

The impact of COVID-19 on black, Asian and minority ethnic communities

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Verdict

The risk of death from COVID-19 is generally higher amongst black, Asian and ethnic minority (BAME) communities than white British people. This appears to be due to a complex mixture of factors, and no one factor alone can explain all of the difference. Contributing factors include, in no particular order: being poorer, where people live, overcrowded housing, types of job, other illnesses, and access to health services.

Background

There is increasing concern that COVID-19 may have a disproportionate impact on individuals from BAME backgrounds¹⁹, including (though not limited to): impact of social distancing measures; effectiveness of communication about COVID-19 with and within BAME communities; impact on health and social care workers from BAME backgrounds; socio-economic impact.

Request for evidence review

- Evidence from the UK where possible, but request to also review international literature whilst being mindful that the context may impact on the generalisability
- If there is limited evidence specific to COVID-19, is there evidence from other epidemics and/or major incidents we could draw from
- Impacts to be included:
 - o Infection risk, severity of the infection, and outcomes (from literature, not requesting primary data analysis)
 - o Other impacts of the infection and the control measures in place on individuals and communities (including those listed in the background above)

The purpose is to help identify potential mitigations to reduce the impact of COVID-19 on BAME communities and inform planning for the recovery phase.

Methods / Search strategy

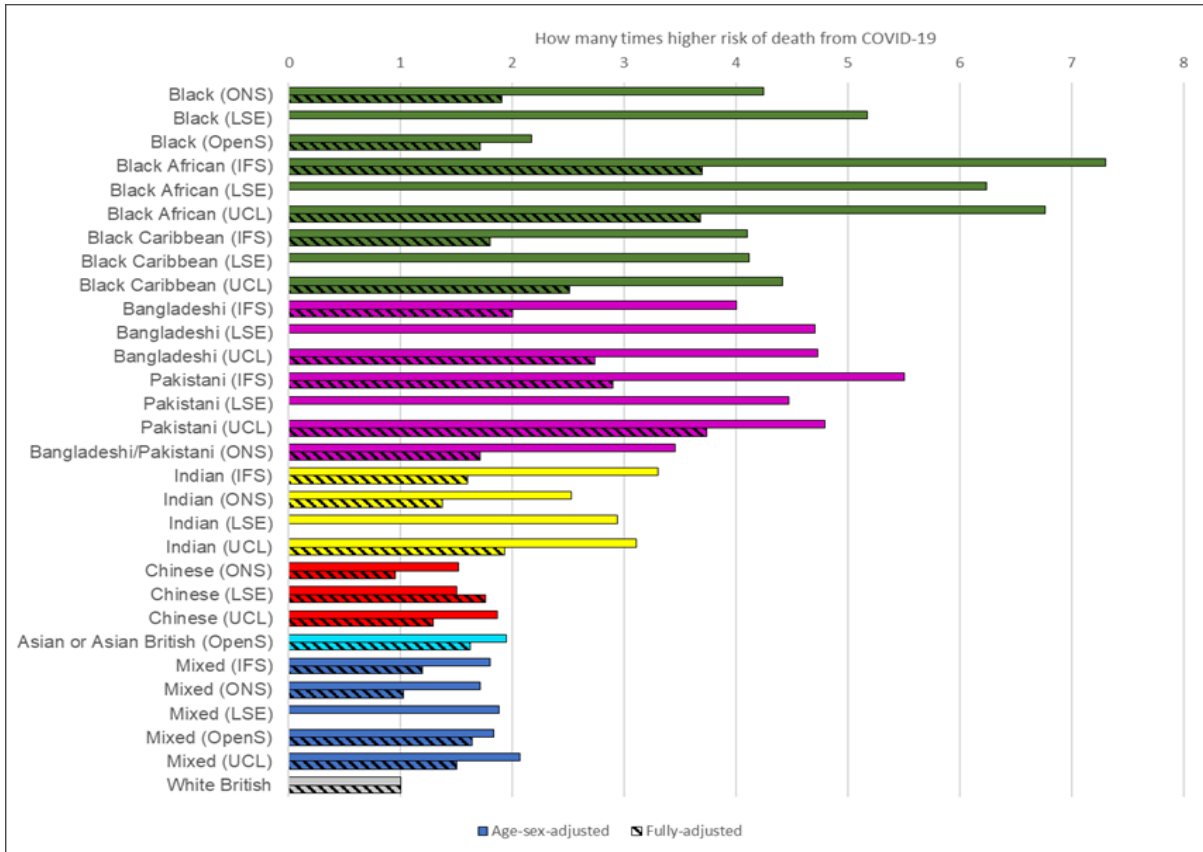
We conducted this rapid data and evidence synthesis as robustly as possible within a limited timeline. Recent articles about the impact of COVID-19 on BAME communities were found via searches of known COVID-19 evidence collections (see Appendix Table A1), internet searches, Twitter, news websites, BBC radio, and colleague recommendations. We additionally constructed search strategies for the Cochrane Library of Reviews and the Central Register of Controlled Trials (see Appendix Figures A1-A5) and OVID Medline, Embase, and Psycinfo (see Appendix Figures A6-A10). These search strategies included the following sub-sections: BAME, COVID-19, pandemic/epidemic, major respiratory infections, UK; and were combined in different ways to check the number of 'hits' (see Appendix Table A2). For the "BAME and COVID-19" combined search (38 hits) and the "BAME and pandemic/epidemic and major respiratory infection and UK" combination (64 hits), we de-duplicated and then double-screened the titles and abstracts and agreed to include 12 articles (see Appendix PRISMA diagram, Figure A11).

