Supplementary materials: The role of masks, testing and contact tracing in preventing COVID-19 resurgences: a case study from New South Wales, Australia

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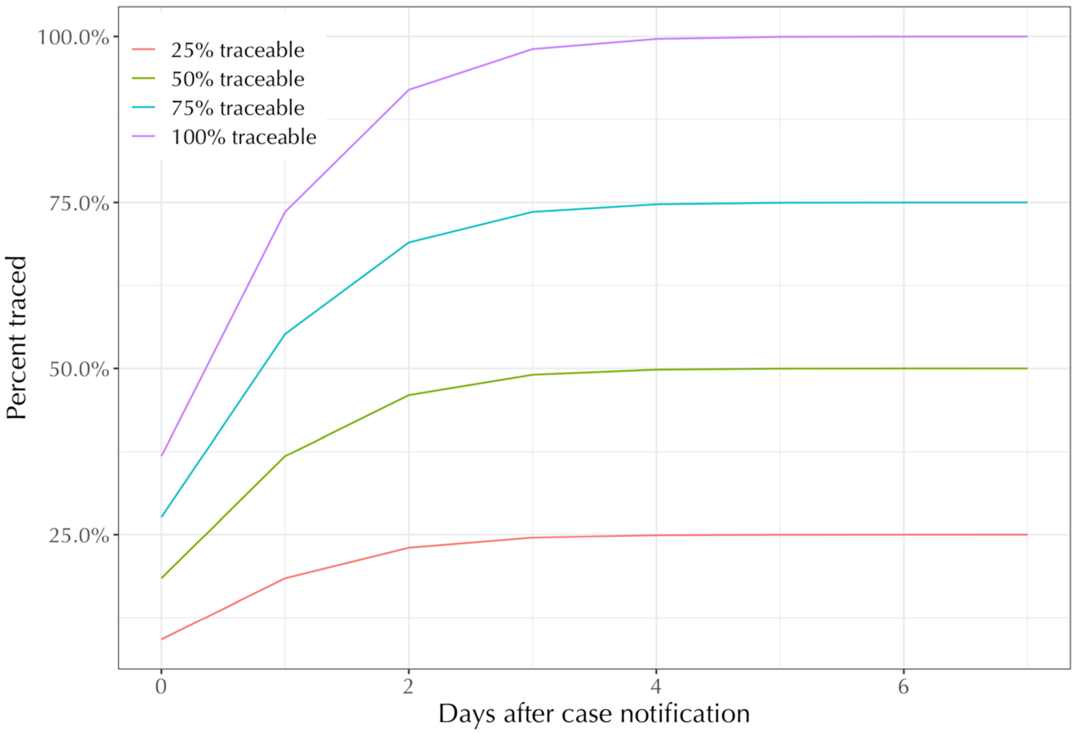

Figure S1. Assumed distribution of times required to find venue-based contacts.

Setting	**Description of policy changes and their effects**
Schools	School attendance rates in NSW had already dropped by 25% by 15 March 2020 (1), and on 23 March 2020 the NSW Premier advised that although schools remained open, parents were encouraged to keep their children at home for online learning (2). School attendance rates subsequently dropped to 5% of their pre-COVID levels (3). However, attendance quickly returned to pre-COVID levels shortly after schools reopened in mid-May (4). To model this, we removed 95% of contacts between school children and then restored them again as schools opened, but with the relative transmission risk set to 80% of its pre-March levels to account for additional safety measures in place for school activities (5).
Workplaces	According to survey data from the Australian Bureau of Statistics, almost half of working Australians were working from home in late April/early May (6), which is roughly consistent with Google movement data indicating that 40% fewer people were at work over that period compared to baseline. Workplace-based activities increased as COVID restrictions eased, but remained 15% lower over June-July compared to baseline. In the model, we removed 50% of workplace contacts and then restored them so that the workplace network was back to 85% of its pre-COVID size by the beginning of July (Figure 1). As with schools, we set the relative transmission risk set to 80% of its pre-March levels to account for the presence of NPIs.

