

Disparities in the impact of COVID-19 in Black and Minority Ethnic populations: review of the evidence and recommendations for action

Executive Summary

The question of why more people from black and ethnic minority (BME) backgrounds appear to be at greater risk of hospitalisation and deaths with COVID-19 – and the need for urgent action in order to address this - has become one of the most urgent issues in this pandemic in the UK.

Our review of the evidence suggests that the reasons why some BME groups appear to be at greater risk of dying with COVID-19 are complex with interplay between socio-economic disadvantage in BME populations, high prevalence of chronic diseases and the impact of long-standing racial inequalities being key explanations.

The Marmot Review in February 2020 highlighted that people from disadvantaged backgrounds or deprived areas, and BME backgrounds, were not only more likely to have underlying health conditions because of their disadvantaged backgrounds, but they were also more likely to have shorter life expectancies as a result of their socio-economic status (including greater representation in poorly paid and insecure employment). Bangladeshi men and Pakistani women were identified as groups with the lowest life expectancy.

Housing conditions, including overcrowding is also likely to have had an impact on vulnerability to COVID-19. Overcrowded households among BME populations are also much more likely to be multigenerational, making social distancing, self-isolation and shielding much more difficult, and increasing opportunities for within-household coronavirus transmission.

We also know that ethnic minorities have been over-represented in key worker jobs during COVID-19: transport and delivery jobs, health care assistants, hospital cleaners, social care workers, taxi drivers, security guards, and in nursing and

medical jobs. These occupations have been frontline jobs with increased the risk of exposure, infection and death. There have also been concerns that some of these occupations have been the last to receive supplies of personal protective equipment.

Rates of mortality have also been higher in BME health care workers. Racial inequalities has been a recurring theme with doctors and nurse surveys experiencing difficulty getting access to personal protection equipment. The long-awaited report from Public Health England on 'Understanding the impact of COVID-19 on BME groups' highlighted a pervasive concern among stakeholders: that the experience of racism, discrimination, stigma, fear and trust among black and ethnic minority communities, including key workers within the National Health Service, made BME groups more vulnerable to COVID-19.

It is also important to consider the social and economic consequences of COVID-19 on ethnic minority groups. There is considerable evidence that COVID-19 has amplified pre-existing inequalities. Bangladeshi, Pakistani, Black African and Black Caribbean men are all much more likely to have had jobs in shutdown industries, such as the restaurant sector and taxi driving. These communities are already afflicted with high rates of child poverty with nearly half of Black children and well over half of Pakistani and Bangladeshi children living in poverty.

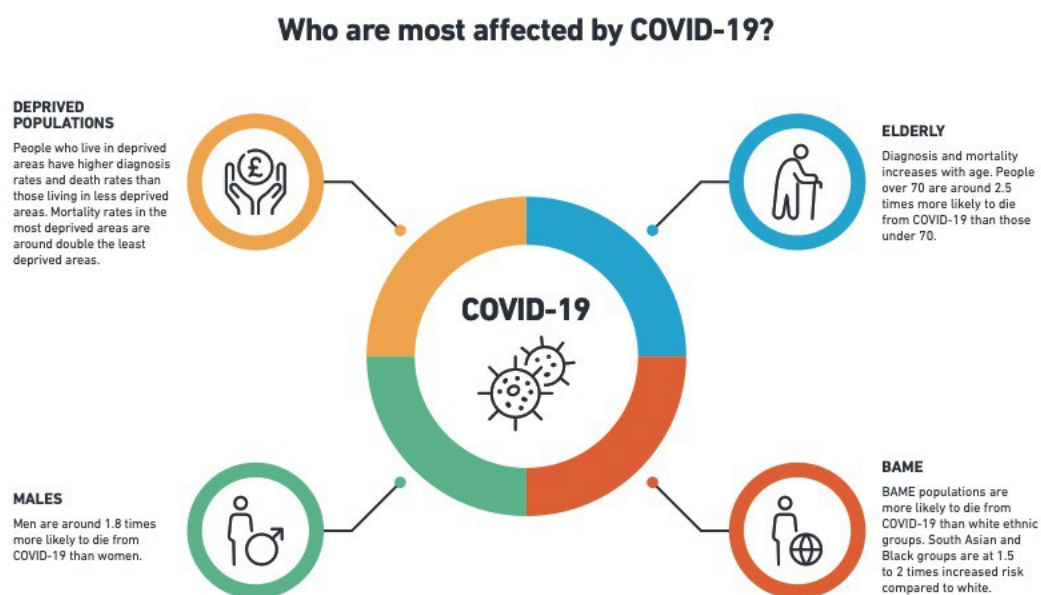
The COVID-19 pandemic is not just a health crisis; it is also a social and economic one, which in turn will also have a longer term impact on health. It is already clear that this burden of the pandemic is not equal across all population groups; we may all be weathering the same storm, but we are not in the same boat.

