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Ethnic inequalities in age-related patterns of multiple long-term conditions in England: Analysis of primary care and nationally representative survey data

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Abstract

Little is known about the patterning of multiple long-term conditions (MLTCs) by age, ethnicity and across conceptualisations of MLTCs (e.g. MLTCs with/without mental health conditions [MHCs]). We examined ethnic inequalities in age-related patterns of MLTCs, and combinations of physical and MHCs using the English GP Patient Survey and Clinical Practice Research Datalink. We described the association between MLTCs and age using multilevel regression models adjusting for sex and area-level deprivation with patients nested within GP practices. Similar analyses were repeated for MLTCs that include MHCs. We observed ethnic inequalities from middle-age onwards such as older Pakistani, Indian, Black Caribbean and Other ethnic people had increased risk of MLTCs compared to white British people, even after adjusting for area-level deprivation. Compared to white British people, Gypsy and Irish Travellers had higher levels of MLTCs across the age groups, and Chinese people had lower levels. Pakistani and Bangladeshi people aged 50–74 years were more likely

than white people to report MLTCs that included MHCs. We find clear evidence of ethnic inequalities in MLTCs. The lower prevalence of MLTCs that include MHCs among some minoritised ethnic groups may be an underestimation due to underdiagnosis and/or inadequate primary care and requires further scrutiny.

KEYWORDS
age-related patterns, ethnicity, general practice, health inequalities, multiple long-term conditions

INTRODUCTION

The impact of multiple long-term conditions

It is estimated that approximately 25% of people in the United Kingdom (UK) and approximately 33% of people globally have two or more long-term conditions (MLTCs; Barnett et al., 2012; Cassell et al., 2018; Hajat & Stein, 2018). MLTCs pose several challenges for patients, health professionals and health-care systems (Kingston et al., 2018; Langan et al., 2013; van der Aa et al., 2017; World Health Organisation, 2016). For example, many secondary care services are fragmented, highly specialised, and focus on single conditions. Without reform, they are unlikely to meet the needs of patients with MLTCs who require holistic care (Moffat & Mercer, 2015; Whitty et al., 2020). A lack of holistic care for people with MLTCs can complicate treatment, compromise care quality, increase patient dissatisfaction and further disadvantage patients with MLTCs (Moffat & Mercer, 2015; van der Aa et al., 2017; Whitty et al., 2020). Beyond health care, MLTCs are associated with long-term care dependency in people with MLTCs being reported to have an increased risk of becoming care dependent (Koller et al., 2014). A systematic review of studies examining the cost of illness found that the average annual cost of MLTCs ranged from approximately £39 to £196,000[1] per capita and increased according to the number of MLTCs (Wang et al., 2018). Clearly, having MLTCs has an impact on different facets of society. In the interest of improving the care and quality of life of people with MLTCs, a better understanding of MLTCs is warranted.

Ethnic inequalities in the prevalence of MLTCs

Over the last decade, there has been a growing number of international studies examining ethnic differences in the prevalence of MLTCs (Hone et al., 2021; Johnson-Lawrence et al., 2017; Kalgotra et al., 2020; Quiñones et al., 2011; Rocca et al., 2014; St Sauver et al., 2015; Verest et al., 2019; Wang et al., 2022). In the UK, interest in this area is also burgeoning. Findings from a systematic review and narrative synthesis of these studies suggest that Black African, Black Caribbean, Indian, Pakistani, Bangladeshi, and people of Other Black, Other Asian and Mixed ethnicity have a higher prevalence of MLTCs compared to their white British counterparts (Hayanga et al., 2023). Also, there is evidence to suggest that people with MLTCs from Black African, Black Caribbean, Other Black, Pakistani or Chinese backgrounds have poorer survival compared with white people

for total number of conditions or for complex multimorbidity (i.e. MLTCs which involve three or more body systems; Stafford et al., 2022). Thus, not only are there ethnic inequalities in the prevalence of MLTCs, but also in the impact of MLTCs. Whilst some may still consider biological, genetic, behavioural and cultural differences as contributors of ethnic inequalities in multiple conditions, it is widely accepted these factors are not the fundamental cause of ethnic inequalities (Eastwood et al., 2015; Kitley et al., 2012; Mann et al., 2008; Stronks et al., 2013). Instead, ethnic inequalities in health and by extension, MLTCs, are recognised to result from structural, institutional and interpersonal racism and discrimination (Bécares et al., 2015; Williams et al., 1997), which shapes the unequal distribution of resources (e.g. education, employment, income and housing (Impact on Urban Health, 2021; Williams et al., 1997)) that are strongly associated with poor health.

The association of MLTCs by age across minoritised ethnic groups

Despite the evidence that MLTCs disproportionately impact many people from minoritised ethnic groups in the UK, it is less clear how MLTCs are patterned at younger ages as well as mid and later life for different ethnic groups. Some studies report that people from minoritised ethnic groups develop MLTCs at an earlier age, on average, compared to those from the majority ethnic group (Eto et al., 2023; Quiñones et al., 2019; Verest et al., 2019). Others report that ethnic inequalities in the prevalence of MLTCs vary at different stages throughout the life course (Bobo et al., 2016; Hone et al., 2021; Quiñones et al., 2011; Rocca et al., 2014; St Sauver et al., 2015; Ward & Schiller, 2013). For example, Rocca and colleagues examined how the prevalence of MLTCs was patterned by age, sex and ethnicity in a US sample (Rocca et al., 2014). In their study, the prevalence of MLTCs among those aged 10–30 years was higher amongst white people compared to Asian and Black people (Rocca et al., 2014). From the ages of 31–62 years, Black people had a higher prevalence of MLTCs compared to all ethnic groups. However, from age 62 years onwards, white people had a higher prevalence of MLTCs than Black or Asian People (Rocca et al., 2014). Asian people had the lowest prevalence of MLTCs across all age groups with the exception of those aged 75 years and above where their prevalence of two or more conditions was higher than that of Black people but lower when compared to white people (Rocca et al., 2014). Whilst such studies provide a nuanced understanding of ethnic inequalities in MLTCs by age, they have been conducted in the United States whose minoritised ethnic groups differ from those in the UK in terms of their migration history, age profile and nationality. Also, we cannot discount the impact of different health-care systems on the development and progression of MLTCs given the association between MLTCs and increased health-care utilisation (Hone et al., 2021). It would, therefore, be inappropriate to apply the findings of these studies to the UK context.

Thus far, we have considered ethnic inequalities in the prevalence of MLTCs without making a distinction between MLTCs that consist of only physical health conditions and those that include mental health conditions (MHCs). It is important to make this distinction because over 50% of people who develop a second long-term condition struggle with their mental health as a result of the complex interaction between social, economic and emotional pressures of living with ill health (Impact on Urban Health, 2021). In fact, studies show a higher prevalence of MHCs, notably depression, in people with long-term physical conditions (Harpole et al., 2005; Moussavi et al., 2007). Additionally, having MLTCs that include MHCs is associated with a higher symptom burden and functional impairment, greater costs and excess mortality (Bobo et al., 2016; Langan et al., 2013). Age-related inequalities in MLTCS that include MHCs have been reported

by Bobo et al. (2016) who conducted an exploration of the prevalence of combined physical and mental health multimorbidity in a US sample. They found ethnic inequalities in the prevalence of general multimorbidity and multimorbidity that includes MHCs; the former increased with age in a linear fashion whilst the latter increased with age with an apparent plateau between ages 50 and 79 years (Bobo et al., 2016). In the UK, ethnic inequalities in the combination of physical and MHCs at different ages has not been examined. Findings from such analyses could allow for the identification of populations with a higher prevalence of particular types of MLTCs which, in turn, can facilitate the development of integrated comprehensive services to assist prevention, improve care in the earliest stage of illness, make disease management more efficient in the long-term and reduce disease burden and progression (Johnson-Lawrence et al., 2017).

