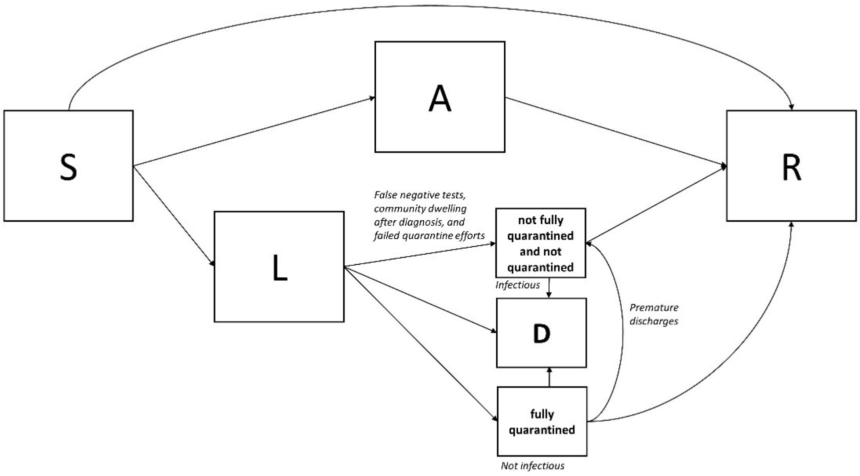
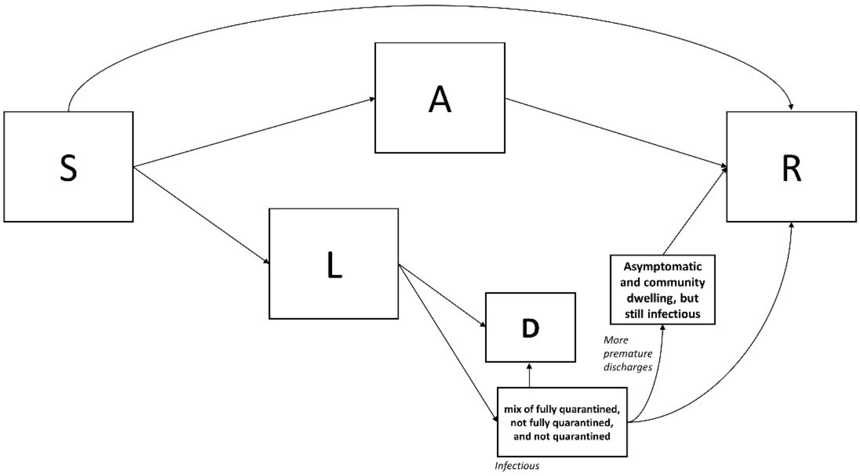
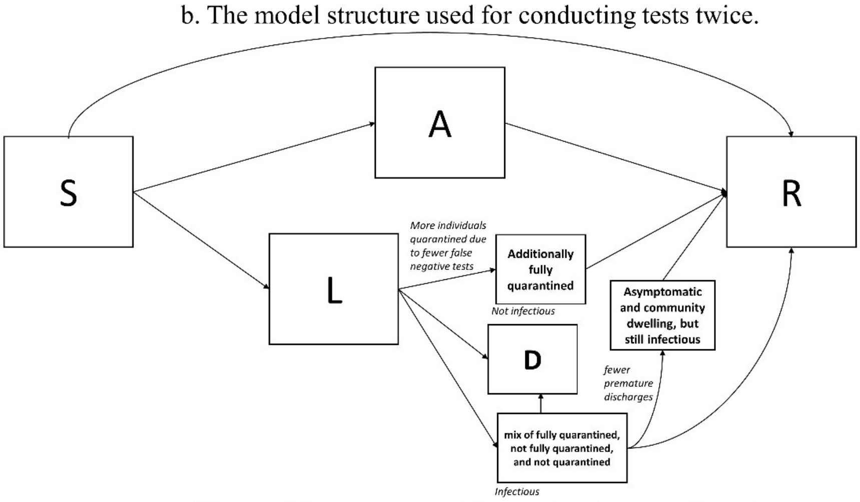
Supplementary materials:




a. The ideal model structure for the economic evaluation of diagnostic tests.




b. The model structure used for conducting tests twice.




c. The model structure used for conducting tests three times.