In this report, we make a number of recommendations to address the greater risk of adverse health outcomes in BME populations. These include recommendations with immediate impact on the course of the pandemic (to mitigate the differential risk of exposure, infection and transmission, and to inform local outbreak control strategies) and longer-term action to reduce health inequalities.

EVIDENCE REVIEW

Potential explanations for increased risk in deprived or ethnic minority populations include co-morbidities, behavioural, and socially driven inequalities such as overcrowded housing, income inequality and occupational risk (Williamson et al., 2020, Nazroo and Becares, 2020, PHE, 2020a, Platt, 2020a, PHE, 2020b, PHE, 2020c). However, it is also important to look upstream at the ‘causes of the causes’, which include structural racism. Figure 1 shows the populations most affected by COVID-19. The approximate level of current supporting evidence on each of these factors, and others that pertain to all population groups, is provided in Table 1.

Figure 1. Populations most affected by COVID-19.



A. Risk of COVID-19 hospitalisation and mortality

A large prospective cohort study using UK Biobank data found that, compared to White individuals, those who identified as Black were 2.6 times more likely to be hospitalized, with the figures for Asians 1.4 times higher and other ethnic groups 1.4

times higher. This is also supported by ICNARC data which has consistently shown increased hospitalisation in minority ethnic groups compared to general population figures (ICNARC, 2020a, ICNARC, 2020b, UK Government, 2019).

With respect to mortality, the Office of National Statistics (ONS) examined community and hospital deaths and found Black men and women to have 1.9 times greater mortality risk compared to those of White ethnicity, with the corresponding figures for Bangladeshi and Pakistani men 1.8 times higher, and 1.6 for Bangladeshi and Pakistani women (See Table 2 for adjusted confounders) (ONS, 2020a). Similarly, OpenSAFELY report all BME groups had higher risk of death (compared to White ethnicity). The difference was lower, but not zero, after adjusting for age, Body Mass Index, smoking, deprivation, hypertension and comorbidities (e.g. cardiovascular disease (CVD), Diabetes etc.) (Williamson et al., 2020). Thus, while it is important to know if a particular group has a worse outcome after adjustment for conditions like diabetes, it is also important to ask why they are at greater risk of the conditions.

Public Health England's (PHE) cross-sectional analysis (PHE, 2020b) showed that, compared to White British populations, Bangladeshis had twice the risk of death, with between 10-50% greater risk seen across the Indian, Pakistani, Other Asian, Chinese, Caribbean and Other Black ethnic groups (an important limitation was that comorbidities, obesity or occupation were not adjusted for). In addition PHE reported that the greater COVID-19 deaths observed in BME populations is the opposite of previous all-cause mortality rates in previous years, which were lower in BME groups (PHE, 2020b).

The NHS and PHE led the analysis of 61 million linked medical records and death data and found a greater COVID-19 mortality risk for BME groups, with 1.3 times higher risk for Asian groups and 1.7 times increased risk for Black ethnic groups (Barron et al., 2020). This is compelling data as it covers almost the entire population of England. Newer data from a prospective cohort study in 260 hospitals across the UK showed a greater likelihood of COVID-19 death in South Asian individuals (hazard ratio of 1.2), but not in any other ethnic minority group, compared to White people (Harrison et al., 2020).

B. Co-morbidities

There is mounting evidence to suggest that existing health conditions play a major role. In a prospective cohort study of over 35,000 COVID-19 patients, the higher mortality observed in South Asian compared to White ethnic groups was mediated by pre-existing diabetes (18% of the increased risk was explained by diabetes) (Harrison et al., 2020), a comorbidity with high prevalence among certain ethnic minority populations in the UK such as South Asians (Gholap et al., 2011). Diabetes is higher in first generation south Asian groups because of lower birth weights and diet in childhood which together pre-dispose to insulin resistance.

