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Examining ethnic inequalities in health and tenure in England: A repeated cross-sectional analysis

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ABSTRACT

Ethnic minorities experience multiple inequalities across different domains including health and tenure. Notwithstanding extensive research demonstrating a clear connection between tenure and health, the relationship between health, tenure and ethnicity is under-explored. In this paper, we examine ethnic inequalities in health and tenure in England using cross-sectional census microdata for 1991, 2001 and 2011. We find that ethnic inequalities in health persist over time while the relationship between health and tenure varies between ethnic groups. These results suggest that traditional explanations linking health and tenure are not sufficient to adequately capture the myriad experiences of different ethnic groups.

1. Introduction

Housing and housing quality are of fundamental importance to our health: place of residence determines access to a wide range of facilities and exposure to hazards, both in the home and local environment. Differential access to the housing market and tenures may therefore contribute to the creation and maintenance of health inequalities in the population. This is pertinent to ethnic inequalities in health given that experiences of and access to the housing market varies between ethnic groups. The housing careers of ethnic minorities have historically been shaped by the settlement patterns of first generation migrants, varying to that of the native majority. Arriving in inner city areas near transport hubs, first generation migrants sought affordable, readily available homes: typically, private rentals. For some, longevity gradually heralded eligibility for social housing while others, after accumulating capital, sought affordable, appropriate home-ownership. Despite movements away from traditional settlement areas and entry into different tenures, ethnic minority groups continue to be disadvantaged in the housing market: living in overcrowded accommodation, disproportionately burdened by insecure tenures and seeing some of the greatest growth in privately rented accommodation (Finney and Harries, 2013).

Persisting inequalities in the housing sector for ethnic minority groups are of critical importance if such disparity translates into multiple inequalities across different social, economic and crucially, health domains. Health inequalities within and between ethnic minority groups are widely documented (Nazroo, 1997; Cooper, 2002; Sproston and Mindell, 2006; Salway et al., 2007a; Bécares, 2015; Darlington et al., 2015) with evidence suggesting these inequalities are transmitted across generations (Harding and Balarajan, 2000; Smith et al., 2009). Explanations for these inequalities are increasingly sought in discussions of the interaction between ethnicity and broader socio-economic and spatial inequalities between ethnic groups (Nazroo, 2003; Nazroo and Williams, 2006; Mindell et al., 2014), rather than discussions of genetic difference (see Kaufman et al., 2015). However, the inter-relationships between health, tenure and ethnicity are under-explored in the context of ethnic inequalities in health.

This paper addresses this research gap, contributing to current debates on the nature of ethnic inequalities in health and the extent to which ethnically differentiated experiences of the housing market shape these differences. Health and housing are inextricably and historically linked (Avecedo-Garcia et al., 2004), entwined through the complex inter-relationships between area characteristics, housing quality, housing tenure and health. However, the dynamics of the relationship between health, tenure and ethnicity will vary over time and across space according to changing migration histories, changes in the housing market, changing patterns of internal migration; and across the life-course. The extent to which responses to these changes are ethnically differentiated may depend on length of residency in England, attachment to traditional values and cultural norms, and broader contextual factors.

To proceed, we review key debates on the relationships between tenure and health, ethnicity and health, and ethnicity and tenure. In particular, this section draws on literatures assessing the causal pathways between tenure and health; exploring segregation, residential

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mobility and the extent to which ethnic minorities have become concentrated in different housing tenures; and the social determination of ethnic inequalities in health. We then address the following research questions:

1) Are the relationships between tenure and health ethnically differentiated?
2) Is this consistent over time?

