



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.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

James R M Black, Chris Bailey,
Joanna Przewrocka, Krijn K Dijkstra,
*Charles Swanton

charles.swanton@crick.ac.uk

Cancer Genome Evolution Research Group, University College London Cancer Institute, University College London, London, UK (JRM); Cancer Evolution and Genome Instability Laboratory, The Francis Crick Institute, London NW1 1AT, UK (CB, JP, KKD, CS); Cancer Research UK Lung Cancer Centre of Excellence, University College London Cancer Institute, London, UK (CS); and University College London Hospitals NHS Trust, London, UK (CS)

- WHO. Coronavirus disease (COVID-19) situation report – 84. April 13, 2020. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019> (accessed April 14, 2020).
- Beeching NJ, Fletcher TE, Beadsworth MBJ. Covid-19: testing times. *BMJ* 2020; **369**: m1403.
- Dunhill L. Intensive care staffing ratios dramatically diluted. March 24, 2020. <https://www.hsj.co.uk/exclusive-intensive-care-staffing-ratios-dramatically-diluted/7027214>. article (accessed April 14, 2020).
- Gilroy R. Already stretched care homes 'must prepare to go beyond' for Covid-19. March 19, 2020. <https://www.nursingtimes.net/news/older-people/already-stretched-care-homes-must-prepare-to-go-beyond-for-covid-19-19-03-2020/> (accessed April 14, 2020).
- Woodcock A. Coronavirus: fewer than one in 50 NHS frontline staff forced to stay at home have been tested. April 1, 2020. <https://www.independent.co.uk/news/uk/politics/coronavirus-nhs-staff-tests-stay-at-home-how-many-a9441251.html> (accessed April 14, 2020).
- The Economist. What's gone wrong with covid-19 testing in Britain. April 4, 2020. <https://www.economist.com/britain/2020/04/04/whats-gone-wrong-with-covid-19-testing-in-britain> (accessed April 14, 2020).
- Philip P, Marsh S-J. Testing of NHS staff and household members. April 12, 2020. <https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/C0295-Testing-of-NHS-staff-and-household-members-letter-12-April-2020.pdf> (accessed April 14, 2020).
- Mizumoto K, Kagaya K, Zarebski A, Chowell G. Estimating the asymptomatic proportion of coronavirus disease 2019 (COVID-19) cases on board the Diamond Princess cruise ship, Yokohama, Japan, 2020. *Euro Surveill* 2020; **25**: pii=2000180.
- Sutton D, Fuchs K, D'Alton M, Goffman D. Universal screening for SARS-CoV-2 in women admitted for delivery. *N Engl J Med* 2020; published online April 13. DOI:10.1056/NEJMc2009316.
- Day M. Covid-19: four fifths of cases are asymptomatic, China figures indicate. *BMJ* 2020; **369**: m1375.
- Bai Y, Yao L, Wei T, et al. Presumed asymptomatic carrier transmission of COVID-19. *JAMA* 2020; **323**: 1406–07.
- Rothe C, Schunk M, Sothmann P, et al. Transmission of 2019-nCoV infection from an asymptomatic contact in Germany. *N Engl J Med* 2020; **382**: 970–71.
- Tong Z-D, Tang A, Li K-F, et al. Potential presymptomatic transmission of SARS-CoV-2, Zhejiang Province, China, 2020. *Emerg Infect Dis* 2020; published online May 17. DOI:10.3201/eid2605.200198.
- Ye F, Xu S, Rong Z, et al. Delivery of infection from asymptomatic carriers of COVID-19 in a familial cluster. *Int J Infect Dis* 2020; published online April 2. DOI:10.1016/j.ijid.2020.03.042.
- Kimball A, Hatfield KM, Arons M, et al. Asymptomatic and presymptomatic SARS-CoV-2 infections in residents of a long-term care skilled nursing facility—King County, Washington, March 2020. *MMWR* 2020; **69**: 377–81.
- He X, Lau EHY, Wu P, et al. Temporal dynamics in viral shedding and transmissibility of COVID-19. *Nat Med* 2020; published online April 15. DOI:10.1038/s41591-020-0869-5.
- Baggett TP, Keyes H, Sporn N, Gaeta JM. COVID-19 outbreak at a large homeless shelter in Boston: implications for universal testing. *medRxiv* 2020; published online April 15. DOI:10.1101/2020.04.12.20059618 (preprint).
- Aguiar JB, Faust JS, Westafer LM, Gutierrez JB. Investigating the impact of asymptomatic carriers on COVID-19 transmission. *medRxiv* 2020; published online March 31. DOI:10.1101/2020.03.18.20037994 (preprint).
- Wang D, Hu B, Chang H, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA* 2020; **323**: 1061–69.
- BBC. Coronavirus: 'half of A&E team' test positive. April 12, 2020. <https://www.bbc.co.uk/news/uk-wales-52263285> (accessed April 14, 2020).
- Day M. Covid-19: identifying and isolating asymptomatic people helped eliminate virus in Italian village. *BMJ* 2020; **368**: m1165.
- Shanafelt T, Ripp J, Trockel M. Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *JAMA* 2020; published online April 7. DOI:10.1001/jama.2020.5893.
- James W. UK has conducted 18 000 coronavirus tests in 24 hours: PM's spokesman. April 13, 2020. <https://www.reuters.com/article/us-health-coronavirus-britain-tests/uk-has-conducted-18000-coronavirus-tests-in-24-hours-pms-spokesman-idUSKCN21V139> (accessed April 15, 2020).
- Iacobucci G. Covid-19: hospitals can remove 15% cap on testing of NHS staff. *BMJ* 2020; **369**: m1339.