Fig A1. The ideal model structure and the model structures used for the economic evaluation of two-tests and three-tests strategies.

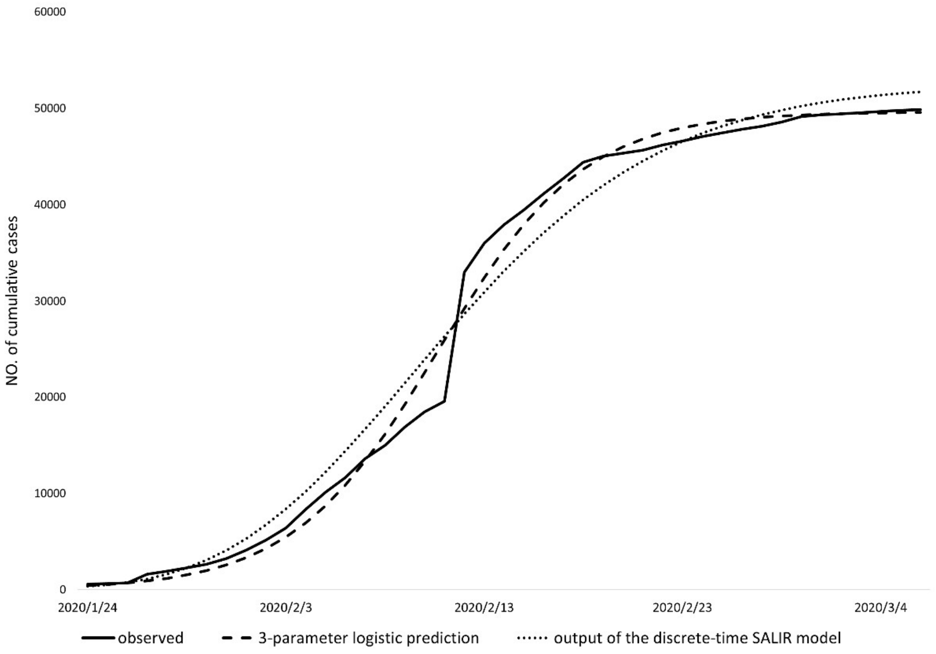



Fig A2. The observed epidemic curve, the predicted three-parameter logistic growth curve, and the curve generated by the calibrated discrete-time SALIR of the number of cumulative confirmed cases.