BME populations have higher rates of cardiovascular disease (CVD), obesity and diabetes and these have been shown to be common co-morbidities associated with COVID-19 mortality in a number of studies (Barron et al., 2020, Harrison et al., 2020, Williamson et al., 2020, Docherty et al., 2020). This is not unique to COVID-19 as in previous pandemics such as the 2009 (influenza) H1N1 outbreak diabetes markedly increased the risk of hospitalisation and critical care admission (Allard et al., 2010).

Major complications of COVID-19 are acute respiratory distress syndrome and pulmonary embolisms, both of which are related to inflammation. From the findings of a recent systematic review, Vepa and colleagues postulate that acute inflammation (resulting from COVID-19) exacerbates chronic inflammation from existing health conditions (i.e. obesity, insulin resistance, cardiovascular disease etc.), creating a 'cytokine storm' which may contribute to the more severe COVID-19 outcomes experienced by BME populations (Vepa et al., 2020).

C. Occupation

There also appear to be a disproportionate number of BME health and social care workers who have died from COVID-19 (Cook, 2020). Among all staff employed by the NHS, BME groups account for approximately 21%, including roughly 20% among nursing and support staff and 44% among medical staff (i.e. doctors and dentists). Initial analysis of health and care worker BME COVID-19 deaths suggest they account for 63%, 64% and 95% of overall deaths in the aforementioned staff groups

respectively (Cook, 2020). In other recent analyses, while healthcare staff were shown to have lower mortality rates than the general population, 76% of deaths were in BME individuals (Levene et al., 2020).

Likewise, BME populations in adult social care appear disproportionately vulnerable. The Care Quality Commission (2020) examined death notifications in adult social care settings from 10 April -15 May 2020 by ethnicity (which is not routinely done by ONS). The proportion of deaths in all adult social care services due to confirmed or suspected COVID-19 was higher for Black (49%) and Asian (42%) individuals than those of White ethnicity (41%) or mixed or multiple ethnic groups (41%) (Care quality commission, 2020). It should be noted however that these numbers were not adjusted for confounding factors, and no inferential analyses were conducted.

BME groups are overrepresented in key worker and health and social care roles, or lower paid employment with less security (e.g. zero hour contracts) (Platt, 2020a, Equality and Human Rights Commission, 2017b, Rose et al., 2020), where it may be very difficult to socially distance or work from home. This includes over representation in transport and delivery, health care assistants, hospital cleaners, social care works, taxi drivers, security guard and nursing and medical jobs (ONS, 2020b). All of these occupations will increase exposure to the virus and most have been shown by ONS to increase risk of death (ONS, 2020c, ONS, 2020d). In addition, many BME individuals may have had to use public transport to travel to work, although data on this is lacking at present.

Despite being at greater occupational exposure to COVID-19 within health and social work roles in particular, survey evidence has shown that only 43% of BME nurses report receiving eye and face protection equipment, whereas 66% of white British nurses self-reported receiving appropriate personal protective equipment (RCN, 2020). Significantly, 49% of BME nurses had been asked to reuse single use equipment, compared with just over a third of white British respondents (37%), and there were marked disparities in perceptions over the provision of PPE training between BME and white British nursing staff (RCN, 2020).

D. Deprivation and housing

In relation to social or socioeconomic factors, pre-existing socioeconomic disparity has rendered BME populations at greater exposure to COVID-19 as they are more likely to be socioeconomically deprived, and therefore overrepresented in densely populated urban areas, overcrowded and multigenerational housing, and key worker/more exposed occupations.

Geographically COVID-19 cases have not been evenly distributed across the country, with densely populated urban areas such as Birmingham and London, particularly hardly hit. This is important to note as ethnic minority groups disproportionately reside in urban areas – for example in England and Wales 60% of the black population and 50% of Bangladeshis live in London (Platt, 2020b). However even when accounting for the regional concentration of COVID-19 cases, BME groups have increased risk of adverse outcomes, which likely result from social/socioeconomic and biological explicators.