Ethnicity data quality

For researchers to fully understand how ethnicity relates to long-term conditions, good quality data is essential (Mathur et al., 2014). In the UK, ethnicity recording in routine electronic health-care records has improved over time, but concerns remain about the accuracy and completeness of the data being captured (Mathur et al., 2014; Raleigh & Goldblatt, 2020; Saunders et al., 2013; Scobie et al., 2021). Recent analysis of the quality of ethnicity coding in hospital datasets by Scobie et al. (2021) highlighted several data quality problems (e.g. incomplete and inconsistent use of ethnicity codes, excessive use of 'unknown', 'other' and 'not stated' categories). These data quality problems were found to disproportionately affect records for people from minoritised ethnic groups (Scobie et al., 2021). The use of such data can introduce bias in the results and/or impede reliable analysis of ethnic inequalities (Raleigh & Goldblatt, 2020; Scobie et al., 2021). Moreover, there is a risk of misclassification brought about by the use of surname recognition software and inconsistencies have been reported when multiple ethnicity coding hierarchies in primary care are used (Tippu et al., 2016). To reduce discrepancies and biases in the data, the use of self-reported ethnicity using official classifications of ethnicity is recommended (Raleigh & Goldblatt, 2020; Saunders et al., 2013).

The aim of this study is to use nationally representative data to provide an up-to-date description of how MLTCs vary across ethnic groups in the UK. We describe the pattern of MLTCs, and MLTCs that include MHCs, with age across ethnic groups using data from a survey of patients in primary care and routine health data. By using these two data sources, we hope to overcome the aforementioned data quality issues and to optimise our understanding of ethnic variation in MLTCs across different age groups.

METHODS

Data

This study uses data from the English GP Patient Survey (GPPS) and Clinical Practice Research Datalink (CPRD) Aurum. The GPPS is a large-scale postal survey which captures reported patient experience of primary care (Davey et al., 2016). It is the only patient experience survey that is standardised across the country and is sent to over two million people asking them to respond to questions on demographics, their health and their experiences of the health-care staff and primary care (GP Patient Survey, 2021). The GPPS collects high quality ethnicity data which

makes it possible to disaggregate the white ethnic group, thereby allowing for the assessment of patterns of MLTCs by age for marginalised white populations such as the Gypsy, Roma and Traveller community whose health outcomes have been shown to differ markedly from the white British ethnic group (Bécares, 2015). For this analysis, GPPS data were shared with the University of Cambridge under a data sharing agreement with NHS England. CPRD Aurum contains longitudinal, routinely-collected electronic health records from primary care practices based in England (Clinical Practice Research Datalink, 2022a). The study was reviewed for ethical and methods content and approved by the CPRD team (eRAP protocol number 21_000333). The database captures demographic characteristics, diagnoses and symptoms, prescriptions, vaccination history, laboratory tests and referrals to hospital and specialist care. Crucially, it provides a comprehensive definition of MHCs which includes a broad range of MHCs as recorded in primary care. As of March 2022, CPRD Aurum had approximately 41 million research acceptable patients (Clinical Practice Research Datalink, 2022a). Full details about the use of data from GPPS and CPRD are available from the respective websites (Clinical Practice Research Datalink, 2022b; GP Patient Survey, 2022).

Study population

For self-reported MLTCs, we combined GPPS data from 2015 to 2016 and 2017 (fieldwork waves January–March 2016, July–September 2016 and January–March 2017; Ipsos MORI, 2016, 2017). In 2017, participants received two reminders and the overall response rate was 37.5%. For this study, we included GPPS respondents aged 18 years and above. For primary care reported MLTCs, we used CPRD Aurum data from a random sample of 690,000 patients to achieve an expected sample of at least 600,000 with complete ethnicity data. We included patients who, on 1st January 2016, were aged 18 years and above, registered in a CPRD practice and eligible for linkage to Hospital Episode Statistics (HES), ONS mortality data and the 2015 Index of Multiple Deprivation (IMD) score (Ministry of Housing Communities & Local Government, 2015).

Measures

To identify long-term conditions in GPPS, we used responses to a question asking participants to specify the long-term conditions they had from a list of 15 conditions (Supplementary Table S1). We considered all responses including 'another long-term condition'. We defined MLTCs as having two or more LTCs and grouped people into those with 0–1 LTC, those with MLTCs and those with MLTCs that include MHCs. In this study, MHCs include everyone who endorsed the response option 'a long-term mental health problem' as one of these 15 responses and would therefore be expected to include both common mental health disorders (e.g. anxiety, depression) and severe mental illnesses (e.g. bipolar disorder). The prevalence of long-term conditions reported in response to this question have been compared with other nationally representative survey data (Health Survey for England), and found to give reasonable estimates, apart from long-term MHCs, where estimates of prevalence are higher than from other sources (Mujica-Mota et al., 2015). Ethnic identity was self-ascribed. Respondents were asked to select their ethnic group from 18 ethnic categories based on the England and Wales 2011 Census categories (Ipsos MORI and National Health Service, 2017; Office for National Statistics, n.d.). Women, older people and those living in more deprived areas were more likely to have missing ethnicity data

(Supplementary Table S2). Participants were grouped into seven age categories (i.e. 18–24, 25–34, 35–44, 45–54, 55–64, 65–74 and 75+). We used IMD scores derived from participants' postcodes linked to the Office of National Statistics aggregated at the Output Area, which we recoded into quintiles (Ipsos MORI, 2016, 2017).

Long-term conditions in CPRD Aurum were identified using diagnosis, symptom and therapy data. We adopted the same approach to defining and operationalising MLTCs as in GPPS described above. We counted the total number of conditions present on 1st January 2016 out of a possible 32 physical and MHCs (Supplementary Table S3) that have previously been linked to higher risk of premature death, poor functioning and quality of life, and high use of primary care services (Cassell et al., 2018) using and adapting published code lists (GitHub, 2022). Ethnic identity, usually self-ascribed, was obtained from SNOMED codes recorded by the GP or, where that was missing or incomplete, from linked HES records. Where multiple values of ethnicity have been recorded, we selected the modal value where this was unique, or the most recent value in line with recommendations made by Mathur et al. (2014). Categories from the England and Wales 2011 Census (Office for National Statistics, n.d.) were used in our analysis but we combined white British, white Irish and other white because these separate categories were not available in HES. Ethnicity data was missing for 14.6% of the sample. Men, younger people and those with fewer LTCs were over-represented in those with missing ethnicity data (Supplementary Table S4). CPRD respondents were also grouped into the seven categories described above. Area-level deprivation data, derived from participant's postcode of residence were based on the 2015 IMD classification at lower super output area (Clinical Practice Research Datalink, 2022c). Deprivation was included in the models as a categorical variable, stratified into quintiles.

Statistical modelling

Preliminary model development was conducted before analysing GPPS data. In preliminary work we explored weighted and unweighted analyses, the inclusion of both linear and categorical age, and the heterogeneity in the relationship between ethnicity and multimorbidity by age. We also explored models with (multilevel) and without a random effect for GP practice and found no impact on the estimates. In our final analysis we combined responses across two years (the 2015/2016 and 2017 survey waves). We report descriptive statistics using numbers of GPPS respondents from both years but estimated weighted percentages in descriptive analyses (to account for non-response and sampling) for 2017 only as cross-sectional survey weights cannot be combined over years (Ipsos MORI, 2017).