Results

COVID-19 deaths in BAME communities

The risk of death from COVID-19 in BAME communities is higher than for white British people, after adjusting for differing age and sex profiles (see Figure 1)^{1,2,3,7,10}. Further adjustment for other risk factors (including region, deprivation, comorbidities, rural/urban classification, household composition) reduces this difference between BAME and white British communities, but does not get rid of it altogether, except possibly for Chinese and mixed ethnic groups. None of the studies included on Figure 1 separate risk of exposure to COVID-19 and risk of death following exposure.

Figure 1. Risk of death from COVID-19 in BAME communities compared to white British



Notes: The figure is based on 5 primary studies^{1,2,3,7,10}, referred to as ONS¹, LSE³, OpenS², IFS¹⁰, and UCL⁷. ONS data was reported separately for males/females, we have produced a weighted average based on proportion of males/females in each ethnic group to simplify the figure. LSE data was reported as excess deaths above expected as % of expected, we have converted this to observed/expected to be in line with other results. LSE and UCL data have been normalised so that results can be compared to a value of '1' for white British to simplify the figure.

Critical Care

BAME communities are more likely to be admitted to critical care than white British patients, with a clear deprivation gradient¹¹. There is higher COVID-19 mortality for BAME patients (roughly 50%) than white patients (44%) in critical care¹¹. White British people in ICU are twice as likely to die from COVID-19 than viral pneumonia, whilst black and mixed ethnicities in ICU are around 4 times more likely to die of COVID-19 than viral pneumonia, and Asian people are 3 times more likely¹¹.

BAME groups are overrepresented among critically ill Covid-19 patients

Sample of patients from across England, Wales and Northern Ireland

Critically ill Covid-19 patients



Overall population



Figure source:

Guardian graphic. Source: Intensive Care National Audit & Research Centre (ICNARC). Based on 3,883 patients admitted to critical care units in England, Wales and Northern Ireland

<https://www.theguardian.com/world/2020/apr/16/inquiry-disproportionate-impact-coronavirus-bame>

Deprivation

Risk of death from COVID-19 in England and Wales increases with deprivation^{2,4}, with the risk in the most deprived areas roughly double that in the least deprived^{2,4}, after accounting for age differences. Bangladeshi, Pakistani, and black ethnic groups are more likely to live in deprived neighbourhoods^{1,6}; and the same groups and Chinese ethnicities are about twice as likely to live on a low income and experience child poverty compared to white groups^{1,6}. However, deprivation does not account for all of the increased risk of death amongst BAME populations; ONS analysis suggested deprivation and geography accounted for around half of the impact of ethnicity on COVID-19 death¹. The OpenSAFELY study suggested little of the risk associated with deprivation was explained by pre-existing disease or clinical risk factors, so must be due to other social factors².

Housing

Ethnic minorities are more likely to live in overcrowded households (more people than bedrooms) and intergenerational households^{1,6,7,9,10}. This increases virus transmission risk and makes self-isolation more difficult^{7,10}. The proportion of Bangladeshi, Pakistani, and black households experiencing overcrowding was 30%, 16%, and 12%, respectively, compared to 2% of white British households^{1,10}. Bangladeshi and Pakistani groups are more likely to live in multi-family households¹. Bangladeshi, Indian and Chinese households are particularly likely to have older people over 65 living with children under the age of 16⁶. BAME communities are more likely than white British to be renting accommodation and not own their own home^{1,6,9}. In the South West, 70% of white British households own their home versus 40% of BAME households⁹. Poor housing and neighbourhood conditions for gypsy and traveller groups are a serious concern⁶.

