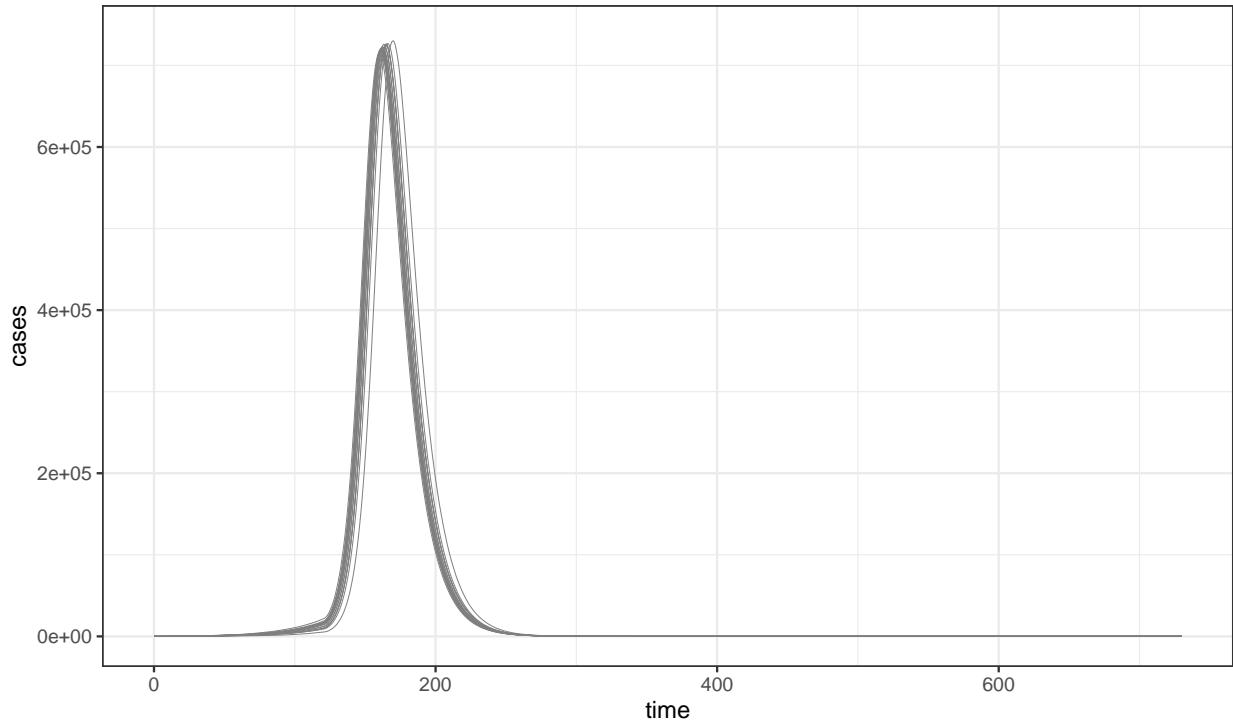
infecteds through time, asymptomatic transmission only



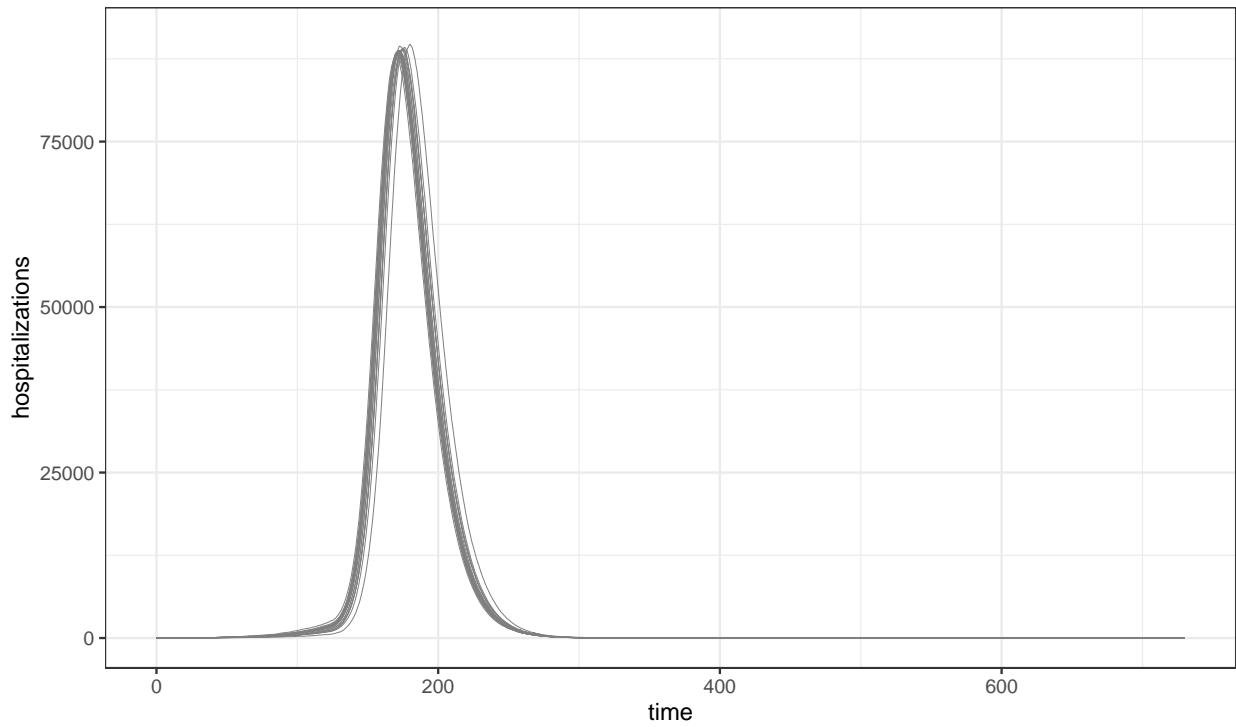
Social distancing interventions

3 Months with 60% reduction in contact rate

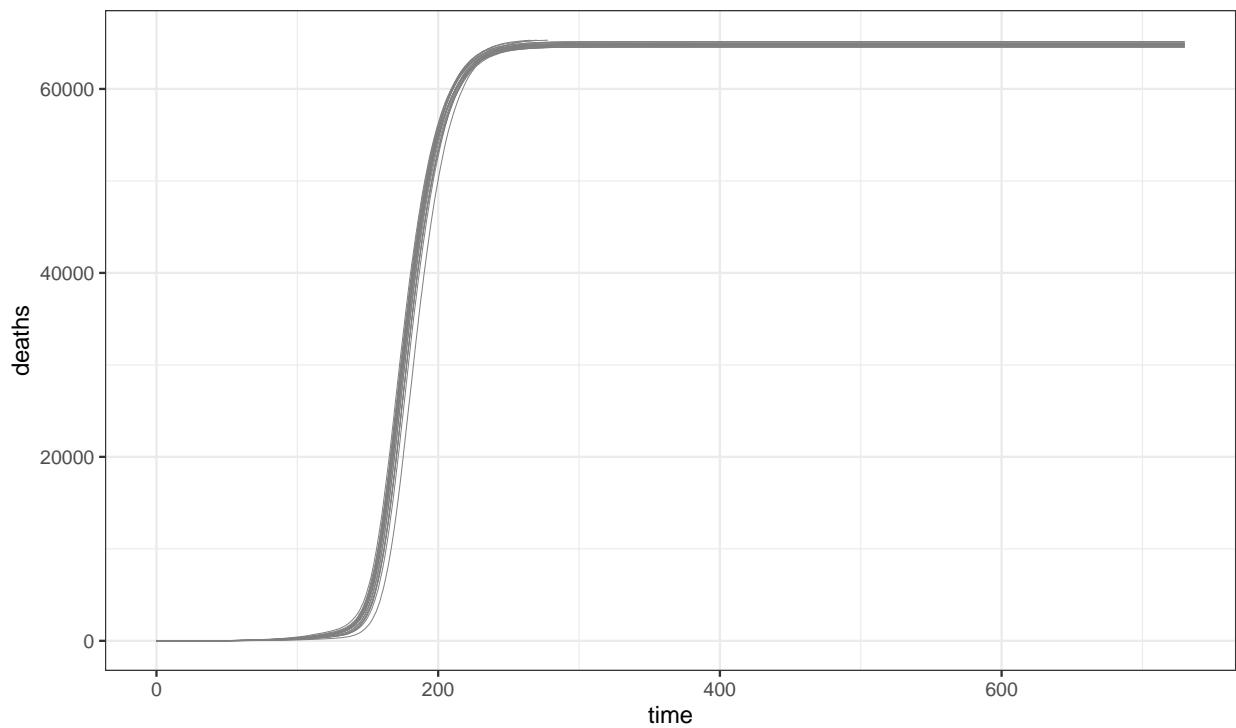
infecteds through time, heavy social distancing for 3 months



