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Digital Health

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Zhou Y, Xu R, Hu D, Yue Y, Li Q, Xia J. Effects of human mobility restrictions on the spread of COVID-19 in Shenzhen, China: a modelling study using mobile phone data. *Lancet Digital Health* 2020; **2:** e417–24.

Appendix

Definition of COVID-19 cases from China CDC

A suspected or probable case is defined as a case that meets: (1) three clinical criteria or (2) two clinical criteria and one epidemiological criterion. Clinical criteria are: fever; radiographic evidence of pneumonia or acute respiratory distress syndrome; and low or normal white blood cell count or low lymphocyte count. Epidemiological criteria are: living in Wuhan or travel history to Wuhan within 14 days before symptom onset; contact with patients with fever and symptoms of respiratory infection within 14 days before symptom onset; and a link to any confirmed cases or clusters of suspected cases.

Prevention and Control programs in the city of Shenzhen, China

On February 29, 2020, the WHO released a China inspection report,that included the Shenzhen three-stage epidemic prevention and control strategy as a classic case because of the high level of control obtained over the epidemic in Shenzhen.

The first stage (before January 15, 2020):

The emergency response measures for pneumonia of an unknown cause was launched on December 31, 2019. On January 5, 2020, Shenzhen Customs and other departments determined the response measures for pneumonia of unknown cause. The first case was found on January 8. On January 10, the city's disease control system emergency response measures were launched. On January 13, the testing reagent antigen was obtained and testing was started. Fever management was designated for treatment; on January 14, the first case of new coronary pneumonia was found by screening.

The second stage (January 16-February 4):

On January 16, The joint prevention and control mechanism for infectious diseases in Shenzhen was launched; On January 21, the centralized isolation location was launched; On January 22, the city launched hospital-based prevention and control supervision and inspection; On January 28, Shenzhen CDC established the headquarters of the epidemic prevention and control work; On January 29, the school was closed and the start of new semester was postponed.

The third stage (after February 5th and February 6th):

Implementation of the "5×100%, 10×uniform" strategy as the followings:

1. 100% of communities are under quarantine management;
2. 100% of people who have travel history to Hubei within the past 14 days are isolated at home;
3. 100% of people who have a history of close contact with the case are in isolation;
4. Two-way body temperature detection is implemented for 100% of residents in and out of the community;
5. 100% of registration for the rental house;
6. All communities and villages in the city shall set up inspection registration cards at entrances and exits;
7. The community will inform the Shenzhen residents who are still in Hubei that they will not return to the Shenzhen until notified to do so, and those who have already returned to Shenzhen must strictly implement home isolation measures;

8．Patients with a fever are reported to the community and should be sent to the hospital for medical treatment as soon as possible;

9．People who do not live in this community are not allowed to enter. Special entrance should be registered if the community residents agree;

10．Shenzhen residents who returned to Shenzhen from outside the city will conduct investigations and inquire about their travel history, and contact history in the past 14 days;

11．All residential units with confirmed cases will be isolated for 14 days, and a notice saying "Isolation management will be implemented in this building due to the need for prevention and control of epidemic " will be posted in a conspicuous place;

12．All takeaways, courier, and delivery will be implemented with contactless distribution, and will be transferred at the entrance of the community;

13．Residents in the community shall not gather together, and strictly implement the requirements of wearing masks in public places;

14．The corridors, elevators will be disinfected daily;

15．Public places that are not necessary for the lives of residents will be closed and all mass gathering activities will be stopped;

16．Declaration measures are implemented on all highways and urban roads in and out of Shenzhen. When vehicles intend to pass the "vehicle epidemic checkpoint" for the first time, they must make a notification online in advance to pass.

