BAME COVID-19 DEATHS - WHAT DO WE KNOW?

RAPID DATA & EVIDENCE REVIEW:

‘HIDDEN IN PLAIN SIGHT’

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Methodology

The rapid data and evidence synthesis goes beyond research evidence and integrates multiple types and levels of evidence to inform decision making to address the emergent alerts of UK BAME COVID-19 deaths amongst the general population and in BAME healthcare and public facing key workers.

A timeline of four days was provided for the production of this report. An ongoing Google Scholar literature search has been conducted since the COVID-19 outbreak began, and this has been updated through publications on MedRxiv preprint and social media.

Additional studies were included by screening references of included studies and thorough hand searching of websites of different government, multinational agencies and COVID-19 resource aggregators.

Executive Summary

Evidence indicates markedly higher mortality risk from COVID-19 among Black, Asian and Minority Ethnic (BAME) groups, but deaths are not consistent across BAME groups. Similarly, adverse outcomes are seen for BAME patients in intensive care units and amongst medical staff and Health and Care Workers. The exact reasons for this increased risk and vulnerability from COVID-19 in BAME populations are not known There may be a number of contributing factors in the general population such as:

- Overrepresentation of BAME populations in lower socio-economic groups.
- multi-family and multi-generational household leading to increased risk of transmission due to the lockdown.
- disproportionate employment in lower band key worker roles who either work in high exposure care environments or are unable to implement safe social distancing due to their roles.
- co-morbidity exposure risks especially for CVD, diabetes, renal conditions and complex multi-morbidities in ICU.
- Increased health and care setting COVID-19 exposure risks.

BAME Deaths by Ethnicity by Excess Deaths in England

- Asian excess deaths (observed vs expected) are 1.5 times higher for the Indian population, 2.8 times higher for the Pakistani population, 3 times higher for the Bangladeshi population.

- Black excess deaths are 4.3 times higher for the Black African population, 2.5 times for the Black Caribbean population, 7.3 times higher for the Black other background population.

- Mixed excess deaths are 1.6 times higher for the Mixed any other background population.

- While the ethnic group 'Black' makes up 3.5 percent of England's population, as of 17 April 2020 it has been identified in 5.8 percent of Covid-19 deaths - 801 people in total. That means the share of deaths is 66 percent higher than the share of the population. The Asian share of deaths is similar to share of the population.

BAME Patient Characteristics and Patient Outcome in Intensive Care Units(ICU)

- 34% of BAME patients with confirmed COVID-19 are admitted to ICU as compared with 12% for viral pneumonia.
- There is a clear social gradient for patients with confirmed COVID-19 admitted to ICU with the most deprived nearly twice as likely than the least deprived by Index of Multiple Deprivation (IMD) quintile.
- Approximately half of BAME patients with COVID-19 were discharged alive from ICU.

- Asian patients with COVID-19 were 3 times more likely to die in ICU than patients with viral pneumonia. Mixed ethnicity patients with COVID-19 were 2 times more likely to die in ICU than patients with viral pneumonia. Black ethnicity patients with COVID-19 were 4 times more likely to die in ICU than patients with viral pneumonia. Other ethnicity patients with COVID-19 were 2.5 times more likely to die in ICU than patients with viral pneumonia.

- 40.0% Asian, Black and Other BAME patients required renal support in ICU.
- There is a clear social gradient with those in IMD quintile 5 (most deprived) nearly twice as likely to require renal support as IMD quintile 1 (least deprived).
- The pattern of ICU outcomes by ethnic group broadly reflect the pattern of overall COVID-19 mortality by ethnic groups suggesting ICU deaths follows the overall death risk pattern overall for BAME communities.

BAME Health and Care worker deaths

- Among all staff employed by the NHS, BAME groups account for approximately 21 per cent, including approximately 20 per cent among nursing and support staff and 44 per cent among medial staff. Initial analysis of publicly available of health and care worker BAME COVID deaths suggests that they account for 63 per cent, 64 per cent and 95 per cent of deaths in the same staff groups for BAME healthcare worker deaths. Health and care worker deaths seem to be concentrated in nursing and care worker groups.

International Evidence

- In the US the latest available COVID-19 mortality rate for Black Americans is 2.4 times higher than the rate for Latinos, 2.5 times higher than the rate for Asians, and 2.7 times higher than the rate for Whites. For each 100,000 Americans (of their respective groups), about 26 Blacks have died, along with 11 Latinos, 10 Asians and 9 Whites. If Black Americans had died of COVID-19 at the same rate as White Americans, 6,400 of the more than 10,000 Black residents who have died in these states would still be alive**.**

- In Italy the percentage of people between the age of 30 and 49 years who live with their parents is up to 20%, which is much higher than in other countries. Adult children and grandchildren, who are often asymptomatic, would have infected their elderly parents. This has important public health policy implications for UK BAME multi-family and multi-generational households during the pandemic.

- Asymptomatic infection at time of laboratory confirmation has been reported from many settings. Some of these cases developed some symptoms at a later stage of infection, however, the proportion is not yet fully understood. A recent modelling study suggested that asymptomatic individuals might be major drivers for the growth of the COVID-19 pandemic. A household cohort study from China to determine the features of household transmission of COVID-19 reports secondary transmission of SARS-CoV-2 developed in 64 of 392 household contacts (16.3%). The secondary attack rate to children was 4% comparing with 17.1% to adults. Ages of contacts and spouse relationship with index case are risk factors for transmission of COVID-19. Quarantine of index patients since onset of symptom is helpful to prevent COVID-19 spread.

1. Introduction

There is emerging evidence of an association between ethnicity and COVID-19 incidence and adverse health outcomes. There are also concerns that healthcare and other key workers who belong to black, Asian and minority ethnic (BAME) groups may be particularly at risk.

These issues are of critical importance and urgently need to be addressed but are not straightforward, because there may be multiple factors driving this association (such as genetic, socioeconomic, behavioural, cultural and religious and environmental) and many potential confounding factors including comorbidity.

Although we need research to further our understanding of potential differences in risk for ethnic groups, which groups are at greatest risk of a range of adverse outcomes, and, based on that understanding, what can be done about this to reduce morbidity and mortality.

We have an emergent picture that although incomplete is already data and evidence 'hidden in plain sight' that highlights inequalities in outcomes for BAME COVID-19 populations that can guide clear actions that could save lives. This synthesis report can complement the further research work planned by academic groups and inform the Public Health England (PHE) national review.

The report considers two population segments, namely:

1. COVID-19 association between ethnicity in the general population.

2. COVID-19 specifically on people working in health and social care from BAME backgrounds.

2. The epidemiology and pathogenesis of coronavirus disease (COVID-19)

2.1 Aetiology

CoVs are positive-stranded RNA viruses with a crown-like appearance under an electron microscope (*coronam* is the Latin term for crown) due to the presence of spike glycoproteins on the envelope. The subfamily *Orthocoronavirinae* of the *Coronaviridae* family (order *Nidovirales*) classifies into four genera of CoVs: Alphacoronavirus (alphaCoV), Betacoronavirus (betaCoV), Deltacoronavirus (deltaCoV), and Gammacoronavirus (gammaCoV). Furthermore, the betaCoV genus divides into five sub-genera or lineages.[1] Genomic characterization has shown that probably bats and rodents are the gene sources of alphaCoVs and betaCoVs. On the contrary, avian species seem to represent the gene sources of deltaCoVs and gammaCoVs.

Members of this large family of viruses can cause respiratory, enteric, hepatic, and neurological diseases in different animal species, including camels, cattle, cats, and bats.

To date, seven human CoVs (HCoVs) capable of infecting humans have been identified. Some of HCoVs were identified in the mid-1960s, while others were only detected in the new millennium.

In general, estimates suggest that 2% of the population are healthy carriers of a CoV and that these viruses are responsible for about 5% to 10% of acute respiratory infections.[2]

- Common human CoVs: HCoV-OC43, and HCoV-HKU1 (betaCoVs of the A lineage); HCoV-229E, and HCoV-NL63 (alphaCoVs). They can cause common colds and self-limiting upper respiratory infections in immunocompetent individuals. In immunocompromised subjects and the elderly, lower respiratory tract infections can occur.
- Other human CoVs: SARS-CoV, SARS-CoV-2, and MERS-CoV (betaCoVs of the B and C lineage, respectively). These cause epidemics with variable clinical severity featuring respiratory and extra-respiratory manifestations. Concerning SARS-CoV, MERS-CoV, the mortality rates are up to 10% and 35%, respectively.

Thus, SARS-CoV-2 belongs to the betaCoVs category. It has round or elliptic and often pleomorphic form, and a diameter of approximately 60–140 nm. Like other CoVs, it is sensitive to ultraviolet rays and heat. Furthermore, these viruses can be effectively inactivated by lipid solvents including ether (75%), ethanol, chlorine-containing disinfectant, peroxyacetic acid and chloroform except for chlorhexidine.

2.2 Pathophysiology

CoVs are enveloped, positive-stranded RNA viruses with nucleocapsid. For addressing pathogenetic mechanisms of SARS-CoV-2, its viral structure, and genome must be considerations. In CoVs, the genomic structure is organized in a +ssRNA of approximately 30 kb in length — the largest known RNA viruses — and with a 5′-cap structure and 3′-poly-A tail. Starting from the viral RNA, the synthesis of polyprotein 1a/1ab (pp1a/pp1ab) in the host is realized. The transcription works through the replication-transcription complex (RCT) organized in double-membrane vesicles and via the synthesis of subgenomic RNAs (sgRNAs) sequences. Of note, transcription termination occurs at transcription regulatory sequences, located between the so-called open reading frames (ORFs) that work as templates for the production of subgenomic mRNAs. In the atypical CoV genome, at least six ORFs can be present. Among these, a frameshift between ORF1a and ORF1b guides the production of both pp1a and pp1ab polypeptides that are processed by virally encoded chymotrypsin-like protease (3CLpro) or main protease (Mpro), as well as one or two papain-like proteases for producing 16 non-structural proteins (nsps). Apart from ORF1a and ORF1b, other ORFs encode for structural proteins, including spike, membrane, envelope, and nucleocapsid proteins.[3] and accessory proteic chains. Different CoVs present special structural and accessory proteins translated by dedicated sgRNAs.

Pathophysiology and virulence mechanisms of CoVs, and therefore also of SARS-CoV-2 have links to the function of the nsps and structural proteins. For instance, research underlined that nsp is able to block the host innate immune response.[4] Among functions of structural proteins, the envelope has a crucial role in virus pathogenicity as it promotes viral assembly and release. However, many of these features (e.g., those of nsp 2, and 11) have not yet been described.

Among the structural elements of CoVs, there are the spike glycoproteins composed of two subunits (S1 and S2). Homotrimers of S proteins compose the spikes on the viral surface, guiding the link to host receptors.[5] Of note, in SARS-CoV-2, the S2 subunit — containing a fusion peptide, a transmembrane domain, and cytoplasmic domain — is highly conserved. Thus, it could be a target for antiviral (anti-S2) compounds. On the contrary, the spike receptor-binding domain presents only a 40% amino acid identity with other SARS-CoVs. Other structural elements on which research must necessarily focus are the ORF3b that has no homology with that of SARS-CoVs and a secreted protein (encoded by ORF8), which is structurally different from those of SARS-CoV.

The pathogenic mechanism that produces pneumonia seems to be particularly complex. Clinical and preclinical research will have to explain many aspects that underlie the particular clinical presentations of the disease. The data so far available seem to indicate that the viral infection is capable of producing an excessive immune reaction in the host. In some cases, a reaction takes place which as a whole is labeled a 'cytokine storm'. The effect is extensive tissue damage. The protagonist of this storm is interleukin 6 (IL-6). IL-6 is produced by activated leukocytes and acts on a large number of cells and tissues. It is able to promote the differentiation of B lymphocytes, promotes the growth of some categories of cells, and inhibits the growth of others. It also stimulates the production of acute phase proteins and plays an important role in thermoregulation, in bone maintenance and in the functionality of the central nervous system. Although the main role played by IL-6 is pro-inflammatory, it can also have anti-inflammatory effects. In turn, IL-6 increases during inflammatory diseases, infections, autoimmune disorders, cardiovascular diseases and some types of cancer. It is also implicated into the pathogenesis of the cytokine release syndrome (CRS) that is an acute systemic inflammatory syndrome characterized by fever and multiple organ dysfunction.

2.3 Phylogenetic analysis

World Health Organisation (WHO) has classified COVID-19 as a β CoV of group 2B [6]. Ten genome sequences of COVID-19 obtained from a total of nine patients exhibited 99.98% sequence identity [7]. Another study showed there was 99.8–99.9% nucleotide identity in isolates from five patients and the sequence results revealed the presence of a new beta-CoV strain [8]. The genetic sequence of the COVID-19 showed more than 80% identity to SARS-CoV and 50% to the MERS-CoV [8,9], and both SARS-CoV and MERS-CoV originate in bats [10]. Thus, the evidence from the phylogenetic analysis indicates that the COVID-19 belongs to the genus betacoronavirus, which includes SARS-CoV, that infects humans, bats, and wild animals [11].

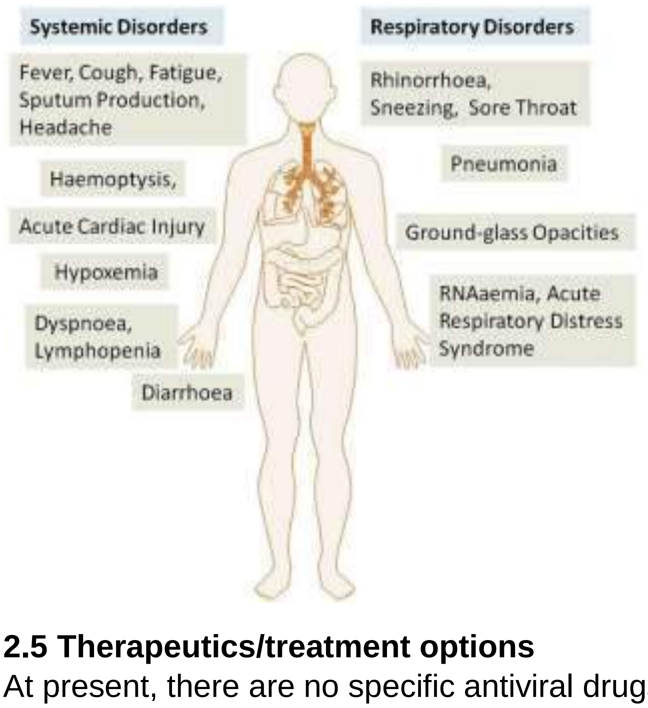
COVID-19 represents the seventh member of the coronavirus family that infects humans and has been classified under the orthocoronavirinae subfamily. The COVID-19 forms a clade within the subgenus sarbecovirus [11]. Based on the genetic sequence identity and the phylogenetic reports, COVID-19 is sufficiently different from SARS-CoV and it can thus be considered as a new betacoronavirus that infects humans. The COVID-19 most likely developed from bat origin coronaviruses. Another piece of evidence that supports the COVID-19 is of bat origin is the existence of a high degree of homology of the ACE2 receptor from a diversity of animal species, thus implicating these animal species as possible intermediate hosts or animal models for COVID-19 infections [12]. Moreover, these viruses have a single intact open reading frame on gene 8, which is a further indicator of bat-origin CoVs. However, the amino acid sequence of the tentative receptor-binding domain resembles that of SARS-CoV, indicating that these viruses might use the same receptor [5].

