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LETTER

The novel coronavirus (SARS-CoV-2) infections in China: prevention, control and challenges

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Dear Editor,

Since December 2019, an outbreak of novel coronavirus (SARS-CoV-2) that began from Wuhan, Hubei Province, has rapidly spread to 34 provincial-level divisions of China [1] and 25 countries around the world [2]. Up to February 15, 2020, 68,586 cases in China and 526 cases in other countries have been identified as having COVID-19 (eFigure 1). The estimated mortality rate is 3.1% in Wuhan, 2.8% in Hubei Province, 0.6% in other provinces of China, 2.4% in China and 0.4% in other countries, respectively.

Faced with such a grim situation, the Chinese government has taken a series of unprecedented rigorous measures. First, all the 31 provincial-level divisions in China mainland have launched the highest level of responding mechanism for major public health emergency. Second, Wuhan and other 12 cities in Hubei Province have consecutively shut down all outbound transportation channels and suspended public transportation. Third, the State Council announced that both the Spring Festival holiday and winter vacation will be extended. Fourth, two emergency makeshift hospitals (Huoshenshan and Leishenshan hospitals) with a total capacity of 2600 beds were built and more than ten cabin hospitals were renovated with more than 10,000 beds in Wuhan. Fifth, more than 30,000 members from military and public hospitals have successively headed out to Wuhan and other cities in Hubei Province.

Although the number of confirmed cases is still increasing, the increasing rate has showed a downward trend from February 4, 2020 (eFigure 2). Despite Hubei Province, Guangdong, Henan, Zhejiang, Hunan and Anhui are the top five provinces with respect to the ranking order of confirmed cases. The increasing rates of confirmed cases in these provinces also showed a downward trend recently (eFigure 3). Using a real-time Bayesian estimation model and a reported serial interval of COVID-19 [3, 4], we computed time-dependent reproduction number, $R(t)$, which is defined as the expected number of secondary cases that one primary case will generate during infectious disease transmission. As shown in Fig. 1, $R(t)$ has showed a downward trend in Wuhan, Hubei Province, outside Hubei, and China from January 27, 2020, to February 10, 2020. The downward trend of $R(t)$ indicates that the prevention and control measures may be effective, although long-term effects remain to be evaluated.

However, we still confront a number of great challenges. First, source of SARS-CoV-2 remains pendent and the population is generally susceptible to the new virus. Second, although human-to-human spread [3] is thought to occur mainly via respiratory droplets and close contact, fecal–oral transmission or vertical transmission may also be a means of transmission. Third, asymptomatic cases with COVID-19 have been reported [5], and several places in China have reported confirmed cases without clear transmission chain, which indicates that there may be some infected cases still wandering among population and spreading virus. Fourth, as the Spring Festival

