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Letter to the Editor

## Non-pharmaceutical intervention strategies for outbreak of COVID-19 in Hangzhou, China



Hangzhou, a city with a population of more than 9.86 million in the south of China, encountered a large-scale outbreak of COVID-19 with 169 confirmed cases reported from January 21 to February 19. As there were no vaccines or antivirals, the spread of the disease was controlled by non-pharmaceutical interventions for nearly 45 days. On February 28, 2020, WHO Director-General Tedros declared that the impact risk of COVID-19 had increased to 'very high at a global level'.<sup>1</sup> In countries such as Italy, the Republic of Korea, Iran, and Japan, the number of new cases has kept increasing, although the number of cases has been declining in China.<sup>2</sup> In the following paragraphs, we introduce intervention strategies in Hangzhou and hope these strategies will help cities still suffering from COVID-19.

The implementation of interventions can be divided into three stages in Hangzhou, as shown in Fig. 1. The first stage was from January 21, the first confirmed case reported, to February 2. The interventions were isolation of patients or suspected patients, quarantine of close contacts, and disinfection of locations where the patients had been previously. Fifty-five imported cases and 37 local cases who had been close contacts of imported cases were detected and isolated from a total of 109 confirmed cases in this stage. However, seven cases of unknown origin had been reported in succession in Tonglu, a county of Hangzhou, since January 28. This indicated that the disease might have spread locally. What is more, more than half of the confirmed cases exhibited only mild symptoms. Some patients were unaware that they were sick. This suggested that some cases unfortunately might not have been identified in time.

The second stage was from February 3 to February 18. The trigger for the government stepping up interventions was that

three districts/counties reported cases of unknown origin, including Tonglu on February 3. The trend of local transmission was obvious. Community-wide containment was added on the basis of the first stage to reduce individuals' contact with unidentified sources of infection. All enterprises and institutions closed except some essential functions, such as supermarkets and hospitals. People were advised to stay at home and allowed only to go out twice a week to buy necessities. In this stage, 19 imported cases and 40 local cases, including nine cases of unknown origin, were reported.

The third stage was from February 19 until now. After 15 days of containment, the outbreak was basically under control. The containment was canceled, and businesses were allowed to resume work orderly. Health status monitoring of workers and preventive disinfection of public areas were required to be carried out every day in this stage. Up to March 2, no new cases were reported for 12 consecutive days, except one imported case on February 19.

In the face of new infectious diseases, such as COVID-19, non-pharmaceutical interventions are effective choices for governments owing to the lack of treatment and immunity vaccination methods.<sup>3</sup> Although the effect of these interventions still needs further accurate evaluation, the large-scale outbreak was controlled in Hangzhou in a short time, and these interventions played an important role. We also find that the effect of non-pharmaceutical interventions is closely related to the timing and quality of implementation, and this might be the reason why similar strategies have different effects in different cities.

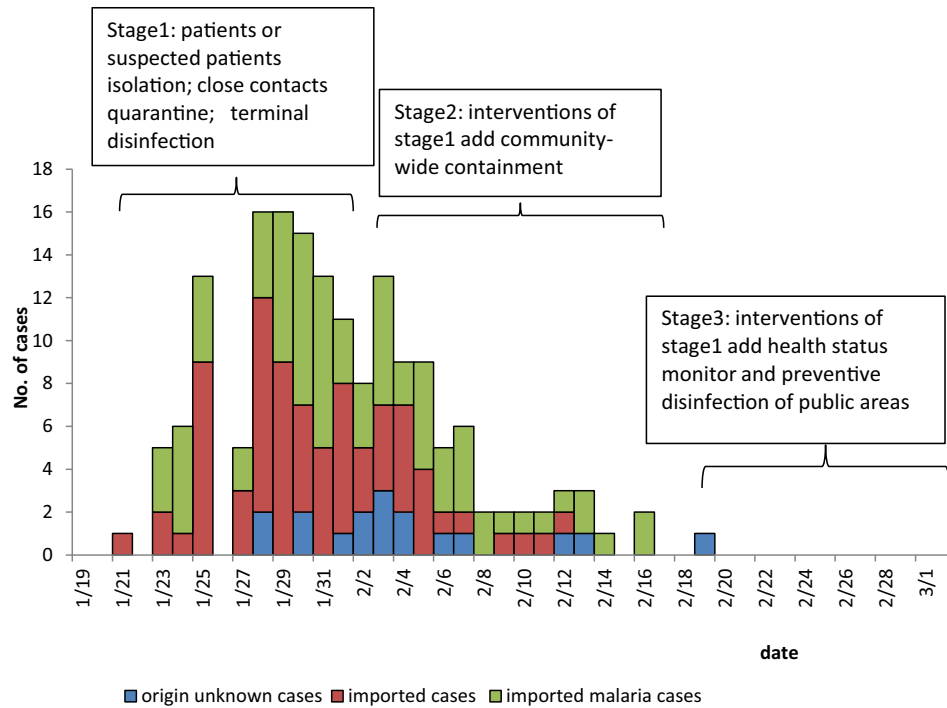


Fig. 1. Intervention strategies at different epidemic stages of COVID-19 in Hangzhou.

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