For example, 8% of Black Caribbean, 15% of Pakistani, 21% of Black African and 26% of Bangladeshi households are classified as overcrowded (i.e. more people than bedrooms), compared to just 2% in White British households (Khan, 2012). Bangladeshi, Indian and Chinese households are particularly likely to have older people over 65 living with children under 16 years (Khan, 2012). In addition less than 2% of white British households in London have more residents than rooms, but in contrast around 30% of Bangladeshi households, 18% of Pakistani households and 16% of Black African households have more residents than rooms in London (Platt, 2020a). Such overcrowded households are more likely to be multigenerational, increasing the difficulty of self-isolation, social distancing, or shielding therefore increasing the opportunity for within-household transmission.

E. Preventative behavioural measures

Social and cultural factors which have also received widespread research and media attention, and for which there is limited supporting evidence include a lack of understanding and uptake of COVID-19 prevention and control measures among

BME communities (i.e. social distancing, self-isolation etc.), and structural discrimination (Nazroo and Becares, 2020). In particular, the recent PHE BME COVID-19 report suggested that racism and distrust may have provided a barrier to accessing healthcare for BME communities and may prevent BME workers speaking out against potentially precarious working conditions (PHE, 2020a). Also linked to fear, trust and discrimination is the potential vulnerability of new or undocumented migrants. Despite a lack of data, undocumented or new BME migrants could be at particularly high risk as they may not speak English, could have low health literacy, and will have minimal rights to access healthcare (Bhopal, 2020) or the support required to self-isolate, quarantine or shield.

F. Structural and racial discrimination

Stakeholders and members of BME communities have suggested discrimination, stigma, fear and trust may have a role to play in COVID-19 disparities (PHE, 2020a). There is substantial historical evidence for this, as outlined above. Moreover, there is an urgent need for research to examine how structural racism plays out in the present pandemic and how the policies developed to control the pandemic impact differently on BME communities. The very fact that we do not have such information is in itself an indication of the extent to which BME experiences and BME lives are under-valued in our society.

Structural discrimination is of critical importance in determining the jobs that people get, the living conditions people experience, their access to different forms of public transport and other factors that impact levels of exposure to infection. Moreover, racism renders people precarious and those in precarious positions are less able to challenge conditions (particularly at work) which place them at risk.

Structural racism is particularly likely to impact BME infections and mortality rates through systematic social and economic inequalities that drive health status. BME populations are more likely to be deprived, reside in overcrowded and multigenerational housing, be overrepresented in densely populated urban environments, and work in occupations with increased viral exposure. These inequalities, coupled with educational and income disparities will constrain the ability

to engage in health-enhancing behaviours (e.g. diet, sleep, physical activity, smoking etc.), which are key determinants of comorbidities related to COVID-19. Indeed, this year's updated Marmot review highlighted that people of BME ethnicity, or from disadvantaged backgrounds or deprived areas were more likely to have underlying health conditions because of their disadvantaged backgrounds, and because more likely to have shorter life expectancies (Marmot et al., 2020).