hospitalizations through time, heavy social distancing for 3 months

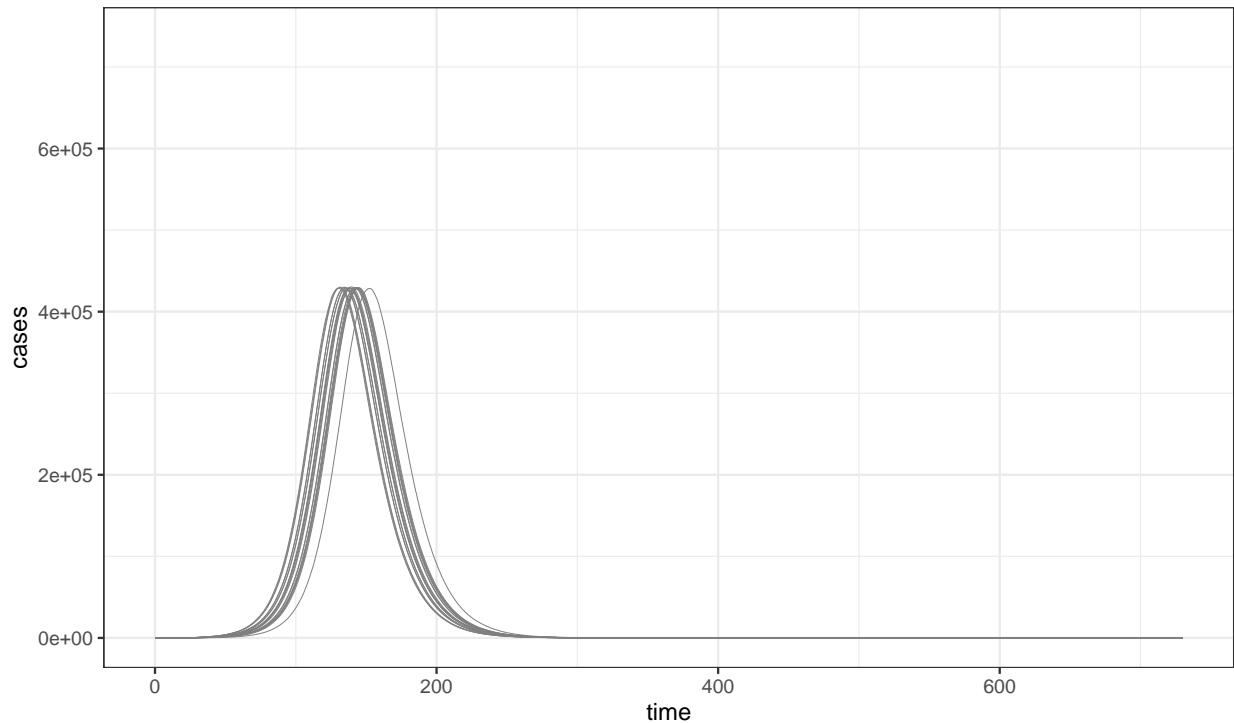


deaths through time, heavy social distancing for 3 months

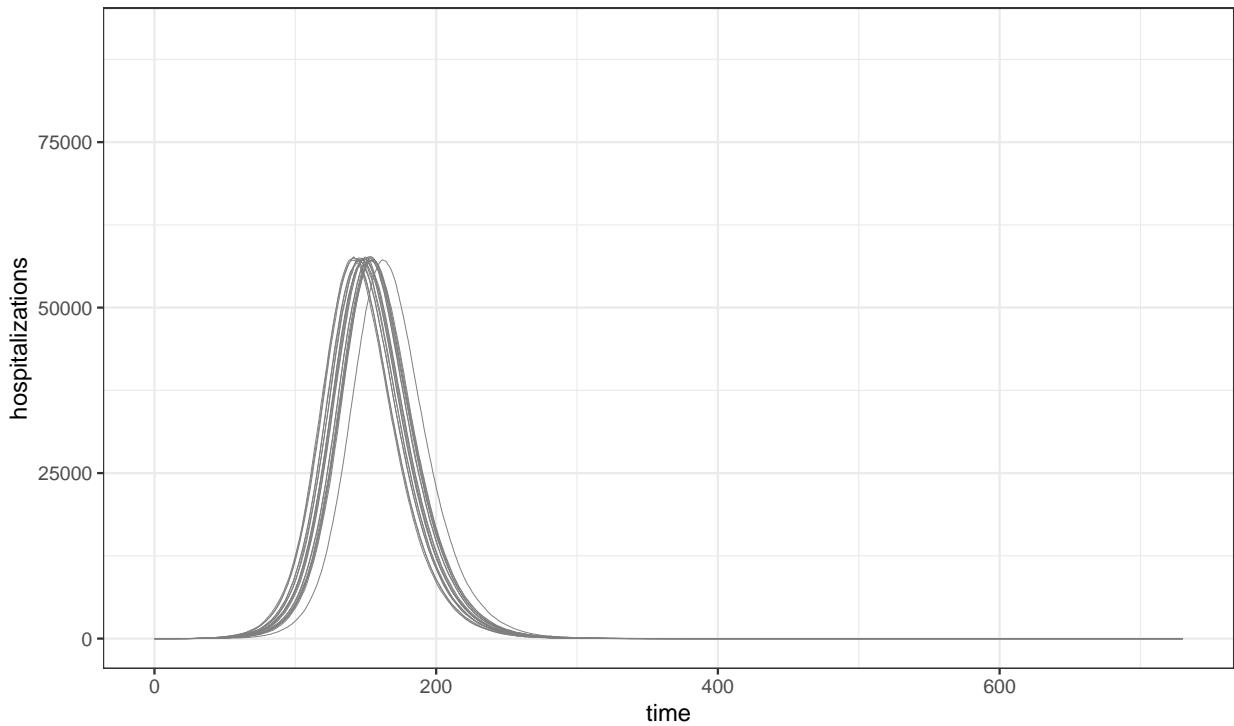


10 months with 40% reduction in contact rate

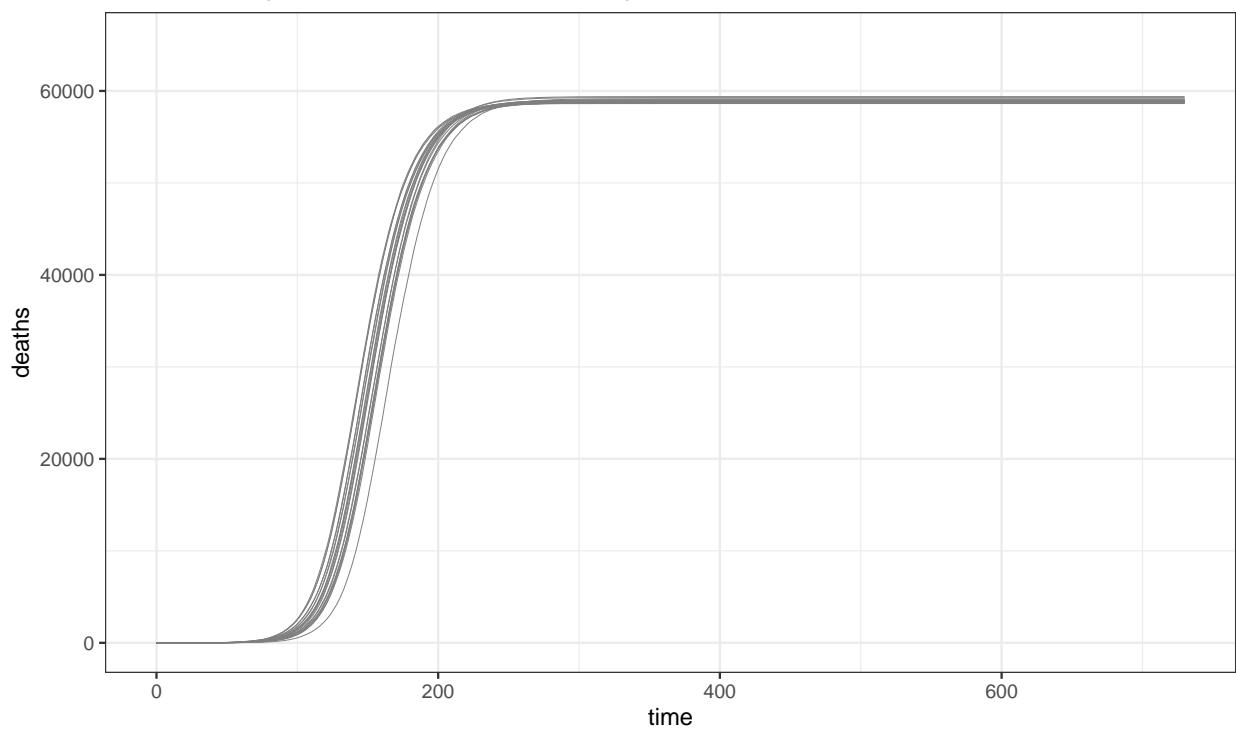
infecteds through time, mild social distancing for 10 months