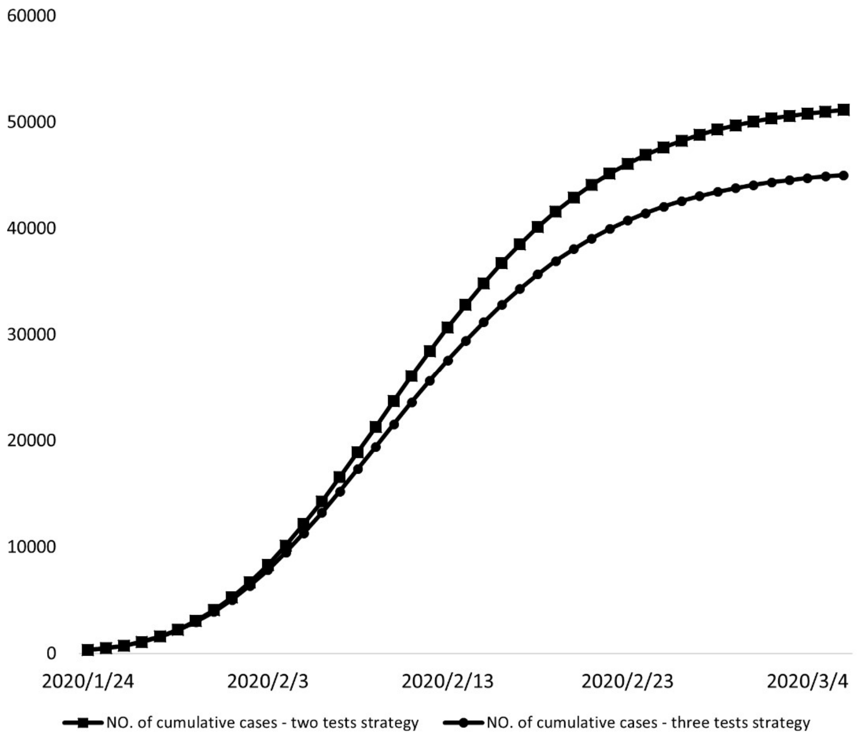



Fig A3. The epidemic curves under the two different test strategies.



Jiang Y, *et al. BMJ Global Health* 2020; 5:e002690. doi: 10.1136/bmjgh-2020-002690

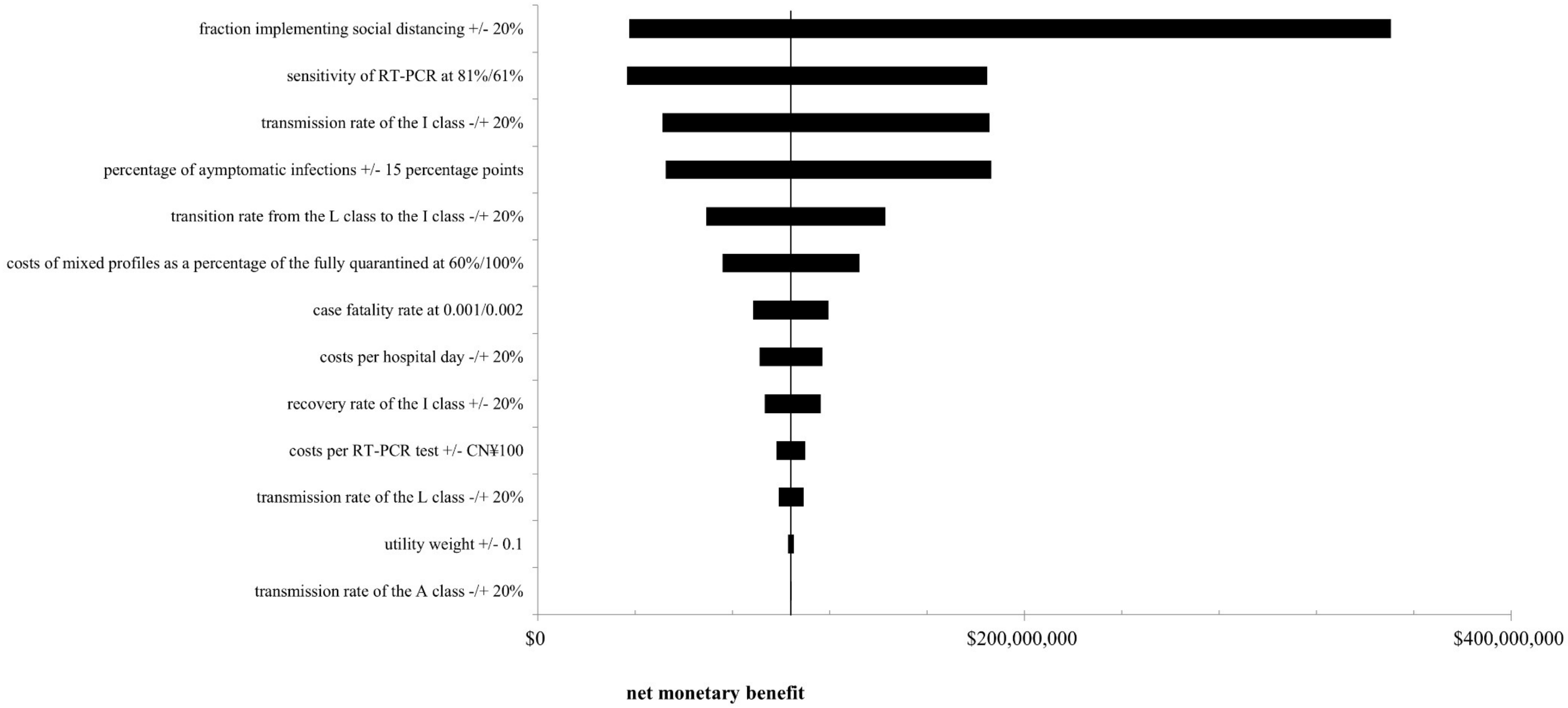



Fig A4. The results of one-way sensitivity analyses.