2.4 Clinical Symptoms

The symptoms of COVID-19 infection appear after an incubation period of approximately 5.2 days [13]. The period from the onset of COVID-19 symptoms to death ranged from 6 to 41 days with a median of 14 days [14]. This period is dependent on the age of the patient and status of the patient's immune system. It was shorter among patients >70-years old compared with those under the age of 70 [14]. The most common symptoms at onset of COVID-19 illness are fever, cough, and fatigue, while other symptoms include sputum production, headache, haemoptysis, diarrhoea, dyspnoea, and lymphopenia [14]. Clinical features revealed by a chest CT scan presented as pneumonia, however, there were abnormal features such as RNAaemia, acute respiratory distress syndrome, acute cardiac injury, and incidence of grand-glass opacities that led to death [15]. In some cases, the multiple peripheral ground-glass opacities were observed in subpleural regions of both lungs [16] that likely induced both systemic and localized immune response that led to increased inflammation.

There are general similarities in the symptoms between COVID-19 and previous betacoronavirus. However, COVID-19 showed some unique clinical features that include the targeting of the lower airway as evident by upper respiratory tract symptoms like rhinorrhoea, sneezing, and sore throat. Additionally, patients infected with COVID-19 developed intestinal symptoms like diarrhoea only a low percentage of MERS-CoV or SARS-CoV patients exhibited diarrhoea.

Figure 1: The systemic and respiratory disorders caused by COVID-19 infection



2.5 Therapeutics/treatment options

At present, there are no specific antiviral drugs or vaccine against COVID-19 infection for potential therapy of humans.

Several groups of scientists are currently working hard to develop a nonhuman primate model to study COVID-19 infection to establish fast track novel therapeutics and for the testing of potential vaccines in addition to providing a better understanding of virus-host interactions.

3. Literature Review

3.1 Health Inequalities between Ethnic Groups in England

Box 1: Summary of evidence relating to explanations for health inequalities between ethnic groups

Factor	**Summary of available evidence**
Socio-economic deprivation (access to health promoting resources)	Most analysts agree that these make a substantial contribution to ethnic inequalities in health. There is evidence that morbidity and mortality within all ethnic groups is strongly patterned by socio-economic position.
Racism and discrimination	There is growing evidence that racism plays a role in the poorer physical and mental health of minority ethnic populations via direct personal experience of racist victimisation or discrimination and via the fear or expectation that racism may be encountered. The pervasive experience of racism in day-to-day life may also increase the likelihood of negative experiences and low satisfaction with health and other statutory services. Racism also impacts indirectly on health via exclusionary processes operating within education, employment and housing.
Residential location (access to health promoting resources; exposure to health risks)	There is clear evidence that ethnic minority people reside disproportionately in areas of high deprivation with poor environmental conditions, with concomitant negative impacts on health. However, the aggregation of ethnic minority people may have some beneficial effects on health.
Access to preventive and curative health services	There is growing evidence of differentially poor access to primary and secondary preventive and curative healthcare that could help to reduce inequalities in the major causes of morbidity and mortality (eg uptake of cancer screening and access to smoking cessation services) among some minority ethnic groups. Individuals identifying as Gypsies and Irish Travellers experience significant barriers to both primary and secondary health care. Lower satisfaction with services among minority ethnic people than the White British majority has been widely documented.
Health-related practices	Evidence in some areas remains limited. There is great diversity within ethnic groups, as well as change over time and space, in health related practices. However, at an aggregate level culturally informed beliefs, attitudes, preferences and associated behaviours contribute to some of the observed inequalities in health between ethnic groups. Patterns are varied for different health-related practices (eg smoking, alcohol consumption) across gender, generation and class, as well as ethnicity. Protective practices may be diminishing across generations and other practices, when transposed into different environments, can increase risk.
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 generations. A history of migration and ongoing transnational mobility can mean exposure to some particular health risks.
Genetic and biological factors	There is more genetic variation within than between ethnic groups. Genetic variation along ethnic lines arises because group classification frequently draws on visible difference or geographical ancestry and because marriage/partnering within ethnic groups is often encouraged. Some genetic traits do become more common amongst individuals identifying with particular ethnic groups. However, socially constructed ethnic groups are generally poor markers for genetic traits. We still know little about the role of genetic and environmental factors in producing some observed biological differences between ethnic groups. There is widespread consensus amongst geneticists and epidemiologists that genetic factors contribute only marginally to ethnic inequalities in health.

Source [17]: Local action on health inequalities Understanding and reducing ethnic inequalities in health, Public Health England (PHE), 2018

3.2 Ethnic inequalities in the social determinants of health

Box 2: Summary of evidence relating to explanations for ethnic health inequalities in the social determinants of health

Key messages:

- educational attainment at GCSE and degree levels is highest for the Chinese and Indian ethnic groups. Gypsy and Irish Travellers have the lowest level of qualifications at both levels
- white and Indian groups are more likely to be in employment, with unemployment highest among Black and Bangladeshi/Pakistani populations
- Bangladeshi, Pakistani, Chinese and Black groups are about twice as likely to be living on a low income, and experiencing child poverty, as the White population
- ethnic minority groups are more likely to live in private rented accommodation and overcrowded households than the White British population
- Bangladeshi, Pakistani and Black groups are the most likely to be living in deprived neighbourhoods
- the poor housing and neighbourhood conditions for Gypsy and Traveller groups are a serious concern
- fascism, harassment and discrimination are widely experienced by minority ethnic people and have direct negative impacts on both mental and physical health. There are about 150,000 incidents of race hate crime each year
- migration journeys are diverse, but experiences before, during and after settlement can negatively affect both physical and mental health.
- there have been increases in ethnic inequalities in employment and housing nationwide over the 2000s
- important differences in the extent and trends in ethnic inequalities across localities indicate the need for both localised initiatives and learning from those areas that have made progres

3.3 Ethnic inequalities and health behaviours

Box 3: Summary of evidence relating to explanations for ethnic inequalities and health hevaiours

Key messages:

- there are large ethnic inequalities in smoking rates but these also vary greatly between men and women within ethnic groups. Bangladeshi, Pakistani and Irish men have particularly high rates of smoking
- 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 groups
- levels of physical activity, and participation in sports, are lower among South Asian groups than other ethnic groups, with South Asian women having particularly high levels of inactivity
- evidence remains limited and contradictory on ethnic differences in healthy eating practices
- information on health-related practices is particularly limited for Gypsies, Irish Travellers and Roma populations. This is a major gap given their generally very poor health outcomes

3.4 Ethnic inequalities and access to services and interventions

Box 4: Summary of evidence relating to explanations for ethnic inequalities and access to services and interventions

Key messages:
• low levels of health literacy are a concern among some minority ethnic groups, particularly those with limited educational attainment and poor English language skills
• ethnic differences in the uptake of preventive interventions have been found to vary across studies and settings so that minority ethnic groups do not always experience disadvantage. This suggests the importance of local level responsiveness to need
• access to some primary care services, notably dental services and talking therapies for common mental disorders, is lower among minority ethnic groups than the White majority
• the significant barriers facing Gypsies and Travellers and asylum seekers in accessing primary care services warrant urgent action
• ethnic differences in satisfaction with healthcare have been repeatedly reported across primary and secondary care and, where these have been investigated, reflect differences in care that demand attention

3.5 Embedding attention to ethnicity within action on health inequalities

Box 5: Summary of evidence relating to explanations for embedding attention to ethnicity within action on health inequalities

Key messages:
• mainstreaming ethnicity: Without explicit consideration of ethnicity within health inequalities work there is a risk of partial understanding of the processes producing poor health outcomes and ineffective intervention
• influencing decision-makers and role of senior leadership: Progress on ethnic health inequalities has been slow and the need for senior leadership on this agenda has been repeatedly highlighted
• data collection, analysis and reporting: Gaps in data collection must be filled and there must be more consistent analysis and reporting of data on ethnicity, health and healthcare so that there is adequate understanding of local needs and the extent to which they are being met by policies and services
• action on the wider social and economic determinants of health may exacerbate ethnic health inequalities unless it adequately takes into account the ethnic patterning in residential, income, educational and occupational profiles
• tackling racism and ethnic discrimination: the central role of racism must be acknowledged, understood and addressed. There is an urgent need to build the evidence base around effective action
• commissioning of culturally sensitive health promotion interventions: Interventions need to work with cultural and religious understandings and values while recognising intra-group diversity and avoiding stereotyping
• improving access, experiences and outcomes of health services: Actions at organisational level include: regular equity audits; integration of equality into quality systems; good representation of black and minority ethnic communities among staff; sustained workforce development; trust-building dialogue with service users
• engagement with minority ethnic groups: Across all areas of activity, the meaningful engagement and involvement of minority ethnic communities, patients, clinical staff and people is central to understanding needs and producing appropriate and effective responses or shaping services. A concerted effort is required by public and private sector employers and service providers
• making use of evidence: The evidence base to inform policy and practice remains limited but more can be done to mobilise the available evidence and to document and evaluate promising local practice both locally and nationally

3.6 Prevalence of Underlying Diseases in Hospitalized Patients with COVID-19: a Systematic Review and Meta-Analysis

The data of 76993 patients presented in 10 articles were included in this study. According to the meta-analysis, the pooled prevalence of hypertension, cardiovascular disease, smoking history and diabetes in people infected with SARS-CoV-2 were estimated as 16.37% (95%CI: 10.15%-23.65%), 12.11% (95%CI 4.40%-22.75%), 7.63% (95%CI 3.83%-12.43%) and 7.87% (95%CI 6.57%-9.28%), respectively [18].

According to the current analysis, hypertension, cardiovascular diseases, diabetes, kidney disease, smoking, and COPDs were among the most prevalent underlying diseases among hospitalized patients with COVID-19.

In terms of pre-existing medical conditions, cardiovascular diseases had the highest prevalence among diseases that put patients at higher risk of SARS-CoV-2 threats. Decreasing the pro-inflammatory cytokines, which leads to a weaker immune function may account for this condition. It is worth noting that similar results were found regarding MERS. The meta-analysis found that smokers are more susceptible to Coronavirus infections, especially to the most recent species. Various reasons may justify this happening. It has been mentioned that smokers have unregulated ACE2 in remodeled cell types, which is consistent with results of SARS studies. However, factors such as amount of smoking, the duration of smoking, and the duration of smoking cessation also play a role. In some previous studies on MERS-CoV-2 it has been shown that dipeptidyl peptidase IV (DPP4), which is the specific receptor for this virus, had a higher rate of expression in smokers and COPD patients (24).

Although the results of the current analysis indicate that smoking can be an underlying factor that makes people susceptible to COVID-19 complications, in some studies, especially COVID-19 related studies, no strong evidence has been found regarding the correlation of COPD and smoking with being infected with this new virus. But the important point that must be taken into consideration is that the outcome of SARS-CoV-2 infection is more severe in COPD cases and smokers.

Patients with malignancies are more in danger than those without any tumor. Anticancer treatments such as chemotherapy and surgery put this group into an immunosuppressive state and subsequently at higher risk of MERS-CoV-2 infection. Among those with malignancies, lung cancer patients seems to be more susceptible, and they must follow guidance on restricting any contact with possible infected zones or individuals for their safety.

The authors of the meta-analysis conclude that possible risk factors for progressive and severe illness may include the above-mentioned factors but are not limited to them; pregnancy and old age are other risky conditions, which should be monitored meticulously.

3.7 Systematic review and meta-analysis of predictive symptoms and comorbidities for severe COVID-19 infection

Of the 2259 studies identified, 42 were selected after title and abstract analysis, and 7 studies (including 1813 COVID-19 patients) were chosen for inclusion. The ICU group were older (62.4 years) compared to the non-ICU group (46 years), with a significantly higher proportion of males (67.2% vs. 57.1%, p=0.04). Dyspnoea was the only significant symptom predictive for both severe disease (pOR 3.70, 95% CI 1.83 – 7.46) and ICU admission (pOR 6.55, 95% CI 4.28– 10.0) [19].

Notwithstanding the low prevalence of COPD in severe disease and ICU admitted groups (4.5% and 9.7%, respectively), COPD was the most strongly predictive comorbidity for both severe disease (pOR 6.42, 95% CI 2.44 – 16.9) and ICU admission (pOR 17.8, 95% CI 6.56 – 48.2). Cardiovascular disease and hypertension were also strongly predictive for both severe disease and ICU admission. Those with CVD and hypertension were 4.4 (95% CI 2.64 – 7.47) and 3.7 (95% CI 2.22 – 5.99) times more likely to have an ICU admission respectively, compared to patients without the comorbidity.

Dyspnoea was the only symptom strongly predictive for both severe disease and ICU admission, and could be useful in guiding clinical management decisions early in the course of illness. When looking at ICU-admitted patients, who represent the more severe end of the spectrum of clinical severity, COPD patients are particularly vulnerable, and those with cardiovascular disease and hypertension are also at a high-risk of severe illness. The systematic review and meta-analysis concluded that to aid clinical assessment, risk stratification, efficient resource allocation, and targeted public health interventions, future research must aim to further define those at high-risk of severe illness with COVID-19.

3.8 Understanding and Addressing Sources of Anxiety among Health Care Professionals during the COVID-19 Pandemic

Health care professionals of all types are caring for patients with this disease. The rapid spread of COVID-19 and the severity of symptoms it can cause in a segment of infected individuals has acutely taxed the limits of health care systems. Although the potential shortage of ventilators and intensive care unit (ICU) beds necessary to care for the surge of critically ill patients has been well described, additional supplies and beds will not be helpful unless there is an adequate workforce.

Maintaining an adequate health care workforce in this crisis requires not only an adequate number of physicians, nurses, advanced practice clinicians, pharmacists, respiratory therapists, and other clinicians, but also maximising the ability of each clinician to care for a high volume of patients. Given that surges in critically ill patients could last weeks to months, it is also essential that health care professionals be able to perform to their full potential over an extended time interval. At the same time they cope with the societal shifts and emotional stressors faced by all people, health care professionals face greater risk of exposure, extreme workloads, moral dilemmas, and a rapidly evolving practice environment that differs greatly from what they are familiar with [20].

These eight concerns can be organised into five requests from health care professionals to their organisation: hear me, protect me, prepare me, support me, and care for me. The principal desire of each request, how the eight sources of anxiety relate to each dimension, and how organizations can respond to them are summarized in **Table 1**.

