

What South Korea's Case Informs Us About the Infection Fatality Rate of Covid-19

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There is on-going debate about what the true infection fatality rate (IFR) of Covid-19 might be. The IFR for Covid-19 is the proportion of deaths among all people infected by Covid-19, including asymptomatic cases. An accurate estimate of the IFR for Covid-19 is important for economic policy. The IFR informs policy makers when and to what extent they should relax or tighten economic lock-down measures. A low IFR is argument for relaxing lock-down measures. A high IFR supports continuation or further tightening of the lock-down measures.

Estimating the IFR for an ongoing disease is difficult because both the numerator (number of deaths) and denominator (number of infections) are constantly evolving. Moreover, the asymptomatic cases of Covid-19 make the denominator estimation particularly challenging. Two key aspects of South Korea's case enable us to infer what the IFR for Covid-19 might be. First, South Korea has implemented aggressive contact tracing from the onset and arguably has a relatively accurate estimate of the infected population compared to most other countries. Second, South Korea is among the first country with transparent and consistent data that has arguably flattened the curve, at least for the first wave of Covid-19.

South Korea has pursued aggressive contact tracing of all confirmed cases since its first case was identified. The government has shared individual case information with the public and tested anyone who might have been exposed to the virus. All confirmed cases were quarantined, monitored, and treated by the government. The government has made transparency a priority and has made information and statistics related to all Covid-19 cases public.

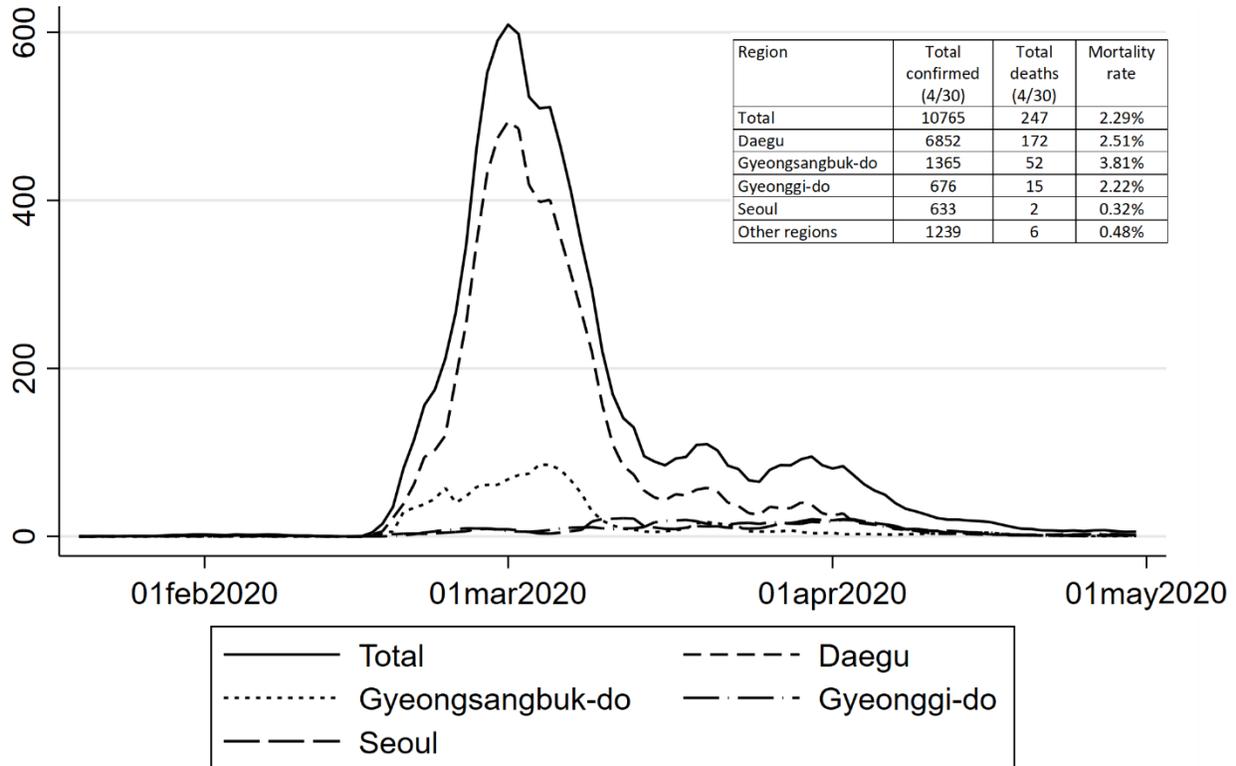
Figure 1 illustrates daily confirmed Covid-19 cases in South Korea. Between April 24, 2020 and April 30, there have been only 20 new community spread cases in the nation. April 30, 2020 marked the first day with zero confirmed community spread cases in the country. The national mortality rate for Covid-19 measured as the number of total deaths divided by the number of total confirmed cases as of April 30 is 2.29%. However, as Figure 1 indicates there is wide regional variation in confirmed cases and deaths. There are 17 province level administrative regions in South Korea. The majority of confirmed cases have been in Daegu and Gyeongsangbuk-do with a mortality rate of 2.51% and 3.81%. Gyeonggi-do and Seoul has the next highest number of cases. Gyeonggi-do's mortality rate is 2.22%. The mortality rate in Seoul is considerably lower at 0.32%. Mortality rates in the other provinces combined is 0.48%, with 10 of these having zero mortality (with confirmed cases ranging from 13 to 143).

Despite successful contact tracing, not all asymptomatic cases would have been identified. Since the denominator of IFR includes unidentified asymptomatic cases, these mortality rates are likely upper bounds of the region's IFR. There could be additional deaths among patients currently in treatment, affecting the numerator of the IFR. However, the relative increase in the number of deaths would be considerably less than the number of unidentified asymptomatic cases.

Of the 20 newly identified domestic cases between April 24 and 30, 10 have been from Daegu, 6 from Gyeonggi-do, 2 from Gyeongsangbuk-do, and 1 from Seoul. It is likely that there are more asymptomatic cases in regions where there are more confirmed cases. Hence, the mortality rates in provinces with more confirmed cases are more likely to over-estimate the IFR for Covid-19. Seoul's and the other region's

mortality rate of 0.32% and 0.45% may still be an overestimate of the IFR for Covid-19, but the degree of overestimation is likely less than in the high prevalence provinces. Seoul's mortality rate seem in line with mortality rate estimates based on recent Covid-19 antibody tests from New York City¹ (0.5%), Los Angeles² (0.14-0.27%), Santa Clara County³ (0.12-0.2%), and the German town of Gangel⁴ (0.37%).

Figure 1. Covid-19 cases by region, and mortality rates as of April 30, 2020



Data source: Korea Center for Disease Control and Prevention. Lines are 5 day moving averages of the number of daily confirmed Covid-19 cases. Data is up until April 30, 2020.

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