**Estimation of $R_0$**

The formula for the calculation of $R_0$ provided in the main text corresponds to the ordinary differential equation (ODE) version of the SALIR model. Hence, the parameter estimates from the ODE model can be used to calculate $R_0$. The ODE model parameter estimates along with the fixed parameters that were used in the calculation of $R_0$ are listed in Table A1.

Table A1. Parameters of the ODE SALIR transmission model.

| parameter | definition | input value | ODE model estimate |
|---|---|---|---|
| $\boldsymbol{p}$ | The probability of not developing symptoms throughout the course | 0.179 | NA |
| $\boldsymbol{\beta_A}$ | the transmission coefficient of the A class | NA | $1.53\times 10^{-11}$ |
| $\boldsymbol{\beta_L}$ | the transmission coefficient of the L class | NA | $1.29\times 10^{-7}$ |
| $\boldsymbol{\beta_I}$ | the transmission coefficient of the I class | NA | $4.39\times 10^{-9}$ |
| $\boldsymbol{\sigma}$ | the transition rate of individuals from the L class to the I class | 0.200/day | NA |
| $\boldsymbol{\mu}$ | the case-fatality rate of the I class | 0.00150/person-day | NA |
| $\boldsymbol{\gamma_A}$ | the recovery rate of the A class | NA | 37.2/day |
| $\boldsymbol{\gamma_I}$ | the recovery rate of the I class | 0.0590/day | NA |

Abbreviation: NA, not applicable.

Based on these estimates, the $R_0$ of COVID-19 was estimated to be 5.3, which was close to the estimation of 5.8 by Sanche et al [1]. However, the value of $R_0$ has already been estimated anywhere between 1.4 – 6.5 [2], so a new estimate would likely agree with something in that range anyways. Consequently, the agreement with another estimate may say little about its external validity.

The predicted three-parameter logistic growth curve and the curve based on the output of the ODE version of the modified SALIR with social distancing are depicted in Fig A5. In spite of dramatic difference in estimated parameter values, the ODE model output visually resembled that of the discrete-time model if this graph is compared with Fig A2, which was attributable to different mathematical processes.