Table 1: Requests from Health Care Professionals to their Organisation during the Coronavirus 2019 Pandemic

Table. Requests From Health Care Professionals to Their Organization During the Coronavirus Disease 2019 Pandemic

Request	Principal desire	Concerns	Key components of response
Hear me	Listen to and act on health care professionals' expert perspective and frontline experience and understand and address their concerns to the extent that organizations and leaders are able	Uncertainty whether leaders recognize the most pressing concerns of frontline health care professionals and whether local physician expertise regarding infection control, critical care, emergency medicine, and mental health is being appropriately harnessed to develop organization-specific responses	Create an array of input and feedback channels (listening groups, email suggestion box, town halls, leaders visiting hospital units) and make certain that the voice of health care professionals is part of the decision-making process
Protect me	Reduce the risk of health care professionals acquiring the infection and/or being a portal of transmission to family members	Concern about access to appropriate personal protective equipment, taking home infection to family members, and not having rapid access to testing through occupational health if needed	Provide adequate personal protective equipment, rapid access to occupational health with efficient evaluation and testing if symptoms warrant, information and resources to avoid taking the infection home to family members, and accommodation to health care professionals at high risk because of age or health conditions
Prepare me	Provide the training and support that allows provision of high-quality care to patients	Concern about not being able to provide competent nursing/medical care if deployed to new area (eg, all nurses will have to be intensive care unit nurses) and about rapidly changing information/communication challenges	Provide rapid training to support a basic, critical knowledge base and appropriate backup and access to experts Clear and unambiguous communication must acknowledge that everyone is experiencing novel challenges and decisions, everyone needs to rely on each other in this time, individuals should ask for help when they need it, no one needs to make difficult decisions alone, and we are all in this together
Support me	Provide support that acknowledges human limitations in a time of extreme work hours, uncertainty, and intense exposure to critically ill patients	Need for support for personal and family needs as work hours and demands increase and schools and daycare closures occur	Provide support for physical needs, including access to healthy meals and hydration while working, lodging for individuals on rapid-cycle shifts who do not live in close proximity to the hospital, transportation assistance for sleep-deprived workers, and assistance with other tasks, and provide support for childcare needs Provide support for emotional and psychologic needs for all, including psychologic first aid deployed via webinars and delivered directly to each unit (topics may include dealing with anxiety and insomnia, practicing self-care, supporting each other, and support for moral distress), and provide individual support for those with greater distress
Care for me	Provide holistic support for the individual and their family should they need to be quarantined	Uncertainty that the organization will support/take care of personal or family needs if the health care professional develops infection	Provide lodging support for individuals living apart from their families, support for tangible needs (eg, food, childcare), check-ins and emotional support, and paid time off if quarantine is necessary

3.9 Vitamin D Supplementation and Risk of Influenza and COVID-19 Infections and Deaths

Public Health England has recommended the use of vitamin D supplements during lockdown because people are spending more time indoors and have less exposure to sunlight as a result. Dr Alison Tedstone, chief nutritionist at Public Health England, has stated that "there is no sufficient evidence to support recommending vitamin D for reducing the risk of Covid-19" [21].

NHs.uk states that people should consider taking 10 micrograms of vitamin D a day to keep your bones and muscles healthy. This is because people may not be getting enough vitamin D from sunlight if they're indoors most of the day. There have been some news reports about vitamin D reducing the risk of coronavirus. However, there is no evidence that this is the case [22].

A review article describes the roles of vitamin D in reducing the risk of respiratory tract infections, knowledge about the epidemiology of influenza and COVID-19, and how vitamin D supplementation might be a useful measure to reduce risk [23]. Through several mechanisms, vitamin D can reduce risk of infections. Those mechanisms include inducing cathelicidins and defensins that can lower viral replication rates and reducing concentrations of pro-inflammatory cytokines that produce the inflammation that injures the lining of the lungs, leading to pneumonia, as well as increasing concentrations of anti-inflammatory cytokines. Several observational studies and clinical trials reported that vitamin D supplementation reduced the risk of influenza, whereas others did not.

Evidence supporting the role of vitamin D in reducing risk of COVID-19 includes that the outbreak occurred in winter, a time when 25-hydroxyvitamin D (25(OH)D) concentrations are lowest; that the number of cases in the Southern Hemisphere near the end of summer are low; that vitamin D deficiency has been found to contribute to acute respiratory distress syndrome; and that case-fatality rates increase with age and with chronic disease comorbidity, both of which are associated with lower 25(OH)D concentration. To reduce the risk of infection, it is recommended that people at risk of influenza and/or COVID-19 consider taking 10,000 IU/d of vitamin D_3 for a few weeks to rapidly raise 25(OH)D concentrations, followed by 5000 IU/d. The goal should be to raise 25(OH)D concentrations above 40-60 ng/mL (100-150 nmol/L). For treatment of people who become infected with COVID-19, higher vitamin D_3 doses might be useful. The paper concludes that randomized controlled trials and large population studies should be conducted to evaluate these recommendations.

3.10 Ethnic Minorities and Housing

Ethnic minorities are more likely to live in ‘overcrowded’ housing as well as multigenerational households; 30% of Bangladeshi households and 15% of black African households are overcrowded (where there are more people than bedrooms), compared to 2% of white British households.

Bangladeshi, Indian and Chinese households are particularly likely to have older people over 65 living with children under the age of 16 [24].

Overall, BAME groups are less likely to own their own home (only around a quarter of black African people are owner-occupiers), and more likely to be renting from private landlords than white British groups.

Why is it important to note these disadvantaging health and housing conditions? [25]. This could confer that some ethnic minority groups, including elderly BAME people, could be more vulnerable to severe illness from COVID-19.

Resolution Foundation figures show that there are currently 27,798,800 households lived in by people over the age of 70 only. Meanwhile, there are just 279,700 South Asian households where 70+-year-olds live by themselves.

‘70% of white 70+ households do not have younger people living with them, compared to just 20% of South Asian and 50% of Black African or Caribbean households.

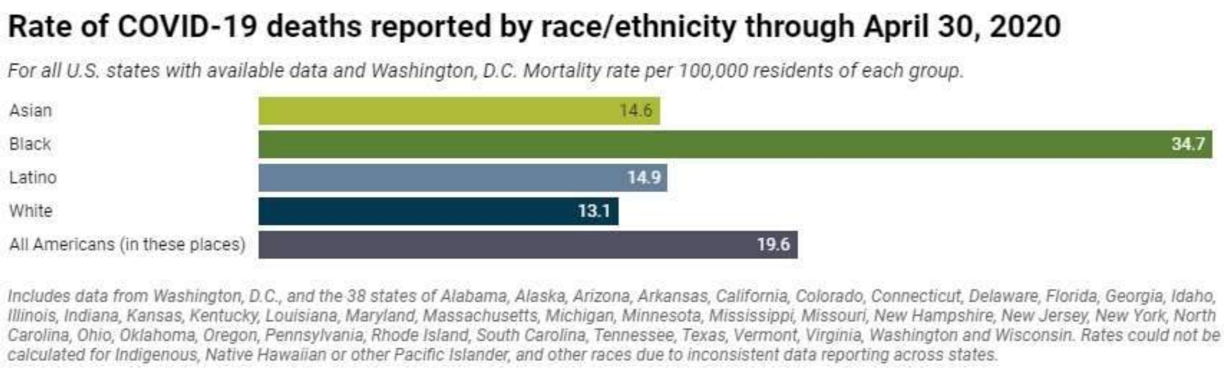
4. International Evidence

4.1 United States

The novel coronavirus has claimed more than 63,000 American lives through April 30th 2020 [26]. Data about the ethnicity of the deceased is now known for 8 in 10 of these deaths, which has been compiled from Washington D.C. and 38 states that are releasing these statistics. While this is an incomplete picture of the toll of COVID-19, the existing data reveals deep inequities by ethnicity especially for Black Americans are evident in existing data.

The latest available COVID-19 mortality rate for Black Americans is 2.3 times higher than the rate for Latino populations, 2.4 times higher than Asian individuals, and 2.6 times higher than White populations. For every 100,000 Americans (of their respective groups), around 34.7 Black individuals have died, along with 14.9 Latino, 14.6 Asian and 13.1 White. If Black Americans had died of COVID-19 at the same rate as White Americans, about 8,600 of the nearly 14,000 Black residents who have died in these states would still be alive**.**

Figure 2: Rate of COVID-19 deaths reported by ethnicity through April 30, 2020

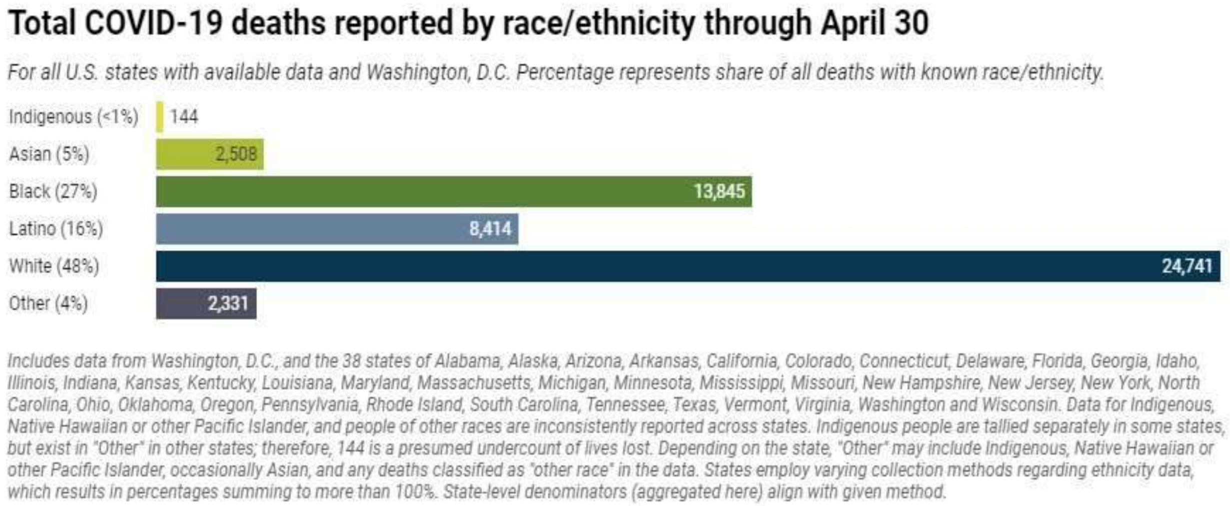


While Black Americans have suffered disproportionate losses in a majority of places, in some areas, their death toll is exceptionally high. In Kansas and Wisconsin, Black residents are 7 times more likely to die than White residents. In Washington D.C., the rate among Blacks is 6 times higher than Whites, while in Michigan and Missouri, it is 5 times greater. In Arkansas, Illinois, Louisiana, New York State, Oregon and South Carolina, Blacks are 3-4 times more likely to die of the virus than Whites.

Another way to examine disproportionality is by comparing percentage of deaths to percentage of population. Across the U.S., Black Americans are dying of COVID-19 at a rate of more than twice their population share. Collectively, they represent 13% of the population in states releasing data, but have suffered 27% of deaths. In 11 states—Michigan, Missouri, South Carolina, Kansas, Wisconsin, Louisiana, Illinois, Georgia, Arkansas, Mississippi and Alabama—as well as in the District of Columbia, the difference between Black residents' share of the deaths and share of the population is greater than 15 percentage points. In Washington, D.C.; Michigan; and Missouri, the difference is 30 or more percentage points.

These are deeply troubling mortality disparities. Data from the 38 states (and the District of Columbia) that are reporting race and ethnicity data in their COVID-19 deaths. The distribution of these nearly 52,000 deaths is shown below. (Percentages refer to the proportion of all deaths with known race/ethnicity occurring in each group; for example, Asians represented 5% of all American deaths with a known race/ethnicity, or 1 in 20).

Figure 3: Total COVID-19 deaths reported by ethnicity through April 30, 2020



4.2 Italy

As at 4 May, 2020 the total number of people who have contracted the virus is 211.938, the total number of currently positive is 99,980. Among the currently positive 1,479 are undergoing intensive care, 16,823 people are hospitalized with symptoms, 81.678 people, equal to 82% of all infected cases, are in isolation without symptoms or with mild symptoms. The total number of deaths is 29,079 [27].

The lethality rate is determined as follows: the number of deaths due to COVID-19 divided by the total number of confirmed coronavirus cases. In Italy, the lethality rate is 9%, which peaks in Lombardy (>10%), whereas the lethality rate in Wuhan was 5.8% and remained <1% in the rest of the People's Republic of China. An initial rationale for the higher lethality rate could be the high average age of the Italian population when compared to, for example, the People's Republic of China and the Republic of Korea; in the latter, the majority of confirmed COVID-19 cases are young women (62%), with 30% of positive cases in the age range of 20–30 years. The average age of those dying in Italy is 79 years, and more than 70% were men.

Another explanation for the higher lethality is the presence of other pathologies and the comorbidities of the elderly population [28]. Based on research by the WHO, a Report of the WHO China Joint Mission on Coronavirus Disease 2019, published in February 2020, reported that patients without other comorbidities have mortality rates of 1.4%, compared to COVID-19 patients with other diseases that compromise their health condition and result in higher mortality rates, which were 13, 9, and 7.6% for those with cardiovascular disease, diabetes, and cancer, respectively. In Italy, data from the Istituto Superiore di Sanità (ISS) indicates that 1% of the patients who died had no other disease, 26% had 1 disease, 26% had 2 disease, and 47% had 3 or more conditions. The most common chronic preexisting disease in the patients who died was arterial hypertension (76%), followed by ischemic heart disease (37%), atrial fibrillation (26%), and active cancer within the previous 5 years (19%).

Another cause for the higher lethality rate may be that Italy had a higher number of infected individuals who were asymptomatic and infected others. As recently reported by Li et al., the transmission rate from unreported infections was 55% of the rate of reported infections, and un- reported infections resulted in 79% of reported cases (1). Therefore, for each positive COVID-19 case, there are ~8–10 undetected cases; thus, the actual number of COVID-19 cases could be up to 10 times higher, and recalculation of the mortality rates on this basis would cause the actual national mortality rate of COVID-19 to decrease approximately to the mortality rates of COVID-19 in the People's Republic of China.