Static community	We assume that almost no contacts occurred over these networks from March 23 to May 1 with the exception of the limited contacts arising from permitted single-person visits., These networks were gradually restored over the period from May 1 to July 9 as restrictions eased.
Dynamic community networks over May-July (negligible mask usage)	Within New South Wales, arts venues such as museums, galleries, theatres, and cinemas, large events such as concerts, festivals, sports games, and pubs/bars were all closed over the period from March 23 to May 15, after which the networks were gradually restored. Cafes and restaurants, public parks and other outdoor settings, public transport, and all other community settings including essential retail remained open in some capacity throughout the year but with decreased demand and operational restrictions to reduce the likelihood of transmission (e.g., takeaway service only, closure of playgrounds, capacity limits on transport, and physical distancing/hygiene).
Dynamic community networks over August (increased mask usage)	From August 3, 2020, the use of masks was mandated in Victoria, which led to a marked increase in mask usage across the country. Only 13% of Australians wore a mask at least once over the month of June, but 58% reported wearing one at least once over August 7–17, 2020 (99% of Victorian residents compared to 44% of residents of other states) (7). Within New South Wales, media sources reported that 30% of people were wearing face masks on public transport in central Sydney in mid-August (8). To reflect the gradual increase in mask uptake in the model, we adjust the relative transmission risk assuming that the proportion of adults who wore masks while at work and in dynamic community settings increased over August to reach 30% by the end of the month.
Testing, tracing, and isolation	We assume that the daily testing probability for those with symptoms increased from 5% in April to 20% by the beginning of June. Assuming a symptomatic period of roughly 10 days, this implies that the proportion of symptomatic people who get tested increased from 40% to 90%. In addition to symptom-based testing, we also assume that 90% of people who are not symptomatic but have been told to quarantine as a result of having been in contact with a confirmed case will get tested. Our assumptions around test sensitivity coupled with our modelling of viral load kinetics are specified such that the probability of identifying a true positive increases and then decreases over the course of an infection, following a similar profile to that reported in the literature (9–10). To model the efficacy of contact tracing over the period from June 1 – September 30, 2020, we assume that all household contacts were traced and notified on the same day that test results were communicated, that 95% of school contacts and 90% of workplace contacts were notified on the following day, and that 50% of all other contacts (which we refer to as community contacts) were traced within a week of a case notification, with a mean time to trace of one day (Figure S1). We assume that confirmed cases will isolate with near-perfect effectiveness, meaning that the probability of them transmitting to school or workplace contacts is zero, and the probability of them transmitting to their household contacts is reduced by 80%. Similarly, we assume high levels of adherence to isolation policies

	imposed on those who have been notified that they were in contact with a confirmed case, with a 90% reduction in their probability of transmitting to school or workplace contacts.
Quarantine, and border control measures	From early on in the epidemic, Australia imposed strict border control measures requiring all arrivals to quarantine for two weeks in a hotel. These policies are assumed to be maintained throughout the duration of the model simulations.

Table S1. Effects of policies on transmission risk in New South Wales

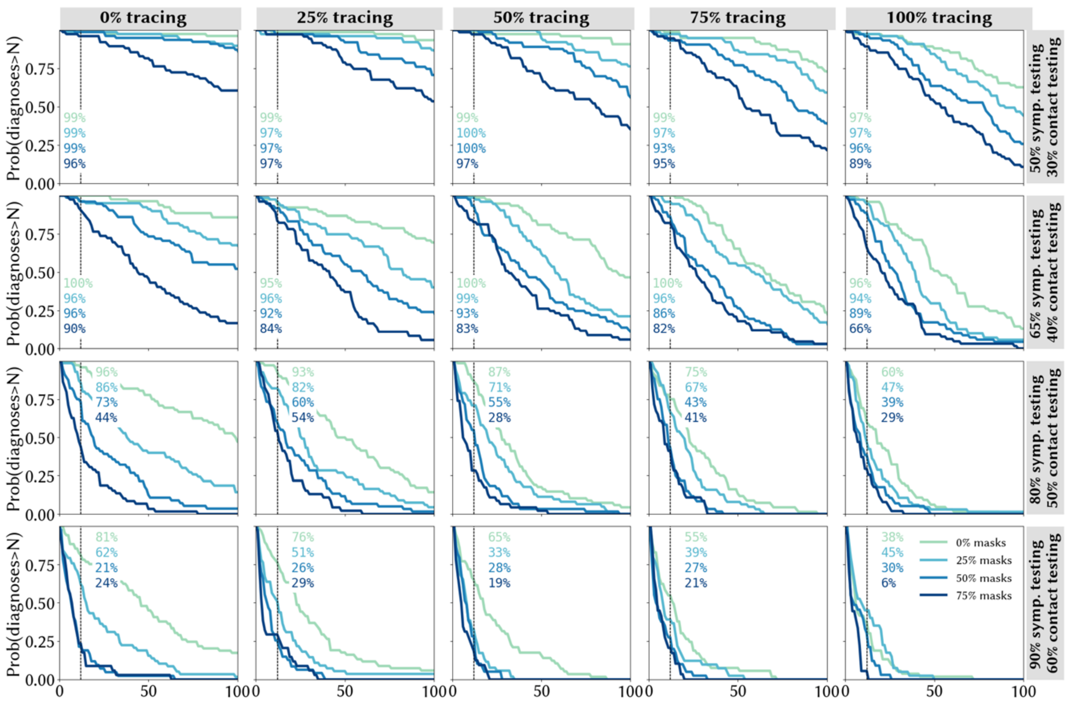

Figure S2. Sensitivity to asymptomatic testing assumption: the probability of the trailing 14-day average of locally-acquired cases exceeding a given number by December 31, 2020 with individual-level mask efficacy set to 15%, under different assumptions about the testing rate (rows), proportion of community contacts that can be traced within one week (columns), and mask uptake (line colours).

