Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Real estimates of mortality following COVID-19 infection

As of March 1, 2020, 79 968 patients in China and 7169 outside of China had tested positive for coronavirus disease 2019 (COVID-19).[1] Among Chinese patients, 2873 deaths had occurred, equivalent to a mortality rate of 3·6% (95% CI 3·5–3·7), while 104 deaths from COVID-19 had been reported outside of China (1·5% [1·2–1·7]). However, these mortality rate estimates are based on the number of deaths relative to the number of confirmed cases of infection, which is not representative of the actual death rate; patients who die on any given day were infected much earlier, and thus the denominator of the mortality rate should be the total number of patients infected at the same time as those who died. Notably, the full denominator remains unknown because asymptomatic cases or patients with very mild symptoms might not be tested and will not be identified. Such cases therefore cannot be included in the estimation of actual mortality rates, since actual estimates pertain to clinically apparent COVID-19 cases.

The maximum incubation period is assumed to be up to 14 days,[2] whereas the median time from onset of symptoms to intensive care unit (ICU) admission is around 10 days.[3,4] Recently, WHO reported that the time between symptom onset and death ranged from about 2 weeks to 8 weeks.[5]

We re-estimated mortality rates by dividing the number of deaths on a given day by the number of patients with confirmed COVID-19 infection 14 days before. On this basis, using WHO data on the cumulative number of deaths to March 1, 2020, mortality rates would be 5·6% (95% CI 5·4–5·8) for China and 15·2% (12·5–17·9) outside of China. Global mortality rates over time using a 14-day delay estimate are shown in the figure, with a curve that levels off to a rate of 5·7% (5·5–5·9), converging with the current WHO estimates. Estimates will increase if a longer delay between onset of illness and death is considered. A recent time-delay adjusted estimation indicates that mortality rate of COVID-19 could be as high as 20% in Wuhan, the epicentre of the outbreak.[6] These findings show that the current figures might underestimate the potential threat of COVID-19 in symptomatic patients.

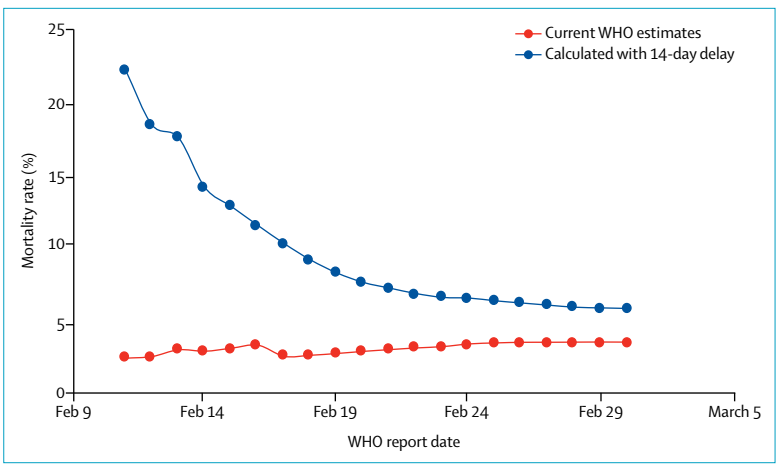

Figure: **Global COVID-19 mortality rates (Feb 11 to March 1, 2020)**
Current WHO mortality estimates (total deaths divided by total confirmed cases), and mortality rates calculated by dividing the total number of deaths by the total number of confirmed cases 14 days previously.

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Estimating case fatality rates of COVID-19

In their model, David Baud and colleagues[1] exclude individuals who die within 14 days of testing positive for severe acute respiratory syndrome coronavirus 2. If an individual contracts symptoms on March 1, tests positive on March 10, and dies on March 11, they would not be included in the denominator for case fatality rate (CFR) on March 11. In addition, patients might test positive up to 13 days after recovery.[2] As testing is

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