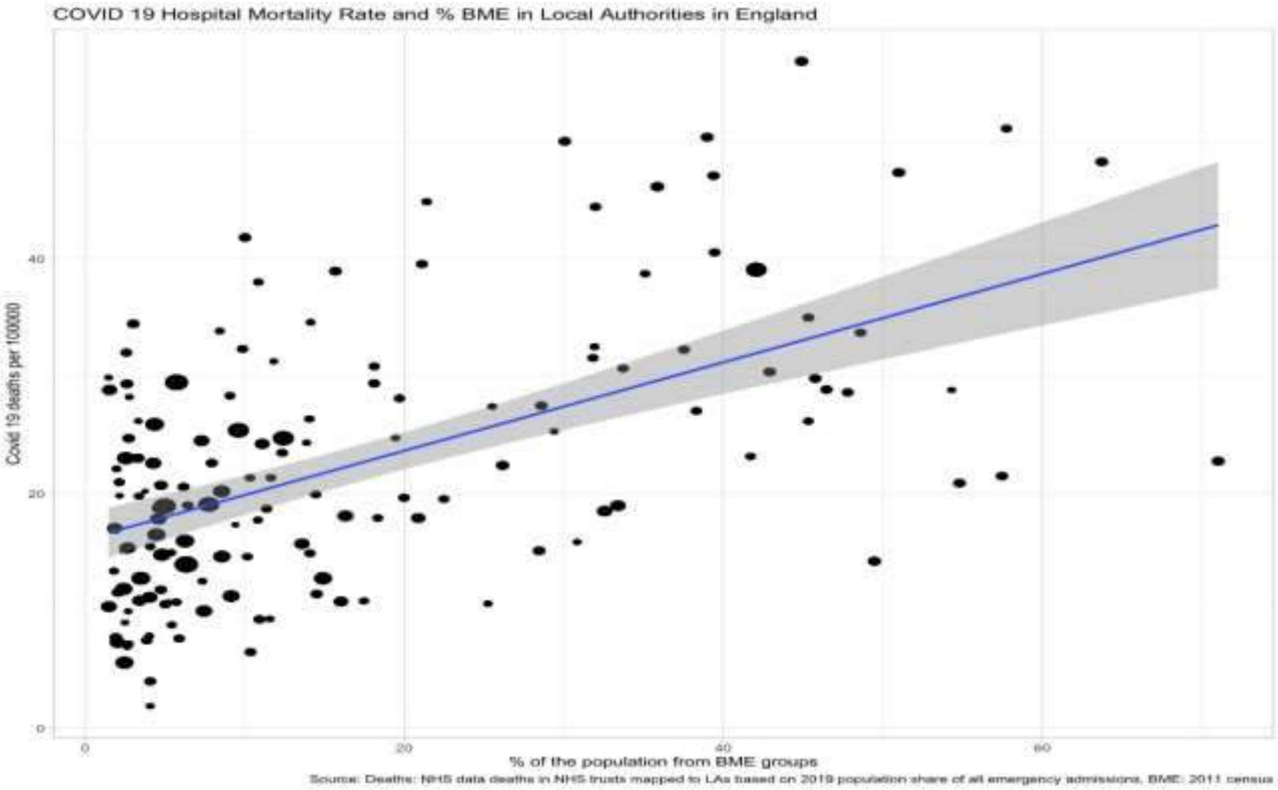
In Lombardy, there is a considerable amount of business travel and many people work in hospitals, which could have amplified the infection spread. In fact, doctors and nurses constitute the most infected occupational categories. Moreover, at the beginning of the epidemic in Lombardy, especially in Bergamo, many patients had visited general practitioners who had no experience with the new virus. Several of these doctors have been infected and have, unfortunately, died.

It also cannot be ignored that the elderly in Italy have frequent contact with their children and often take care of grandchildren. The percentage of people between the age of 30 and 49 years who live with their parents is up to 20%, which is much higher than in other countries. Adult children and grandchildren, who are often asymptomatic, would have infected their elderly parents.

5. COVID-19 and ethnicity in the general population in England

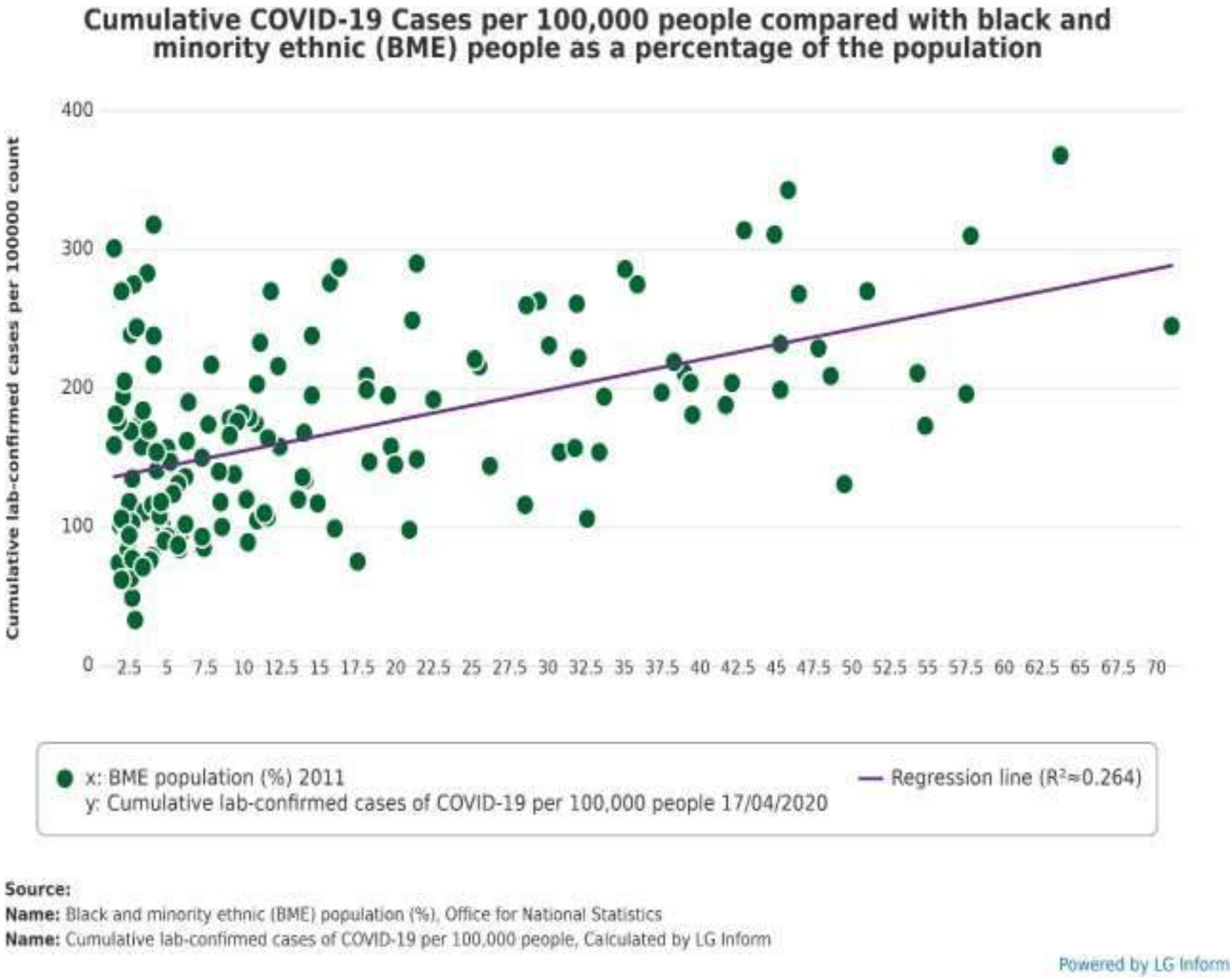
5.1 COVID 19 mortality and ethnicity

Figure 4: Local authorities in England. Areas with higher proportion of populations from black and ethnic minority groups are experiencing high death rates [29].



5.2 LG Inform - COVID-19 Hospital Cases and Area Characteristics

Figure 5: Comparison of the rate of cumulative hospital cases of COVID-19 per 100,000 people to a range of social, economic and health indicators at the local authority level across England



Source: https://lginform.local.gov.uk/reports/view/lga-research/covid-19-cases-and-area-characteristics

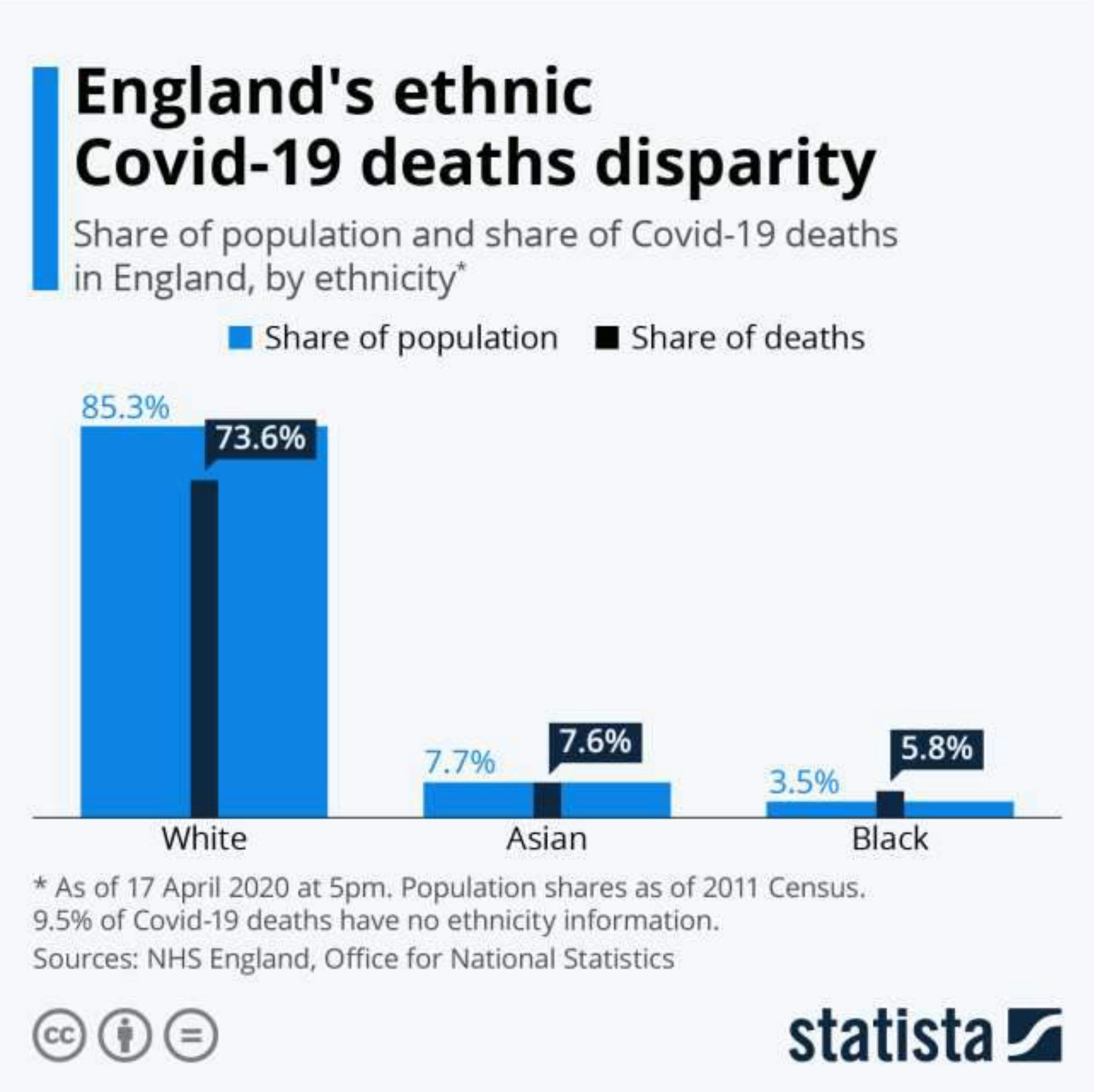
- This charts are based on the rate of COVID-19 cases per 100,000 people, not on the overall number of cases.
- This charts rely on figures from the latest available *non-provisional* day, not the latest available day, as the latest five available days are considered provisional and are less reliable than earlier figures.
- These figures relate to confirmed hospital cases of COVID-19 following a positive test. They do not cover all cases of COVID-19 which may exist.

Statista have compared the share of deaths accounted for by three ethnic groups to their share of the country's total population [**30**].

While the ethnic group 'Black' makes up 3.5 percent of England's population, as of 17 April it has been identified in 5.8 percent of Covid-19 deaths - 801 people in total. That means the share of deaths is 66 percent higher than the share of the population.

In contrast, the group 'White', which represents 85.3 percent of the population according to the latest census, has so far made up only 73.6 percent of deaths. In comparison to the Black percentage difference of +66 percent, here we have -14 percent.

Figure 6: England's ethnic COVID-19 deaths disparity



5.3 BAME COVID19 deaths – observed versus expected

Analysis from Miqdad Asaria at the London School of Economics (LSE) on NHS England hospital death data by ethnicity reveals stark ethnicity differences in expected and observed deaths for the Asian, Black and Other categories [31].