Education

Educational attainment at GCSE and degree levels is highest for Chinese and Indian ethnic groups, and lowest for gypsy and Irish travellers^{1,6}. Lower educational attainment or poor English skills may lead to low health literacy and understanding⁶. GCSE and A-level cancellations are likely to have a greater impact on children from poorer or ethnic minority backgrounds who are often predicted worse grades than they end up achieving⁹. The lack of free school meals for those on low incomes could also exacerbate health inequalities⁹.

Employment

The nature of people’s jobs is likely to be an important factor for their risk of infection and key workers face ongoing risks from contact with individuals who are contagious (see Figure 3). Striking early figures on COVID-19 deaths showed a highly disproportionate toll on those from BAME communities. As of the 22nd of April 2020, 18 out of 19 (95%) doctors and 25 out of 35 (71%) of the nurses who died of COVID-19 were from BAME communities³. BAME staff however account for 21% of all NHS employees, including approximately 20% among nursing and support staff and 44% among medical staff⁶. Staff working for the NHS and exposed to the virus were reported to have been disproportionately drawn from minority ethnic groups⁹. We know that nurses accounted for the largest numbers of deaths among the NHS and a majority of them were from ethnic minorities¹⁰. A breakdown of these figures also shows that Indian and black African men are 150% and 310% more likely to work in health or social care than white British men, respectively¹⁰. NHS staff are not the only key workers; in the black African ethnic group approximately a third of the working-age population are employed in keyworker roles, with one in five in health and social care jobs. This means a black African of working age is 50% more likely to be a key worker than a British working-age person of a white background¹⁰.

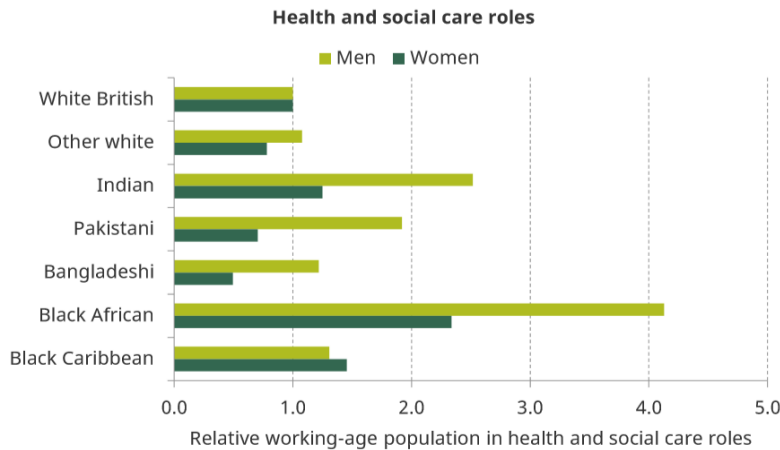


Figure source: *The Institute for Fiscal Studies - Are some ethnic groups more vulnerable to COVID-19 than others? March 2020*

Financial hardship

Loss of income has affected many households during the pandemic lockdown. This is especially true for BAME groups who are more likely to have low income, be in zero hours contracts and non-salaried jobs than white ethnic groups. Ethnic inequalities have been increasing in employment and housing nationwide since the start of the 2000s⁶. Unemployment rates were highest in the black, Bangladeshi and Pakistani populations and lowest among the white and Indian ethnic groups in 2015^{1,7,6}. With the shut-down of many sectors across the UK, the government's scheme to support individuals who are self-employed or working in the gig economy has been put in place. Signing up to this scheme however may have barriers, as some migrants may not want to make themselves known to the authorities⁷. Sixty percent of working-age people live in households with accessible savings that cover three months of income, but this varies substantially by ethnic group¹⁰. Among working-age Bangladeshi, black Caribbean and black African people, around 30% live in households with enough savings to cover one month of household income, and around 10% can cover three months of income¹⁰.

BAME communities are harder hit than any other groups in two main ways; the first being that males are more likely to be the sole providers in a family unit with dependents, and second that most of these communities work in shut-down sectors or are unemployed. Combined together, men

working in the lowest skilled occupations had the highest rate of death involving COVID-19, with 21.4 deaths per 100,000 males (225 deaths); men working as security guards had one of the highest rates, with 45.7 deaths per 100,000 (63 deaths)⁵. Men from Bangladeshi and Pakistani groups for example are four times as likely to work in shut-down sectors as white British men¹⁰. Additionally, black African and black Caribbean men are both 50% more likely than white British men to be in shut-down sectors. We know that men are much more vulnerable to the virus. Pakistani and Bangladeshi men are much more likely to be in self-employment compared to the overall population. This translates to these groups being particularly hard hit at present. In addition to these two groups, black Africans and black Caribbeans are among the groups that are more likely to be sole earners at home and among those more likely to have dependent children with no economic buffer. Pakistanis, Bangladeshis, black Africans and black Caribbeans are less likely to be living in households with two or more earners¹⁰. Additionally, in caring and leisure industries black groups are overrepresented, in sales and consumer service occupations Pakistani and Bangladeshi groups are overrepresented and the same is true for black groups in public administration, education and health^{7,10}.