2. Context

2.1. Ethnicity and health

Ethnic minorities tend to have poorer health than majority ethnic groups. Nazroo (2003) found a higher risk of cardiovascular disease (CVD) amongst Indians, higher risk of diabetes amongst Pakistanis and Bangladeshis, and higher rates of stroke and hypertension amongst Caribbeans in the UK. More generally, Pakistanis, Bangladeshis and Caribbeans have relatively higher rates of poor health when measured by general mortality and morbidity (Nazroo, 1998; Harding, 2003; Bécares et al., 2012; Darlington et al., 2015). Whilst Indians tend to experience relatively good health overall, Babb et al. (2004) found gendered differences noting the poorer health of Indian women. Supposed biological differences or inherent features of distinct ethnic groups are no longer thought to explain these disparities in health. Instead, we must consider both the socioeconomic composition of different ethnic groups in relation to social determinants of health, and the possible additional impact of an 'ethnic penalty'. Contemporary research increasingly finds that ethnic inequalities in health are maintained within unfair societies, divided along social and economic lines (Smaje, 1995; Nazroo, 2001; Stronks and Kunst, 2009). A breadth of research reveals sustained ethnic disadvantage in the labour market (Nazroo, 1997; DWP, 2014; Kapadia et al., 2015; Catney and Sabater, 2015); lower incomes (Hills et al., 2010; Nandi and Platt, 2010); increased risk of living in deprived neighbourhoods (Jivraj and Khan, 2015); and, despite a narrowing gap in educational attainment (Lymperopoulou and Parameshwaran, 2015) ethnic minorities reap less return on their educational investment (Lynch and Kaplan, 2000). Where ethnic minorities are disproportionately concentrated in more disadvantaged circumstances (Modood et al., 1997; Barnard and Turner, 2011), it follows that the uneven exposure to different social determinants of health results in uneven health outcomes (Marmot, 2005; Bambra and Eikemo, 2008).

Not all population subgroups experience equivalent levels of poor health in equivalent disadvantage, suggestive of an ethnic penalty: are ethnic minorities penalised in some way over and above what would be expected given their socioeconomic status? The additional health disadvantage experienced by ethnic minorities after adjusting for socioeconomic status or defined features of disadvantage (e.g. deprivation) can be explained by experiences of discrimination, marginalisation and racial harassment (Nazroo, 1998; Karlsen and Nazroo, 2002; Williams and Mohammed, 2009; Harris et al., 2012).

2.2. Tenure and health

Research consistently finds housing tenure to be associated with mortality and morbidity. Those in owner-occupied accommodation tend to be in better health than those in rented accommodation, with further differences found between private and social rentals (Macintyre et al., 1998; Macintyre, 2001; Macintyre et al., 2003; Cairney and Boyle, 2004; Shaw, 2004). In older ages, risk of entry into long-stay care facilities varies by tenure, with lower risks for those in owner-occupied accommodation contrasting with higher risks for renters (Connolly, 2012). However, it is unclear why this association arises: does tenure act as a marker of socioeconomic status or income and therefore indicate material well-being? Or, do variations in health arise through exposure to different hazards in the home environmental or local area?

A study of elderly adults across Europe found lower levels of educational attainment amongst renters compared to owners (Dalstra et al., 2006) suggesting that the composition of tenures may be an important determinant of health differences. Similarly, an Australian study found no independent effect of tenure on mental health outcomes explaining health differences by tenure compositions (Baker et al., 2013). Nevertheless, tenure has an independent significant relationship with health after adjusting for socioeconomic attributes such as educational attainment or social class (Macintyre et al., 2001). However, the strength of the association varies between countries (Dalstra et al., 2006). In countries where the association is stronger, this may arise from the differential exposure to different levels of health hazards, with housing quality and type varying dramatically between tenures, and differences in the characteristics of the local area also often varying by tenure (Windle et al., 2006; Habib et al., 2009). For example, inner city *more deprived* areas may feature more socially provided housing or private rentals than *less deprived*, more suburban or rural areas characterised by owner-occupied accommodation. Uneven health outcomes by tenure may therefore relate to wider contextual features.

The quality of housing, often tied up in the nature of the tenure, and the security of the tenure are also related to mental health (Evans et al., 2000). Wider aspects of the domestic environment, linked to housing, are also associated with mental and general health (Dunn, 2002). Where housing is viewed as a reflection of self-identity (analogous to views that tenure acts as a socioeconomic marker), a retreat, 'place of refuge' or place to exercise control (Dunn, 2002: 672), the association with mental and general health status may vary.

