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# No evidence of substantial underreporting of COVID-19 deaths in Taiwan during 2020

Until January 31, 2021, Taiwan has recorded 911 laboratory-confirmed cases of coronavirus disease 2019 (COVID-19) and 8 deaths due to COVID-19.<sup>1</sup> There has been speculation that the 8 recorded COVID-19 deaths may be an underestimate of the true number of deaths directly caused by COVID-19.<sup>2</sup> The recording of total deaths is thought to be reliable. If so, then calculating the excess all-cause deaths - the number of additional deaths during the pandemic compared to the pre-pandemic average - could provide useful information for monitoring the overall impact of the pandemic.

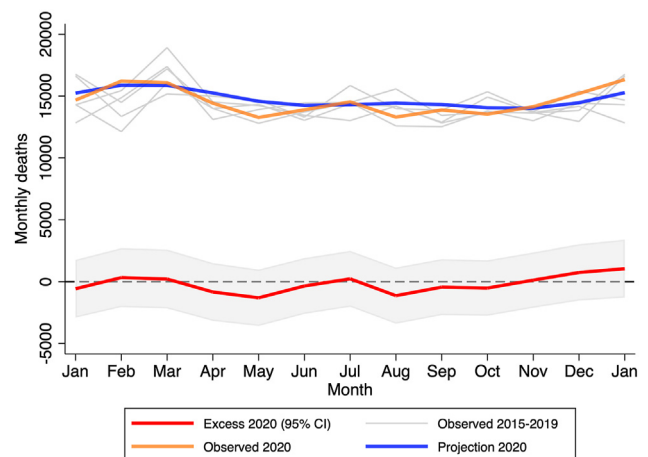
Governmental data on monthly all-cause deaths and population sizes during January 2015 and January 2021 were obtained from Department of Household Registrations, Ministry of the Interior, ROC (Taiwan). (Data from Monthly Bulletin of Interior Statistics; accessed from: [https://ws.moi.gov.tw/001/Upload/400/refile/0/4413/51a1688f-b2a2-4240-847f-8ec948ba7b0a/month/month\\_en.html](https://ws.moi.gov.tw/001/Upload/400/refile/0/4413/51a1688f-b2a2-4240-847f-8ec948ba7b0a/month/month_en.html) on February 15, 2021.)

We used spline-smoothed Poisson regression models accounting for seasonal effect and death rate change across time with data from January 2015 to December 2019. The expected deaths were then projected for January 2020 to January 2021, and excess deaths were estimated as the observed deaths minus the expected. The computation was done using the R package *excessmort* (<https://github.com/rafalab/excessmort>).<sup>3</sup> The statistical analyses were done in R, version 4.0.3, and the graph generated using Stata, version 16.1.

Figure 1 shows the trend of point estimates and confidence intervals (CIs) of monthly all-cause excess deaths in Taiwan from January 2020 to January 2021. The point estimate for numbers of cumulative all-cause excess deaths during this period was -2433 (95% CI: -10715 to 5850).

In conclusion, our results suggest there is no evidence of considerable underreporting of deaths due to COVID-19 in Taiwan, January 2020–January 2021. The Taiwanese government implemented several approaches in response to

COVID-19, including the widespread use of masks, social distancing, tracing close contacts of confirmed cases, and 14-day quarantine for people travelling to Taiwan. These measures can be expected to reduce deaths due to causes other than COVID-19, for example, lower mortality rates due to pneumonia and influenza in 2020.<sup>4</sup> New Zealand also observed lower all-cause mortality during 2020, which was attributed to stringent disease prevention strategies and an absence of influenza epidemic.<sup>5</sup> It is important to continue monitoring monthly/weekly excess and cause-specific mortality as the COVID-19 pandemic progresses.



**Figure 1** Excess deaths (with 95% confidence intervals) during January 2020–January 2021 (red line with gray-shaded area) (see [Supplementary Appendix](#) for sensitivity analysis), observed deaths during January 2015–January 2020 (gray lines), observed deaths during January 2020–January 2021 (orange line), and projected deaths for January 2020–January 2021 (blue line). The x-axis shows time by month (January 2020 until January 2021).

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## Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jfma.2021.03.018>.

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