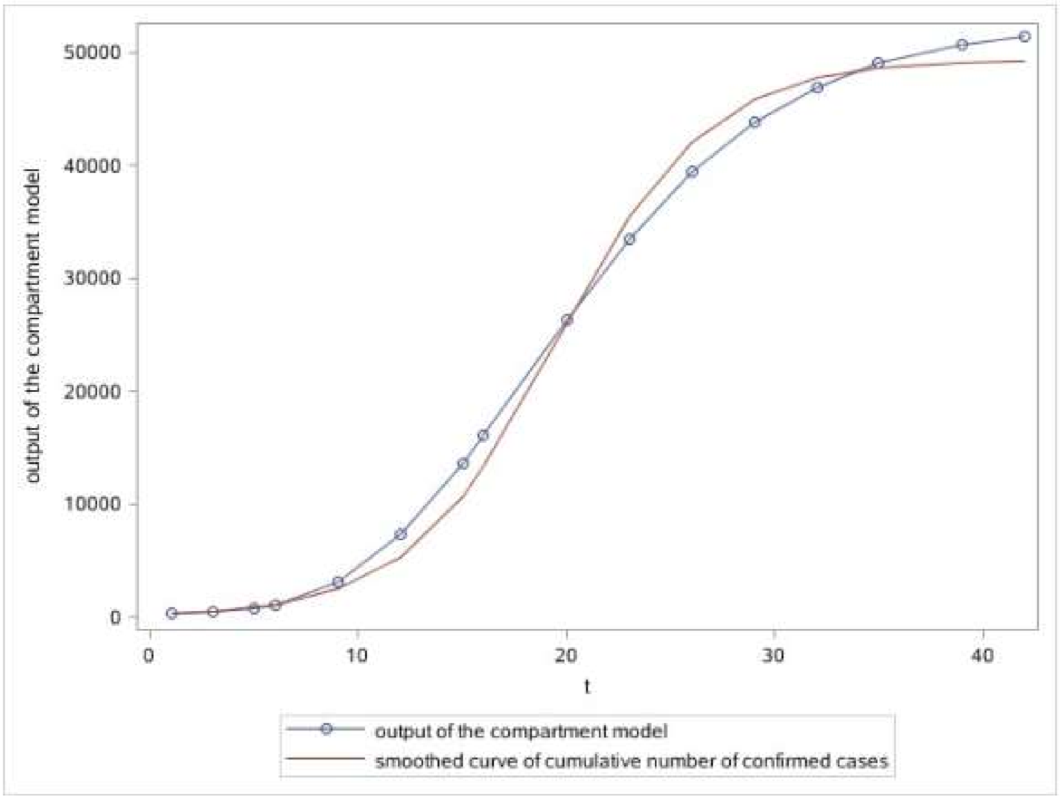



Fig A5. The predicted three-parameter logistic growth curve and the curve based on the output of the ODE version of the modified SALIR model. T=0 was Jan 23, 2020.

Our calculation of $R_0$ represented an effort to retrieve the underlying value when the post-lockdown epidemic curve was observed. However, it is noteworthy that the estimated value of $R_0$ likely represented an underestimate of the true value. Specifically, the transmission coefficient of the I class (symptomatic and infective) might only reflect the situation that the individuals in this class were partially quarantined. As an exploration, the value of $R_0$ would increase to 6.4 if the transmission coefficient estimates of the I class was three times of its original value.

Another caveat was that the estimate of $\gamma_A$ (the recovery rate of the asymptomatic class) was not realistic although the epidemic curve of the ODE version of the model was visually plausible. As such, the parameter estimates of the ODE model may be inaccurate. However, $\gamma_A$ had very limited impact on the value of $R_0$. For example, $R_0$ remained at about 5.3 if $\gamma_A$ was set at 0.058 (the same as that of the symptomatic patients).

Due to such limitations, we believe the method we derived for the calculation of $R_0$ that can be used for other infectious diseases sharing the same epidemiological characterization has more value than the exact estimate we calculated. In the meantime, it is advisable to be cautious when interpreting our estimate of $R_0$.

To deterministically account for the uncertainty of the fixed parameters used in the calibrations of the estimated parameters, the fixed parameters were varied to re-calibrate the model so that alternative estimates of $R_0$ could be obtained. The corresponding estimates are presented in Table A2. The value of $R_0$ ranged from 4.0 to 6.9 in these scenarios.

Table A2. Alternative estimates of $R_0$.

| Alternative scenario | Definition | Alternative $R_0$ estimate |
|---|---|---|
| $\boldsymbol{p}$=0.1 | The proportion of not developing symptoms throughout the course = 10%. | 5.9 |
| $\boldsymbol{p}$=0.3 | The proportion of not developing symptoms throughout the course = 30%. | 6.3 |
| $\boldsymbol{\sigma}$=0.25 | The period in the L class lasts for 4 days. | 4.0 |
| $\boldsymbol{\sigma}$=0.17 | The period in the L class lasts for 6 days. | 6.9 |
| $\boldsymbol{\gamma_I}$=0.83 | The period in the I class lasts for 12 days. | 5.0 |
| $\boldsymbol{\gamma_I}$=0.45 | The period in the I class lasts for 22 days. | 4.9 |

References

1. Steven, S., et al., *High Contagiousness and Rapid Spread of Severe Acute Respiratory Syndrome Coronavirus 2.* Emerging Infectious Disease journal, 2020. **26**(7).
2. Liu, Y., et al., *The reproductive number of COVID-19 is higher compared to SARS coronavirus.* Journal of Travel Medicine, 2020. **27**(2).