hospitalizations through time, mild social distancing for 10 months

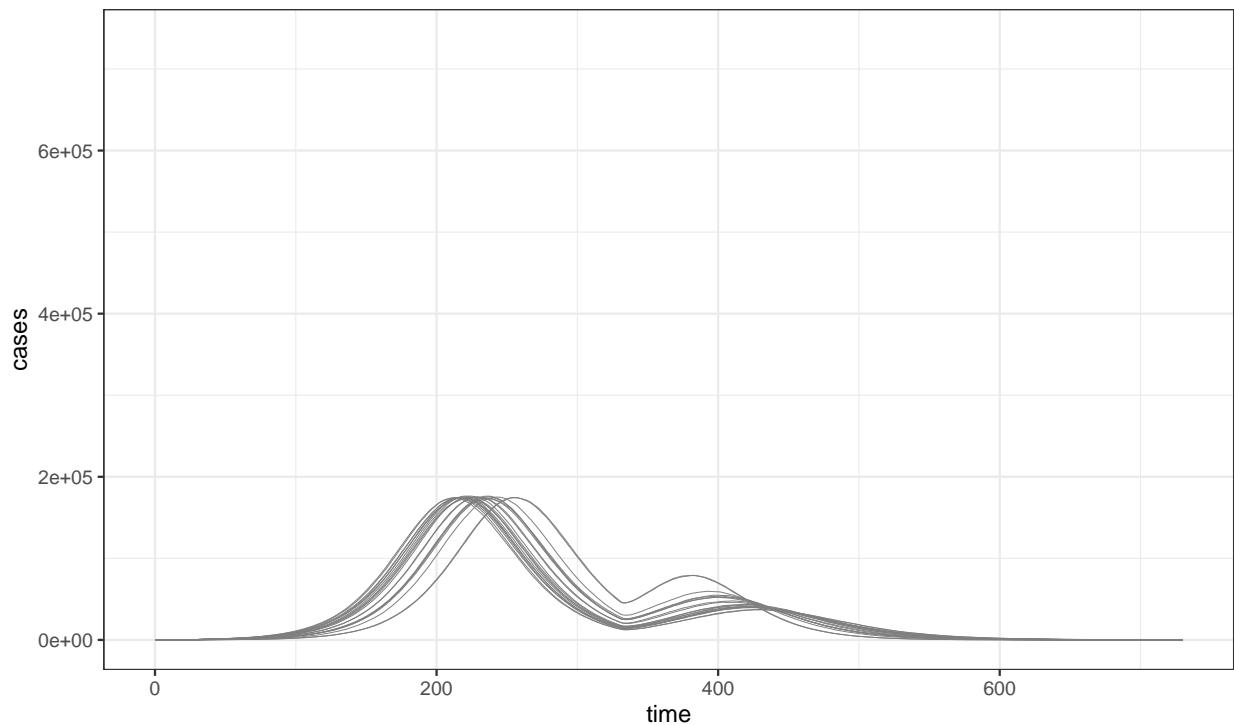


deaths through time, mild social distancing for 10 months

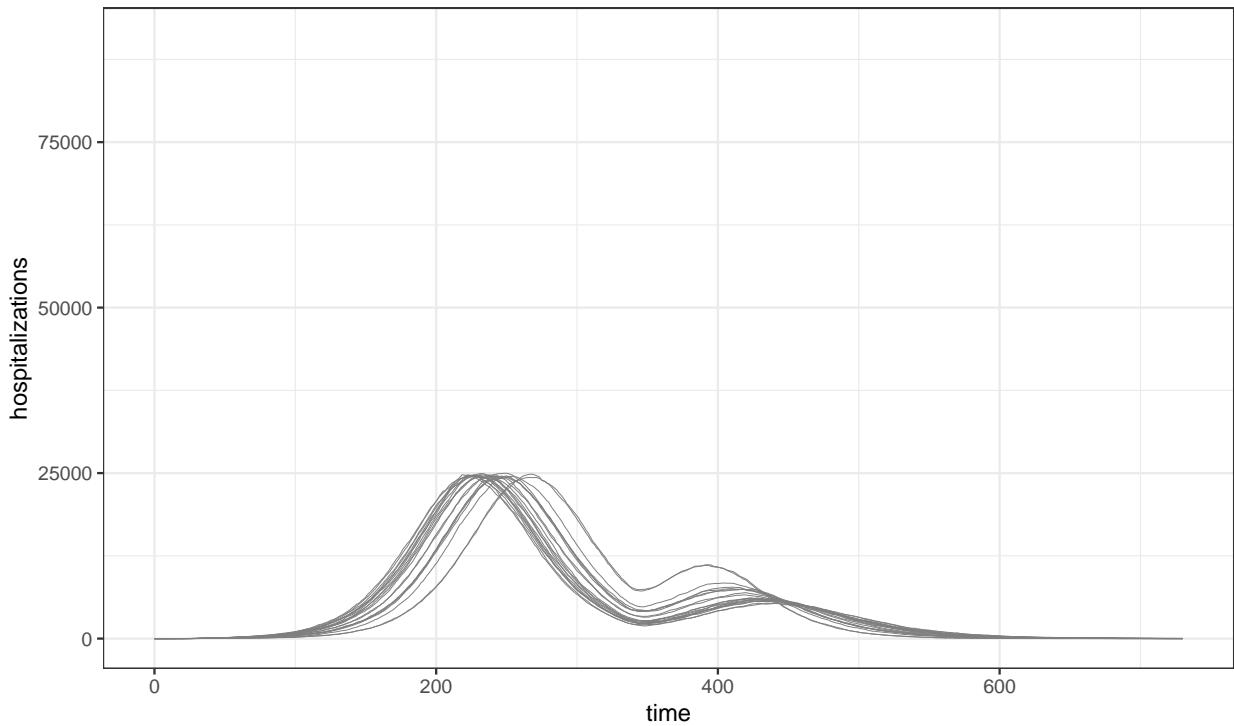


10 months with 60% reduction in contact rate

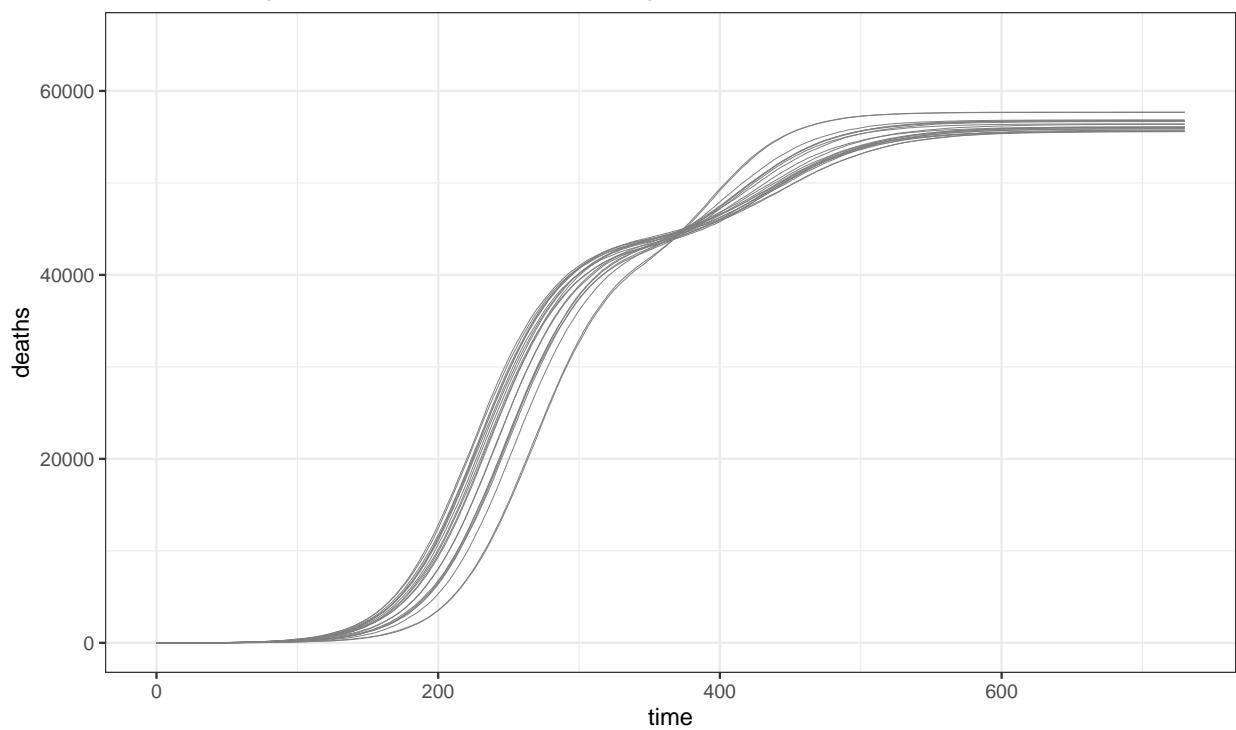
infecteds through time, heavy social distancing for 10 months



