THE LANCET

Supplementary appendix

This appendix formed part of the original submission. We post it as supplied by the authors.

This online publication has been corrected. The corrected version first appeared at thelancet.com on June 19, 2020.

Supplement to: Okell LC, Verity R, Watson OJ, et al. Have deaths from COVID-19 in Europe plateaued due to herd immunity?. *Lancet* 2020; published online June 11. http://dx.doi.org/10.1016/S0140-6736(20)31357-X.

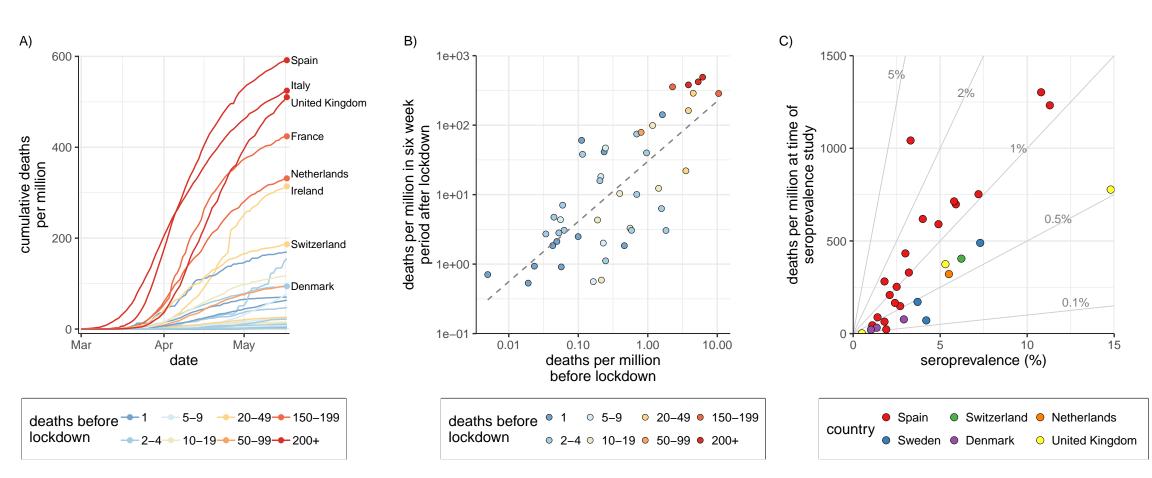


Figure 1. (A) Cumulative deaths in individuals with confirmed (diagnosed) COVID-19 per million population in countries with at least 10 recorded COVID-19 deaths and available data. Colours represent the number of deaths before lockdown. (B) Deaths in individuals with confirmed COVID-19 per million population before lockdown vs. in the six week period after lockdown. The dashed line gives the best-fitting linear model. The colours match figure 1. (C) Seroprevalence of SARS-CoV-2 against cumulative COVID-19 deaths per million population in European countries (national or subnational region data). Dashed lines show the approximate expected relationship at different infection fatality rates, although note no adjustment was made for sensitivity and specificity of serology tests and time lags between infection, seroconversion and death. Cumulative deaths are recorded at the midpoint of the seroprevalence survey date. Where subnational mortality data were not available at the same date as the seroprevalence survey, the national cumulative mortality at that date was taken and the distribution of deaths between regions was assumed to be the same as that at a more recent available time.

Data availability

All data, references and code used to generate the plots are available at https://github.com/ImperialCollegeLondon/covid19cumdeaths