2.3. Ethnicity and tenure

The changing housing market positions of ethnic minorities are influenced by historic migration trajectories and settlement patterns governing the types of housing to which they are exposed. Traditionally, first generation migrants settled within the least desirable urban areas, typically within poorer quality, cheaper housing (Murie and Musterd, 1996; Musterd and Duerloo, 1997; Özüekren and van Kempen, 2003; Musterd, 2005). Settlement areas are characterised by specific employment and housing structures amenable to new arrivals (Catney and Simpson, 2010). Affordable, readily available housing is key because of the relatively disadvantaged labour market position of first generation migrants (Hamnett and Butler, 2008). Over time, theories of assimilation hold that ethnic minorities integrate into the social and economic structures of society while moving away from traditional settlement areas (Alba and Nee, 1997). Ethnic minority spatial mobility is therefore an important marker of immigrant integration (Bolt and van Kempen, 2010). We might therefore assume that, over time, ethnic minority distribution across tenures would converge to that of the majority population.

However, the socioeconomic and spatial trajectories of ethnic minorities in Britain who arrived during the post-World War II period are diverse in terms of occupational profile, geography and tenure (Peach, 1998). Further, there is growing differentiation within and between ethnic groups in their tenure profiles (Hamnett and Butler, 2008). Differentiation between ethnic groups (something that is not specific to the UK context) can be explained in a number of ways which are pertinent to the purpose of this paper. Mulder (1993) defines constraints as those which prevent groups from viewing certain parts of the housing market as opportunities: for ethnic minorities, this might mean the availability or accessibility of appropriate housing which meets their familial and financial needs. As housing stocks vary geographically, ethnic minorities may concentrate in those areas where availability meets demand. Relatedly, resources may constrain or enable housing choices for different ethnic minorities: as ethnic

minorities are disadvantaged in the labour market this may determine their housing choices due to constraints on resources (Özüekren and van Kempen, 2003). Pakistanis, Bangladeshis, Black Africans and Black Caribbeans all have between 44% (Black Caribbeans) and 60% (Bangladeshis) living in more deprived areas (Jivraj and Khan, 2015: 203). For these ethnic groups, the quality of housing available to them will be markedly different to the options available to groups in less deprived areas. External influences can also shape the housing careers of ethnic minorities: housing officers, estate agents and landlords may act in accordance with their own prejudices and ideologies when granting access to different sectors of the housing market. The selectivity of the housing market and the extent to which this contributes to a segregated and divided society has elsewhere been explored in the context of health (Smith, 1990; Smith and Easterlow, 2005), and is analogous to the scope of this paper.

While constraints, resources and discriminatory practices may promote self-segregation or what Peach (1996) terms 'bad-segregation'. Diverse ethnic profiles across housing tenures and housing careers may be ethnically differentiated through cultural-preferences and the role of choice (Peach, 1998; Bowes et al., 2002). For example, preferences for multi-family households or contrasting aspirations to home-ownership should not be under-stated in terms of the housing careers of different ethnic minorities and therefore, in the ethnic profile of different household tenures. Whilst this is a positive reflection on the housing choices of ethnic minorities, these are still choices within the parameters of constraints different to those of the ethnic majority. For example, if in need of social housing, are houses available of sufficient size to house multi-family households? Limited access to appropriate social housing (and declining social housing stocks) might restrict some ethnic minorities into buying poorer quality houses in less desirable areas (Bowes et al., 2002).

Constrained by initial settlement patterns of first-generation migrants, restricted resources, experiences of discrimination and selectivity in the housing sector, alongside the exercise of choice within these constrains may therefore maintain a distinct ethnic profile in different household tenures across generations over time. This contrasts with theories of assimilation and integration, and is pertinent to debates on social and spatial segregation (see Stillwell et al., 2010) insofar as disadvantage in the housing market connects with wider disadvantage across multiple domains of inequality.

Given this review, it is worth reflecting on the research questions posed for this study. Firstly, whether or not the relationships between tenure and health ethnically differentiated, and secondly, whether this may be consistent over time. Where tenure acts as a socioeconomic marker and the conduit by which individuals are exposed to different levels of health hazards in the local environment, it may be assumed that all ethnic groups are more likely to experience the best health in owner-occupation and the poorest health in socially rented accommodation. It might then be assumed that within each tenure, inequalities in health between ethnic groups would be maintained owing to wider experiences of socioeconomic (dis)advantage and differential marginalisation. However, of interest is whether ethnic minority groups in owner-occupation are in poorer health than the ethnic majority in, for example, privately rented accommodation and importantly, whether this changes over time. This may either signal a process of assimilation and integration, or sustained differentiation and marginalisation. For example, do complex migration histories and experience of multiple disadvantage constrain entry into higher-quality housing disrupting expected gradients to health by tenure and by ethnic group? Or, is there evidence to suggest that for some ethnic groups their experience of the housing market may be converging to that of the majority population? Temporal changes will also be shaped by wider macro- and meso-level changes in the socio-economic and political climate: these are particularly important for policy evaluations.