For the CPRD analyses unweighted descriptive statistics were calculated. Using data from both datasets, in two separate analyses, we modelled the association between log odds of having MLTCs and age using a multilevel logistic regression model with patients nested within GP practices and adjusted for sex and deprivation. From these models we estimated adjusted percentages ('recycled predictions') at the median deprivation quintile and at estimates at an average of the male and female responses. Age categories were interacted with ethnicity to describe differences in the age-related change in number of LTCs in minoritised ethnic groups compared with the white majority. Because the relationship between multimorbidity and ethnicity varies by age (Stafford et al., 2022), we only present adjusted analyses from models which include this interaction term. We also modelled the log odds of having MLTCs including MHCs recorded versus having 0–1 LTC by age and ethnicity.

RESULTS

The characteristics of the GPPS and CPRD Aurum sample are presented in Table 1. We included 1,432,641 participants from GPPS and 589,246 participants from CPRD Aurum. In both datasets, there were more women than men. People from the white majority ethnic group were generally older than people from minoritised ethnic groups. In the GPPS sample, the higher proportions of older people (i.e. people aged 65 years and above) appear to be driven by white British (27.7%) and Irish (37.4%) respondents who are older than Gypsy or Irish Travellers (7.7%) and those from other white backgrounds (7.8%). In both the GPPS and CPRD sample, most people from minoritised ethnic groups were overrepresented in the most deprived areas.

Table 2 shows the age and ethnicity specific odds ratios (ORs) with 95% confidence intervals (CI) for people living with MLTCs, adjusted for age and gender and with an interaction between age and ethnicity. At the youngest age group, the odds of reporting MLTCs are lower for Indian [OR: 0.5, 95%CI: 0.4–0.6], Pakistani [OR: 0.5, 95%CI: 0.4–0.7], Bangladeshi [OR: 0.5, 95%CI: 0.4–0.8], Chinese [OR: 0.3, 95%CI: 0.2–0.5], other Asian [OR: 0.4, 95%CI: 0.3–0.6], Black African [OR: 0.4, 95%CI: 0.3–0.6] and people of other ethnicity [OR: 0.6, 95%CI: 0.5–0.8] compared to their white British counterparts. The likelihood of reporting MLTCs increases with age and in the older age groups, minoritised ethnic group people have higher odds of reporting MLTCs.

The adjusted prevalence of self-reported MLTCs by age and ethnic group is presented in Figure 1 (see Supplementary Table S5 for the full model estimates). For all ethnic groups, the likelihood of MLTCs was greater at older ages compared with younger ages. Among people aged 18–24 years, people of Indian [OR: 0.5, 95%CI: 0.4–0.6], Pakistani [OR: 0.4, 95%CI: 0.3–0.5], Bangladeshi [OR: 0.4, 95%CI: 0.3–0.6], Chinese [OR: 0.3, 95%CI: 0.1–0.5], African [OR: 0.3, 95%CI: 0.2–0.5], Other Asian [OR: 0.4, 95%CI: 0.3–0.5] and Other ethnicity [OR: 0.5, 95%CI: 0.4–0.7] were less likely to have MLTCs than their white British counterparts (Supplementary Table S5). The odds of MLTCs steadily increases for all ethnic groups and by middle age most people from minoritised ethnic groups fare worse than people with a white British ethnic background. This trend continues in later life, albeit with some attenuation to the effect size, such that at ages 75 years and above, the odds of having MLTCS are higher for people of Indian [OR: 1.3, 95%CI: 1.2–1.4], Pakistani [OR: 1.2, 95%CI: 1.1–1.4], Black Caribbean [OR: 1.2, 95%CI: 1.1–1.3] and Other ethnicity [OR: 1.1, 95%CI: 1.0–1.1] (Supplementary Table S5). Chinese people are less likely to have MLTCs across all age groups when compared to white British people. In contrast, Gypsy and Irish Travellers aged between 25 and 74 years of age have the highest odds of having MLTCs among all ethnic groups. The age-related patterns of MLTCs by ethnicity in the CPRD sample follow a similar trend; people from minoritised ethnic groups in the youngest age group had lower odds of having MLTCs compared to their white counterparts. Similarly, the odds of reporting MLTCs increases with age across all ethnic groups, and people from minoritised ethnic groups aged 75 years and above were more likely to report MLTCs than white people (see Supplementary Tables S6 and S7 for CPRD model estimates with and without adjustment for deprivation).

Table 3 shows the unadjusted percentages of people living with long-term MHCs, and those living with MLTCs that include a long-term MHC. Compared to the white British ethnic group, the proportion of people living with a self-reported long-term MHC is lower for people from minoritised ethnic groups except for Gypsy or Irish Travellers (14.9%). Similarly, levels of primary care recorded long-term MHCs are higher in white people than in people from minoritised ethnic groups. When we consider MLTCs including MHCs in the CPRD sample, all minoritised ethnic groups have a lower prevalence than their white counterparts. We observe a similar

TABLE 1 Description of the CPRD and GPPS samples.

	GPPS					CPRD				
	Number of respondents	Age 65+ (weighted %)	Female (weighted %)	Living in the most deprived 20% of areas (weighted %)	Living with MLTCs (weighted %)	Number of respondents	Age 65+ (%)	Female (%)	Living in the most deprived 20% of areas (%)	Living with MLTCs (%)
All included respondents	1,432,641	23.9	50.7	20.1	24.1	589,246	20.6	52.8	19.2	26.8
White						493,837	23.0	52.9	16.8	29.0
White British	1,172,070	27.7	51.1	16.7	26.3					
Irish	14,553	37.4	48.4	18.6	29.8					
Gypsy or Irish Traveller	365	7.7	40.4	35.3	26.7					
Any other White background	69,851	7.8	52.3	27.4	12.2					
Mixed						9405	5.7	54.6	29.1	13.6
White and Black Caribbean	3367	4.1	57.1	33.3	16.0					
White and Black African	1847	3.4	47.2	38.1	15.8					
White and Asian	3231	5.5	48.9	20.8	14.5					
Any other Mixed background	3637	7.2	52.6	28.3	17.2					
Asian										
Indian	37,643	10.0	45.1	20.8	16.0	16,999	12.0	50.3	18.1	19.6
Pakistani	21,690	5.9	44.1	51.7	16.1	10,554	7.2	49.0	40.3	18.4
Bangladeshi	6955	3.5	45.2	56.3	17.4	4271	5.7	47.0	49.6	16.5
Chinese	7831	6.8	52.1	22.8	8.3	6065	5.6	56.8	20.3	5.9
Any other Asian background	20,199	8.5	49.3	27.3	15.9	11,654	8.0	53.0	20.3	13.9
Black										
African	19,922	3.7	47.9	50.5	11.8	14,052	4.9	53.2	44.1	11.8

TABLE 1 (Continued)

	GPPS					CPRD				
	Number of respondents	Age 65+ (weighted %)	Female (weighted %)	Living in the most deprived 20% of areas (weighted %)	Living with MLTCs (weighted %)	Number of respondents	Age 65+ (%)	Female (%)	Living in the most deprived 20% of areas (%)	Living with MLTCs (%)
Caribbean	12,573	16.3	57.8	42.3	25.8	7813	18.7	53.9	42.5	13.3
Any other Black background	5819	11.4	50.4	48.6	22.7	3930	4.5	52.3	42.5	13.3
Other						10,666	6.7	52.0	29.0	10.0
Arab	3023	6.0	38.7	37.7	16.4					
Any other ethnic group	28,065	10.5	44.1	40.0	19.3					

Abbreviations: CPRD, Clinical Practice Research Datalink; GPPS, GP Patient Survey; MLTCs, multiple long-term conditions.