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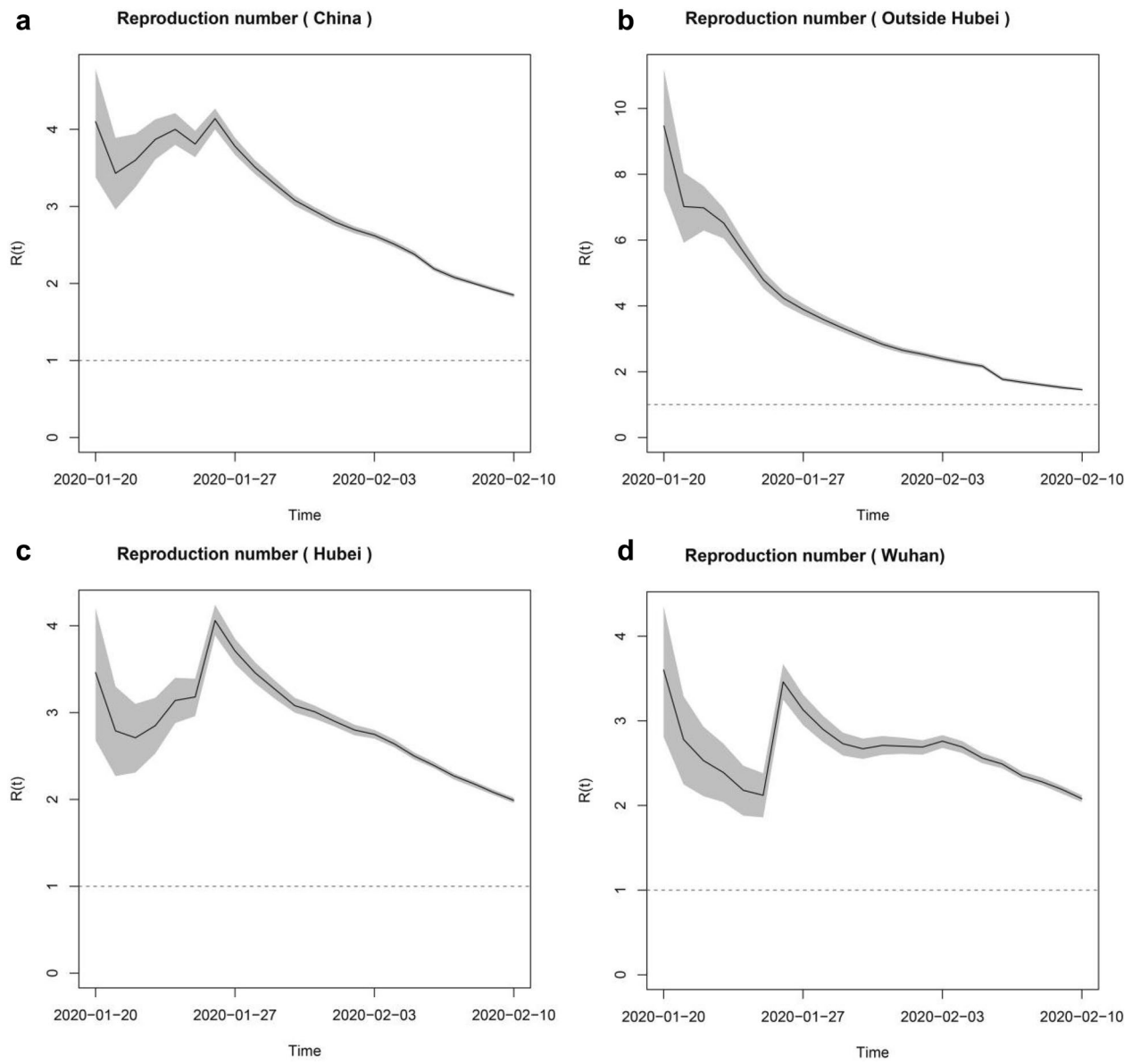

Fig. 1 Real-time reproduction number of COVID-19 in China, outside Hubei, Hubei and Wuhan. Real-time reproduction number $R(t)$ with 95% confidence interval of COVID-19 in **a** China, **b** outside Hubei, **c** Hubei Province and **d** Wuhan. The estimates of $R(t)$ were truncated at February 10, 2020, because the diagnosis criteria for COVID-19 are adjusted since February 12, giving a sharp increase in number of new cases who was identified as having COVID-19. Incorporating these data for $R(t)$ derivation would obtain misleading results

holiday nears its end, hundreds of millions people will migrate from hometown to metropolitan areas for work. Such a large scale of population migration proposes a huge challenge for epidemic control and prevention.

Electronic supplementary material
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Authors' contribution
SZ and MYD helped in the conception and design of the study. SZ and LWD contributed to data collection and analysis. MYD helped in the first draft writing. ZFL and CDC contributed to the final approval of the version to be

submitted. All authors commented on previous versions of the manuscript and read and approved the final manuscript.

Compliance with ethical standards

Conflicts of interest
The authors declared no conflict of interest.

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