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Further explanations for the eq. (3) in "Estimating the daily trend in the size of the COVID-19 infected population in Wuhan"

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Abstract

To avoid possible confusions to the readers, we provide further explanations for the eq. (3) in the research article "Estimating the daily trend in the size of the COVID-19 infected population in Wuhan" published in the *Infectious Diseases of Poverty*.

In our study [1], we proposed a new model to estimate the daily trend in the size of the COVID-19 infected population in Wuhan. When discussing this article with our colleagues, we found that a little more explanations for eq. (3) are needed to avoid possible confusions to the readers.

In the Methods section, we let x_t be the number of imported cases outside Hubei province on Day t, and derive a binomial model $x_t \sim Binomial(N_t, p)$ if $t_0 + d < t \leq t_0 + 2d$, and $x_t \sim Binomial(N_t - N_{t-d}, p)$ if $t > t_0 + 2d$. To make our model clearer, here x_t is in fact the number of infected individuals that travelled from Wuhan to places outside Hubei province on Day $t - d$. However, among the 10 940 confirmed cases in our data, 8546 (78.1%) do not have information on the date of departure from Wuhan, so the number of cases leaving Wuhan every day is unknown and hard to impute.

But the date of confirmation is available for each of the 10 940 cases, so we use the cumulative number of imported cases outside Hubei province as of Day t as approximation of $X_t = \sum_{k=1}^{t} x_k$. Since the window from infection to detection is assumed as d days in our model, the infected cases that left Wuhan before Day $t - d$ should be confirmed outside Hubei province before Day t, thus this approximation is reasonable and would not affect the conclusion in the paper.

Availability of data and materials
All data and materials used in this work were publicly available.

Ethics approval and consent to participate
The ethics approval and individual consent was not applicable.

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Reference
1. Lin QS, Hu TJ, Zhou XH. Estimating the daily trend in the size of the COVID-19 infected population in Wuhan. Infect Dis Poverty. 2020;9(1):69.