Universal weekly testing as the UK COVID-19 lockdown exit strategy

The British public have been offered alternating periods of lockdown and relaxation of restrictions as part of the coronavirus disease 2019 (COVID-19) lockdown exit strategy.¹ Extended periods of lockdown will increase economic and social damage, and each

relaxation will almost certainly trigger a further epidemic wave of deaths. These cycles will kill tens of thousands, perhaps hundreds of thousands, of people before a vaccine becomes available, with the most disadvantaged groups experiencing the greatest suffering.

There is an alternative strategy: universal repeated testing.² We recommend evaluation of weekly severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) antigen testing of the whole population in an entire city as a demonstration site (preferably several towns and cities, if possible), with strict household quarantine after a positive test. Quarantine would end when all residents of the household test negative at the same time; everyone else in the city can resume normal life, if they choose to. This testing programme should be assessed for feasibility in one or more cities with 200 000–300 000 people. Such a feasibility study should begin as soon as possible and continue after the current lockdown ends, when the infection rate will be fairly low but rising. The rate at which the number of infections then rises or falls, compared with the rest of the UK, will be apparent within a few weeks. A decision to proceed with national roll-out can then be made, beginning in high-risk areas and limited only by reagent supplies. If the epidemic is controlled, hundreds of thousands of lives could be saved, intensive care units will no longer be overloaded, and the adverse effects of lockdown on mental ill health and unemployment will end.

A local population of 200 000 people, with 90% compliance, will require 26 000 tests per day, plus a small excess to offer daily antigen testing for National Health Service (NHS) staff and care workers. Such a study is likely to have the enthusiastic support of the population. Whatever the results, these data will enable policy to be based on real-time evidence, rather than modelling assumptions, of new infection rates in the expanding,



Published Online
April 17, 2020
[https://doi.org/10.1016/S0140-6736\(20\)30936-3](https://doi.org/10.1016/S0140-6736(20)30936-3)

regularly tested population and the untested remainder. The untested population can be monitored by testing population samples and by NHS number linkage to hospital diagnoses and general practitioner records. Complementary strategies, including contact tracing and telephone applications, will be crucial in the untested population and might enable testing to be done less frequently, as prevalence falls. Testing would be voluntary, but penalties for breaching quarantine after a positive test in a household could be considered. Helplines would be provided to support quarantined households with access to income compensation, mental health support, and food delivery.

National roll-out of this SARS-CoV-2 testing strategy would entail mobilisation of community assets. Public advisory groups and citizens supporting these efforts would be indispensable. A voluntary Dunkirk spirit would be the only way for 10 million tests to be done daily by collaborating university and commercial laboratories with the necessary quality-checked equipment (PCR machines). PCR reagents should be obtained from manufacturers, rather than clinical test companies, and exempt from regulatory requirements on medical testing to limit costs and ensure supplies. This might require emergency legislation.

A more detailed version of this Correspondence was sent to the UK Government on April 10, 2020, with 34 signatories. The full letter is available online, and the signatories are listed in the appendix. KMG has received reimbursement for speaking at Nestle Nutrition Institute conferences and research funding from Nestec. All other authors declare no competing interests.

