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Excess mortality from COVID-19 in an English sentinel network population

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There have been several attempts to predict mortality from COVID-19 in the UK, including calculation of age-based case fatality rates¹ and relative risk (RR) of mortality.² David Spiegelhalter said that “roughly speaking, we might say that getting COVID-19 is like packing a year’s worth of risk into a week or two”.³

In response to these predictions, we decided to calculate the excess mortality in the Oxford Royal College of General Practitioners (RCGP) Research and Surveillance Centre (RSC) cohort. The RCGP RSC cohort has been recruited to be nationally representative,⁴ and the mortality data for the cohort align well with those from the Office of National Statistics (ONS; appendix p 1).

Our excess mortality estimate was based on an additive hazard model separating the observed mortality hazard into a sum of background—or expected—mortality and an excess term, assuming that the number of deaths (both observed and expected) followed a Poisson distribution.⁵ We used robust standard errors to address overdispersion and potential violation of the Poisson assumption. The expected or background mortality was estimated from life tables reported in ONS figures, downloaded from the

Human Mortality Database.⁶ These life tables give the annual probability of death according to sex, calendar year, and age, and we can extrapolate to obtain mortality risk in the period considered. In the additive hazard model, excess mortality was obtained by subtracting the expected mortality from the observed mortality. In this way, excess mortality can be interpreted as the mortality directly or indirectly related to the disease of interest (after excluding all other causes of death).

Between weeks 2 and 20 of 2020, we observed 1573 648 person-years of follow-up (4.41 million individuals observed for 0.36 years) and 17 130 deaths (appendix p 2). Based on background mortality for the same period in 2019, we would have expected 6069 deaths for this period had the COVID-19 pandemic and lockdown not happened. The resulting absolute excess risk (the difference between observed and expected deaths, divided by person-years at risk) was 702.9 per 100 000 person-years (95% CI 686.8–719.3). For comparison, the ONS estimate for mortality in the UK population for the entirety of 2018 was 902 per 100 000 person-years. As measured by the RCGP RSC data, excess mortality rose steadily from week 13 to a peak between weeks 15 and 16, after which a steady decline was observed. Around weeks 20–22, cohort mortality merged with the background or expected mortality (data not shown).

We conclude that in about a third of the year, the excess risk amounted to three-quarters of the deaths we might have anticipated in the whole of the previous year. Sharing this estimate might be of help in modelling for future waves of infection and quantifying the impact of future mitigation strategies.

SdeL is director of the Oxford RCGP RSC and has attended advisory boards for Sanofi and Seqirus. All other authors declare no competing interests.

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See Online for appendix