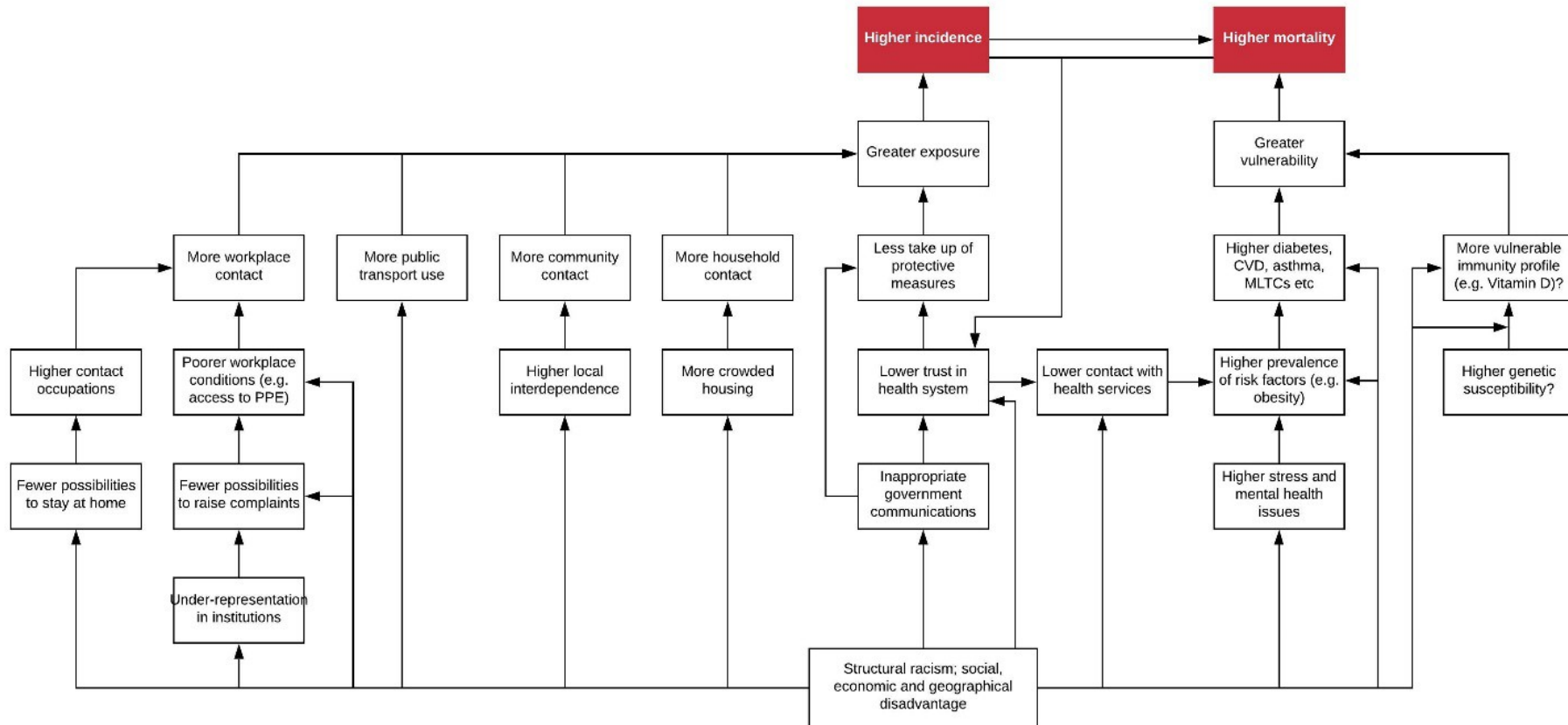
Racism also creates barriers to accessing health care. The 2014 Immigration Act, and follow-on charging regulations now links immigration status to NHS access, including the Immigration Health surcharge, and with the onus on health providers to check immigration status and enforce upfront payments. Over 50% of migrant support organisations report their clients avoiding seeking healthcare for such concerns. Although COVID-19 related healthcare costs have been exempt from these regulations, 70% report of that the COVID-19 pandemic has increased the unwillingness to seek NHS support (Medact, 2020). This also includes concern about health data collected during the pandemic to be passed to the Home Office. No Recourse to Public Funds conditions also exacerbate precarity and destitution by excluding families from essential services- which are a prerequisite for social care during isolation. This also includes access to many domestic violence services, trapping people - mostly women - in abusive relationships at a time when domestic violence has risen across the UK.

In sum, there are multiple paths through which structural and racial discrimination may impact infections and deaths amongst BME communities. This occurs through putting community members in contexts where infection is more likely, through affecting access to the healthcare necessary to deal with infection and through creating co-morbidities which make people more vulnerable to the infection and its effects. Figure 2 provides a representation of these multiple pathways and their inter-connections. It is not intended to be exhaustive and details all the relations between different factors. Nor is it intended to suggest that all BME communities are impacted in the same way. Indeed one use of the figure is to consider how different communities are differentially affected by the different pathways.

Finally, and perhaps most importantly, by identifying the different paths to differential

infection and mortality rates, the figure points the way to the different interventions that are necessary if we are to address the greater impact of COVID-19 on BME communities.