*Julian Peto, *Nisreen A Alwan, Keith M Godfrey, Rochelle A Burgess, David J Hunter, Elio Riboli, Paul Romer, on behalf of 27 signatories
julian.peto@lshtm.ac.uk;
n.a.alwan@soton.ac.uk

London School of Hygiene & Tropical Medicine, London WC1E 7HT, UK (JP); School of Primary Care, Population Sciences and Medical Education, Faculty of Medicine (NAA) and MRC Lifecourse Epidemiology Unit and NIHR Southampton Biomedical Research Centre (KMG), University of Southampton, Southampton SO16 6YD, UK;

University Hospital Southampton, NHS Foundation Trust, Southampton, UK (KMG); Institute for Global Health, University College London, London, UK (RAB); Nuffield Department of Population Health, University of Oxford, Oxford, UK (DJH); School of Public Health, Imperial College London, London, UK (ER); Imperial College Healthcare NHS Trust, London, UK (ER); and New York University, New York City, NY, USA (PR)

- 1 Scientific Advisory Group for Emergencies. SPI-M-O: consensus view on behavioural and social interventions. March 16, 2020. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/873729/06-spi-m-o-consensus-view-on-behavioural-and-social-interventions.pdf (accessed April 17, 2020).
- 2 Peto J. Covid-19 mass testing facilities could end the epidemic rapidly. *BMJ* 2020; **368**: m1163.

Ethnicity and COVID-19: an urgent public health research priority

As the coronavirus disease 2019 (COVID-19) pandemic continues advancing globally, reporting of clinical outcomes and risk factors for intensive care unit admission and mortality are emerging. Early Chinese and Italian reports associated increasing age, male sex, smoking, and cardiometabolic comorbidity with adverse outcomes.¹ Striking differences between Chinese and Italian mortality indicate ethnicity might affect disease outcome, but there is little to no data to support or refute this.

Ethnicity is a complex entity composed of genetic make-up, social constructs, cultural identity, and behavioural patterns.² Ethnic classification systems have limitations but have been used to explore genetic and other population differences. Individuals from different ethnic backgrounds vary in behaviours, comorbidities, immune profiles, and risk of infection, as exemplified by the increased morbidity and mortality in black and minority ethnic (BME) communities in previous pandemics.³

As COVID-19 spreads to areas with large cosmopolitan populations, understanding how ethnicity affects COVID-19 outcomes is essential. We therefore reviewed published papers and national surveillance reports on notifications and outcomes of COVID-19 to ascertain ethnicity data reporting patterns, associations, and outcomes.

Only two (7%) of 29 publications reported ethnicity disaggregated data (both were case series without outcomes specific to ethnicity). We found that none of the ten highest COVID-19 case-notifying countries reported data related to ethnicity; UK mortality reporting, for example, does not require information on ethnicity. This omission seems stark given the disproportionate number of deaths



Published Online
April 21, 2020
[https://doi.org/10.1016/S0140-6736\(20\)30922-3](https://doi.org/10.1016/S0140-6736(20)30922-3)

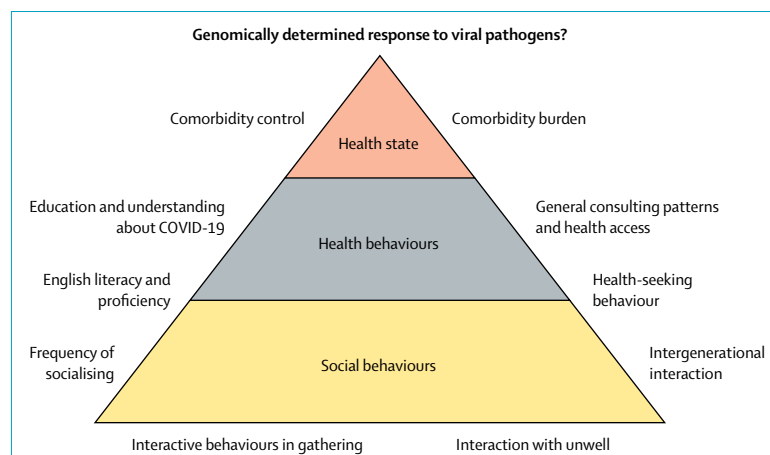


Figure: The potential interaction of ethnicity related factors on SARS-CoV-2 infection likelihood and COVID-19 outcomes

COVID-19=coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2.

For the full letter to the UK Government see <https://ephg-covid-19.org/>

See Online for appendix