TABLE 2 Age and ethnicity specific odds ratios (ORs) and 95% confidence intervals for people living with MLTCs, adjusted for age and gender and with an interaction between age and ethnicity. GP Patient Survey.

	Odds ratio for ethnicity in baseline age group (18–24)	**18–24**	**25–34**	**35–44**	**45–54**	**55–64**	**65–74**	**75+**
Odds ratio for age among people of White British ethnicity		Reference	1.2 (1.2–1.3)	1.9 (1.8–2.0)	3.5 (3.3–3.6)	6.6 (6.3–6.9)	11.5 (11.1–12.0)	21.4 (20.5–22.3)
		Additional age and ethnicity specific OR over and above effect of age and ethnicity in baseline groups						
White								
White British	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Irish	1.5 (0.9–2.6)	Reference	0.6 (0.3–1.1)	0.6 (0.3–1.0)	0.7 (0.4–1.2)	0.7 (0.4–1.2)	0.6 (0.4–1.1)	0.6 (0.3–1.0)
Gypsy or Irish Traveller	1.7 (0.5–5.6)	Reference	2.4 (0.6–9.3)	1.8 (0.5–6.9)	1.7 (0.5–6.1)	1.3 (0.4–4.7)	1.3 (0.3–5.1)	0.4 (0.1–1.8)
Any other White background	0.6 (0.5–0.7)	Reference	0.9 (0.7–1.1)	1.0 (0.8–1.3)	1.4 (1.2–1.8)	1.6 (1.3–2.0)	1.6 (1.3–2.0)	1.5 (1.3–1.9)
Mixed								
White and Black Caribbean	1.2 (0.9–1.7)	Reference	1.1 (0.7–1.6)	1.1 (0.7–1.6)	1.1 (0.8–1.6)	0.9 (0.6–1.3)	0.9 (0.6–1.4)	0.7 (0.4–1.0)
White and Black African	0.9 (0.5–1.7)	Reference	0.7 (0.3–1.5)	0.9 (0.5–1.8)	1.3 (0.7–2.4)	1.4 (0.7–2.6)	1.4 (0.7–2.9)	1.2 (0.5–2.7)
White and Asian	0.9 (0.6–1.4)	Reference	0.7 (0.4–1.3)	1.3 (0.8–2.1)	1.1 (0.7–1.8)	1.2 (0.7–1.9)	1.1 (0.7–1.8)	1.2 (0.7–2.2)
Any other Mixed background	1.7 (1.2–2.4)	Reference	0.7 (0.5–1.1)	0.6 (0.4–1.0)	0.7 (0.5–1.1)	0.6 (0.4–1.0)	0.7 (0.4–1.0)	0.5 (0.3–0.8)

TABLE 2 (Continued)

	Odds ratio for ethnicity in baseline age group (18–24)	18–24	25–34	35–44	45–54	55–64	65–74	75+
Asian								
Indian	0.5 (0.4–0.6)	Reference	0.8 (0.6–1.0)	1.2 (0.9–1.5)	2.0 (1.6–2.5)	2.7 (2.1–3.4)	2.9 (2.3–3.6)	2.7 (2.2–3.5)
Pakistani	0.5 (0.4–0.7)	Reference	1.2 (0.9–1.6)	2.0 (1.5–2.5)	2.9 (2.3–3.6)	4.1 (3.2–5.2)	4.1 (3.2–5.3)	3.0 (2.3–3.8)
Bangladeshi	0.5 (0.4–0.8)	Reference	1.7 (1.2–2.6)	2.8 (1.9–4.0)	3.6 (2.5–5.3)	5.1 (3.5–7.6)	3.9 (2.6–6.0)	2.8 (1.8–4.4)
Chinese	0.3 (0.2–0.5)	Reference	1.0 (0.5–2.0)	1.4 (0.7–2.6)	1.5 (0.8–2.8)	1.9 (1.0–3.6)	2.2 (1.2–4.1)	2.6 (1.4–4.8)
Any other Asian background	0.4 (0.3–0.6)	Reference	1.5 (1.1–2.2)	1.6 (1.2–2.3)	2.1 (1.5–2.9)	2.8 (2.0–4.0)	2.9 (2.1–4.0)	2.6 (1.8–3.7)
Black								
African	0.4 (0.3–0.6)	Reference	0.9 (0.6–1.4)	1.3 (0.9–1.8)	1.9 (1.4–2.7)	2.3 (1.6–3.2)	2.9 (2.0–4.1)	2.3 (1.6–3.4)
Caribbean	1.0 (0.7–1.5)	Reference	0.9 (0.6–1.4)	0.9 (0.6–1.3)	1.1 (0.8–1.7)	1.3 (0.9–1.8)	1.5 (1.0–2.2)	1.6 (1.1–2.3)
Any other Black background	0.9 (0.5–1.5)	Reference	1.2 (0.6–2.2)	1.1 (0.6–2.0)	1.3 (0.8–2.3)	1.6 (0.9–2.8)	2.0 (1.1–3.5)	1.6 (0.9–2.8)
Other								
Arab	0.8 (0.4–1.4)	Reference	0.7 (0.4–1.5)	1.6 (0.8–3.0)	2.2 (1.1–4.1)	2.2 (1.2–4.2)	2.0 (1.0–3.8)	1.7 (0.8–3.5)
Any other ethnic group	0.6 (0.5–0.8)	Reference	1.3 (0.9–1.7)	1.6 (1.2–2.1)	2.0 (1.5–2.7)	2.3 (1.7–3.0)	2.3 (1.7–3.0)	1.9 (1.4–2.5)

Abbreviation: MLTCs, multiple long-term conditions.