hospitalizations through time, heavy social distancing for 10 months



deaths through time, heavy social distancing for 10 months

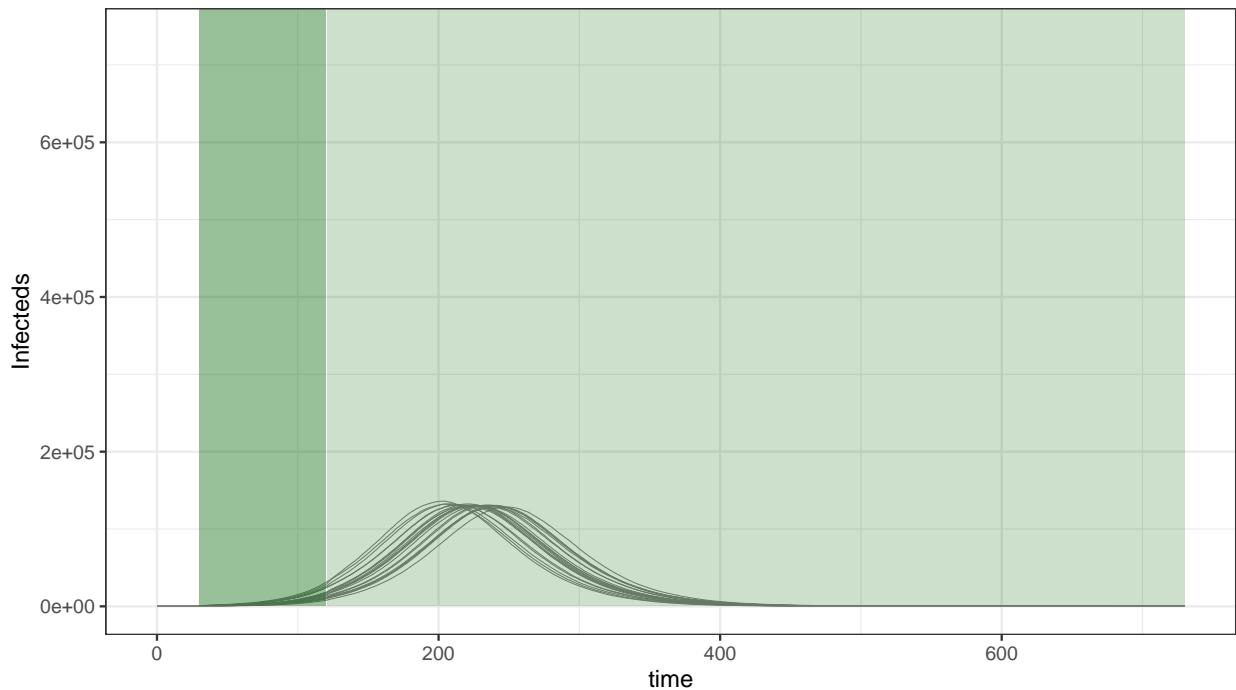


Quarantining interventions

What proportion of symptomatics need to be quarantined?

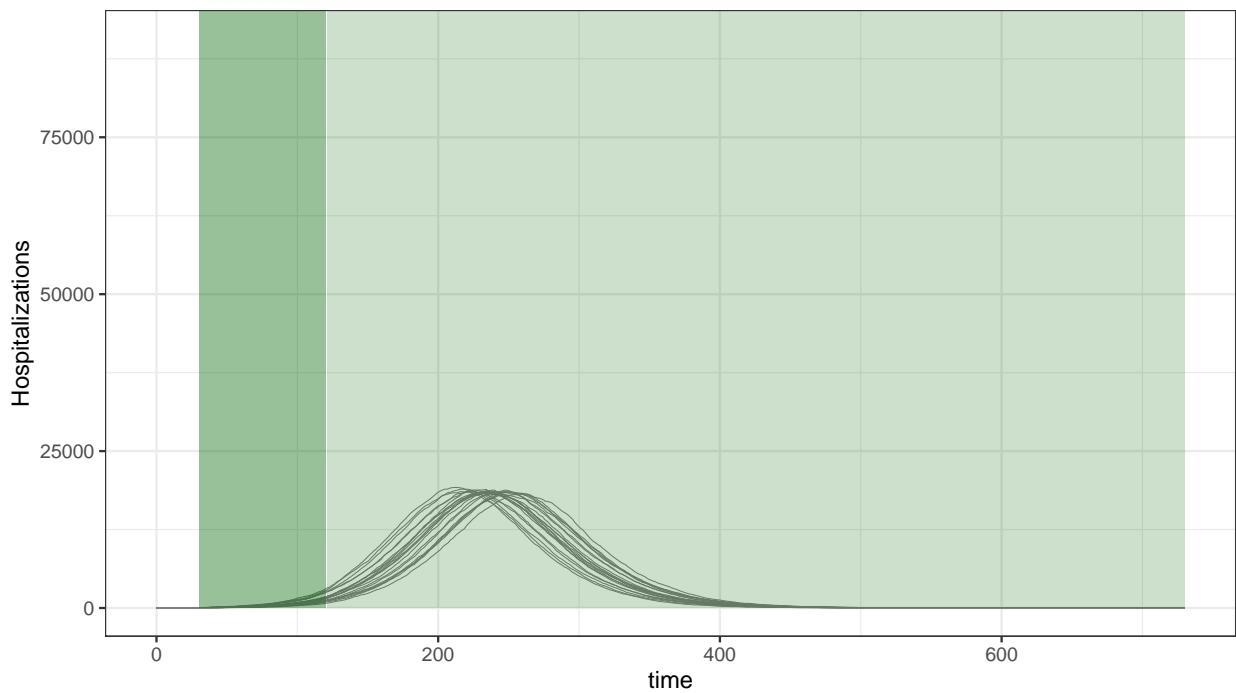
Social distancing+quarantine of symptomatics

