Estimation of Coronavirus Disease Case-Fatality Risk in Real Time

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We ran a simulation comparing 3 methods to calculate case-fatality risk for coronavirus disease using parameters described in previous studies. Case-fatality risk calculated from these methods all are biased at the early stage of the epidemic. When comparing real-time case-fatality risk, the current trajectory of the epidemic should be considered.

We read with interest the research letter on estimating case-fatality risk for coronavirus disease (COVID-19) by Wilson, et al. (*1*). In their analyses, the authors estimated the case-fatality risk adjusted to a fixed lag time to death. They acknowledged that the calculated adjusted case-fatality risk (aCFR) might be influenced by residual uncertainties from undiagnosed mild COVID-19 cases and a shortage of medical resources. However, we believe the time-varying number of cumulative cases and deaths also should be considered in the epidemic profile.

Because of the exponential growth curve of the COVID-19 outbreak, the numbers of cumulative cases and cumulative deaths have been relatively close to each other in the early stages of the outbreak, leading to a much higher aCFR. As the outbreak progresses, the ratio of the cumulative cases and deaths declines, which reduces the aCFR. Thus, a higher aCFR does not necessarily indicate increased disease severity.

To test our hypothesis, we performed a simulation study by using a susceptible-infectious-recovered–death model and parameters set according to prior studies. We set the infectious period as 10 days (*2*); case-fatality risk as 3% (*3*); basic reproductive ratio (R_0) as 2.5 (*4*); recovery rate as 1/13 day (*5*), that is, 13 days from illness onset to recovery; and the population size as 1 million. We compared crude case-fatality risk, aCFR per Wilson et al.'s method, and aCFR per Mizumoto et al.'s method (*6*). Although the case-fatality risk calculated from these methods all are biased at the early stage of the epidemic, case-fatality risk calculated from Mizumoto et al.'s method was closer to the true case-fatality risk of 3% (Figure).

In conclusion, we recommend the Mizumoto et al. method (*6*) to calculate aCFR in real time. When comparing real-time estimation of the case-fatality risk across countries and regions, our results indicate that the current trajectory of the epidemic should be considered, particularly if the epidemic is still in its early growth phase.

About the Authors

Mr. Ge is a PhD candidate in the Department of Epidemiology and Biostatistics at the University of Georgia, Athens, Georgia, USA. His research interests include infectious disease modeling and vaccine design.

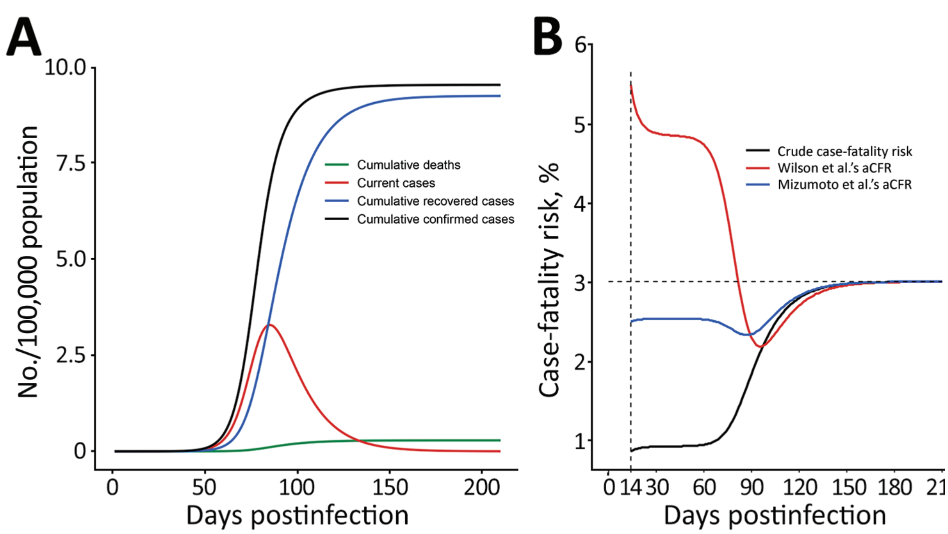

Figure. Progression of coronavirus disease outbreak and changes in the case-fatality risk by crude and adjusted rates. Crude case-fatality risk is the cumulative number of deaths on a given day divided by the cumulative number of cases on the same day. We set the infectious period as 10 days (*2*); case-fatality risk as 3% (*3*); basic reproductive ratio (R_0) as 2.5 (*4*); recovery rate as 1/13 day (*5*), that is, 13 days from illness onset to recovery; and the population size as 1 million. A) Changes in the number of subpopulations over time after the first infection. B) Changes in crude case-fatality risk after 13th day of exposure and aCFR calculated by using Wilson et al.'s method (*1*) and by using Mizumoto et al.'s method (*6*). aCFR, adjusted case-fatality risk.

Dr. Sun is a research scientist at the Boston University School of Public Health. His research focuses on estimating the impact of air pollution and climate change on human health.

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Secondary Transmission of Coronavirus Disease from Presymptomatic Persons, China

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We explored the secondary attack rate in different types of contact with persons presymptomatic for coronavirus disease (COVID-19). Close contacts who lived with or had frequent contact with an index case-patient had a higher risk for COVID-19. Our findings provide population-based evidence for transmission from persons with presymptomatic COVID-19 infections.

Coronavirus disease (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is rapidly spreading across the globe. Some case reports and modeling studies suggest asymptomatic carriage of SARS-CoV-2 plays a role in transmission (*1*–*3*). Studies have shown that 30%–59% of SARS-CoV-2 infections are asymptomatic (*3*,*4*), which poses tremendous infection control challenges. To control asymptomatic infections, China implemented active case surveillance and enhanced social distancing measures, which include contact tracing, quarantine for key populations, medical observation, and curtailed social activities (*5*). However, additional information on the characteristics of presymptomatic transmission is needed to develop targeted control and prevention guidance.

We analyzed contact-tracing surveillance data collected during January 28–March 15, 2020, to explore the secondary attack rate from different types of contact with persons presymptomatic for COVID-19 in Guangzhou, China. Asymptomatic COVID-19 cases were found mainly through close contact screening, clustered epidemic investigations, follow-up investigation of infection sources, and active surveillance of key populations with travel or residence history in areas with continuous transmission of COVID-19 in China and abroad. We developed a case definition for presymptomatic COVID-19, criteria for close contact, and contact investigation and management

[1]These first authors contributed equally to this article.