Comorbidities

People with comorbidities such as hypertension, chronic heart disease, cardiovascular disease (CVD)⁶, diabetes, asthma, cancer, obesity⁹, and liver disease are at increased risk of death from COVID-19². Diabetes, CVD, and hypertension are linked to a doubling of severe disease and death⁶. People living in deprived areas are likely to have more comorbidities⁶. Black and South Asian ethnic groups have been found to have much higher rates of diabetes than the general population, and older Pakistani men have higher levels of CVD¹⁰. Older Indian, Pakistani, Bangladeshi and black Caribbean people are much more likely than white British people to report one or more health problems which could increase their mortality risk from COVID-19¹⁰. However, some evidence suggests comorbidities only relate to a small part of the increased risk in BAME communities².

Health Practices

There are large differences in smoking by ethnic group but these also vary greatly between men and women within ethnic groups. Bangladeshi, Pakistani and Irish men have particularly high rates of smoking⁶. Non-white minority ethnic groups have higher rates of abstinence and lower levels of frequent and heavy alcohol drinking than white British and white Irish groups⁶. Levels of physical activity are lower among South Asian groups than other ethnic groups, with South Asian women having particularly low levels of activity⁶. 73% of England's adult black population live with overweight or obesity – 10 percent more than for the white British population and 15 percent more than for the Asian population¹⁰. There is an indication that ethnic minorities are more likely to intend to have seasonal influenza vaccination (partly due to increased risk of hospitalisation and death)¹², which may also apply to other vaccinations. However, there is also a suggestion of reduced collection of antiviral drugs for influenza in regions with more ethnic minorities in the UK¹⁴.

Geography

Urban areas have higher age-standardised COVID-19 death rates than rural areas, with London and the North West having the highest rates⁴. The gathering of ethnic minorities into particular areas can have some beneficial effects on health⁶. Important local differences in ethnic inequalities indicate the need for localised initiatives and learning from areas that have made progress⁶.

Racism and Discrimination

Racism and discrimination, including the fear or expectation of it happening, are widely experienced by minority ethnic people and have direct negative impacts on both mental and physical health⁶. There are about 150,000 incidents of race hate crime each year. Black people are already nearly 10 times more likely to be stopped and searched and four times as likely to be arrested than their white British counterparts⁹. Racism impacts indirectly on health via exclusionary processes operating within education, employment and housing⁶.

Access to Health Services

Satisfaction with government services is lower among ethnic minorities than white British people⁶. Poorer access to primary and secondary healthcare, including dental and mental health services, can exacerbate inequalities⁶; gypsy and traveller communities experience significant barriers. There is great diversity within ethnic groups, but in aggregate cultural beliefs, attitudes, and preferences contribute to some of the observed inequalities⁶. Ethnic differences in uptake of preventive healthcare vary by area and highlight the importance of local responsiveness to need. Some in BAME communities may lack the knowledge and language skills required to navigate health, social care, and welfare systems without support, particularly amongst migrants⁹.

Migration Effects

Migrants into the UK tend to be healthier than those who do not migrate, but this advantage wears off over time and across generations⁶. More than half of those health and social care workers who have died were born outside the UK, compared to a reported 18 per cent of all NHS staff⁶. Migration, and particularly repeated migrations, can lead to particular health and mental health risks⁶. Migrants may need to deal with unfamiliar language and processes to access services, overcrowded housing, lack of access to healthcare, public services, and shelter, all of which add to psychological distress^{15,16}. The closing of borders due to pandemic may mean refugees are returned to countries of origin where they might be at risk¹⁶. Search and rescue operations in the Mediterranean have been suspended due to COVID-19¹⁶, and UN resettlement procedures have also been cancelled¹⁷. These groups are similarly affected by the reduction in help from volunteers due to social distancing and quarantine¹⁶.

Genetic and Biological Factors

There is more genetic variation within than between ethnic groups⁶, with widespread consensus amongst geneticists and epidemiologists that genetic factors contribute only little to ethnic inequalities in health⁶. Whilst there is some tendency towards within-group partnering/marriage, socially constructed ethnic groups are usually poor markers for genetic traits⁶. There is a possibility that susceptibility to respiratory infections, vitamin D deficiency, increased inflammatory burden, or other biological factors contribute towards increased severity^{21,22} in minority groups⁶.