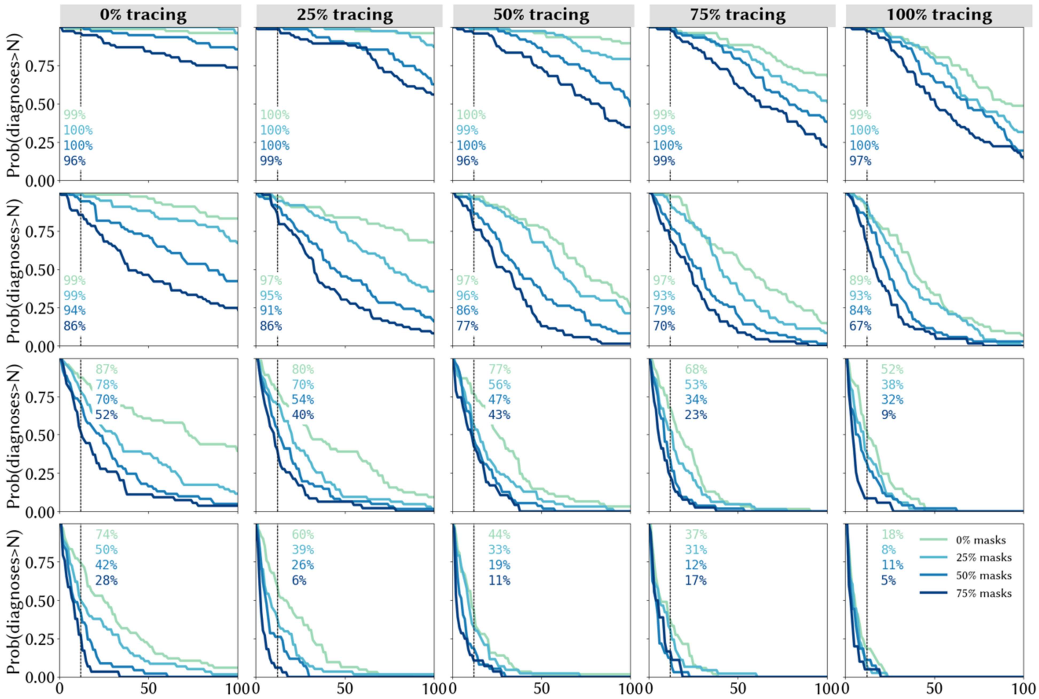

Figure S3. Sensitivity to mask efficacy assumption: the probability of the trailing 14-day average of locally-acquired cases exceeding a given number by December 31, 2020 with individual-level mask efficacy set to 15%, under different assumptions about the testing rate (rows), proportion of community contacts that can be traced within one week (columns), and mask uptake (line colours).

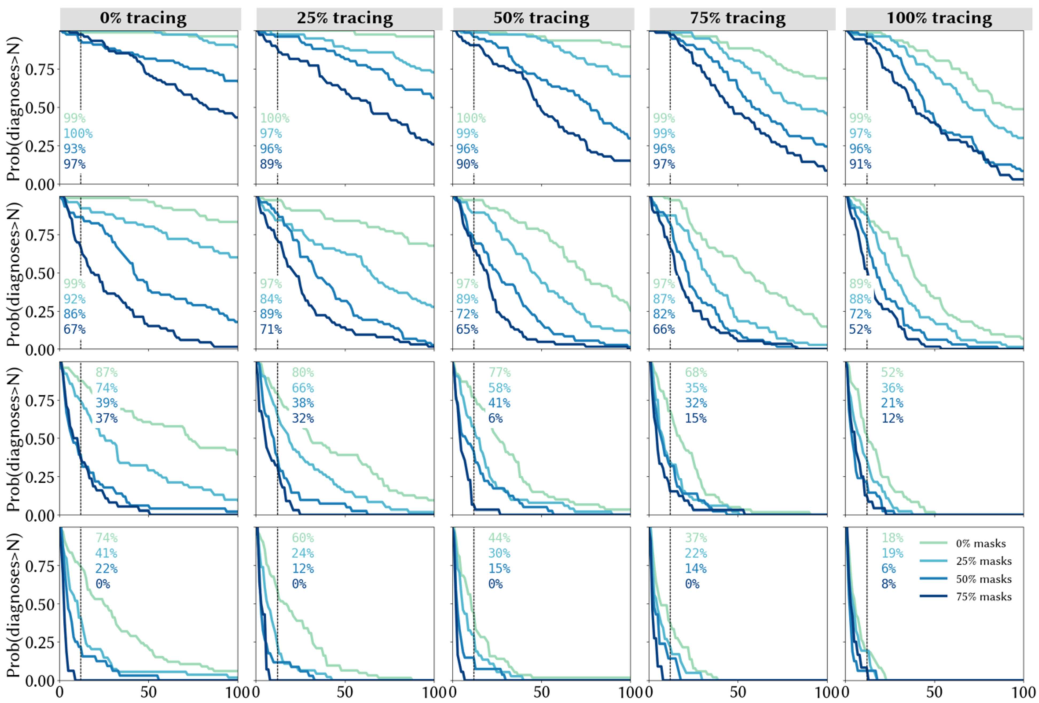

Figure S4. Sensitivity to mask efficacy assumption: the probability of the trailing 14-day average of locally-acquired cases exceeding a given number by December 31, 2020 with individual-level mask efficacy set to 45%, under different assumptions about the testing rate (rows), proportion of community contacts that can be traced within one week (columns), and mask uptake (line colours).

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