Appendix Figures

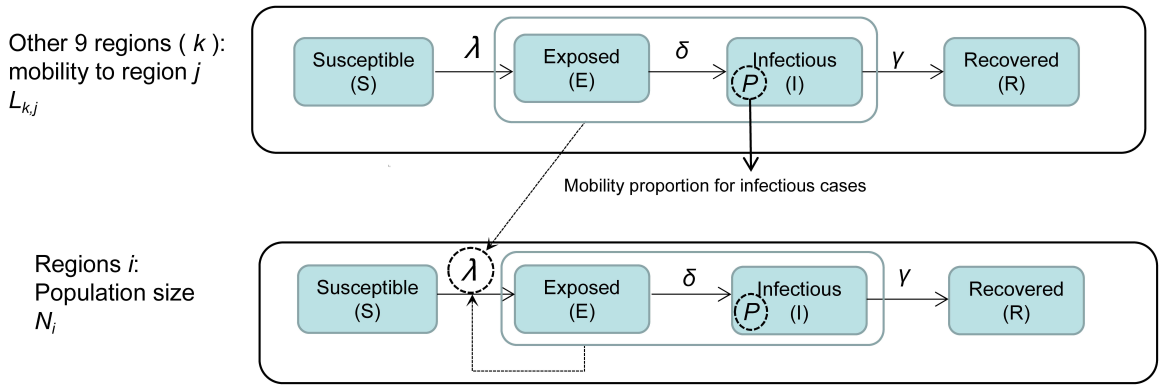

Figure S1. Model overview

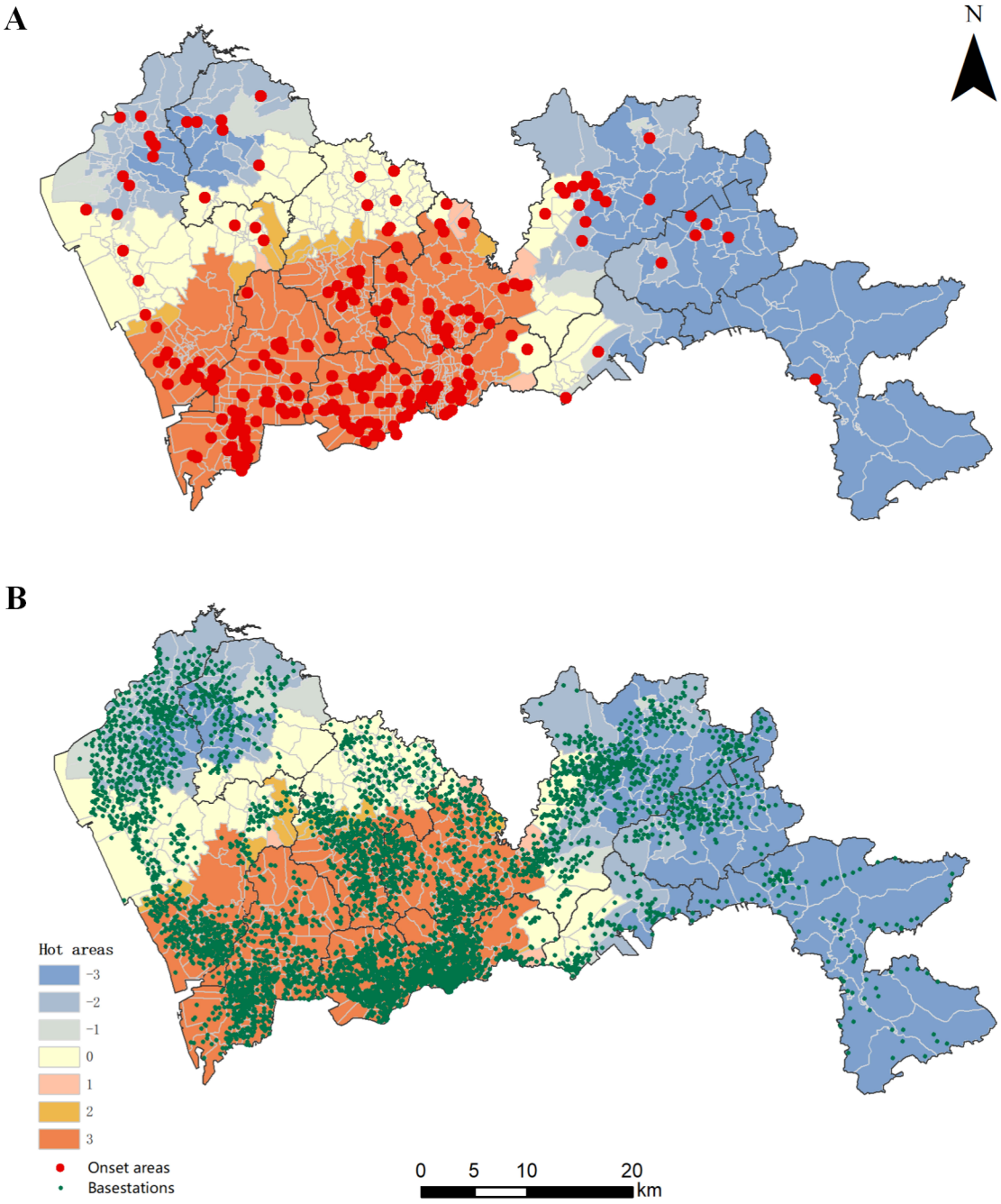

Figure S2. The distribution of confirmed COVID-19 cases and the locations of mobile phone base stations in Shenzhen

A) The distribution of COVID-19 confirmed cases in Shenzhen (The red dots represent the reported cases geographical gathering community in each region (until Feb 7, 2020). B) Mobile phone base stations (green dots) are overlaid over the extended region boundaries in Shenzhen.