Policy Recommendations

Actions that might help reduce inequities include ensuring adequate income protection for those in low paid or precarious employment (so workers can follow quarantine recommendations)⁸, reducing occupational risks (e.g. providing appropriate PPE), and providing culturally and linguistically appropriate public health communications^{7,20}. This should be developed with affected communities and tailored to culturally specific challenges, such as preventing transmission in overcrowded households or shielding vulnerable people in multigenerational households⁷. The removal of all NHS charges^{9,13} during this public health emergency could ensure that no migrant or individual from a

BAME group delays seeking healthcare and risks death through fear of being charged for their NHS care⁷. Somerset Foundation Trust recently included BAME staff in its vulnerable and at risk group⁶.

Ethnic groups should be included in health inequalities work with senior leadership of this agenda⁶. Data should be collected and reported by ethnicity to understand local needs and whether they are being met^{6,18,19}, and take into account ethnic patterning in residential, income, educational, and occupational profiles⁶. Interventions need to work with cultural and religious understanding while recognising intra-group diversity and avoiding stereotyping⁶. There should be good representation of BAME communities in staff and leadership, and regular equity audits⁶. Across all areas, there should be meaningful engagement and involvement of minority ethnic communities in their services^{6,9,13}.

Other Information

- Public Health England are producing a report on COVID-19 and BAME communities with consultation from Trevor Phillips, due to be published at the end of May 2020
- The Labour Party are conducting a review into COVID-19 and BAME communities led by Baroness Doreen Lawrence, publication date unclear
- Doctors of the World UK have produced COVID-19 information in different languages: <https://www.doctorsoftheworld.org.uk/>
- BBC Asian Network has produced COVID-19 information in a variety of South Asian languages: <https://www.bbc.co.uk/mediacentre/latestnews/2020/asian-network-advice-videos>
- Article about pregnant women admitted to hospital with COVID-19: <https://www.npeu.ox.ac.uk/downloads/files/ukoss/annual-reports/UKOSS%20COVID-19%20Paper%20pre-print%20draft%2011-05-20.pdf>

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Disclaimer

This report has not been peer-reviewed; it should not replace individual clinical judgement and the sources cited should be checked. The views expressed in this report represent the views of the

authors and not necessarily those of the University of Bristol, the NHS, the NIHR, or the Department of Health and Social Care. The views are not a substitute for professional medical advice.

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Appendix

Table A1: Initial Project Screen

| | | |
|---|--|--|
| CEBM, University of Oxford | https://www.cebm.net/covid-19/ | - |
| Evidence aid | https://www.evidenceaid.org/coronavirus-covid-19-evidence-collection/ | None found |
| Cochrane Methodology Review Group | Infection control and prevention: https://www.cochranelibrary.com/collections/doi/SC000040/full Evidence relative to critical care: https://www.cochranelibrary.com/collections/doi/SC000039/full | None found None found |
| Department of Health and Social Care Reviews Facility | http://eppi.ioe.ac.uk/COVID19_MAP/covid_map_v3.html | None found |
| PROSPERO | https://www.crd.york.ac.uk/prospero/#searchadvanced | None found |
| UCSF COVID19 papers | https://ucsf.app.box.com/s/2laxq0v00zg2ope9jp-psqtnv1mtxd52z | None found |
| PHE Knowledge and Library Services | https://phelibrary.koha-ptfs.co.uk/coronavirusinformation/ | None found |
| McMaster PLUS | https://plus.mcmaster.ca/COVID-19/ | None found |
| WHO Global Research COVID19 database | https://www.who.int/emergencies/diseases/novel-coronavirus-2019/global-research-on-novel-coronavirus-2019-ncov | Racial Variations in COVID-19 Deaths May Be Due to Androgen Receptor Genetic Variants Associated with Prostate Cancer and Androgenetic Alopecia. Are Anti-Androgens a Potential Treatment for COVID-19? McCoy, John; Wambier, Carlos G; Vano-Galvan, Sergio; Shapiro, Jerry; Sinclair, Rodney; Müller Ramos, Paulo; Washenik, Kenneth; Andrade, Murilo; Herrera, Sabina; Goren, Andy. |