Figure 7: Age Structure of population by ethnicity, 2011 Census

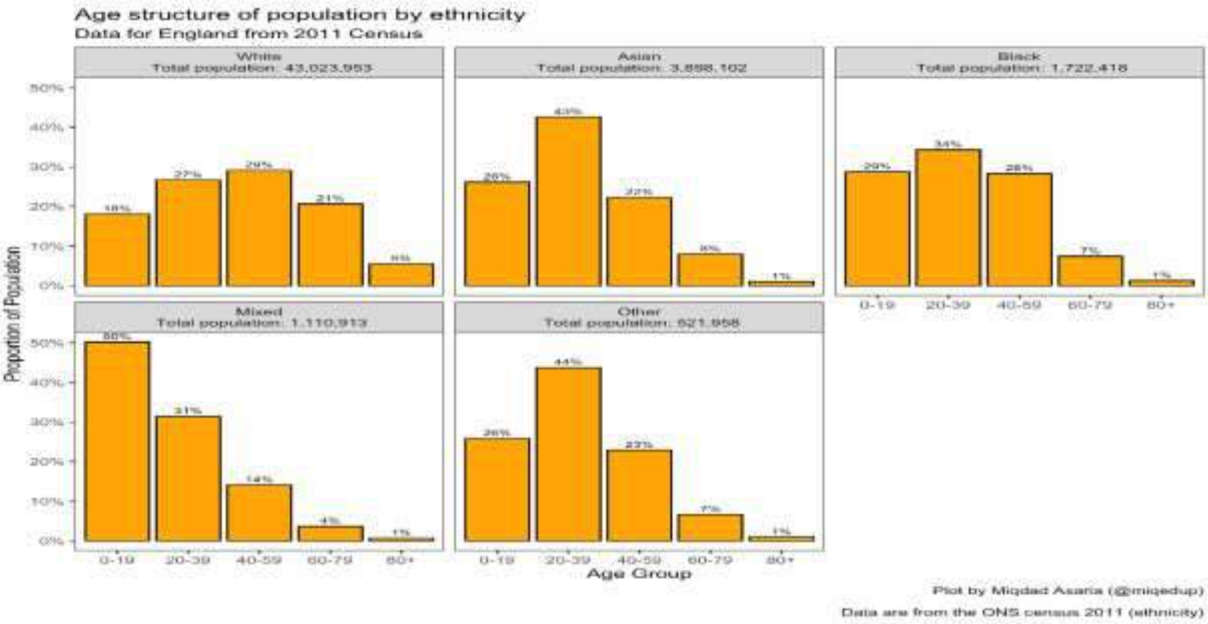


Figure 8: Deaths in hospital from COVID-19 by ethnicity

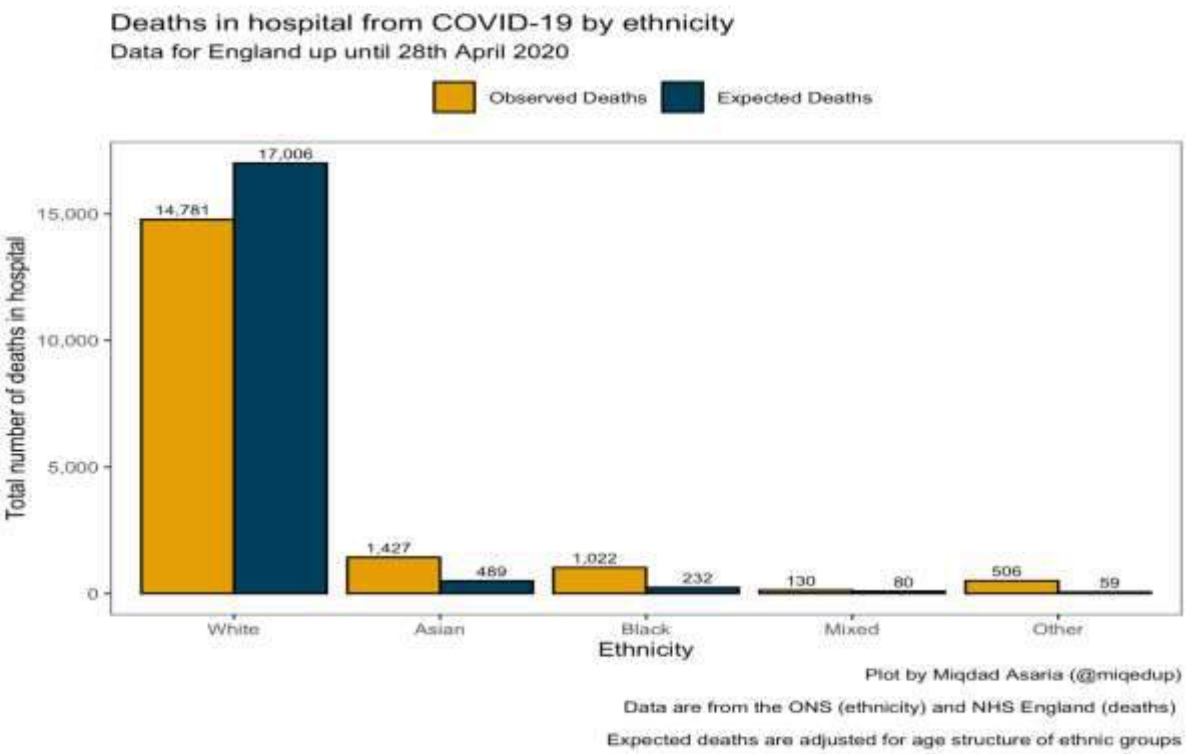
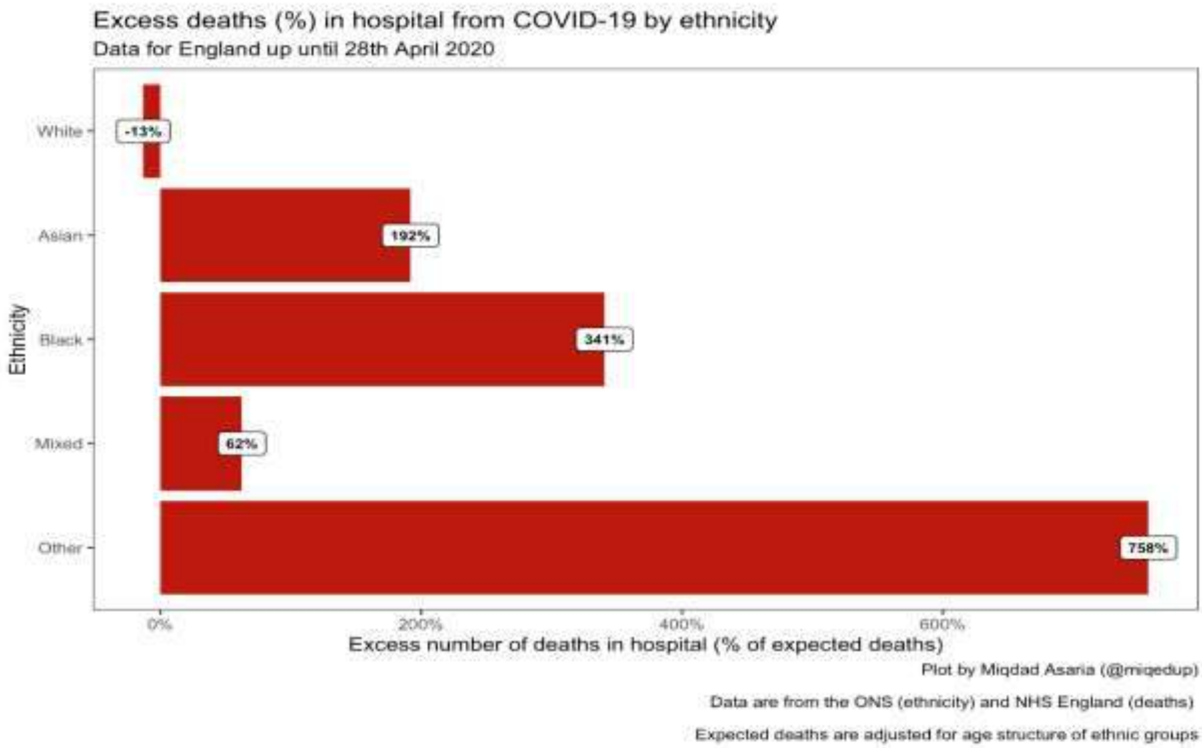


Figure 9: Excess deaths in hospital from COVID-19 by ethnicity



Further analysis at Table 2 shows that hospital COVID19 deaths by ethnicity category:

Asian

- 1.5 times higher excess deaths (observed vs expected) for the Indian population.
- 2.8 times higher excess deaths (observed vs expected) for the Pakistani population.
- 3 times higher excess deaths (observed vs expected) for the Bangladeshi population.

Black

- 4.3 times higher excess deaths (observed vs expected) for the Black African population.
- 2.5 times higher excess deaths (observed vs expected) for the Black Caribbean population.
- 7.3 times higher excess deaths (observed vs expected) for the Black other background population.

Mixed

- 1.6 times higher excess deaths (observed vs expected) for the Mixed any other background population.

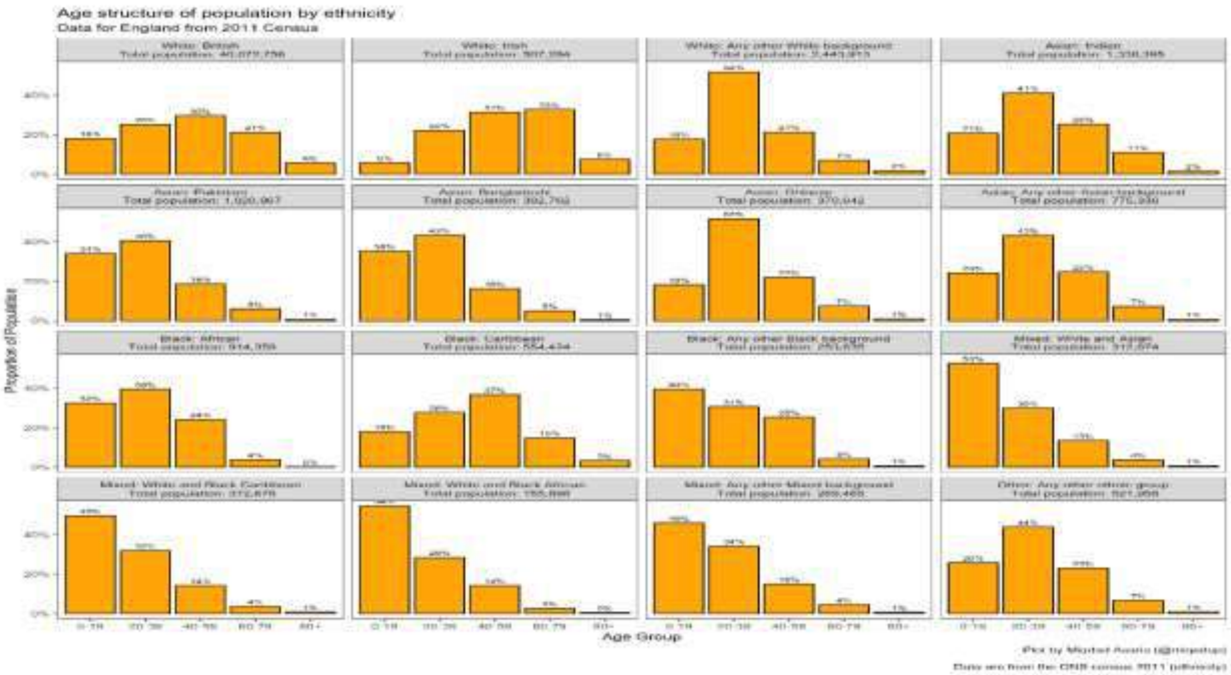
Table 2: Deaths in Hospital from COVOD19 by ethnicity

Deaths in Hospital from COVID-19 by ethnicity
Data for England up until 28th April 2020 (published 30th April 2020)

	Population	Population (%)	Observed Deaths	Observed Deaths (%)	Expected deaths if distributed by age structure of population	Excess Deaths = Observed Deaths - Expected Deaths	Excess Deaths (% of expected deaths)
White							
British	40,072,756	79.7%	13,960	78.1%	16,351	-2,391	-15%
Irish	507,284	1.0%	180	1.0%	289	-109	-38%
Any other White background	2,443,913	4.9%	641	3.6%	366	275	75%
Total White	*43,023,953*	*85.6%*	*14,781*	*83%*	*17,006*	*-2,225*	*-13%*
Asian							
Indian	1,338,395	2.7%	560	3.1%	228	332	146%
Pakistani	1,020,967	2.0%	381	2.1%	100	281	281%
Bangladeshi	392,762	0.8%	120	0.7%	30	90	300%
Chinese	370,642	0.7%	66	0.4%	44	22	50%
Any other Asian background	775,336	1.5%	300	1.7%	87	213	245%
Total Asian	*3,898,102*	*7.8%*	*1,427*	*8.0%*	*489*	*938*	*192%*
Black							
African	914,359	1.8%	331	1.9%	62	269	434%
Caribbean	554,424	1.1%	525	2.9%	150	375	250%
Any other Black background	253,635	0.5%	166	0.9%	20	146	730%
Total Black	*1,722,418*	*3.4%*	*1,022*	*5.7%*	*232*	*790*	*341%*
Mixed							
White and Asian	312,874	0.6%	23	0.1%	22	1	5%
White and Black African	155,898	0.3%	13	0.1%	8	5	63%
White and Black Caribbean	372,676	0.7%	39	0.2%	29	10	34%
Any other Mixed background	269,465	0.5%	55	0.3%	21	34	162%
Total Mixed	*1,110,913*	*2.2%*	*130*	*0.7%*	*80*	*50*	*63%*
Other							
Any other ethnic group	521,958	1.0%	506	2.8%	59	447	758%
Total Other	*521,958*	*1.0%*	*506*	*2.8%*	*59*	*447*	*758%*
Total	50,277,344	100%	17,866	100%	17,867		

Analysis by Miqdad Asaria (@miqedup)
Data are from the ONS (ethnicity) and NHS England (deaths)
Expected deaths are adjusted for age structure of ethnic groups and normalised to sum to total observed deaths

Figure 10: Age Structure of England Population by Ethnicity from 2011 Census



6. COVID-19 and people working in health and social care from BAME backgrounds in England

6.1 UK health and care worker deaths

The Health Service Journal (HSJ) reported that Tim Cook and Simon Lennane were, until 12 April, separately collating this data, independent of each other. On discovering this, the two data sets the work was combined.

One hundred and nineteen cases were identified. Thirteen cases were excluded — in four cases multiple attempts to confirm information over several days were unsuccessful, in six cases the individual had retired and was not working, and in three the individual was not an active healthcare worker.

Among the 106 included cases, 98 had patient facing roles, seven did not and this was unclear for one. In 89 cases, we were able to establish the individual had been working during the pandemic. In no included cases was it clear they were not working, but there was no decisive evidence in 17.

The characteristics of the cases are presented in Table 3. The date of death was known in 99 (93 per cent) of cases and the rising number of deaths over time is shown in Figure 1, tracked against all UK deaths. For the last 10 days, healthcare worker deaths remain steady as a proportion of all UK deaths at 0.51-0.58 per cent.

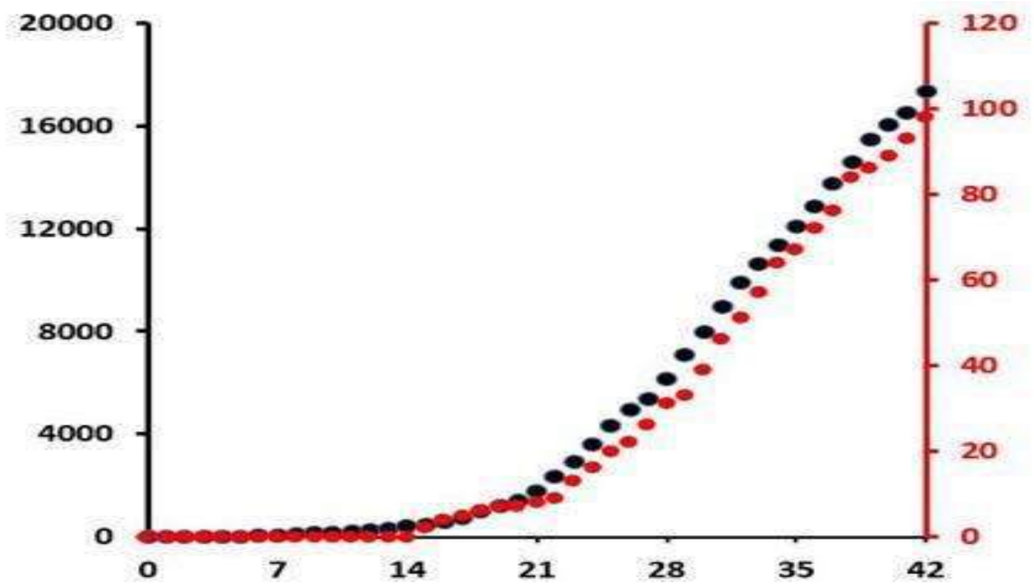
Table 3. The characteristics of 106 cases of deaths of UK health and social care workers from coronavirus-19 as reported in the media up to 22 April 2020

Variable	Known	% of known
All cases	119	
Included	106	89
Excluded	13	11
Of included cases		
Four confirmations	99	93
Three confirmations	3	3
Two confirmations	1	1
Judged likely but unnamed	3	3
Sex		
Female	54	52
Male	50	48
Unknown	2	

Variable	Known	% of known
Age		
Median (IQR, [range])	54 (48-63 [21-84])	
<30	7	8
31-50	23	26
51-60	34	38
61-70	17	19
>70	8	9
Unknown	17	
Professional sector		
NHS	94	89
Social care	10	9
Dental	2	2
Location		
Hospital	63	61
Care home	10	10
Mental health	9	9
Community	9	9
General practice surgery	5	5
Other non-hospital setting	3	3
Pharmacy	2	2
Dental surgery	2	2
Hospice	1	1
Unknown	2	
Profession		
Nurse	35	33
Healthcare support worker	27	25
Doctor	18	17
Administration/managerial	7	7
Paramedic/transport	5	5
Portering	4	4
Housekeeping/cleaning	2	2
Midwifery	2	2
Other allied health professional	2	2
Dentist	1	1
Pharmacist	1	1
Radiographer	1	1
Receptionist	1	1
Geographic region		
London	34	33
South East	14	14
North West	13	13
Wales	9	9
West Midlands	7	7

Variable	Known	% of known
East Midlands	7	7
South West	5	5
Scotland	4	4
Yorkshire and Humber	4	4
East of England	3	3
North East	2	2
N Ireland	1	1
Unknown	3	

Figure 11: Cumlative HCW deaths reported by PHE and the media



The black dots represent cumulative daily deaths as reported by Public Health England and equivalent agencies of devolved nations and the red dots represent cumulative deaths of health and social care workers reported in the media.

