Appendix A – Victorian Specific Application

Model description

Individual agents making up a synthetic population representing the Victorian population were modelled. Agents move and interact based on stochastic processes and/or in response to policies reflecting government-imposed restrictions. Their aggregate behaviour, experiences (e.g., of infection and recovery) and actions were used to assess the effect of SARS-CoV-2 disease progression and suppression strategies across the Victorian population. Specifically, we estimated the median date of elimination in Victoria. Elimination was defined here as no active cases, which differs from that observable in the real-world as the model user has perfect knowledge of active cases in the synthetic population – i.e., there is no need to wait for the lapse of multiple incubation or illness periods[1].

Because it is underpinned by stochastic processes, we report results from 1000 model runs conducted for 100 simulated days. All programming, documentation, data and details related to the calculations, estimations and assumptions are available for download from the online repository (https://bit.ly/2XI3v3z) as is a full and detailed description of the model following the principles of the Overview, Design concepts and Details (ODD)[2] standard protocol for ABMs. Parameters used in the model under policies 1-4 (1.Standard, 2. Standard + 50% masks, 3. Stringent + 50% masks, 4. Stringent + 90% masks) are set out in Table 1.

Table 1. Parameter estimates and 'agent' characteristics most relevant to current paper used in the ABM [2] (for a full details, see https://bit.ly/30eblSi).

Key Parameters	Parameter Estimates (Policies 1, 2, 3, 4)
Physical distancing (% of people limiting movement and maintaining a distance of 1.5m in pubic) [3]	85%
Physical distancing - time (% of time that people successfully maintain a distance of 1.5m (Aus)) [3]	85%
Proportion of essential workers[¥]	30% of working age-people in standard conditions 1 and 2, 20% of working aged in stringent conditions 3 and 4
Mean incubation period (days, log-normal)[4]	m = 5.1, sd = 1.5
Mean illness period (days, log-normal)[5]	m = 20.8, sd = 2
Mean adherence with isolation of infected cases (%, beta distribution (28,2)) [¥]	m = 0.93, sd = 0.05
Super-spreaders as a proportion of infected population[¥¥]	10%
Number of days after infection that new cases are publicly reported ¥	6
Date of case simulation initialisation (Day 0)	July 8th, 2020
Days from case 0 to policy enactment	1 (July 9th, 2020)
Asymptomatic cases (% of cases) [1,5]	20%

Infectiousness of asymptomatic cases vs symptomatic cases (per contact) [6]	33%
Schools shutdown policy enacted	False (policies 1 and 2), True (policies 3 and 4)
Proportion of people wearing face-masks during interactions outside the home	0% (policy 1), 50% (policies 2 and 3), 90% (policy 4)
Reduction in transmission risk per contact for people wearing face-masks ¥¥¥	80%[7]
Compliance with isolation orders ¥	95%
Seeded cases	An initial volume of 1200 active cases was seeded into the model on day 0, followed by 7 days of 150 new cases representing infections gained prior to lockdown to reflect lag in testing and reporting.
COVID-Safe App Uptake	20% of population, reducing track and trace time by 1/2

Agent Characteristics	Definition
Infection status	Infected, susceptible, recovered, deceased
Time now	The number of days (integer) since an infected person first became infected with SARS-CoV-2
Age-range	The age-bracket (categorical) of the person, calibrated to census data deciles from 0 to 100.
Risk of death	The overall risk of death (float) for each person based on their age-profile
Location	The current location of the simulated person (agent) in the model interface
Pace	The speed at which the person moves around the environment – higher speeds resulted in more close contact with other people (agents) in the model
Heading	The direction of travel of the person at the current time-step. In conjunction with the scaling approach, the heading variable was used to create local communities and control interaction between and across communities
Contacts	A count (integer) of contacts the person (agent) had interacted with in the past day as they moved within the model's environment

¥ Assumed parameter based on expert opinion

¥¥ 10% of the population potentially transmit infections widely through occasional travel to random locations.

¥¥¥ The source paper reports an adjusted odds ratio of 0.15 for a systematic review of observational studies. Given possible residual confounding, and to be conservative, we used 80% rather than 85%.

References

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