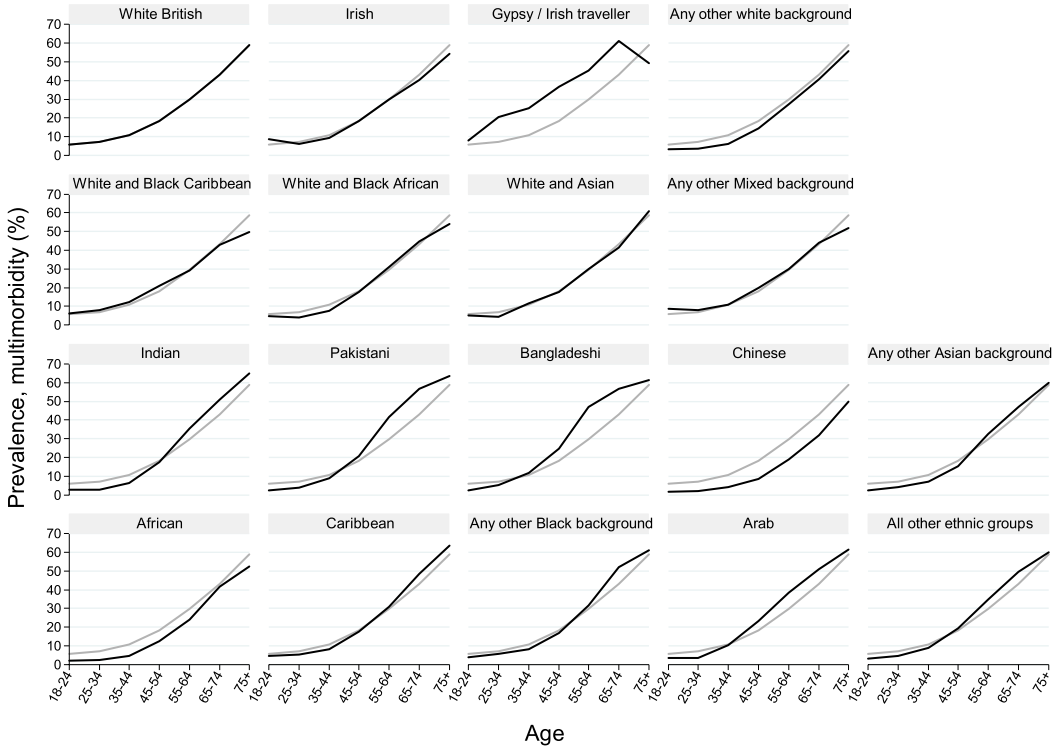

FIGURE 1 Adjusted percentage of people living with multiple long-term conditions, stratified by age and ethnicity from the GP Patient Survey sample. Estimates for white ethnic group are represented in grey for comparison; see Supplementary Table S5 for model underlying the figure. For Clinical Practice Research Datalink model estimates with and without adjustment for deprivation see Supplementary Tables S6 and S7.

trend in the GPPS sample, however Gypsy or Irish Travellers, white and Black Caribbean, white and Black African, white and Asian and Other mixed people have higher rates of MLTCs that include MHCs (9.9%, 6.1%, 4.4%, 4.6% and 4.8%, respectively) than the white British ethnic group (3.8%).

In Table 4, we present the age and ethnicity specific ORs and their 95% CIs for people living with MLTCs that include MHCs, adjusted for age, and gender and with an interaction between age and ethnicity. At the youngest age group, the odds of reporting MLTCs including MHCs are lower for all minoritised ethnic groups when compared to their white counterparts. The likelihood of reporting MLTCs that include MHCs are higher in the older age groups. Figure 2 illustrates the adjusted percentages of people living with MLTCs that includes a long-term MHC (see Supplementary Table S8 for full model estimates). Among all ethnic groups, the prevalence of having MLTCs that includes MHCs is considerably lower than the prevalence of having MLTCs (note the different scale for Figures 1 and 2). From approximately 50 years until 74 years of age, Pakistani and Bangladeshi ethnic group people not only have higher rates of MLTCs that include MHCs, but they also have steeper age-related increases when compared to white ethnic group people. None of the other minoritised ethnic groups had higher rates of MLTCs that include MHCs in comparison to people of white ethnicity. These patterns were similar in GPPS data with most people from minoritised ethnic groups reporting lower prevalence of MLTCs that include MHCs when compared to people of white British ethnicity across the age groups (Supplementary Table S9).

TABLE 3 Percentage of people living with long-term MHCs, and MLTCs that include a long-term MHC. GP Patient Survey and CPRD Aurum.

	GPPS		CPRD	
	Living with a long-term MHC (number, weighted %)	**Living with MLTCs including MHCs (number, weighted %)**	**Living with a long-term MHC (number, %)**	**Living with MLTCs including MHCs (number, %)**
All included respondents				
White			57,099 (11.6)	41,812 (8.5)
White British	59,624 (6.0)	39,274 (3.8)		
Irish	720 (5.9)	533 (4.3)		
Gypsy or Irish Traveller	55 (14.9)	45 (9.9)		
Any other White background	2402 (3.1)	1515 (1.9)		
Mixed			760 (8.1)	438 (4.7)
White and Black Caribbean	292 (9)	175 (6.1)		
White and Black African	124 (7.2)	69 (4.4)		
White and Asian	220 (7.9)	120 (4.6)		
Any other Mixed background	250 (7.4)	147 (4.8)		
Asian				
Indian	858 (2.1)	604 (1.4)	860 (5.1)	601 (3.5)
Pakistani	722 (3)	518 (1.9)	672 (6.4)	476 (4.5)
Bangladeshi	269 (3.7)	192 (2.5)	281 (6.6)	190 (4.4)
Chinese	151 (2.2)	68 (0.9)	161 (2.7)	57 (0.9)
Any other Asian background	571 (3.2)	383 (1.9)	518 (4.4)	331 (2.8)
Black				
African	430 (2.1)	252 (1.4)	614 (4.4)	330 (2.3)
Caribbean	481 (4.5)	327 (2.9)	596 (7.6)	436 (5.6)
Any other Black background	292 (5.3)	185 (3.2)	239 (6.1)	143 (3.6)
Other			597 (5.6)	330 (3.1)
Arab	148 (5.0)	106 (3.8)		
Any other ethnic group	1330 (4.7)	963 (3)		

Abbreviations: CPRD, Clinical Practice Research Datalink; MHCs, mental health conditions; MLTCs, multiple long-term conditions.

DISCUSSION

Summary of principle findings

In this study, we set out to describe ethnic inequalities in the pattern of MLTCs, and MLTCs that include MHCs by age using routine health data from primary care records and self-reported data from a survey of patients in primary care. We found that ethnic inequalities in MLTCs emerge by middle age as most people from minoritised ethnic groups aged 45 years and above had higher prevalence of MLTCs than people of white British ethnicity. These ethnic inequalities extended

TABLE 4 Age and ethnicity specific odds ratios (ORs) and 95% confidence intervals for people living with 2 + LTCs including a long-term MHC, adjusted for age, and gender and with an interaction between age and ethnicity. CPRD Aurum sample.

	Odds ratio for ethnicity in baseline age group (18–24)	**18–24**	**25–34**	**35–44**	**45–54**	**55–64**	**65–74**	**75+**
Odds ratio for age among people with White ethnicity		Reference	1.3 (1.2–1.4)	1.9 (1.8, 2.0)	2.7 (2.6, 2.9)	3.6 (3.5, 3.8)	5.1 (4.9, 5.4)	10.8 (10.3, 11.4)
		Additional age and ethnicity specific OR over and above effect of age and ethnicity in baseline groups						
White	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Mixed	0.6 (0.5, 0.8)	Reference	0.8 (0.6, 1.0)	1.0 (0.8, 1.3)	1.8 (1.4, 2.2)	2.1 (1.5, 2.8)	4.9 (3.4, 7.2)	7.0 (4.3, 11.2)
Asian								
Indian	0.4 (0.3, 0.6)	Reference	0.3 (0.3, 0.4)	0.5 (0.4, 0.6)	1.5 (1.3, 1.8)	3.0 (2.5, 3.6)	3.6 (2.8, 4.6)	7.0 (5.4, 9.0)
Pakistani	0.4 (0.3, 0.6)	Reference	0.5 (0.4, 0.6)	1.0 (0.8, 1.2)	2.4 (1.9, 2.9)	3.2 (2.5, 3.9)	7.8 (5.6, 10.7)	16.9 (11.7, 24.3)
Bangladeshi	0.3 (0.2, 0.5)	Reference	0.6 (0.4, 0.8)	1.1 (0.8, 1.5)	2.4 (1.7, 3.4)	7.9 (5.6, 11.2)	5.7 (3.2, 10.2)	7.6 (3.9, 14.7)
Chinese	0.1 (0.1, 0.2)	Reference	0.1 (0.1, 0.3)	0.1 (0.1.0.3)	0.4 (0.2, 0.8)	0.5 (0.3, 1.0)	0.7 (0.3, 1.5)	2.6 (1.0, 7.1)
Any other Asian background	0.2 (0.1, 0.3)	Reference	0.3 (0.3, 0.4)	0.5 (0.4, 0.6)	1.2 (1.0, 1.5)	1.7 (1.3, 2.3)	3.9 (2.9, 5.2)	6.4 (4.2, 9.7)
Black								
African	0.2 (0.2, 0.3)	Reference	0.3 (0.2, 0.3)	0.4 (0.3, 0.5)	0.9 (0.7, 1.1)	1.6 (1.2, 2.2)	2.3 (1.5, 3.5)	3.9 (2.4, 6.4)
Caribbean	0.4 (0.2, 0.6)	Reference	0.7 (0.5, 1.0)	1.1 (0.8, 1.4)	1.7 (1.4, 2.1)	3.0 (2.4, 3.7)	3.9 (2.9, 5.4)	8.7 (6.8, 11.0)
Any other Black background	0.4 (0.2, 0.6)	Reference	0.5 (0.4, 0.8)	0.8 (0.6, 1.2)	1.6 (1.2, 2.2)	2.3 (1.4, 3.7)	2.1 (0.9, 4.8)	5.5 (2.5, 11.9)
Other	0.3 (0.2, 0.4)	Reference	0.4 (0.3, 0.5)	0.7 (0.6, 0.9)	1.2 (1.0, 1.6)	2.2 (1.7, 2.9)	1.9 (1.2, 2.9)	6.4 (4.2, 9.6)