Reduction in symptomatic contact 0.5



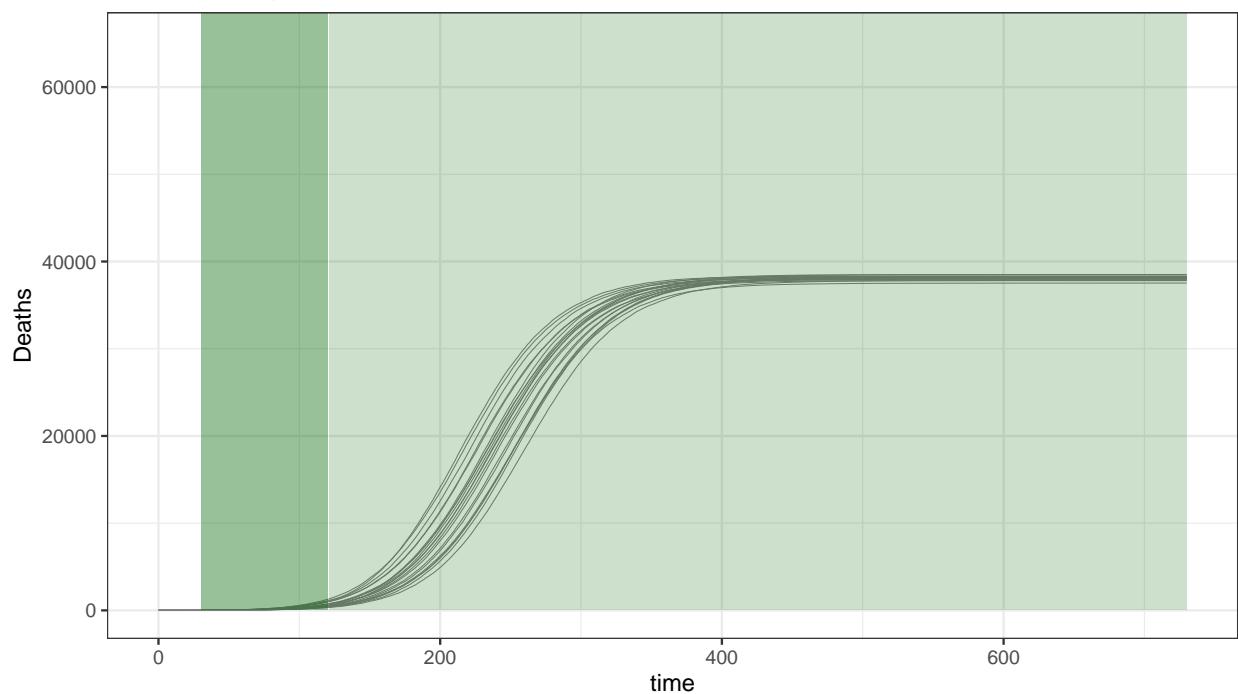
Social distancing+quarantine of symptomatics

Reduction in symptomatic contact 0.5

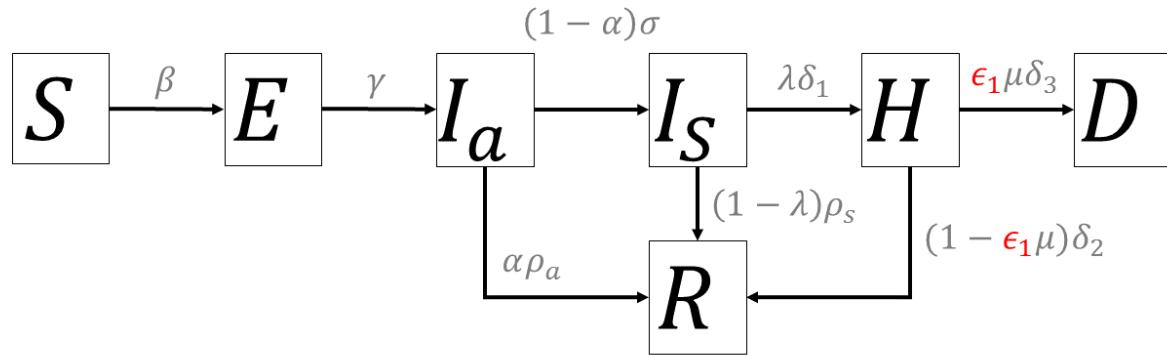


Social distancing+quarantine of symptomatics

Reduction in symptomatic contact 0.5



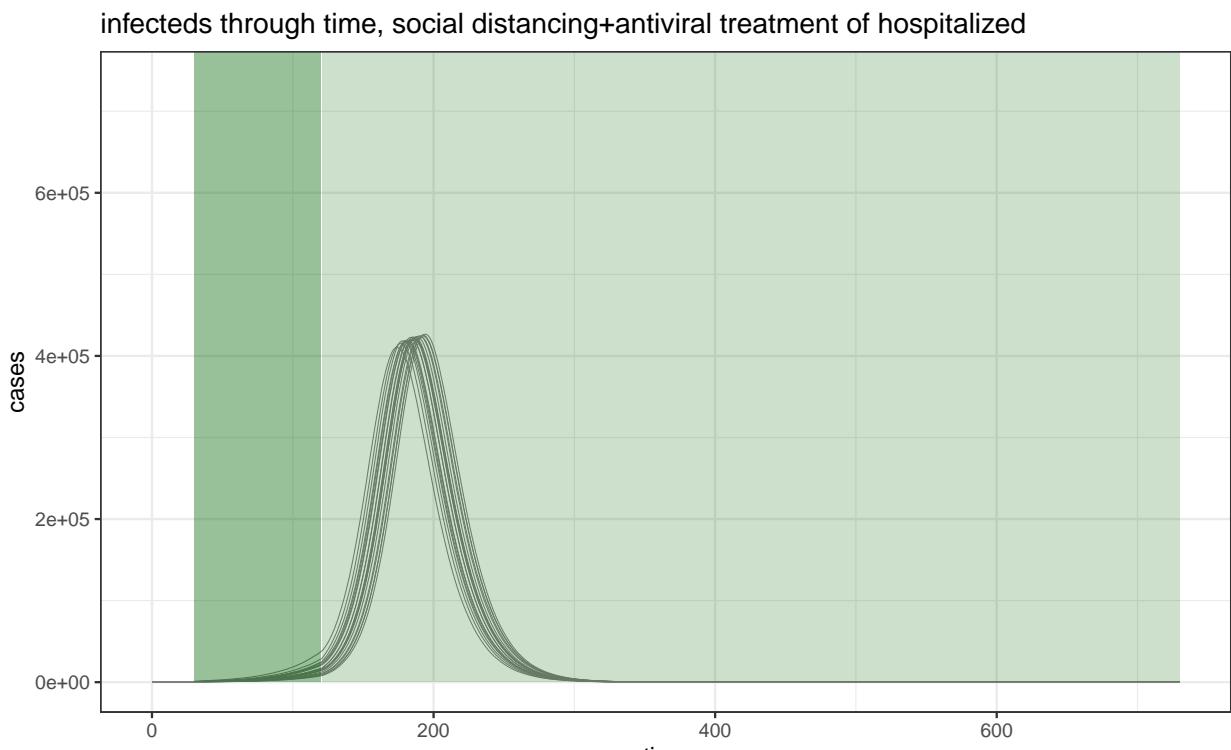
SARS-CoV2 Model with antiviral intervention administered at hospitalization