Figure 2



G. Other factors

Additional biological explanations include genetic polymorphisms, poorer lung function and Vitamin D deficiency (Abuelgasim et al., 2020). Vitamin D deficiency in particular has captured the attention of the popular press, despite limited supporting evidence. Vitamin D deficiency is common amongst ethnic minority groups in the UK (e.g. 42% of South Asians had severe deficiency in one study (Patel et al., 2013)), and due to its role in immune response and association with reducing the incidence of acute respiratory tract infections (Abuelgasim et al., 2020). There are a number of trials now examining the impact of Vitamin D supplementation on COVID-19 outcomes (e.g. <https://clinicaltrials.gov/ct2/show/NCT04344041>)

H. Recommendations

To address the greater risk of adverse outcome in BME populations, we make a number of recommendations. These include recommendations with immediate impact on the course of the pandemic and longer-term action to reduce health inequalities.

H.1 RECOMMENDATIONS

Short term recommendations

1. Occupational Risk Assessments for all employees and PPE Provision for all workers in public facing roles

Risk assessment for all employees in all workplaces and implement appropriate measures to protect them. Protection arrangements could include working from home, reduced exposure-working practices, temporary furloughing of staff, and guaranteeing that sick leave will not adversely affect employment status. There are a number of risk stratification tools that have already been developed for NHS staff (Khunti et al., 2020) that could be

deployed. The Department for Business, Energy and Industrial Strategy (BEIS) and PHE could provide guidance to all employers on how to carry out risk assessments on BME employees as well as all vulnerable groups and mitigation strategies to reduce exposure risk.

Given the Royal College of Nursing and BMA findings of inadequate PPE for BME staff, ensure that all health and social care workers, and indeed key workers in other public-facing roles have access to appropriate PPE.

2. A tailored Find, Test, Trace, Isolate, Support (FTTIS) Programme

As find, test, trace, isolate and support (FTTIS) programmes are developed, including the use of mobile phone applications, they will require adaptation and targeting to ensure that they reach marginalised and BME communities, as well as those with limited proficiency in English (Khunti, 2020), highlighting importance of co-creation of these programme with BME communities. More specific recommendations for each part of FTTIS further detailed below.

Improve Access to Healthcare to improve case-finding and contact tracing

Fear and mistrust among BME and migrant populations may be acting as a barrier to accessing healthcare reducing the likelihood of timely identification of people with COVID-19 symptoms and their contacts. Example steps that could be taken to address this include the improvement of translation services in testing and tracing, implement wide scale cultural diversity training within the health and social care system, engagement with BME communities to build trust, change government policies on healthcare charging regulations for some migrants, as well as the data-sharing agreement between the NHS and the Home Office for immigration enforcement purposes.

Test: Priority Testing

As part of the FTTIS programme, accelerate availability and ramp up priority testing for the most at-risk groups, particularly where people are working in public facing roles. A number of NHS trusts have already implemented this process for BME individuals (Pulse, 2020).

Isolation and Support: Improve Statutory Sickness Pay (SSP)

This support is critical to increase chances of compliance with self-isolation of cases, quarantine of contacts and shielding of the vulnerable. Increase the amount and eligibility for statutory sickness pay. There are concerns about SSP levels in the context of COVID-19. Currently, SSP is too low (£95.85 per week) to live on for working families. Many low pay/zero hour workers and migrants are not eligible for SSP.

3. Increase social security safety net and remove barriers for migrants accessing essential benefits

The government must recognise the impact of poverty and disadvantage on access to social and health care, and disease severity for people within BAME communities. While the government have taken steps to mitigate the economic impact of COVID-19, these measures have not equally benefitted all groups in the labour market (as well as those not active in the labour market).

To protect the most vulnerable sectors of society we recommend the government increases the level of universal credit (which is currently too low and does not take into account changes in circumstances due to COVID-19), increase child benefit (to cover gaps in free school meals and costs of having children at home full time), and align housing allowances with local rent costs, so that the costs of local housing does not push more families into poverty. In addition, benefit caps, under-occupancy benefits and the two-child limit in Universal credit (which means that families with three or more children, born after April 2017, do not receive support for these children) all need to be lifted.

Remove the No Recourse to Public Funds (NRPF) condition that relates to migrants with limited leave, or those without leave to remain. Under the NRPF, migrant workers with limited or no leave to remain cannot access local authority housing support, public funds including Universal Credit, Child Benefit or Housing Benefit. In addition steps need to be taken to increase trust with authorities, and to open communication between these vulnerable individuals and public sector organisations to aid with access to healthcare and to support uptake of COVID-19 prevention and control measures (Bhopal,

2020).