Abbreviations: CPRD, Clinical Practice Research Datalink; MHCs, mental health conditions.

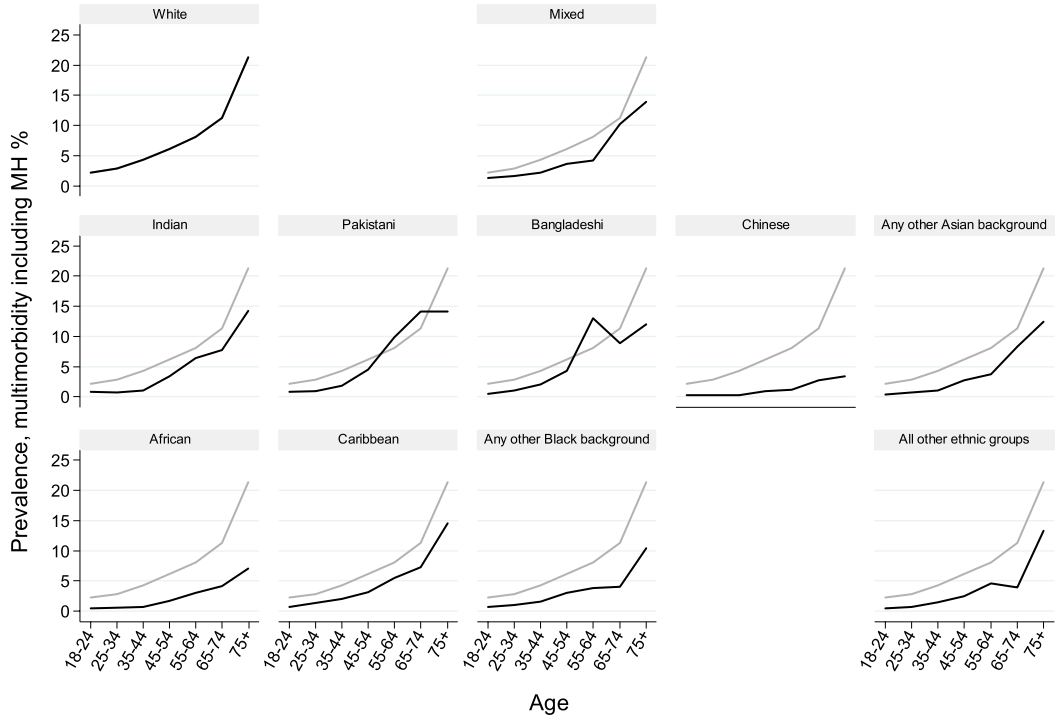

FIGURE 2 Adjusted percentage of people living with multiple long-term conditions including a long-term mental health condition. Clinical Practice Research Datalink Aurum sample. Estimates for white ethnic group represented in grey for comparison. See Supplementary Table S8 for model underlying this figure. For GP Patient Survey model estimates see, Supplementary Table S9.

into later life as older Indian, Pakistani, Black Caribbean and people of other ethnicity were found to be at an increased risk of MLTCs when compared to older white British people. We also found stark differences between some minoritised ethnic groups. For example, at all age groups, the prevalence of MLTCs was lower among Chinese ethnic group people compared to white British people. In contrast, except for the youngest and oldest age group, the prevalence of MLTCs was higher for Gypsy and Irish Travellers at all age groups. The prevalence of MLTCs including MHCs was considerably lower than the prevalence of having MLTCs. Compared to white people, Pakistani and Bangladeshi people aged between approximately 50 and 74 years had higher rates of long-term conditions that include MHCs. None of the other ethnic groups had higher levels of this type of MLTCs when compared to their white counterparts.

Comparison with existing literature

Our findings are consistent with those of Watkinson et al. (2021) who examined the association between ethnicity, gender and MLTCs among older adults in the UK. They found that with the exception of Black African men and Chinese people, older adults from minoritised ethnic groups reported as many or more long-term conditions as those from the white British majority group (Watkinson et al., 2021). Their study also found that inequalities were widest for Gypsy or Irish Travellers, Pakistani and Bangladeshi women (Watkinson et al., 2021). Whilst our study did not compare inequalities between men and women, we found that these three populations were indeed at an

increased risk of MLTCs. Our study contributes new knowledge by looking beyond the older population. Such analyses allow for the identification of ethnic group populations that are at particular risk of developing MLTCs at particular stages in the life course. Ultimately, the findings can inform policy makers and practitioners in the development of tailored interventions to address MLTCs.

The findings of this study are also concordant with international studies that have examined age-related ethnic inequalities in MLTCs (Hone et al., 2021; Rocca et al., 2014; St Sauver et al., 2015). As with our study, these studies also found that ethnic inequalities were not evident at younger ages but developed and widened in mid-life (Hone et al., 2021; Rocca et al., 2014; St Sauver et al., 2015). In addition, they found that people of Asian ethnicity reported fewer LTCs at most age groups compared to their white, Black or mixed counterparts (Hone et al., 2021; Rocca et al., 2014; St Sauver et al., 2015). This finding partially mirrors that of our study in that people of Chinese ethnicity had a lower prevalence of MLTCs than white British people across all age groups. Noteworthy is that unlike in our study, the Asian ethnic group in these studies was not disaggregated, thereby masking ethnic inequalities within individual ethnic groups. The data we used in our study allowed for the disaggregation of the Asian ethnic group and other ethnic groups, for example, the white ethnic group which consisted of Gypsy and Irish Travellers who had a higher prevalence of MLTCs compared to their white British counterparts across most age groups.

Our findings concerning ethnic inequalities in MLTCs that involve MHCs also partially support those of Bobo and colleagues who explored how the prevalence and patterns of somatic-mental health multimorbidity varied by age, sex and race in a US sample (Bobo et al., 2016). They also found that the prevalence of somatic-mental health multimorbidity was lower compared to the prevalence of general multimorbidity. The presence of somatic-mental health multimorbidity was lower in Asian people than in white and Black people (Bobo et al., 2016). Just as with the aforementioned international studies, Asian people were aggregated into one broad ethnic group leaving us with a partial understanding of ethnic inequalities in the prevalence of this type of MLTCs. Our study makes an important contribution to this body of literature by disaggregating the major ethnic groups and identifying Asian groups at risk of MLTCs that include MHCs (i.e. middle-aged Pakistani and Bangladeshi people).