Among the doctors, the specialties involved were surgery (five cases), general practice (four), emergency medicine and medicine (each two), and one each from histopathology, geriatrics, neurorehabilitation, paediatrics, and psychiatry. There were no anaesthetists or intensivists identified.

Among the nursing staff, specialty was not always mentioned, but none were described as intensive care nurses. There were no deaths of physiotherapists reported.

The relative ages, proportions of either sex and of ethnicity among the main groups of staff are shown in Table 4. Overall doctors who died tended to be older than other staff members and the vast majority were male, whereas most fatalities among nurses and supporting health care workers were in females.

Table 4. Age, gender and ethnicity of those who died from covid-19 among the main health and social care staff groups.

For comparison, the approximate % of BAME the NHS workforce [**32**] *is included in the final row.*

	Nurses and midwives	**Healthcare support workers**	**Doctors and dentists**	**Other staff**
Number	35	27	19	25
Age; yrs median (IQR [range])	51 (46-57 [23-70])	54 (42-64 [21-84])	62 (54-76 [36-79])	51 (34-58 [29-65])
Male; %	39	22	94	55
BAME; %	71	56	94	29
BAME workforce; %*	20	17	44	-

Ethnicity was described for most (96 per cent) cases and most were accompanied by pictures of the individual. In 63 per cent of cases the individual was of BAME background. Further, many of the individuals were born outside the UK (Table 3).

For 53 of 64 BAME individuals, their country of birth was not the UK and, for the other 11 (17 per cent), this was uncertain. Among the Caucasian individuals, there were further staff who were not born in the UK, including three from elsewhere in Europe, meaning a minimum of 56 (53 per cent) of those healthcare workers who died were not born in this country (Table 3).

Table 5. Ethnicity of health and social care workers who died from covid-19. Observed ethnicity is compared to *ethnicity among the NHS workforce*.

	n	% of known	% of NHS workforce
Ethnicity			
White	38	38	79
Asian	36	36	10
Black	27	27	6
Chinese	0	0	1
Mixed	0	0	2
Other	0	0	2
Unknown	5		
Country of birth for BAME individuals not born in the UK			
Philippines	19	36	
Zimbabwe	5	9	
Nigeria	4	8	
India	4	8	
Sudan	3	6	
Pakistan	2	4	
West Indies	1	2	
Other African	8	15	
Other Asian	7	13	
Unknown	11		

6.2 Discussion

There are three key findings from this analysis to highlight in particular:

- The disproportionately high rate of BAME individuals among those who have died;
- The absence of those members of staff considered at high risk of viral exposure and transmission; and
- The overall rate of fatalities compared to the population.

The excess of BAME health and social care workers who have died during this pandemic has been commented on by others but has not previously been formally analysed and therefore confirmed. Among all staff employed by the NHS, BAME account for approximately 21 per cent, including approximately 20 per cent among nursing and support staff and 44 per cent among medial staff.

BAME individuals account for 63 per cent, 64 per cent and 95 per cent of deaths in the same staff groups. BAME patients also accounting for 34 per cent of the patients admitted to UK intensive care units with covid-19 but only 17 per cent of the UK population.

There is a need for a concerted effort to seek explanations and solutions. The high number of deaths among Filipino staff has also been highlighted: with an estimated 40,000 such staff employed in the NHS they constitute a significant proportion of the nursing workforce.

A UK government inquiry has been established and this is required to act apace. Along with ethnicity migration should be considered as we find that more than half those health and social care workers who have died were born outside the UK, compared to a reported 18 per cent of NHS staff.

Conversely, the absence of certain workforce groups among those who have died, while welcome, is also notable. Anaesthetists, intensive care doctors and by association nurses and physiotherapists who work in similar settings are believed to be among the highest risk groups of all healthcare workers.

This is because both caring for the sickest patients with covid-19 and undertaking airway management (so-called aerosol generating procedures) are associated with high risk of viral exposure and transmission. It is therefore notable that all of these groups are completely absent from the data set.

Again, the reason for this is not known and data on infections and serious illnesses are important to consider as well as fatalities, but these data also are currently lacking. What is likely is that these groups of healthcare staff are rigorous about use of personal protective equipment and the associated practices known to reduce risk.

It may be that this rigour is protecting staff better than some fear and the results can be considered cautiously reassuring. However, this finding is not a reason to slacken off on the appropriately rigorous use of PPE, but rather to wonder why others, who are likely involved in what are generally considered to be lower risk activities, are becoming infected and consider whether wider use of rigorous PPE is indicated.

It is also worth considering the overall patterns of fatal infection among health and social care workers. In China, it was estimated that fewer than 4 per cent of covid-19 infections affected healthcare workers, whereas in Italy this was at least 8 per cent and possibly higher. The figure in the UK is unknown.

However, the NHS is estimated to employ approximately 1.2-1.5 million staff, including more than 120,000 doctors, approximately 300,000 nurses and a similar number of healthcare support workers. A modest estimate of the patient-facing NHS workforce might be 600,000-800,000, which is more than 1 per cent of the UK population and more than 2 per cent of the employed population.

There is also a remarkable correlation between the cumulative UK deaths from covid-19 in the UK population and among health and social care workers. Accepting a lag of one to two days, the ratio is very close to 1:200 so the deaths among health and social care workers are approximately 0.5 per cent of all deaths, suggesting they are not overrepresented.

Although there are caveats to this estimate — explained below — and every death is one to be mourned, the data does not clearly show that healthcare workers are dying at rates proportionately higher than other employed individuals or even the population as a whole. Again, this is cautiously reassuring.

A modest estimate of the patient-facing NHS workforce might be 600,000-800,000 which is more than 1 per cent of the UK population and more than 2 per cent of the employed population

The distribution of deaths by occupation among nurses, healthcare support workers and doctors is broadly consistent with employment ratios. Distribution of deaths by geographical region correlates well with known regional distribution of cases.

Many of the other features of the data — such as the preponderance of women in this dataset, compared to the male dominated figures among those infected or admitted to ICU likely reflect the female dominated population delivering health and social care.

Perhaps of note, women, as well as BAME individuals, are also perhaps more likely to be employed in some of the less senior and lower paid jobs in these sectors. Though not formally analysed, there is a sense that the cases included many from the lower paid roles and those on the lower rungs of the hierarchy.

There are numerous limitations to this data set. First, it is not known whether the cases accessible via news and social media capture the majority of the fatalities occurring, nor whether there are biases in the cases reported to or by the media. The authors have not been able to validate the cases absolutely, though they believe their methods make it highly unlikely that any included cases are fabricated.

It is not possible to know whether infection occurred at home or at work, but the authors have determined that the vast majority of individuals who died had both patient-facing jobs and were actively working during the pandemic. It seems likely that, unfortunately, many of the episodes of infection will have occurred during the course of work.

This analysis report shows that a significant number of health and social care workers are dying during this pandemic. Overall the rate of deaths appears to be largely consistent with the number of healthcare workers in the population and the distributions by occupation and geography are largely as expected. However, individuals of black and minority ethnicity are notably over-represented in the data and conversely those working in the high risk specialties of anaesthesia and intensive care appear to be under-represented, most likely through good practice.

To further understand this data, there is an urgent need for a central registry of deaths among health and social care workers to establish facts, enable robust rapid analysis and to explore whether social or employment inequalities are impacting on the rates of infection of these staff during the conduct of their duties and causing avoidable deaths.

A further analysis of the data in the HSJ on 5th May 2020 indicates further work is need to explore the finding of younger female NHS staff death rate is double that of non NHS staff.

6.3 ICNARC ICU Audit

The ICNARC report on COVID-19 in critical care (24th April 2020) presents analyses of data on patients critically ill with confirmed COVID-19 reported to ICNARC up to 4pm on 23 April 2020 from critical care units participating in the Case Mix Programme (the national clinical audit covering all NHS adult, general intensive care and combined intensive care/high dependency units in England, Wales and Northern Ireland, plus some additional specialist and non-NHS critical care units) [33] .

Figure 12: Characteristics of patients critically ill with confirmed COVID-19

Demographics	Patients with confirmed COVID-19 and 24h data (N=6720)	Patients with viral pneumonia (non-COVID-19), 2017-19 (N=5782)
Age at admission (years) [N=6718]		
Mean (SD)	59.4 (12.5)	58.0 (17.4)
Median (IQR)	60 (52, 68)	61 (48, 71)
Sex, n (%) [N=6716]		
Female	1894 (28.2)	2641 (45.7)
Male	4822 (71.8)	3141 (54.3)
Currently or recently pregnant, n (% of females) [N=1835]		
Currently pregnant	20 (1.1)	58 (2.2)
Recently pregnant (within 6 weeks)	25 (1.4)	29 (1.1)
Not known to be pregnant	1790 (97.5)	2554 (96.7)
Ethnicity, n (%) [N=5993]		
White	3938 (65.7)	4951 (88.4)
Mixed	94 (1.6)	52 (0.9)
Asian	925 (15.4)	325 (5.8)
Black	639 (10.7)	155 (2.8)
Other	397 (6.6)	117 (2.1)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=6436]		
1 (least deprived)	954 (14.8)	873 (15.3)
2	1030 (16.0)	999 (17.5)
3	1263 (19.6)	1115 (19.5)
4	1598 (24.8)	1232 (21.6)
5 (most deprived)	1591 (24.7)	1489 (26.1)
Body mass index *, n (%) [N=6005]		
<18.5	39 (0.6)	310 (5.5)
18.5-<25	1579 (26.3)	1933 (34.2)
25-<30	2077 (34.6)	1691 (29.9)
30-<40	1871 (31.2)	1330 (23.5)
40+	439 (7.3)	394 (7.0)

- 34.3% of BAME patients with confirmed COVID-19 are admitted to ICU as compared with 11.6% for viral pneumonia.

- A clear social gradient for patients with confirmed COVID-19 admitted to ICU with the most deprived nearly twice as likely than the least deprived by Index of Multiple Deprivation (IMD) quintile.

Figure 13: Ethnicity distribution of patients critically ill with confirmed COVID-19

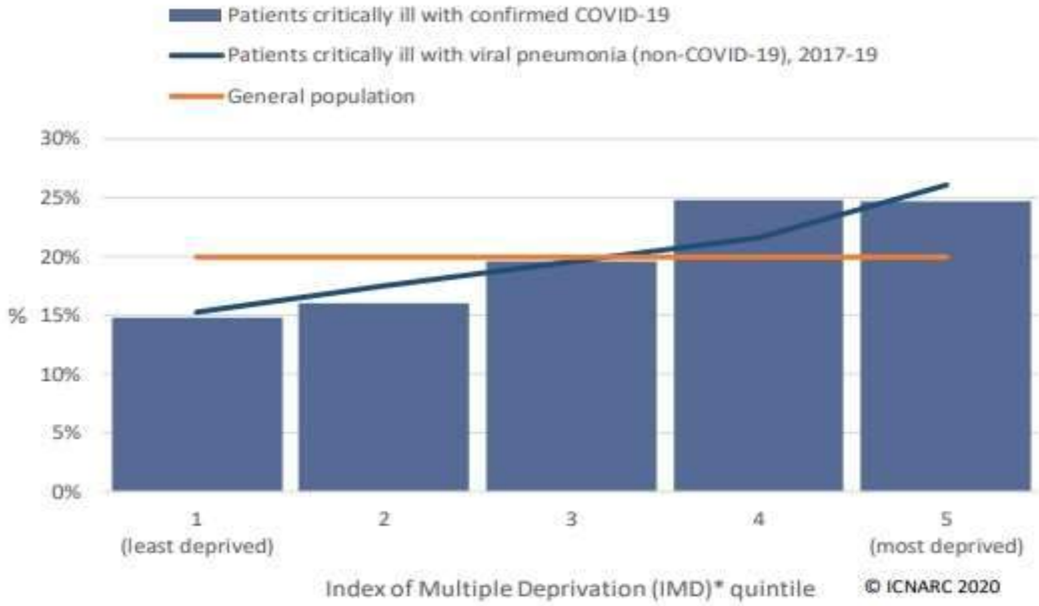


Figure 13: Patient characteristics: demographics by receipt of respiratory support

Demographics	Patients receiving advanced respiratory support (N=2667)	Patients receiving only basic respiratory support (N=1092)
Age at admission (years) [N=3758]		
Mean (SD)	60.7 (12.5)	59.8 (13.8)
Median (IQR)	62 (53, 70)	60.5 (51, 70)
Sex, n (%) [N=3757]		
Female	735 (27.6)	340 (31.1)
Male	1930 (72.4)	752 (68.9)
Currently or recently pregnant, n (% of females) [N=1062]		
Currently pregnant	5 (0.7)	5 (1.5)
Recently pregnant (within 6 weeks)	7 (1.0)	3 (0.9)
Not known to be pregnant	713 (98.3)	329 (97.6)
Ethnicity, n (%) [N=3430]		
White	1589 (65.6)	768 (76.3)
Mixed	36 (1.5)	13 (1.3)
Asian	374 (15.4)	116 (11.5)
Black	281 (11.6)	70 (7.0)
Other	143 (5.9)	40 (4.0)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=3628]		
1 (least deprived)	407 (15.9)	187 (17.6)
2	419 (16.3)	180 (17.0)
3	484 (18.9)	209 (19.7)
4	628 (24.5)	213 (20.1)
5 (most deprived)	629 (24.5)	272 (25.6)
Body mass index *, n (%) [N=3475]		
<18.5	14 (0.6)	10 (1.0)
18.5-<25	610 (24.7)	256 (25.4)
25-<30	882 (35.7)	366 (36.3)
30-<40	764 (31.0)	285 (28.3)
40+	198 (8.0)	90 (8.9)

- 34.4% Asian, Black and Other BAME patients received higher advanced respiratory support in ICU.