Antiviral Treatment Scenarios

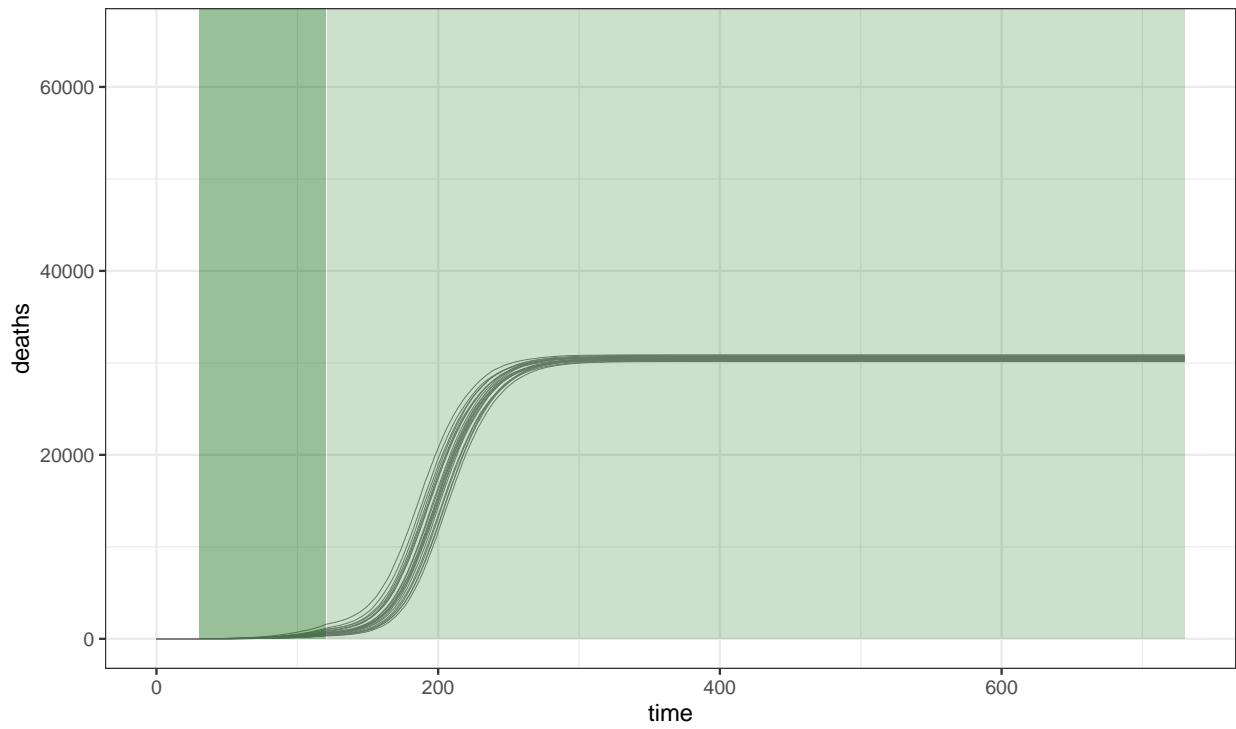
For now assuming that antiviral treatment will become available 3 months into heavy social distancing intervention at which point social distancing is relaxed to light social distancing

Scenario 1: Antivirals administered upon hospitalization, reduce the mortality rate



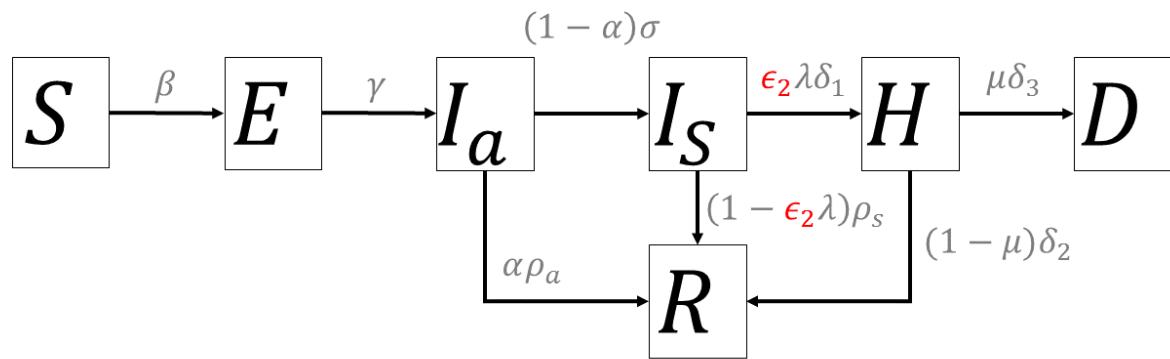
infecteds through time, social distancing+¹³antiviral treatment of hospitalized

infecteds through time, social distancing+antiviral treatment of hospitalized

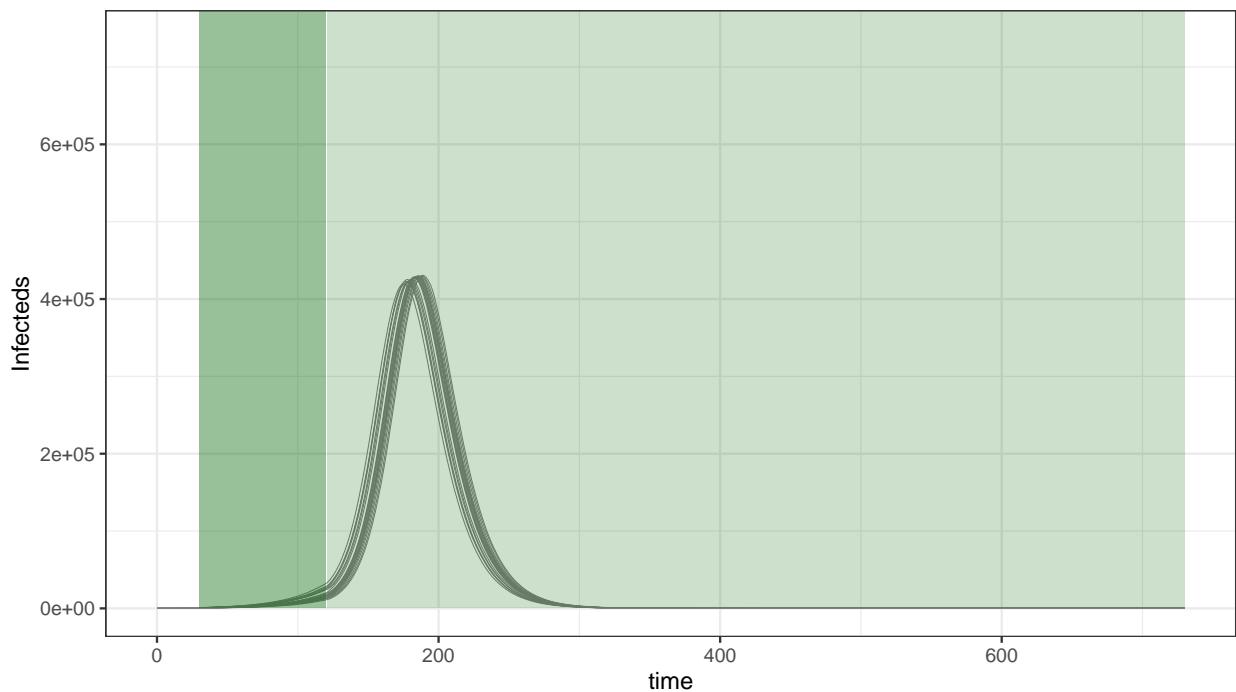


Scenario 2: Antivirals administered upon symptom onset, reduce the hospitalization rate