By examining the patterning to health by tenure and ethnic group in 1991, 2001 and 2011, we will contribute to efforts to disentangle the complex relationship between health and tenure, and the extent to which these are ethnically differentiated. This may have important implications for our understanding of (persisting) ethnic inequality.

3. Data

We use census microdata from the Samples of Anonymised Records (SARs) in 1991, 2001 and 2011, restricting the sample to England household residents aged between 16 and 74 years old. Census microdata denotes individual-level records from the census describing data at a single point in time (contrasting with the linked records available through the ONS Longitudinal Study). Established in 1991, the SARs are a family of datasets covering the full range of census topics at 1991, 2001 and 2011 (labelled Individual Safeguarded Sample in 2011). Each dataset contains a random sample of anonymised individual records, increasing in size with each successive census (see Li, 2004 for further information on the SARs). Thus, the SARs comprise a 2% (1991), 3% (2001) and 5% (2011) sample of the enumerated population of England and Wales. These data are particularly appropriate for this analysis given the flexibility in the choice of variables and categories that can be explored, the degree of statistical control in the modelling of social and geographic differences in health, and the analysis of ethnic differences owing to large sample sizes (see Norman and Boyle, 2010).

For this analysis, (recent) international migrants, persons aged 0–15 or 75 and over and residents in communal establishments are excluded. Migrants are identified according to a one-year migration variable in the SARs, establishing whether addresses differ from that one-year prior to the census. Thus, recent international migrants are those with an overseas address one-year prior to the census. The sample is restricted by age as individuals aged under 16 and over 76 do not always have full socioeconomic data recorded. We are interested in moves made as adults hence excluding children and young teens: while this age cut-off could be increased to 18 or 21, in the interest of maximising our sample size we settled on 16. Similarly aged samples have elsewhere been used to investigate differences in population health (e.g. Norman and Fraser, 2013). Further, residents in communal establishments are excluded as their health statuses are very different to the general population. All SARs members with missing ethnicity, health or socioeconomic data are also excluded.

3.1. Dependent variable

Health is defined as the presence or absence of limiting long-term illness (LLTI). Although LLTI is a subjective measure of health status, it is a valid predictor of population mortality and morbidity (Cohen et al., 1995; Manor et al., 2001). Further, whilst Chowbey et al. (2007b) find that ethnic minorities under-report on LLTI, others have successfully employed this measure (or similar) in studies of ethnic inequalities in health (Harding and Balarajan, 2000; Harding, 2003; Smith and Grundy, 2011; Wohland et al., 2015; Darlington et al., 2015; Evandrou et al., 2016). There are some minor changes in the question wording on the census between 1991, 2001 and 2011, and changes to the response options in 2011 Census form. For example, between 1991 and 2001 the word 'handicap' is replaced with 'disability': this might influence a respondent's answer. These are listed in Table 1, all questions ask respondents to include problems related to old age (all census forms are available from the UK Data Service website). Although this may influence the absolute rates in reporting of LLTI (Bajekal et al., 2003), it is unlikely to substantively bias estimates of prevalence gaps between ethnic groups.

3.2. Independent variables

Independent variables are selected insofar as they reflect known social determinants of health (see Marmot, 2005), known covariates

Table 1
Census questions on limiting long-term illness.

	Question	Response
1991	Do you have any long-term illness, health problem or handicap which limits your daily activities or the work you can do?	Yes, I have a health problem which limits activities I have no such health problems
2001	Do you have any long-term illness, health problem or disability which limits your daily activities or the work you can do?	Yes No
2011	Are your day-to-day activities limited because of a health problem or a disability which has lasted, or is expected to last, at least 12 months?	Yes, limited a lot Yes, limited a little No

with health (e.g. age and gender), broad geography (see below), or to identify tenure or ethnicity. In this report, we explicitly examine health variations between ethnic groups by tenure and social class, controlling for geography, educational attainment, country of birth, age and gender (these controls will not be further discussed).