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| | | <p><i>J Cosmet Dermatol ; 2020 Apr 25.</i></p> <p>Why are ethnic minorities worse affected? <i>Liverpool, Layal. New Scientist ; 246(3279):11-Nov, 2020.</i></p> <p>Covid-19: Two thirds of healthcare workers who have died were from ethnic minorities. <i>Rimmer, Abi. BMJ ; 369: m1621, 2020 Apr 23.</i></p> <p>Ethnicity and COVID-19: an urgent public health research priority. <i>Pareek, Manish; Bangash, Mansoor N; Pareek, Nilesh; Pan, Daniel; Sze, Shirley; Minhas, Jatinder S; Hanif, Wasim; Khuntj, Kamlesh. Lancet ; 395(10234): 1421-1422, 2020 05 02.</i></p> <p>Covid-19: Disproportionate impact on ethnic minority healthcare workers will be explored by government. <i>Rimmer, Abi. BMJ ; 369: m1562, 2020 Apr 17.</i></p> <p>The COVID-19 Pandemic: a Call to Action to Identify and Address Racial and Ethnic Disparities. <i>Laurencin, Cato T; McClinton, Aneesah. J Racial Ethn Health Disparities ; 2020 Apr 18.</i></p> |
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| | | <p>Sars-CoV-2 and black population: ACE2 as shield or blade? Vinciguerra, Mattia; Greco, Ernesto. <i>Infection, Genetics and Evolution</i> ; 2020.</p> <p>The COVID-19 Pandemic Illuminates Persistent and Emerging Disparities among Rural Black Populations. Zahnd, Whitney E. <i>J Rural Health</i> ; 2020 May 03.</p> <p>Racial Capitalism: A Fundamental Cause of Novel Coronavirus (COVID-19) Pandemic Inequities in the United States. Laster Pirtle, Whitney N. <i>Health Educ Behav</i> ; : 1090198120922942, 2020 Apr 26.</p> <p>Covid-19: Black people and other minorities are hardest hit in US. Dyer, Owen. <i>BMJ</i> ; 369: m1483, 2020 Apr 14.</p> |
| CDC COVID19 guidance | https://www.cdc.gov/coronavirus/2019-ncov/hcp/index.html | None found |
| Oxford Centre for Evidence-based Medicine | https://www.cebm.net/covid-19/ | BAME COVID-19 DEATHS – What do we know? Rapid Data & Evidence Review |

Table A2: Search strategy results

Searches run on 11/05/2020, only the COVID-19 search is limited to 2019/2020

| Search Strategy | Cochrane Library (Reviews and RCTs) | OVID (Medline, Embase, Psycinfo) |
|---|-------------------------------------|----------------------------------|
| BAME | 8,180 | 741,456 |
| COVID-19 (2019/2020) | 344 | 39,477 |
| Pandemic/Epidemic | 3,558 | 338,886 |
| Corona/SARS/Flu | 9,167 | 320,418 |
| UK Filter | 52,801 | 6,801,693 |
| BAME and COVID-19 (2019/2020) | 0 | 38 |
| BAME and pandemic/epidemic | 68 | 7,385 |
| BAME and Corona/SARS/Flu | 51 | 2,999 |
| BAME and pandemic/epidemic and Corona/SARS/Flu | 5 | 553 |
| BAME and pandemic/epidemic and Corona/SARS/Flu and UK | 0 | 64 |

Note: Highlighted are the 'hits' we took forward to double-screening of titles/abstracts

Figure A1: Cochrane BAME Search Strategy

| | | | |
|---|---|-----|---|
| - | + | #1 | MeSH descriptor: [Minority Groups] explode all trees |
| - | + | #2 | MeSH descriptor: [Ethnic Groups] explode all trees |
| - | + | #3 | MeSH descriptor: [Refugees] explode all trees |
| - | + | #4 | MeSH descriptor: [Hispanic Americans] explode all trees |
| - | + | #5 | MeSH descriptor: [African Continental Ancestry Group] explode all trees |
| - | + | #6 | MeSH descriptor: [American Native Continental Ancestry Group] explode all trees |
| - | + | #7 | MeSH descriptor: [Asian Continental Ancestry Group] explode all trees |
| - | + | #8 | MeSH descriptor: [African Americans] explode all trees |
| - | + | #9 | MeSH descriptor: [Roma] explode all trees |
| - | + | #10 | MeSH descriptor: [Mexican Americans] explode all trees |
| - | + | #11 | MeSH descriptor: [Arabs] explode all trees |
| - | + | #12 | ethnic NEAR/3 minorit*.ti,ab |
| - | + | #13 | #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 #9 or #10 or #11 or #12 |

Figure A2: Cochrane COVID-19 Search Strategy

| | |
|-----|--|
| #14 | MeSH descriptor: [Coronavirus] explode all trees |
| #15 | MeSH descriptor: [Severe Acute Respiratory Syndrome] explode all trees |
| #16 | (nCoV or 2019-nCoV or ((new or novel or wuhan) near/3 coronavirus) or covid19 or covid-19 or SARS-CoV-2) |
| #17 | (corona* or coron*) NEAR/2 (virus* or viral* or virinae*) |
| #18 | #14 or #15 or #16 or #17 |
| #19 | #14 or #15 or #16 or #17 with Cochrane Library publication date in The last 2 years |