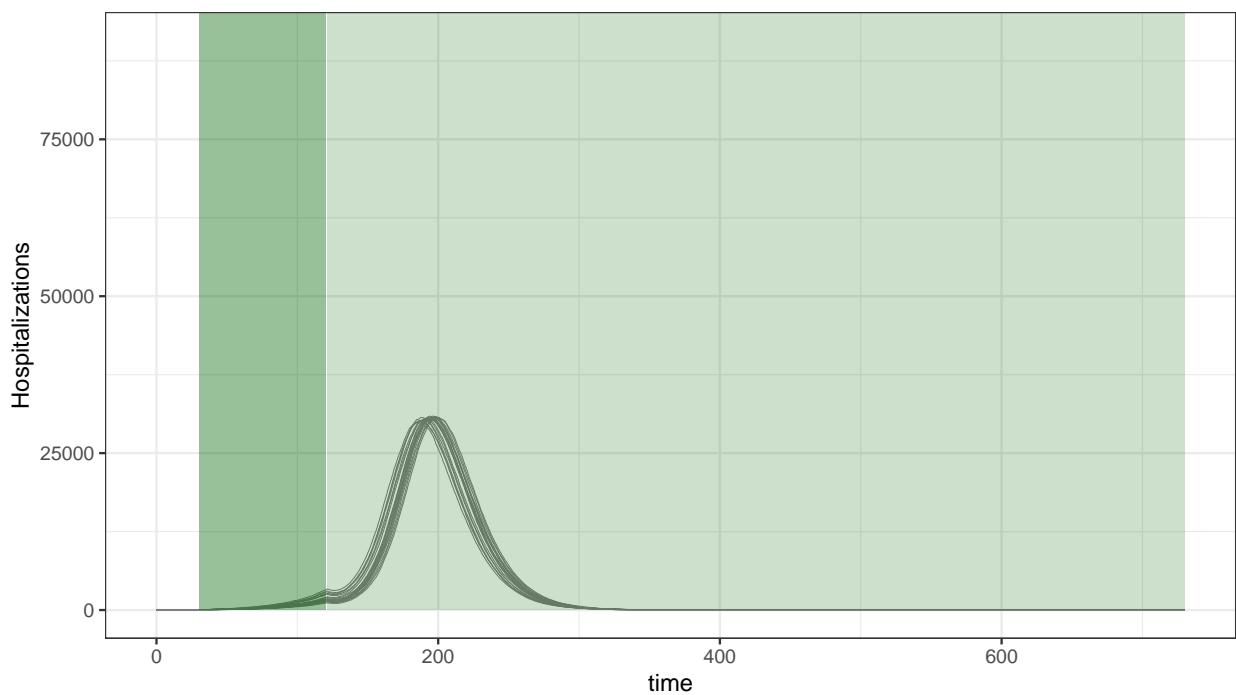
SARS-CoV2 Model with antiviral intervention administered at symptom onset



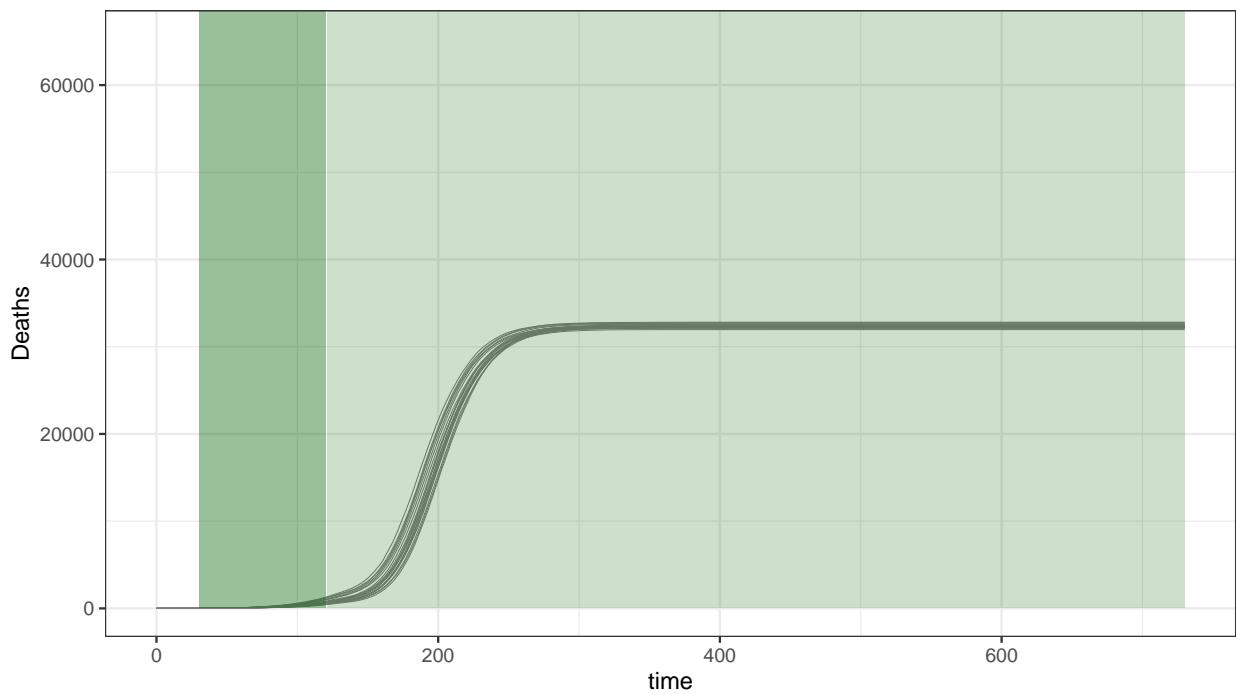
Social distancing+antiviral treatment of symptomatic
Reduction in hospitalization rate of 0.5



Social distancing+antiviral treatment of symptomatic
Reduction in hospitalization rate of 0.5

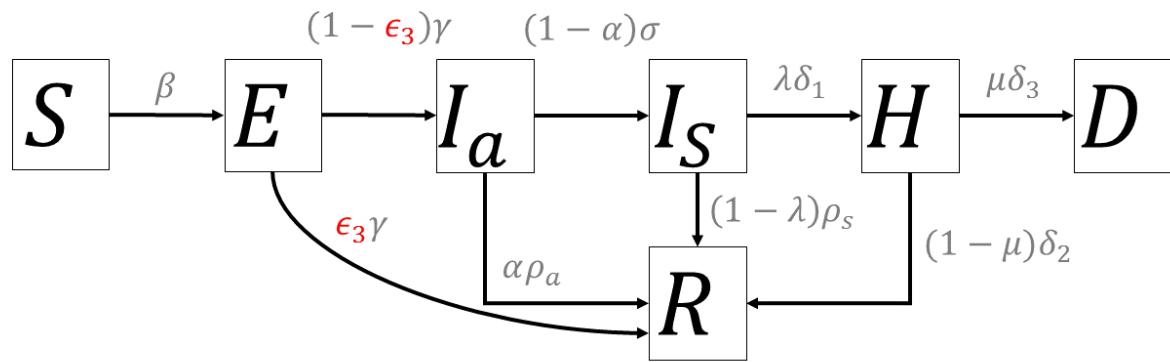


Social distancing+antiviral treatment of symptomatic
Reduction in hospitalization rate of 0.5