References

- 1 European Centre for Disease Prevention and Control. https://www.ecdc.europa.eu/en/publications-data/download-todays-data-geographic-distribution-covid-19-cases-worldwide (accessed May 18, 2020).
- Walker PG, Whittaker C, Watson OJ, Baguelin M, Winskill P, Hamlet A, Djafaara BA, Cucunubá Z, Mesa DO, Green W, Thompson H, S Nayagam, K E. C. Ainslie, S Bhatia, S Bhatt, A Boonyasiri, O Boyd, N F. Brazeau, L Cattarino, G Cuomo-Dannenburg, A Dighe, C A. Donnelly, I Dorigatti, S L. van Elsland, R FitzJohn, H Fu, KA.M. Gaythorpe, L Geidelberg, N Grassly, D Haw, S Hayes, W Hinsley, N Imai, D Jorgensen, E Knock, D Laydon, S Mishra, G Nedjati-Gilani, LC. Okell, H. J Unwin, R Verity, M Vollmer, C E. Walters, H Wang, Y Wang, X Xi, DG Lalloo, NM Ferguson, AC Ghani. The impact of COVID-19 and strategies for mitigation and suppression in low- and middle-income countries. Science. 2020 DOI: 10.1126/science.abc0035
- Federal Office of Public Health FOPH. Swiss Confederation: COVID-19 epidemiological situation. https://www.bag.admin.ch/bag/en/home/krankheiten/ausbrueche-epidemien-pandemien/aktuelle-ausbrueche-epidemien/novel-cov/situation-schweiz-und-international.html (accessed May 24, 2020).
- 4 Christian Erikstrup, Christoffer Egeberg Hother, Ole Birger Vestager Pedersen, Kåre Mølbak, Robert Leo Skov, Dorte Kinggaard Holm, Susanne Sækmose, Anna Christine Nilsson, Patrick Terrence Brooks, Jens Kjærgaard Boldsen, Christina Mikkelsen, Mikkel Gybel-Brask, Erik Sørensen, Khoa Manh Dinh, Susan Mikkelsen, Bjarne Kuno Møller, Thure Haunstrup, Lene Harritshøj, Bitten Aagaard Jensen, Henrik Hjalgrim, Søren Thue Lillevang, Henrik Ullum. Estimation of SARS-CoV-2 infection fatality rate by real-time antibody screening of blood donors. https://www.medrxiv.org/content/10.1101/2020.04.24.20075291v1.full.pdf (accessed June 3, 2020).
- Ministerio de Sanidad, Consumo y Bienestar Social Ciudadanos Estudio Nacional de sero-Epidemiología de la Infección por SARS-CoV-2 en España (ENE-Covid). https://www.google.com/url?q=https://www.mscbs.gob.es/ciudadanos/ene-covid/home.htm&sa=D&ust=1591183771888000&usg=AFQjCNGP3kdMDcdWUJbzRVbbguURZ3_ffw (accessed May 31, 2020).
- De Ridder Dusan Petrovic Stephanie Schrempft Kailing Marcus Sabine Yerly Isabelle Arm Vernez Olivia Keiser Samia Hurst Klara M. Posfay-Barbe Didier Trono Didier Pittet Laurent Gétaz François Chappuis Isabella Eckerle Nicolas Vuilleumier Benjamin Meyer Antoine Flahault Laurent Kaiser Idris Guessous SSAWGPSASALHBD. Repeated seroprevalence of anti-SARS-CoV-2 IgG antibodies in a population-based sample from Geneva, Switzerland. https://www.medrxiv.org/content/10.1101/2020.05.02.20088898v1.full.pdf (accessed June 3, 2020).
- 7 Statistics Denmark. https://www.statistikbanken.dk/statbank5a/default.asp?w=1440 (accessed May 13, 2020).
- 8 Statistics Sweden. Statistikdatabasen. http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START_BE_BE0101_BE0101A/BefolkningNy/ (accessed May 28, 2020).
- 9 Swedish public health authority: antibody results. http://www.folkhalsomyndigheten.se/nyheter-ochpress/nyhetsarkiv/2020/maj/forsta-resultaten-fran-pagaende-undersokning-av-antikroppar-for-covid-19-virus/ (accessed May 31, 2020)
- 10 Swiss confederation: COVID-19 portal. https://covid-19-schweiz.bagapps.ch/fr-1.html (accessed May 25, 2020).
- Swedish public health authority: confirmed cases. http://www.folkhalsomyndigheten.se/smittskydd-beredskap/utbrott/aktuella-utbrott/covid-19/bekraftade-fall-i-sverige/ (accessed May 28, 2020).

- 12 Danish national board of health. https://www.sst.dk/da/corona/tal-og-overvaagning (accessed May 22, 2020).
- 13 Reuters. Study shows coronavirus antibodies in 5.5% of Dutch blood donors https://uk.reuters.com/article/uk-health-coronavirus-netherlands-study/study-shows-coronavirus-antibodies-in-5-5-of-dutch-blood-donors-idUKKBN23A0OT Accessed 05/05/2020
- 14 NL COVID-19 Hub. COVID-19 Historical data RIVM. https://nlcovid-19-esrinl-content.hub.arcgis.com/datasets/covid-19-historische-gegevens-rivm-vlakken Accessed 04/05/2020
- 15 United Kingdom Office for National Statistics. Deaths registered weekly in England and Wales. https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/weeklyprovisionalfiguresond eathsregisteredinenglandandwales Accessed 05/05/2020
- 16 Public Health England. Weekly Coronavirus Disease 2019 (COVID-19) Surveillance Report. Accessed 05/05/2020 https://www.gov.scot/publications/coronavirus-covid-19-trends-in-daily-data/
- 17 C Thompson, N Grayson, R Paton, J Lourenço, B Penman, LN Lee, V Odon, J Mongkolsapaya, S Chinnakannan, W Dejnirattisai, M Edmans, A Fyfe, C Imlach, K Kooblall, N Lim, C Liu, C Lopez-Camacho, CA McInally, N Ramamurthy, J Ratcliff, P Supasa, B Wang, AJ Mentzer, M Turner, C Semple, JK Baillie, ISARIC4C Investigators, H Harvala, G Screaton, N Temperton, P Klenerman, L Jarvis, S Gupta, P Simmonds. Neutralising antibodies to SARS coronavirus 2 in Scottish blood donors a pilot study of the value of serology to determine population exposure https://www.medrxiv.org/content/10.1101/2020.04.13.20060467v1 Accessed 01/05/2020
- 18 United Kingdom Office for National Statistics. Population estimates. https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates Accessed 05/05/2020
- 19 McMichael TM, Clark S, Pogosjans S, et al. COVID-19 in a Long-Term Care Facility King County, Washington, February 27–March 9, 2020. MMWR Morb Mortal Wkly Rep 2020;69:339-342. DOI: http://dx.doi.org/10.15585/mmwr.mm6912e1