Figure A3: Cochrane Pandemic/Epidemic Search Strategy

| | |
|-----|--|
| #22 | MeSH descriptor: [Pandemics] explode all trees |
| #23 | MeSH descriptor: [Epidemics] explode all trees |
| #24 | pandemic* or epidemic*.ti,ab |
| #25 | #22 or #23 or #24 |
| #26 | #13 and #25 |

Figure A4: Cochrane Major Respiratory Search Strategy

| | |
|-----|--|
| #27 | MeSH descriptor: [Influenza, Human] explode all trees |
| #28 | MeSH descriptor: [Coronavirus] explode all trees |
| #29 | MeSH descriptor: [Coronavirus Infections] explode all trees |
| #30 | MeSH descriptor: [Severe Acute Respiratory Syndrome] explode all trees |
| #31 | MeSH descriptor: [Paramyxoviridae Infections] explode all trees |
| #32 | influenza or flu.ti,ab |
| #33 | #27 or #28 or #29 or #30 or #31 or #32 |

Figure A5: Cochrane UK Search Strategy

| | |
|-----|---|
| #37 | MeSH descriptor: [United Kingdom] explode all trees |
| #38 | (national health service* or nhs*):ti,ab |
| #39 | (english not ((published or publication* or translat* or written or language* or speak* or literature or citation*) adj5 english)):ti,ab |
| #40 | (gb or "g.b." or britain* or (british* not "british columbia") or uk or "u.k." or united kingdom* or (england* not "new england") or northern ireland* or northern irish* or scotland* or scottish* or ((wales or "south wales") not "new south wales") or welsh*):ti,ab |
| #41 | (bath or "bath's" or ((birmingham not alabama*) or ("birmingham's" not alabama*) or bradford or "bradford's" or brighton or "brighton's" or bristol or "bristol's" or Carlisle* or "Carlisle's" or (cambridge not (massachusetts* or boston* or harvard*)) or ("cambridge's" not (massachusetts* or boston* or harvard*)) or (canterbury not zealand*) or ("canterbury's" not zealand*) or chelmsford or "chelmsford's" or chester or "chester's" or chichester or "chichester's" or coventry or "coventry's" or derby or "derby's" or (durham not (carolina* or nc)) or ("durham's" not (carolina* or nc)) or ely or "ely's" or exeter or "exeter's" or gloucester or "gloucester's" or hereford or "hereford's" or hull or "hull's" or lancaster or "lancaster's" or leeds* or leicester* or "leicester's" or (lincoln not nebraska*) or ("lincoln's" not nebraska*) or (liverpool not (new south wales* or nsw)) or ("liverpool's" not (new south wales* or nsw)) or ((london not (ontario* or ont or toronto*)) or ("london's" not (ontario* or ont or toronto*))) or manchester or "manchester's" or (newcastle not (new south wales* or nsw)) or ("newcastle's" not (new south wales* or nsw)) or norwich or "norwich's" or nottingham or "nottingham's" or oxford or "oxford's" or peterborough or "peterborough's" or plymouth or "plymouth's" or portsmouth or "portsmouth's" or preston or "preston's" or ripon or "ripon's" or salford or "salford's" or salisbury or "salisbury's" or sheffield or "sheffield's" or southampton or "southampton's" or st albans or stoke or "stoke's" or sunderland or "sunderland's" or truro or "truro's" or wakefield or "wakefield's" or wells or westminster or "westminster's" or winchester or "winchester's" or wolverhampton or "wolverhampton's" or (worchester not (massachusetts* or boston* or harvard*)) or ("worchester's" not (massachusetts* or boston* or harvard*)) or (york not ("new york*" or ny or ontario* or ont or toronto*)) or ("york's" not ("new york*" or ny or ontario* or ont or toronto*))))):ti,ab |
| #42 | (bangor or "bangor's" or cardiff or "cardiff's" or newport or "newport's" or st asaph or "st asaph's" or st davids or swansea or "swansea's"):ti,ab |
| #43 | #37 or #38 or #39 or #40 or #41 or #42 |

Figure A6: OVID BAME Search Strategy

| | |
|----|---|
| 1 | exp Minority Groups/ |
| 2 | exp Ethnic Groups/ |
| 3 | exp Refugees/ |
| 4 | exp Hispanic Americans/ |
| 5 | exp African Continental Ancestry Group/ |
| 6 | exp American Native Continental Ancestry Group/ |
| 7 | exp Asian Continental Ancestry Group/ |
| 8 | exp African Americans/ |
| 9 | exp Roma/ |
| 10 | exp Mexican Americans/ |
| 11 | exp Arabs/ |
| 12 | (ethnic adj3 minorit*).ti,ab. |
| 13 | 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 |