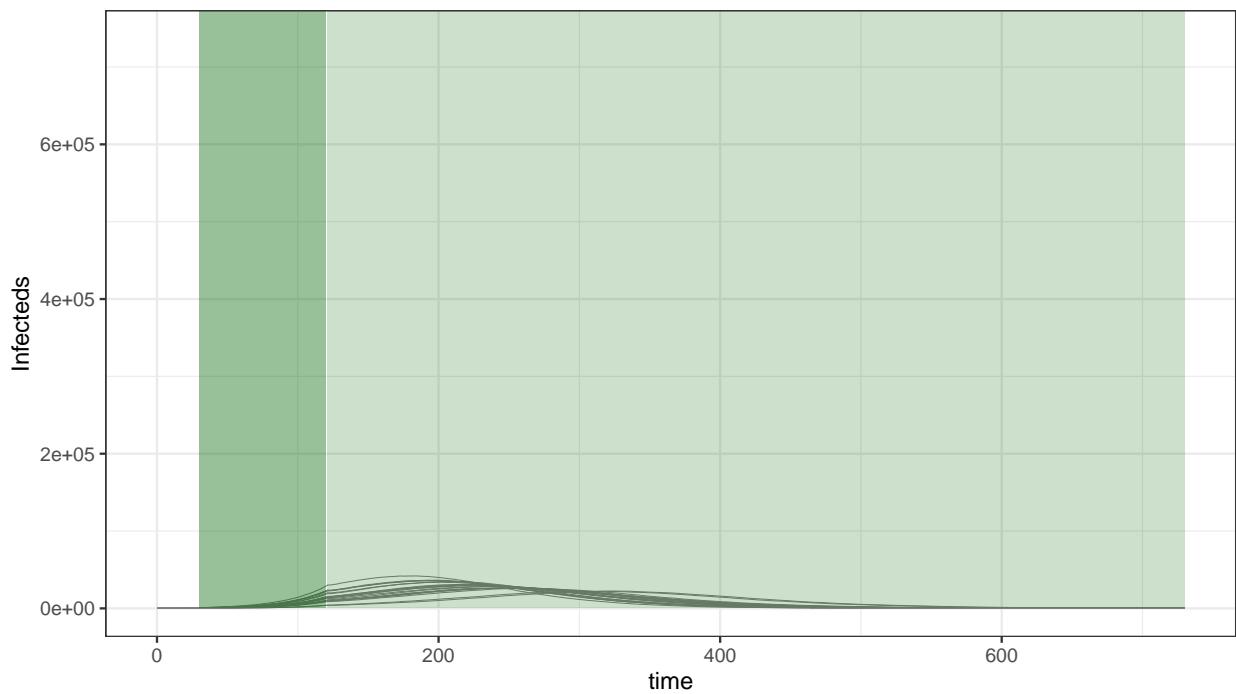
Scenario 3: Antivirals administered upon exposure, suppress viral load to prevent transmission and progression to infectious

SARS-CoV2 Model with antiviral intervention administered at exposure



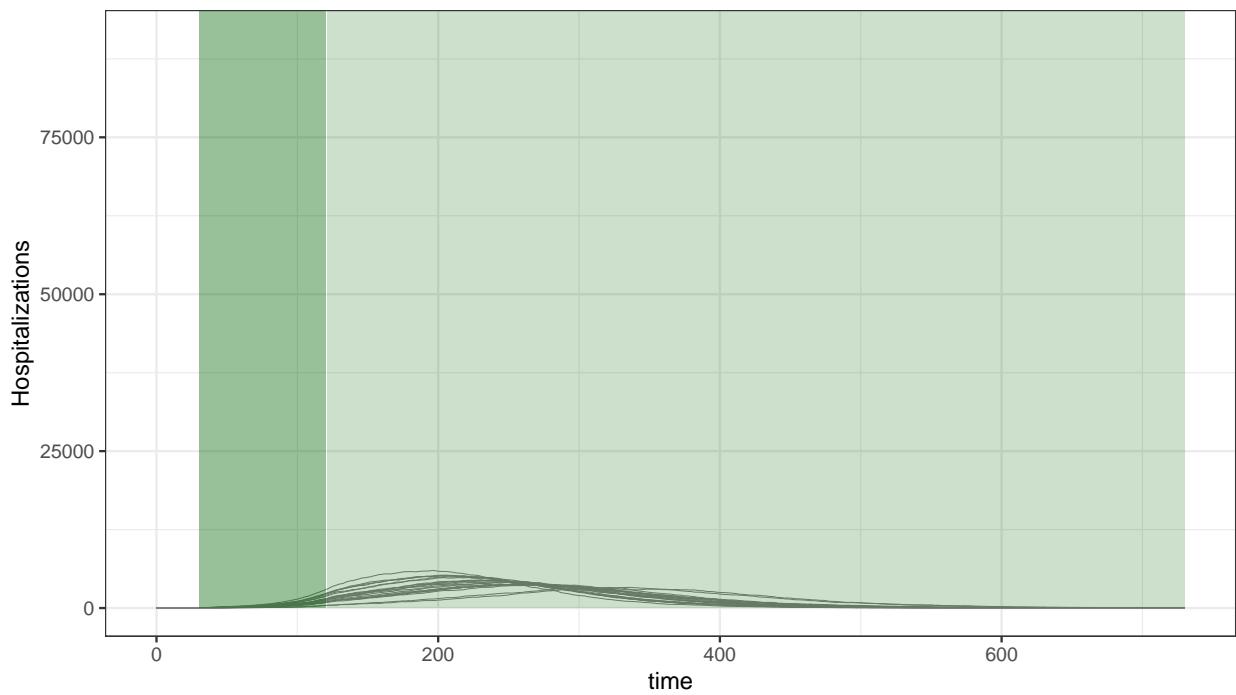
Social distancing+antiviral treatment of exposed

Reduction in infectious rate of 0.5

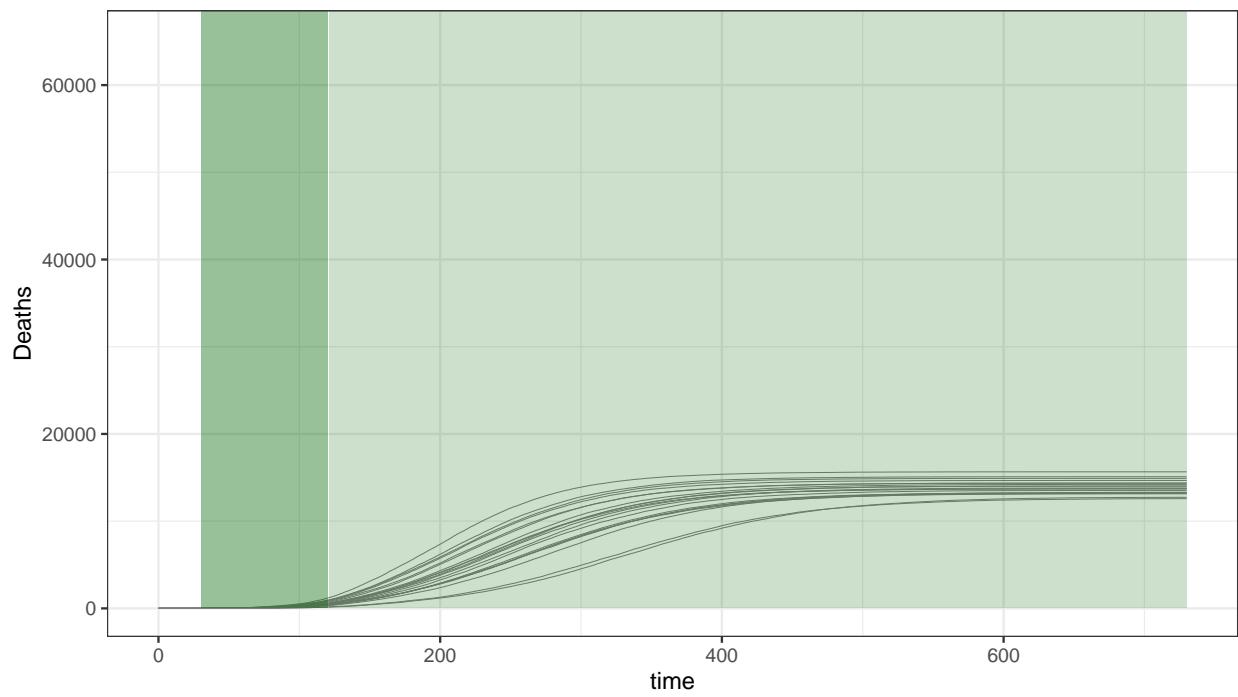


Social distancing+antiviral treatment of exposed

Reduction in infectious rate of 0.5



Social distancing+antiviral treatment of exposed
Reduction in infectious rate of 0.5



Vaccination Scenarios

Vaccine available within 12 months