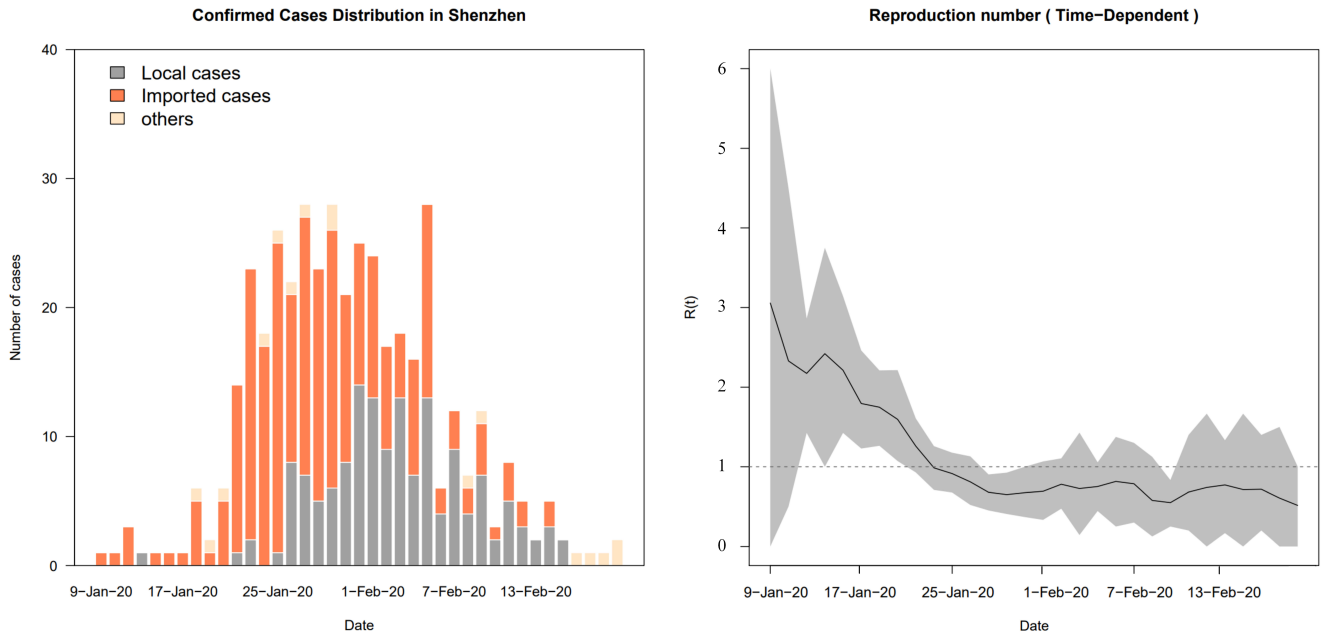

Figure S3. COVID-19 infection and effective reproduction number R(t) in Shenzhen from January to February 2020