Figure A7: OVID COVID-19 Search Strategy

| | |
|----|--|
| 14 | exp Coronavirus/ |
| 15 | exp Severe Acute Respiratory Syndrome/ |
| 16 | (nCoV or 2019?nCoV or ((new or novel or wuhan) adj3 coronavirus) or covid19 or covid?19 or SARS?CoV?2).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] |
| 17 | ((corona* or corono*) adj2 (virus* or viral* or virinae*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] |
| 18 | 14 or 15 or 16 or 17 |
| 19 | 13 and 18 |
| 20 | limit 19 to yr="2019 -Current" |

Figure A8: OVID Pandemic/Epidemic Search Strategy

| | |
|----|--------------------------------|
| 20 | limit 19 to yr="2019 -Current" |
| 21 | exp Pandemic/ |
| 22 | exp Epidemic/ |
| 23 | (pandemic* or epidemic*).tw. |
| 24 | 21 or 22 or 23 |

Figure A9: OVID Major Respiratory Search Strategy

| | |
|----|--|
| 26 | exp Influenza/ |
| 27 | exp Coronavirus/ |
| 28 | exp Coronavirus Infections/ |
| 29 | exp Severe Acute Respiratory Syndrome/ |
| 30 | exp Parainfluenza/ |
| 31 | (influenza or flu).tw. |
| 32 | 26 or 27 or 28 or 29 or 30 or 31 |

Figure A10: OVID UK Search Strategy

| | |
|----|--|
| 36 | exp Great Britain/ |
| 37 | (national health service* or nhs*).ti,ab,in. |
| 38 | (english not ((published or publication* or translat* or written or language* or speak* or literature or citation*) adj5 english)).ti,ab. |
| 39 | (gb or "g.b." or britain* or (british* not "british columbia") or uk or "u.k." or united kingdom* or (england* not "new england") or northern ireland* or northern irish* or scotland* or scottish* or ((wales or "south wales") not "new south wales") or welsh*).ti,ab,jw,in. |
| 40 | (bath or "bath's" or ((birmingham not alabama*) or ("birmingham's" not alabama*)) or bradford or "bradford's" or brighton or "brighton's" or bristol or "bristol's" or carlisle* or "carlisle's" or (cambridge not (massachusetts* or boston* or harvard*)) or ("cambridge's" not (massachusetts* or boston* or harvard*)) or (canterbury not zealand*) or ("canterbury's" not zealand*)) or chelmsford or "chelmsford's" or chester or "chester's" or chichester or "chichester's" or coventry or "coventry's" or derby or "derby's" or (durham not (carolina* or nc)) or ("durham's" not (carolina* or nc)) or ely or "ely's" or exeter or "exeter's" or gloucester or "gloucester's" or hereford or "hereford's" or hull or "hull's" or lancaster or "lancaster's" or leeds* or leicester or "leicester's" or (lincoln not nebraska*) or ("lincoln's" not nebraska*) or (liverpool not (new south wales* or nsw)) or ("liverpool's" not (new south wales* or nsw)) or ((london not (ontario* or ont or toronto*)) or ("london's" not (ontario* or ont or toronto*))) or manchester or "manchester's" or (newcastle not (new south wales* or nsw)) or ("newcastle's" not (new south wales* or nsw)) or norwich or "norwich's" or nottingham or "nottingham's" or oxford or "oxford's" or peterborough or "peterborough's" or plymouth or "plymouth's" or portsmouth or "portsmouth's" or preston or "preston's" or ripon or "ripon's" or salford or "salford's" or salisbury or "salisbury's" or sheffield or "sheffield's" or southampton or "southampton's" or st albans or stoke or "stoke's" or sunderland or "sunderland's" or truro or "truro's" or wakefield or "wakefield's" or wells or westminster or "westminster's" or winchester or "winchester's" or wolverhampton or "wolverhampton's" or (worchester not (massachusetts* or boston* or harvard*)) or ("worchester's" not (massachusetts* or boston* or harvard*)) or (york not ("new york*" or ny or ontario* or ont or toronto*)) or ("york's" not ("new york*" or ny or ontario* or ont or toronto*))))).ti,ab,in. |
| 41 | (bangor or "bangor's" or cardiff or "cardiff's" or newport or "newport's" or st asaph or "st asaph's" or st davids or swansea or "swansea's").ti,ab,in. |
| 42 | 36 or 37 or 38 or 39 or 40 or 41 |

Figure A11: PRISMA Diagram