A recent analysis of ethnic inequalities in physical health MLTCs among people with psychosis living in the UK found that Black people were at higher risk of psychosis compared to white people (Fonseca de Freitas et al., 2022). The differences between our findings and those of Fonseca de Freitas and colleagues could be attributed to the fact that their study included people below 18 years (age range 13–65 years) and focused on people with a particular type of severe mental illness: psychosis. Others have also found ethnic inequalities in MLTCs that include MHCs when they have focused on people with a particular physical condition. For example, Das-Munshi and colleagues found ethnic inequalities not only among people with diabetes, but also among people with diabetes and severe mental illness (Das-Munshi et al., 2021). Taken together, our findings and those of other studies illustrate the complexity of ethnic inequalities in health and raise several questions concerning the underlying processes that lead to differential health outcomes for different minoritised ethnic groups. It is to this that we turn to in the following section.

Possible mechanisms

The link between socioeconomic status, ethnicity and MLTCs has been articulated by many (Guy's and St Thomas' Charity, 2018; Hone et al., 2021; Impact on Urban Health, 2021; Verest et al., 2019; Watkinson et al., 2021). It is acknowledged that many, but not all people from minor-

itised ethnic groups are disadvantaged in terms of socioeconomic position due to racism and racial discrimination, reducing their access and opportunities within employment, education, health care, housing, and other sectors (Impact on Urban Health, 2021). These negative social outcomes may lead to the development of long-term conditions through lower access to health care, inadequate living standards, exposure to environmental stressors and pollutants, reduced levels of health literacy and increased risk of unhealthier behaviours (e.g. physical inactivity, substance abuse and poor diet; Hone et al., 2021; The Richmond Group of Charities and Impact on Urban health, 2021). Given underlying ethnic inequalities in economic and social factors, we adjusted for area-level deprivation (individual-level measures of socioeconomic deprivation were not present in the data analysed).

Whilst we acknowledge the limitations of adjusting for socioeconomic status at a single point in time, that ethnic inequalities in MLTCs were still evident suggests the need to look beyond socioeconomic disadvantage towards the root causes of this disadvantage. It is recognised that structural and institutional racism pattern the unequal distribution of access, power and opportunities (privileging some whilst disadvantaging others) resulting in ethnic inequalities across different domains of society, including socioeconomic position (Bécares et al., 2022). Yet, the role of structural racism as the fundamental cause of ethnic inequalities in health has often been overlooked in academic and political realms in favour of more proximal socioeconomic factors (Bécares et al., 2022). Historically, many people from minoritised ethnic groups have faced economic and social marginalisation due to racism and anti-Muslim discrimination in immigration policies, the housing sector and the labour market (Saini, 2022). In turn, these experiences result in differential health and social outcomes. These experiences and outcomes are further complicated for forced migrants (e.g. asylum seekers and refugees) who may not only face anti-immigrant sentiments, but also precarious accommodation and employment (Shankley & Finney, 2020). Therefore, racism and discrimination should be considered in the theorising of, and when available, measuring of future analyses of ethnic inequalities in health and their underlying mechanisms.

The cumulative advantage/disadvantage theory has provided a framework for researchers to understand ethnic inequalities in MLTCs (Quiñones et al., 2011, 2019; Watkinson et al., 2021). The theory emphasises how early advantage or disadvantage is critical to how cohorts become differentiated over time. It recognises the power of social processes and forces that influence the distribution of opportunities among individuals which impact on short-term and long-term outcomes (Dannefer, 2003; Ferraro & Kelley-Moore, 2003). When ethnic inequalities in MLTCs are viewed through this lens, the higher prevalence of MLTCs in some minoritised ethnic groups can be attributed to earlier and longer cumulative exposure to risk factors common to many long-term conditions (Quiñones et al., 2019). In fact, risk factors that affect multiple body systems (e.g. obesity, persistently raised levels of stress and systemic inflammatory markers) are prevalent among minoritised ethnic groups and can lead to earlier development of MLTCs (Quiñones et al., 2019).

Geronimus et al. (2006) offer support for this notion. They examined whether Black people living in the US experienced earlier health deterioration than their white counterparts and found racial differences in the cumulative wear and tear of the body caused by repeated adaptation to stressors (Geronimus et al., 2006). For them, the challenges that come with living in a race-conscious society which stigmatises and disadvantages Black people may result in disproportionate physiological deterioration, such that a Black person may exhibit the morbidity and mortality typical of a white person who is significantly older (Geronimus et al., 2006). Evidence from the UK also shows that the detrimental impacts of the experience of racism on health start

early in the life course and accumulate over time (Bécares et al., 2015; Wallace et al., 2016). For these reasons, a discussion of processes underlying ethnic inequalities in MLTCs cannot be complete without a consideration of how these upstream forces (e.g. racism and discrimination) intersect with individual level processes (Bowleg, 2012; Impact on Urban Health, 2021; Nazroo et al., 2020) to shape the health outcomes of different ethnic groups at different stages in life.

Our study finds that ethnic inequalities in the prevalence of MLTCs emerge in middle age and continue into later life for many people from minoritised ethnic groups. It is possible that this trend could be the result of particular long-term conditions. MHCs tend to increase in prevalence to mid-life (Gondek et al., 2022). Our analysis shows that based on primary care records, MHCs are more prevalent in white people than in people from minoritised ethnic groups. Arguably, MHCs could be driving the higher prevalence of MLTCs in younger white adults. Similarly, diabetes prevalence increases with age and is markedly higher in some people from minoritised ethnic groups than white people (Mathur et al., 2020). It is possible that diabetes could be driving the higher prevalence of MLTCs that we observed in mid and later life for some people from minoritised ethnic groups.

Given that ethnic inequalities in the prevalence of MHCs have been reported by several studies (Halvorsrud et al., 2019; McManus et al., 2016; Nazroo et al., 2020; Weich et al., 2004), the lower levels of MLTCs that include MHCs among most people from minoritised ethnic groups seen in our study requires further scrutiny. We may be observing an underestimation of the levels of MLTCs that include MHCs among some people from minoritised ethnic groups in primary care. Therefore, these findings must be interpreted with caution. This underestimation may stem from lower levels of health-care utilisation caused by language barriers, shame, stigma, mistrust and fear due to racism and discrimination (Grey et al., 2013), which might hinder some people from minoritised ethnic groups from seeking support for MHCs from primary care practitioners. These underestimations may also be the result of misdiagnosis or the failure to detect symptoms by primary health-care practitioners when people from minoritised ethnic groups engage with primary care (de la Cruz et al., 2015). Support for this notion is provided by Bignall et al. (2020) who posit that people from minoritised ethnic groups are often less likely to access mental health support services through primary care (e.g. via general practitioners) and are more likely to end up in crisis care. Evidently, the reasons underlying any underestimations of the prevalence of MLTCs that include MHCs among minoritised ethnic groups are likely to involve the complex interaction of several processes.

In this study, we found a lower prevalence of MLTCs among Chinese people when compared to white British people. This observation has also been reported by others. For example, Watkinson and colleagues found a lower prevalence of MLTCs among Chinese elders (Watkinson et al., 2021). It is possible that differential migration histories, migrant identities and processes of racialisation all intersect to produce different outcomes for different ethnic groups. However, it is important to remember that there is heterogeneity within the Chinese group and inequalities in the impact of MLTCs have been reported by those who have analysed primary care data and found that when compared to white people, the mortality rate associated with MLTCs that affect different body systems is significantly higher for Chinese people as well as Black African, Black other and Pakistani people (Stafford et al., 2022).