Key workers are more likely to be from BME populations and be economically vulnerable (Platt, 2020a, ONS, 2020e, McCormack et al., 2020). Remedial action could include relative pay improvements for all currently low paid workers in the health and social care sectors, and, in addition, expansion and improvement in occupational health services, as well as better access to childcare.

4. Provide more housing (e.g. hotels, B&Bs and community shelters) and emergency financial support for necessary isolation during COVID-19

People from disadvantaged areas and black and ethnic minority communities are more likely to live in densely-populated areas, and overcrowded and multigenerational housing. Temporary housing availability (e.g. hotels and community shelters) should be made available to facilitate self-isolation of symptomatic individuals. This will also need to include provision for food and essential amenities. If individuals are to comply with isolation, employers will also need to ensure that those isolating are paid during isolation and do not suffer financial hardship.

Looking to the future there is a need for investment in affordable housing and social housing, as well as larger housing specifically aimed at disadvantaged communities.

5. Reverse NHS charges for all new migrants and all levels of workers in the NHS, and remove all data-sharing obligations between NHS and the Home Office

NHS charges for migrants act as a major disincentive for recent migrants and asylum seekers to engage in the health and social care support required to diagnose, treat and prevent COVID-19. Although COVID-19 is specifically excluded from these laws, evidence suggests that many such people remain reluctant to engage in care because of the hostile environment. We support calls for an end to discriminatory NHS charges, as well as use of health data

to enforce the Home Office's "Compliant Environment" policies - all of which act to exclude vulnerable communities from the integrated health and social care system required to eliminate COVID-19.

6. Mandatory data on ethnic background in all health and social care contexts

In light of the clear evidence for excess risk of some BME communities from COVID-19, and the need to mitigate against this adverse outcome, the routine collection and reporting of ethnicity data in health and social care should be mandated. All relevant research studies should collect and present disaggregated ethnicity data, national minimum datasets should include ethnicity data (all existing data sets should be reviewed), and ethnicity should be included in mortality reporting (i.e. death certification) (Pareek et al., 2020).

It is critical, however, that health and social care ethnicity data is not shared with non-health agencies, including the Home Office, to ensure that all communities can access health services without fear of immigration enforcement.

7. Undertake and publish all equality impact assessments on previous and new government measures in relation to COVID-19

In addition, for any new policy or policy change during the pandemic, publish an equality impact assessment for all those with protected characteristics, including BME communities. The equality impact assessment should include barriers to adherence to social distancing, taking into consideration the key causes and sources of disparities outlined in this review.

8. NHS Trusts need to undertake an independent review of racial inequalities and discrimination in the NHS

A reoccurring theme throughout the evidence on the impact of COVID19 on ethnic minority communities is the issue of racism and discrimination within the health and social care system, including within the NHS. We therefore

recommend that the NHS reiterates its commitment for increasing diverse leadership at all levels in health and care system, reflecting the communities which it serves. It is also critical for NHS Trusts to review processes by which BME staff are able to raise concerns about occupational risk and safety.

Broader long term recommendations

9. Co-creating strategies and policies for primary prevention, secondary prevention, and local outbreak control with BME communities

Ensure that members of BME communities are actively consulted and involved at all stages of the policy process and public information strategies: development, implementation and assessment to foster co-ownership, to build trust, and to ensure that messaging to reducing risk of infection and transmission are appropriate (including availability in a wide range of spoken and written languages (Khunti, 2020) and that approaches to the control of local outbreaks are sensitive to lived experiences and local contexts.

10. Tackle Health Inequality

Improve the prevention and treatment of long-term conditions, with a specific focus on deprived communities and BME individuals. Develop a national, cross-governmental strategy for action on the social determinants of health, with a focus on deprived populations and ethnic minorities (Marmot et al., 2020) to address the differential vulnerability to disease and access to care.