Figure 14: Patient characteristics: demographics by receipt of renal support

Demographics	Patients receiving any renal support (N=870)	Patients not receiving any renal support (N=3038)
Age at admission (years) [N=3907]		
Mean (SD)	61.1 (11.5)	60.2 (13.5)
Median (IQR)	62 (54, 69)	61 (52, 70)
Sex, n (%) [N=3906]		
Female	212 (24.4)	921 (30.3)
Male	657 (75.6)	2116 (69.7)
Currently or recently pregnant, n (% of females) [N=1119]		
Currently pregnant	1 (0.5)	12 (1.3)
Recently pregnant (within 6 weeks)	0 (0.0)	14 (1.5)
Not known to be pregnant	209 (99.5)	883 (97.1)
Ethnicity, n (%) [N=3561]		
White	477 (60.0)	1969 (71.2)
Mixed	7 (0.9)	43 (1.6)
Asian	132 (16.6)	378 (13.7)
Black	131 (16.5)	233 (8.4)
Other	48 (6.0)	143 (5.2)
Index of Multiple Deprivation (IMD) quintile *, n (%) [N=3766]		
1 (least deprived)	122 (14.5)	495 (16.9)
2	127 (15.1)	496 (17.0)
3	171 (20.4)	547 (18.7)
4	200 (23.8)	672 (23.0)
5 (most deprived)	220 (26.2)	716 (24.5)
Body mass index *, n (%) [N=3596]		
<18.5	8 (1.0)	20 (0.7)
18.5-<25	169 (20.4)	734 (26.5)
25-<30	284 (34.3)	1002 (36.2)
30-<40	289 (34.9)	793 (28.6)
40+	77 (9.3)	220 (7.9)

- 40.0% Asian, Black and Other BAME patients required renal support in ICU.

- A clear social gradient with those in IMD quintile 5 (most deprived) nearly twice as likely to require renal support as IMD quintile 1 (least deprived).

Figure 15: Outcome by patient characteristics

Patient characteristic	Patients with COVID-19 and outcome reported (N=4078)		Patients with viral pneumonia (non-COVID-19), 2017-19 (N=5782)
	Discharged alive from critical care	Died in critical care	Died in critical care
	n (%)	n (%)	(%)
Age at admission (years)			
16-39	240 (78.4)	66 (21.6)	(7.5)
40-49	350 (73.2)	128 (26.8)	(12.6)
50-59	568 (57.0)	429 (43.0)	(19.7)
60-69	503 (41.8)	701 (58.2)	(26.2)
70-79	293 (32.2)	617 (67.8)	(31.6)
80+	57 (31.3)	125 (68.7)	(31.5)
Sex			
Female	659 (55.8)	522 (44.2)	(19.6)
Male	1352 (46.7)	1543 (53.3)	(24.1)
Ethnicity			
White	1306 (51.6)	1227 (48.4)	(22.3)
Mixed	25 (47.2)	28 (52.8)	(15.9)
Asian	218 (42.2)	299 (57.8)	(19.8)
Black	165 (44.2)	208 (55.8)	(13.0)
Other	106 (51.2)	101 (48.8)	(20.4)
Index of Multiple Deprivation (IMD) quintile *			
1 (least deprived)	330 (52.1)	304 (47.9)	(22.8)
2	323 (50.2)	320 (49.8)	(23.3)
3	379 (50.6)	370 (49.4)	(22.9)
4	427 (46.7)	488 (53.3)	(20.8)
5 (most deprived)	471 (48.2)	506 (51.8)	(21.2)
Body mass index			
<25	515 (52.0)	475 (48.0)	(23.5)
25-<30	644 (48.5)	685 (51.5)	(23.4)
30-<40	566 (50.2)	561 (49.8)	(19.4)
40+	144 (47.4)	160 (52.6)	(15.3)

- Approximately half of BAME patients with COVID-19 were discharged alive from ICU.
- Asian category patients with COVID-19 were 3 times more likely to die in ICU than patients with viral pneumonia.
- Mixed category patients with COVID-19 were 2 times more likely to die in ICU than patients with viral pneumonia.
- Black category patients with COVID-19 were 4 times more likely to die in ICU than patients with viral pneumonia.
- Other category patients with COVID-19 were 2.5 times more likely to die in ICU than patients with viral pneumonia.
- These ethnicity ICU outcomes broadly fits the pattern and correlates well with the overall NHS England ethnicity data COVID-19 deaths analysis of raised death risk for the Asian, Black and mixed BAME communities suggesting ICU deaths follows the overall death risk pattern overall for BAME communities.

7. Compounding BAME Health Risks and Increased Vulnerability to SARS-CoV-2

Recent clinical SARS-CoV-2 studies link diabetes, cardiovascular disease, and hypertension to increased disease severity. In the US, racial and ethnic minorities and low socioeconomic status (SES) individuals are more likely to have increased rates of these comorbidities, lower baseline health, limited access to care, increased perceived discrimination, and limited resources, all of which increase their vulnerability to severe disease and poor health outcomes from SARS-CoV-2. Previous studies demonstrated the disproportionate impact of pandemic and seasonal influenza on these populations, due to these risk factors. Pandemic response must prioritise these marginalised communities to minimise the negative, disproportionate impacts of SARS-CoV-2 on them and manage spread throughout the entire population [34] .

Figure 16: BAME SARS COV2 exposure increased vulnerability risk grid – a conceptual framework

BAME Population	**Community exposure risk**	**Co-morbidity condition risk**	**Disease severity risk**	**Health and care setting exposure risk**	**Death risk**
Male 60+, healthy	Low	Low	Low	Raised	Low
Age 70+, healthy	Low	Low	Low	Raised	Low
Age 70+, healthy, mutigenerational household	Raised	Raised	Raised	Raised	Raised
Age 70+, shielded extremely vulnerable, mutigenerational household	Raised	High	High	High	High
Age 70+, shielded extremely vulnerable, mutigenerational household, lower socio-economic group	Raised	High	High	High	High
Health and care worker, healthy, direct care in aerosol generating environment	Low	Low	Low	Raised	Raised
Health and care worker, LTC's, direct care in aerosol generating environment	Low	Raised	Raised	Raised	Raised
Age 30-69, healthy	Low	Low	Low	Raised	Low
Age 30-69, healthy, mutigenerational household	Low	Low	Low	Raised	Low
Age 30-69, key health and care worker, LTC's, mutigenerational household	Raised	Raised	High	High	High
Age 30-69, key health and care worker, LTC's, mutigenerational household, lower socio-economic group	Raised	High	High	High	High
Under 30, healthy	Low	Low	Low	Low	Low
Child 0-9, health conditions	Low	Raised	Raised	Raised	Raised

Note: BAME SARS COV2 exposure increased vulnerability risk grid (conceptual framework). Razaq, A - April 2020. Thresholds for categorisation of low, raised and high vulnerability based on latest evidence, risk assessments, clinical diagnosis and prognosis.

The exact reasons for this increased risk and vulnerability from COVID-19 in BAME populations are not known. We postulate that compounding BAME exposure risks in the community of overrepresentation in lower socio-economic group, multifamily and multi-generational household increased risk of transmission due to the lockdown, disproportionate employment in lower band key worker roles who either work in high exposure care environments or are unable to implement safe social distancing due to their roles , co-morbidity exposure risks especially for CVD, diabetes and renal conditions, disease severity due to very complex multi-morbidities in ICU, health and care setting COVID-19 exposure risks could provide an explanation for the root causes of the BAME COVID-19 excess death inequalities and poorer outcomes.

Possible factors compounding health risks for SARS COV2.

1. BAME pre existing medical condition risks higher than general population.
2. Higher ICU mortality with a social gradient.
3. Genetic risks.
4. Multi generational households transmission.
5. NHS disparities – e.g. safety of health and care workers, exposure risks.
6. Lower socioeconomic status – e.g. deprivation, higher representation in key worker roles.

<u>1. BAME pre existing medical condition risks higher than general population.</u>

Khunti, K et al have noted that higher observed incidence and severity in minority groups may be associated with pathophysiological differences in susceptibility or response to infection. Possible susceptibilities include an increased risk of admission for acute respiratory tract infections, an increased prevalence of Vitamin D deficiency, vaccination policies in their country of birth and immune effects, increased inflammatory burden, and higher prevalence of cardiovascular risk factors such as insulin resistance and obesity than white populations. Some of these are also risk factors for increased disease severity in COVID-19 [35] .

Interest has also focused on the possibility of ethnic differences in the expression of angiotensin converting enzyme 2 (the host receptor for SARS-CoV-2), and risk of both acute kidney injury and cardiac complications because of a higher prevalence of cardiovascular risk factors in ethnic minority populations.

An unpublished meta-analysis by Khunti et al (April 2020) suggests that mortality and severity is associated with cardio-metabolic conditions of diabetes, CVD and hypertension. These are the 3 most prevalent chronic conditions in people with COVID-19. They are associated with a 2-fold increased risk of severe disease and mortality. Deprivation is also associated with increased prevalence of these conditions.

A latest publication describing the features of 16,749 hospitalised UK patients with COVID-19 [36] shows that the median age was 72 years [IQR 57, 82; range 0, 104], the median duration of symptoms before admission was 4 days [IQR 1,8] and the median duration of hospital stay was 7 days [IQR 4,12]. The commonest comorbidities were chronic cardiac disease (29%), uncomplicated diabetes (19%), non-asthmatic chronic pulmonary disease (19%) and asthma (14%); 47% had no documented reported comorbidity. Increased age and comorbidities including obesity were associated with a higher probability of mortality. Distinct clusters of symptoms were found: 1. respiratory (cough, sputum, sore throat, runny nose, ear pain, wheeze, and chest pain); 2. systemic (myalgia, joint pain and fatigue); 3. enteric (abdominal pain, vomiting and diarrhoea). Overall, 49% of patients were discharged alive, 33% have died and 17% continued to receive care at date of reporting. 17% required admission to High Dependency or Intensive Care Units; of these, 31% were discharged alive, 45% died and 24% continued to receive care at the reporting date. Of those receiving mechanical ventilation, 20% were discharged alive, 53% died and 27% remained in hospital.

2. Higher ICU mortality with a social gradient

The ICNARC latest report of April 24th 2020 shows a raised mortality for BAME patients and a clear social gradient [33].

3. Genetic risks

A recent study of self-reported symptoms of covid-19 including symptoms indicates most predictive of SARS-CoV2 infection, are heritable [37] .

Infectious diseases may demonstrate a heritable component – that is the propensity to contract and develop active infection and the severity of the immune response - is influenced by host genetic factors. Viral diversity is associated with genetic variants mediating the immune response and biosynthesis of glycan structures functioning as virus and immunogenetic factors are implicated in risk and severity of H1N1 infection. Understanding how symptoms of covid-19 pass through the population may indicate the pathogenic mechanisms of SARS-CoV-2 infection as well as offering utility in the allocation of scarce healthcare resources, particularly intensive care beds.

50% of the variance of 'predicted covid-19' phenotype is due to genetic factors. The current prevalence of 'predicted covid-19' is 2.9% of the population. Symptoms related to immune activation such as fever, delirium and fatigue have a heritability >35%. The symptom of anosmia, that we previously reported to be an important predictive symptom of covid-19, was also heritable at 48%. Symptomatic infection with SARS-CoV-2, rather than representing a purely stochastic event, is under host genetic influence to some extent and may reflect inter-individual variation in the host immune response. Viral infections typically lead to T cell activation with IL-1, IL-6 and TNF-α release causing flu-like symptoms such as fever. The genetic basis of this variability in response will provide important clues for therapeutics and lead to identification of groups at high risk of death, which is associated with a cytokine storm at 1-2 weeks after symptom onset.

The genetic influence on covid-19 symptoms may reflect genotype status of candidate genes such as ACE2R which encodes the target for viral attachment. Further genetic work is underway to determine whether twins' genotype at ACE2R influences either predicted positivity or symptoms and a global genetic study is underway (https://www.covid19hg.org/). Public health measures to identify those at increased genetic risk of severe infection would be useful as a way of mitigating the economic effects of lockdown and social distancing policies.

4. Multi-generational households – asymptomatic transmission risks

Asymptomatic carriers of the virus display no clinical symptoms but are known to be contagious. Recent evidence reveals that this sub-population, as well as persons with mild disease, are a major contributor in the propagation of COVID-19. The asymptomatic sub-population frequently escapes detection by public health surveillance systems. Asymptomatic transmission of COVID-19 has been documented. The viral loads of asymptomatic carriers are similar to those in symptomatic carriers. A recent study concluded that asymptomatic and symptomatic carriers may have the same level of infectiousness [38].

Asymptomatic infection at time of laboratory confirmation has been reported from many settings. Some of these cases developed some symptoms at a later stage of infection, however, the proportion is not yet fully understood. There are also reports of cases remaining asymptomatic throughout the whole duration of laboratory monitoring, which revealed viral RNA shedding in various sample types. A recent modelling study suggested that asymptomatic individuals might be major drivers for the growth of the COVID-19 pandemic [39].

A household cohort study from China to determine the features of household transmission of COVID-19 reports secondary transmission of SARS-CoV-2 developed in 64 of 392 household contacts (16.3%). The secondary attack rate to children was 4% comparing with 17.1% to adults. The secondary attack rate to the contacts within the households with index patients quarantined by themselves since onset of symptoms was 0% comparing with 16.9% to the contacts without index patients quarantined. The secondary attack rate to contacts who were spouses of index cases was 27.8% comparing with 17.3% to other adult members in the households. Ages of contacts and spouse relationship with index case are risk factors for transmission of COVID-19. Quarantine of index patients since onset of symptom is helpful to prevent COVID-19 spread [40].

5. NHS disparities - healthcare workers exposure risk

The European Centre for Disease Prevention and Control (ECDC) 8th update of April 8th 2020 states that of the confirmed cases in China, 3.8% (1 716/44 672) were healthcare workers. Of those, 14.8% were severely or critically ill and 5% of the severe cases died. Latest figures reported from Italy show that 9% of COVID-19 cases are healthcare workers, with Lombardy region reporting up to 20% of cases in healthcare workers. In Spain, the latest COVID-19 situation overview from the Ministry of Health reports that 26% of COVID-19 cases are in healthcare workers. In a Dutch study, healthcare workers were tested voluntarily for COVID-19 and 6% tested positive. In a report on 30 cases in healthcare workers in China, all cases had a history of direct contact (distance within 1 metre) with COVID-19 patients, with an average number of 12 contacts (7, 16), and the average cumulative contact time being two hours (1.5, 2.7). In the Dutch study, only 3% of the healthcare workers reported being exposed to hospital patients with COVID-19 prior onset of symptoms and 63% had worked while asymptomatic.

The NHS Confederation BME Leadership Network has published a briefing on the impact of COVID-19 on BME communities and health and care staff [41] . The briefing considers the evidence on the impact of COVID-19 on black and minority ethnic (BME) communities and health and care staff. It explores potential underlying factors, recommends areas for improvement and offers practical advice on how to mitigate risks. Intended for senior health and care leaders, it aims to inform decision making and influence change. The briefing follows the publication of an early analysis of the deaths of 119 NHS staff, which was reported by the HSJ.

An alert was raised on April 21st 2020 asking whether the NHS should adopt the CDC or Ireland risk assessment to exposure risks through active and passive monitoring [42]. The US CDC issued interim guidance on April 15th 2020 that is intended to assist with assessment of risk, monitoring, and work restriction decisions for HCP with potential exposure to COVID-19 [43]. The Health Protection Surveillance Centre, Ireland interim guidance document aims to outline the role of Occupational Health (OH) in preparing for and managing potential COVID-19 exposures and risk assessments for potential exposure for active and passive monitoring [44].