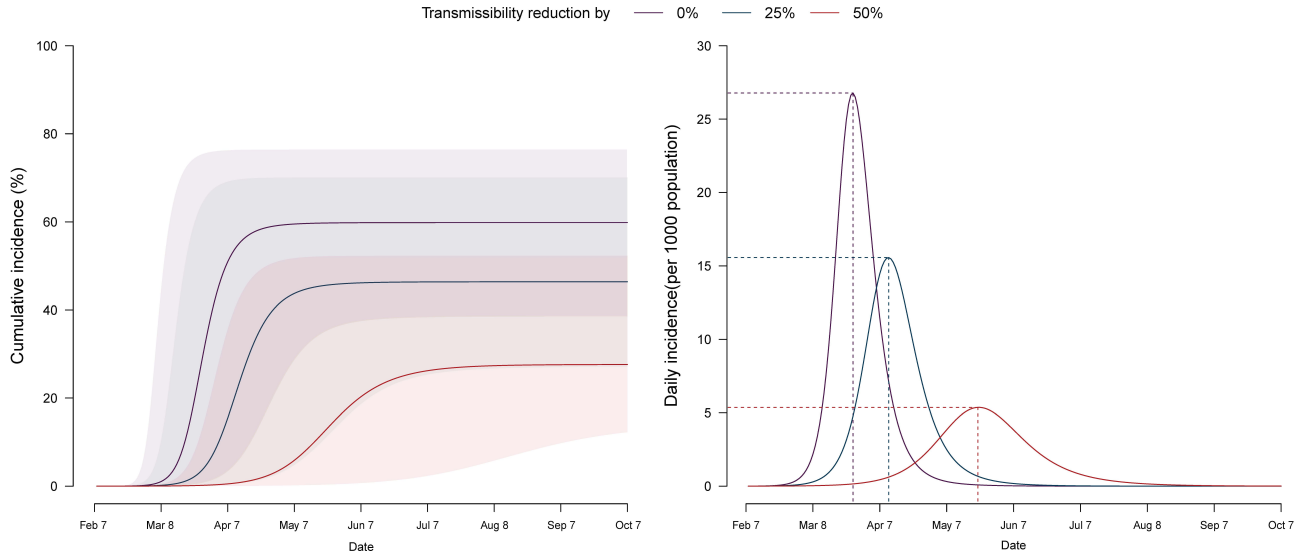

Figure S4.The effect of various transmissibility reduction interventions on controlling the COVID-19 outbreak in the basic scenario

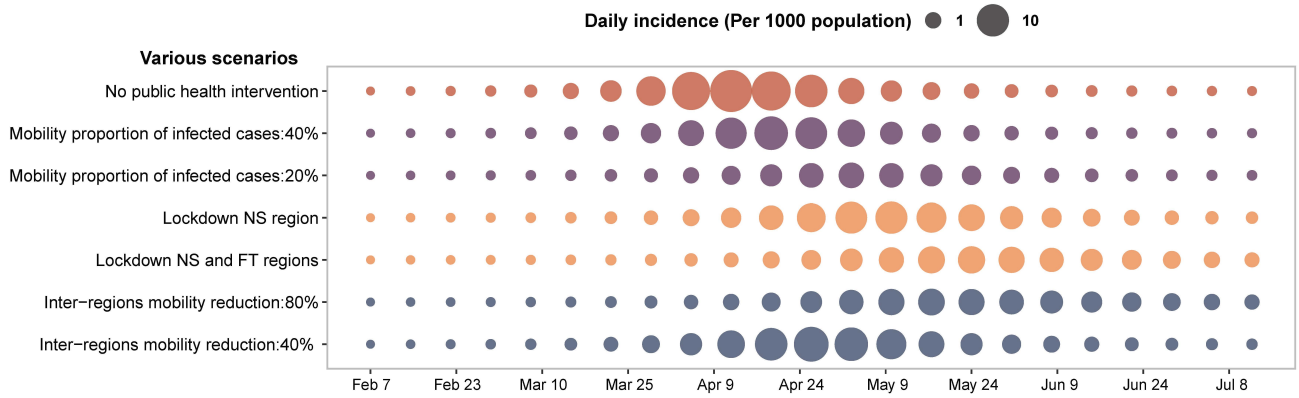

Figure S5. The effect of various mobility restriction intervention at different levels on the controlling the COVID-19 outbreak when R_0 is 2

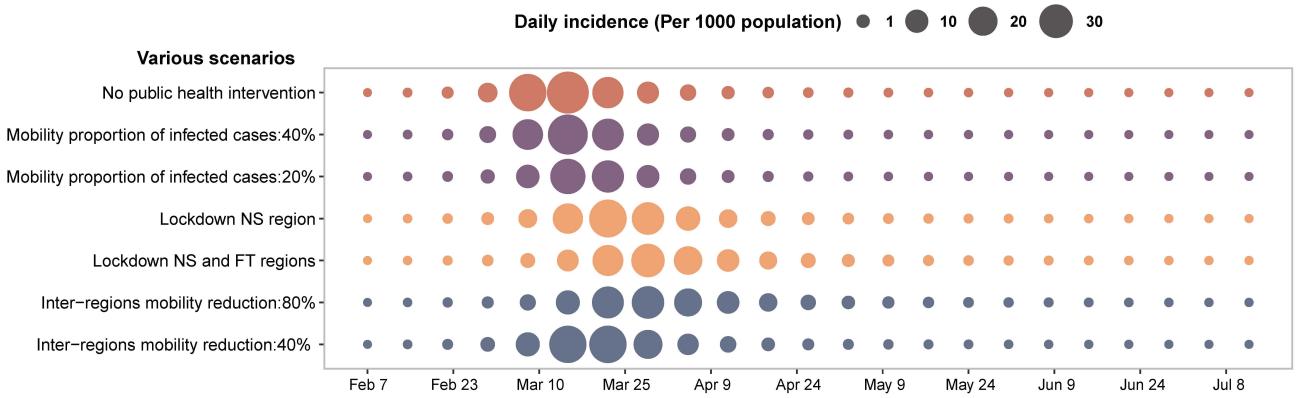

Figure S6. The effect of various mobility restriction intervention at different levels on the controlling the COVID-19 outbreak when R_0 is 4