11. Tackle Employment Inequality

Government-level action should be taken to reduce precarious or poorer quality employment which will increase risk of exposure to disease and illness (Marmot et al., 2020). For BME populations, develop a national strategy to break barriers to entry into higher paying occupations; provide clear career development opportunities and pathways; tackle bias in recruitment, promotion and pay decisions; and report on the ethnicity pay/employment gap (Equality and Human Rights Commission, 2017a, Equality and Human Rights Commission, 2017b). Those from minority ethnic populations are also more likely to be in precarious employment and not be members of Trade Unions,

limiting their ability to challenge employers placing them in hazardous situations. (PHE, 2020a, Nazroo and Becares, 2020), although evidence is lacking for this assertion.

Table 1. Key analyses examining COVID-19 mortality in Black and Minority Ethnic Health Groups

Office for National Statistics (ONS, 2020a)	Cross-sectional	General population (England and Wales)	Region, rural and urban classification, area deprivation, household composition, socio-economic position, highest qualification held, household tenure, and health or disability in the 2011 Census.	Black males and females, 1.9x greater mortality risk, Bangladeshi and Pakistani men 1.8x, and 1.6x for Bangladeshi and Pakistani women.
OpenSafely Collaboration (Williamson et al., 2020)	Cross-sectional	General population (England)	Age, sex, BMI, smoking, deprivation, and comorbidities.	Black 2.2x greater mortality risk, Asian/Asian British 1.9x, Mixed 1.8, and Other 1.3x.
Sapey et al. (Sapey et al., 2020)	Retrospective Cohort	General population (Patients with confirmed COVID-19 requiring admission to University Hospital Birmingham)	Age, sex, comorbidity and deprivation.	South Asian 1.6x greater mortality risk, no increased risk for Black, Mixed or Other groups.
Public Health England(PHE, 2020b)	Cross-sectional	General population (England)	Sex, age, deprivation and region.	Bangladeshi 2x greater mortality risk. Between 10-50% greater risk for Indian, Pakistani, Other Asian, Chinese, Caribbean and Other Black ethnic groups
Apea et al.(Apea et al., 2020)	Observational cohort	General Population (Patients admitted to 5 east London hospitals for COVID-19)	Age and sex.	Asian 1.5x greater 30-day mortality risk, Black 1.3x. No increased risk in Mixed and Other Ethnicity group.
Barron et al. (Barron et al., 2020)	Cross-sectional	General population (England)	Sex, age, deprivation, diabetes status and region.	Greater mortality risk for BME groups with 1.3x greater risk 1-3 for Asian groups and 1-7x for Black groups.
Harrison et al. (Harrison et al., 2020)	Prospective observational cohort	General population (Patients admitted to 260 UK hospitals)	Age, sex, and location.	Greater mortality likelihood in South Asian (hazard ratio 1.2), but not East Asian, Black or Other Ethnic Minority, groups, compared to white.
Cook et al. (Cook, 2020)	Cross-sectional	NHS workers	None reported.	Disproportionate BME deaths of 63%, 64% and 95% of overall deaths in NHS nursing, support and medical staff.

Table 2. Predictors of increased risk of adverse outcomes from COVID-19

Variable	Description	Level of Current Evidence
Age	Risk increases with age	Evidence known
Sex	Men have higher risk than women	Evidence known
Deprivation	Risk is greatest in the most deprived	Evidence known
Ethnicity	Risk is greater in ethnic minority groups compared to White ethnic groups	Evidence known
Obesity	People with obesity are at increased risk	Evidence known
Comorbidities	People with comorbidities are at increased risk	Evidence known
Occupation	Health care staff are at increased risk (key workers increased risk of infection)	Limited evidence
Housing	Overcrowded and multigenerational housing may increase transmission	Limited evidence
Environmental Pollution	Air pollution is associated with respiratory diseases and may play a role in viral transmission.	Limited evidence
Genetics	Some genetic variations may be associated with infection susceptibility and diverse clinical presentation of COVID-19	Limited evidence
Lifestyle	Smoking, alcohol intake, diet and physical activity contribute to comorbidities	Evidence lacking
Vitamin D	Low vitamin D is associated with some non-communicable diseases and increased susceptibility to infectious disease	Evidence lacking
Structural/Racial Discrimination	Structural discrimination may impact on health seeking behaviours and challenging work conditions	Indirect evidence
Behaviour	Social distancing, shielding, wearing of facemasks etc. can reduce transmission risk.	Evidence lacking

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