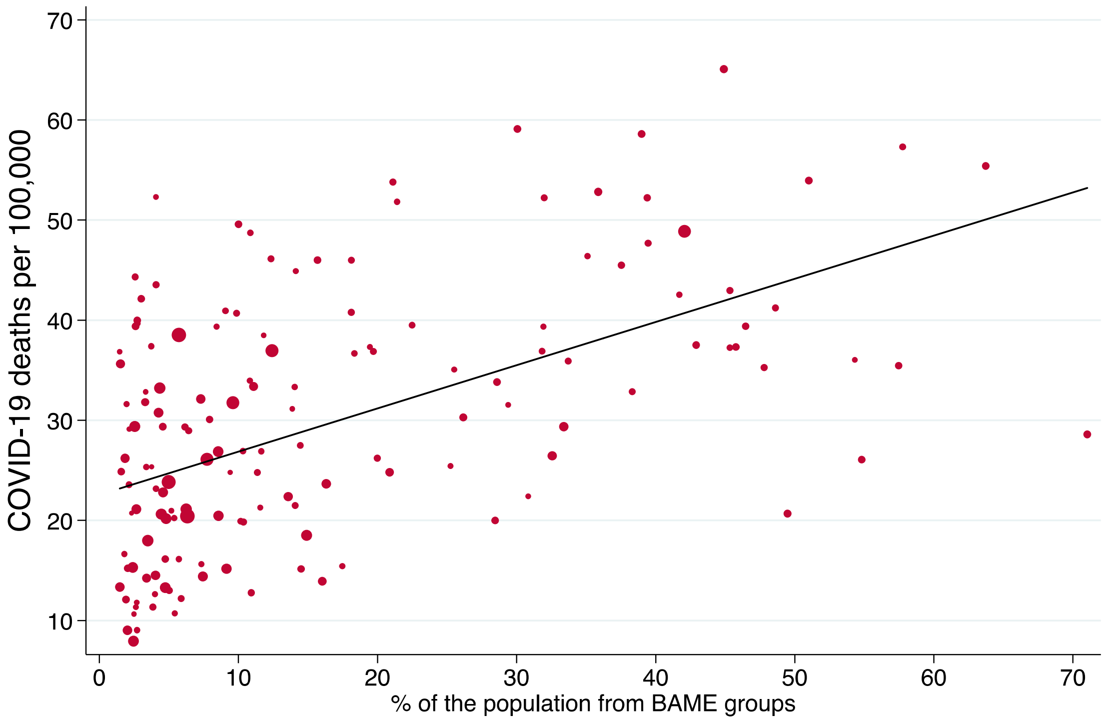
In response, RCP president Professor Andrew Goddard said: 'NHS staff across the UK are saddened and increasingly concerned by the number of COVID-19 related deaths of colleagues, particularly those from black and minority ethnic (BAME) backgrounds. The RCP welcomes this briefing and supports the recommendations as a crucial first step in protecting health and care workers and the public.

The HSJ reported on April 27th 2020 that Somerset Foundation Trust has now included all its BAME staff in the vulnerable and at risk group, and is asking managers to have conversations with them and discuss concerns. It is thought to be the first NHS organisation to take this step [45].

6. Lower socioeconomic status

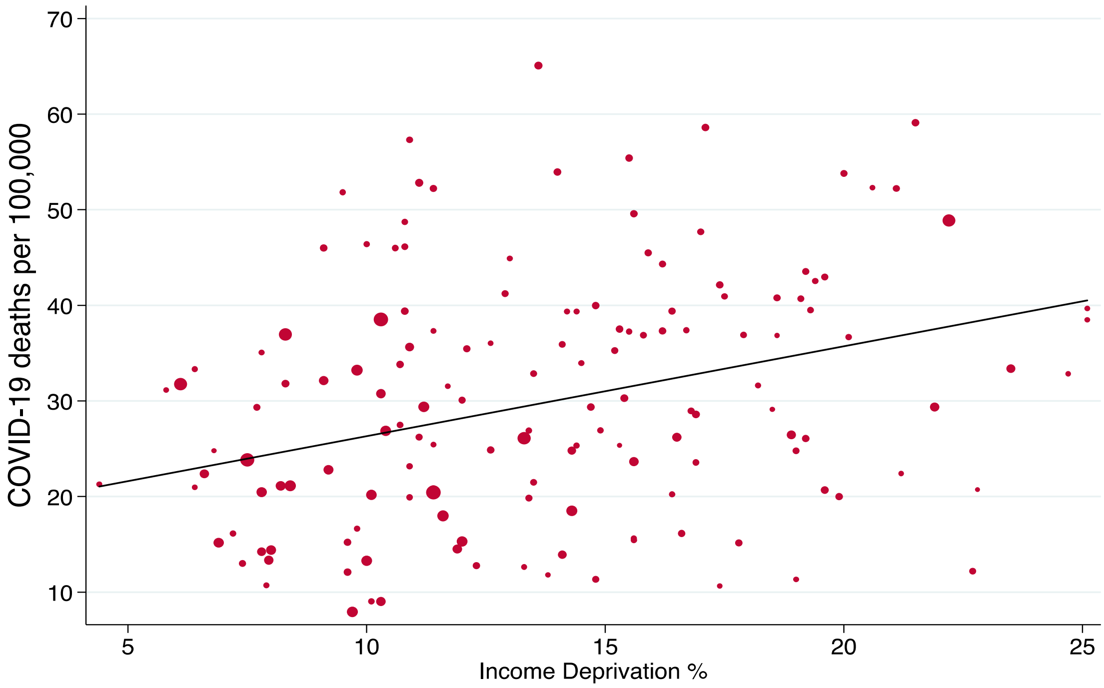
Rose et al (submitted for publication April 2020 MEDrxiv) [46] have assessed the association between ethnic composition, income deprivation and COVID19 mortality rates in England.

Figure 17: Correlation between the percentage of people from BAME backgrounds and the COVID19 mortality rate for local authorities in England. The size of each data point is proportional to the local authority population.



Local authorities with a greater proportion of residents from ethnic minority backgrounds had statistically significantly higher COVID19 mortality rates, as did local authorities with a greater proportion of residents experiencing deprivation relating to low income. After adjusting for income deprivation and other covariates, each percentage point increase in the proportion of the population from BAME backgrounds was associated with a 1% increase in the COVID19 mortality rate [IRR=1.01, 95%CI 1.01–1.02]. Each percentage point increase in the proportion of the population experiencing income deprivation was associated with a 2% increase in the COVID19 mortality rate [IRR=1.02, 95%CI 1.01–1.04].

Figure 18: Correlation between the income deprivation score and the COVID19 mortality rate for local authorities in England. The size of each data point is proportional to the local authority population.



Results from the regression analysis showed that the associations in Figures 1 and 2 remained after adjusting for population density, the duration of the epidemic and the proportion of older residents. Both ethnicity and income deprivation were independently associated with COVID19 mortality.

This study provides evidence that both income deprivation and ethnicity are associated with greater COVID19 mortality. To reduce these inequalities governments need to target effective control measures at these disadvantaged communities, ensuring investment of resources reflects their greater need and vulnerability to the pandemic.

Figure 19: Relationship between ethnicity of population and of household overcrowding, illness and disability, air quality and adult skills of IMD in England

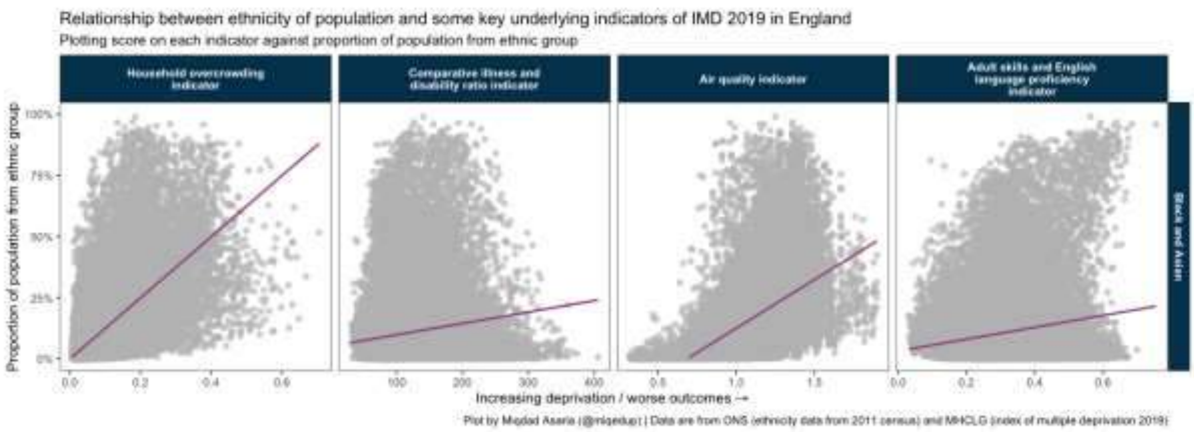
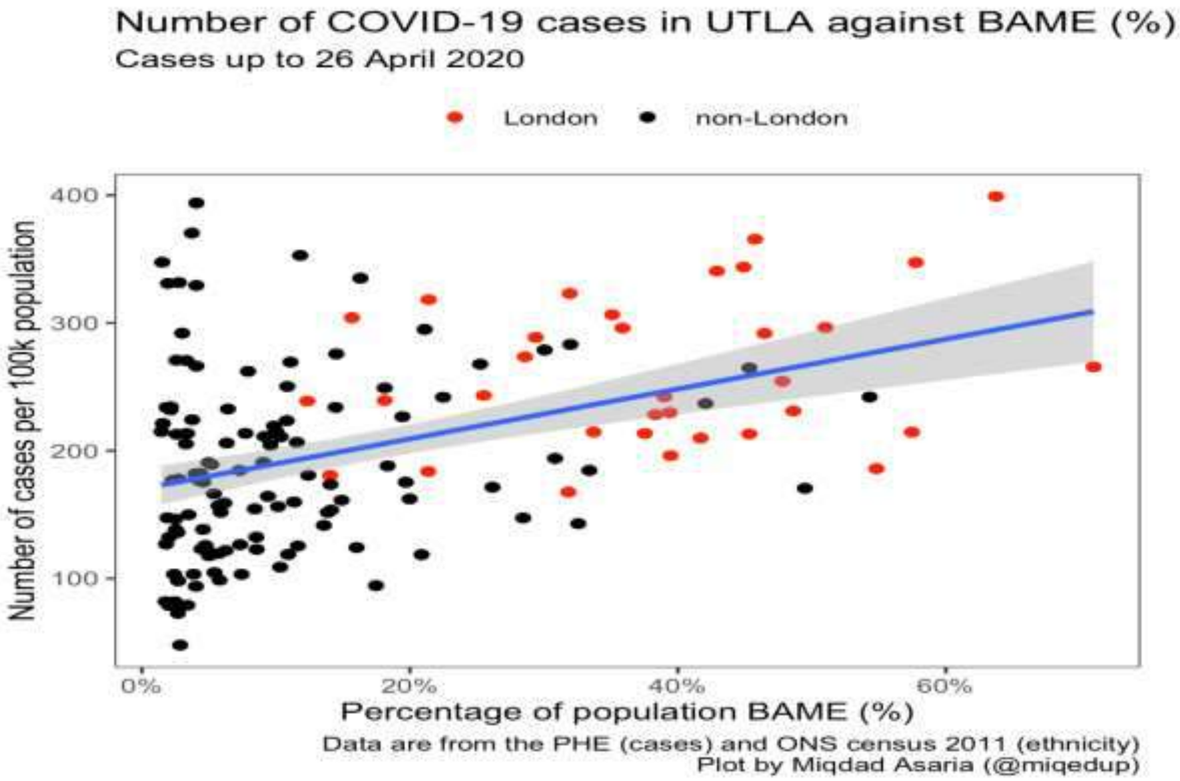
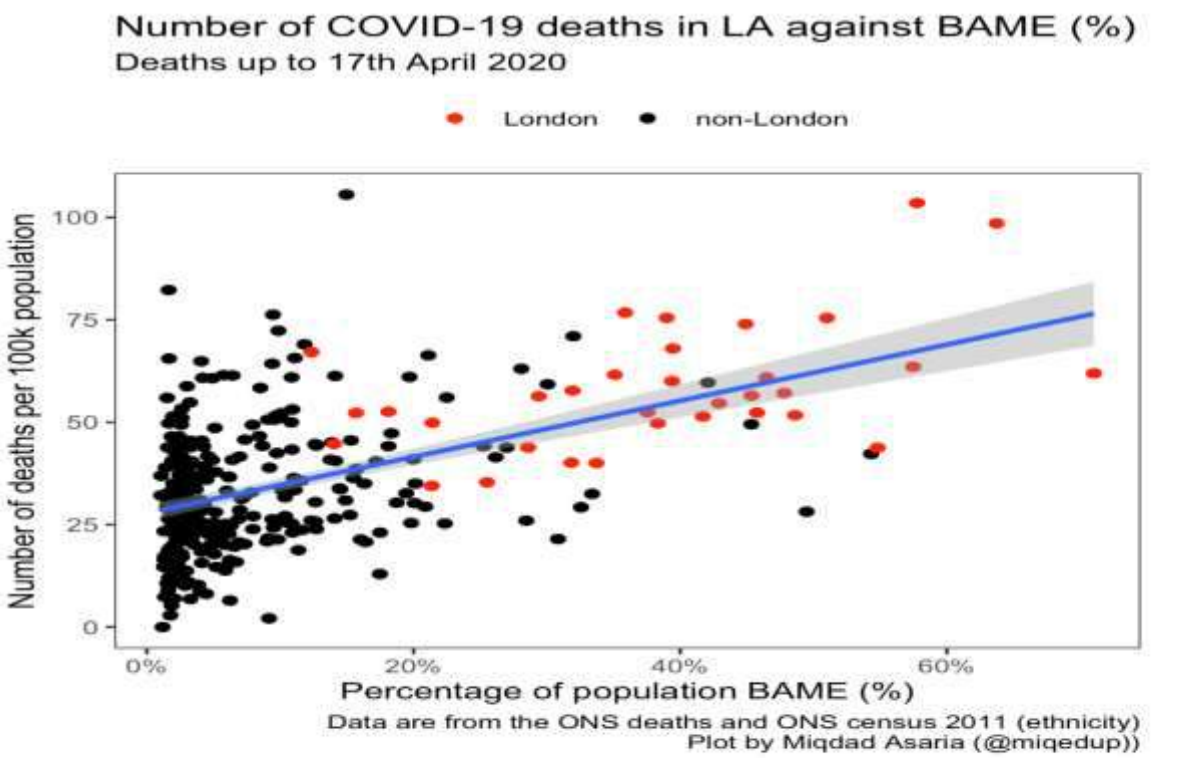


Figure 20: Number of deaths in Local Authorities against BAME (%)





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