Strengths and limitations

A shortcoming of this study is that we assessed MLTCs cross-sectionally. Consequently, we are unable to draw conclusions about the temporal nature of MLTCs across ethnic groups. Also, whilst we use a commonly used definition of MLTCs (Barnett et al., 2012; Cassell et al., 2018), this

definition fails to capture the severity and duration of the primary care reported and self-reported LTCs and their impact on quality of life. Relatedly, conditions such as hypertension are considered risk factors for other diseases (e.g. stroke and heart attacks; National Health Service, 2023). Thus, some may exclude hypertension from analyses of the prevalence of MLTCs. In keeping with other studies exploring ethnic inequalities in MLTCs (Dorrington et al., 2020; Watkinson et al., 2021) we included hypertension in our analyses. To ensure the results were not biased as a result of the inclusion of hypertension, we conducted sensitivity analyses comparing the results with and without hypertension and found no difference in the reported trends.

In this study, we adopted complete-case analysis to address missing data. We recognise that this solution can lead to the exclusion of a large proportion of the sample and introduce some degree of bias. However, this approach is commonly used in epidemiological analysis and the large sample size in both the CPRD and GPPS dataset meant that there was no substantial loss in statistical power and precision in our analyses (Ross et al., 2020; Sterne et al., 2009). Other approaches for addressing missing data are also imperfect; for example, including an 'unknown ethnicity' category can also produce biased estimates (Vach & Blettner, 1991) and multiple imputation assumes that data is missing at random. Given the nature of primary care data, such assumptions may not hold as data quality problems often affect people from minoritised ethnic groups (Saunders et al., 2013; Scobie et al., 2021).

Additionally, the proportion of people with missing data in the CPRD dataset was higher than that of the GPPS. An assessment of the vulnerability of those with missing data revealed that they had fewer recorded LTCs. However, this group also had shorter follow-up time. Therefore, it is unclear as to whether the lower prevalence of LTCs in this group is due to their shorter follow-up time or due to actual differences in health status. Further research would be required to ascertain not only the extent to which follow-up time impacts on recording of LTCs, but also the characteristics of those with shorter follow-up time, the reasons for differences in follow-up time and the impact on health and well-being.

It is important to remember that the CPRD sample (and to a lesser but still important extent GPPS sample) we used in this analysis represents a population that is in contact with health-care services. Our findings may, therefore, not reflect the true level of inequality as we may have inadvertently excluded those who do not access or utilise health services. Lastly, we did not examine the role that migration history and/or immigration status plays on the prevalence of MLTCs. Future research could investigate the extent to which these processes impact on the health outcomes of people from minoritised ethnic groups.

This study has identified ethnic inequalities in the prevalence of MLTCs but has not examined differences across gender. Other studies, such that by Watkinson et al. (2021) have examined and identified gender differences in the prevalence of MLTCs for different ethnic groups. Their analysis focused on older people and revealed that Black African men were least likely to report MLTCs when compared to white men. In contrast, Black African women had higher odds of reporting MLTCs than their white counterparts (Watkinson et al., 2021). Future research could examine whether and how the identified inequalities differ between younger men and women from different ethnic groups. Such findings would be key for informing targeted efforts aimed at addressing any observed inequalities.

Despite these limitations, this study has several strengths. First, by examining ethnic differences in age-related patterns in MLTCs, we provide a nuanced understanding of ethnic inequalities in MLTCs. It is crucial for health-care systems to recognise and respond to the higher prevalence of MLTCs that develop by middle age for many people from minoritised ethnic groups. Support with management of MLTCs is required to slow or even halt the progression

of MLTCs, thereby improving their quality of life and well-being. At the same time, continued efforts are required across government, public, private sector bodies and the third sector to tackle structural, institutional and interpersonal racism, the fundamental causes of ethnic inequalities in health (Bécares et al., 2022; Khan, 2020; Stopforth et al., 2022).

Second, the use of two data sources, GPPS data and CPRD Aurum meant that we analysed self-reported and primary care recorded LTCs. In doing so, we address reporting bias which some consider to be a potential factor driving observed differences in the prevalence of MLTCs between ethnic groups (Afuwape et al., 2006). Given that similar patterns were observed using self-reported health and primary care records, the inequalities observed in mid- and later life do not seem to be driven by differences in recording. Third, it has been reported that prevalence estimates tend to be influenced not only by the types of conditions, but also by the number of conditions considered when operationalising MLTCs (Fortin et al., 2012). The fewer the conditions reported, the lower the prevalence estimates. The broad range of MHCs in CPRD Aurum prevents the underestimation of the prevalence of MLTCs that include a MHC. Lastly, the good quality ethnicity data collected through the GPPS gives insight into other white, Arab and Gypsy or Irish Traveller ethnic groups who are often aggregated with other ethnic groups or excluded from analyses due to small numbers (Hayanga et al., 2023). Thus, we avoid the essentialisation of people from minoritised ethnic groups and generate a holistic understanding of ethnic inequalities in the prevalence of MLTCs.

Conclusion

In this study, we examined ethnic inequalities in the age-related patterns of MLTCs using self-reported and primary care data. We found ethnic inequalities from mid-life onwards for Gypsy or Irish Travellers, older Black Caribbean, Indian, Pakistani and other ethnic group people, and reported ethnic inequalities in MLTCs that include MHCs for Pakistani and Bangladeshi people aged between 50 and 74 years. This study adds to the sparse body of literature in this field. However, it raises further questions concerning the accuracy of the prevalence of MLTCs that include MHCs in primary care that warrants further investigation. To arrive at a better understanding of age-related inequalities in MLTCs, future work that adopts a longitudinal, intersectional approach is required. Such work would illuminate the role that key explanatory factors (including racism and discrimination) play in the development, accumulation and progression of MLTCs over time for different ethnic groups. Analysis that considers how MLTCs impact on quality of life is also required. Such findings can help health-care leads who serve people from minoritised ethnic groups to prioritise and tailor clinical management efforts and inform policymakers on how to prevent and reduce inequalities in MLTCs at different stages in the life course.

AUTHOR CONTRIBUTIONS

Brenda Hayanga: Investigation (lead); project administration (equal); writing—original draft (lead); writing—review and editing (lead). **Mai Stafford**: Conceptualization (equal); formal analysis (equal); funding acquisition (equal); methodology (equal); writing—review and editing (equal). **Catherine L Saunders**: Conceptualization (equal); formal analysis (equal); methodology (equal); writing—review and editing (equal). **Laia Bécares**: Conceptualization (equal); funding acquisition (equal); project administration (equal); writing—review and editing (equal).

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CONFLICT OF INTEREST STATEMENT

MS is employed by The Health Foundation. The authors have no competing interest to declare.

DATA AVAILABILITY STATEMENT

The study uses individual-level data from General Practice Patient Survey which is available from Ipsos MORI via a data sharing agreement with NHS England. The authors also use routinely collected individual patient data which can be obtained from Clinical Research Practice Datalink subject to protocol approval via CPRD's Research Data Governance (RDG) Process. Although these data are anonymised, they are considered sensitive data in the UK by the Data Protection Act and, therefore, cannot be shared publicly. Information about applying to use data from GPPS and CPRD can be found at https://gp-patient.co.uk/contact and https://www.cprd.com/data-access respectively.

ETHICS STATEMENT

The study was reviewed for ethical and methods content and approved by the CPRD team (eRAP protocol number 21_000333).

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ENDNOTE

[1] Converted from $50 to $25000 using exchange rates valid on 22 August 2023.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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