Nine ethnic groups are identified in the SARs for 2001 and 2011, distinguishing between White British, White Other, Black Caribbean, Black African, Indian, Pakistani, Bangladeshi, Chinese, and Mixed and Other. In 1991, it is not possible to distinguish between White British and White Other so we just have an overall White group. Tenure differentiates SARs members who are resident in owner-occupied, privately rented or socially rented accommodation at the time of each census. The latter includes all forms of social housing, including those provided by housing associations or the local authority. We use the Registrar General's schema of social class (SC), converting the 2001 and 2011 National Socioeconomic Classification (NS-SeC) to SC. All SARs members not assigned to a class are defined as 'unclassified' and included in the analysis giving four classes: I (Professional) and II (Managerial and Technical) combined; IIIN (Skilled non-manual) and IIIM (Skilled manual) combined; IV (Partly skilled) and V (Unskilled) combined; U (Unclassified). Broad geography is accounted for by aggregating Government Office Regions (GOR) into the North, South and Inner London. These are based on the 2001/2011 boundaries. Inner London is substantively different from Outer London, both in terms of context and composition (particularly the concentration of ethnic minorities). It is therefore appropriate to distinguish between the South and Inner London while Outer London is grouped with the South. Future research may examine this in more detail at a finer geographic scale, particularly given the breadth of and change in experience within either Outer or Inner London (Mace, 2011). Although crudely aggregated, these regions help control for broad contextual factors differently influencing health between the North and South of England. Further, this permits detailed ethnic analysis with sufficient sample sizes by tenure and social class.

4. Methods

First, to assess changing ethnic inequalities in health, we calculate standardised illness ratios for each ethnic group at 1991, 2001 and 2011. The illness ratios are standardised to the sample population for each year. From these, we derive rate ratios (RRs) for each ethnic minority group relative to Whites (1991) and White British (2001, 2011). RRs >1 suggest the groups fare worse than the White/White British, whereas <1 suggests that the minority group are in better health relative to the majority group. We report modelled probabilities of LLTI and 95% confidence intervals by ethnic group and social class, adjusting for geography, educational attainment, country of birth, age and gender. Modelled probabilities are derived from binary logistic regression models whereby the outcome was LLTI. Each model was subset by household tenure and run for each census year, adjusting for each of the listed independent variables. We first ran unadjusted models (controlling only for ethnicity, age and gender) to test the contribution of the dependent variables to the model. Notably, odds of LLTI were attenuated for all ethnic groups with the addition of wider social determinants of health. Table 2 illustrates these results presenting the odds ratios by ethnic group in the unadjusted and fully adjusted models: Odds Ratios (ORs) tend to move closer to 1 in the adjusted models although there are some differences including differences in direction of the OR. However, we focus on modelled probabilities in the following section: presenting modelled probabilities allows results to be compared by models (subset by tenure) and between ethnic groups more effectively than the presentation of odds ratios. All statistical analyses were carried out in R.

5. Results

Fig. 1 depicts the RRs for each ethnic minority relative to the White or White British. Values <1 suggest the minority group is in better health relative to the majority group, whereas the inverse is true if the RRs >1. According to these data, Bangladeshis and Pakistanis are consistently relatively worse off than White (1991) or White British (2001, 2011). In 1991 and 2001, Indians are also in relatively poorer health; though by 2011, the differences are negligible. Only Chinese and Black Africans consistently fare better than Whites or White British.

Figs. 2–4 summarise the modelled probability of LLTI by tenure in 1991, 2001 and 2011, stratified by ethnic group and social class. The data are ordered according to the probability of LLTI decreasing by ethnic group in social housing in 1991. This order is maintained to illustrate change over time and between tenures. Supplementary Table 1 lists the probabilities. The overall social patterning to health is consistent between ethnic groups: probability of LLTI decreases when comparing different levels of the social class structure (though some change in 2011 discussed below). Probability of LLTI is higher in privately rented accommodation than owner-occupied, and higher still in socially rented accommodation (though differences are not always significant, particularly between private renters and owner-occupiers). Despite the broad trends identified here, there are some interesting variations between ethnic groups and changes over time. We focus on those differences which are significant but refer the reader to the supplementary material to see the probabilities presented in full.

In 1991 (Fig. 2), the most striking result is the significantly poorer health of Indian, White, Pakistani and Black Caribbean social renters not assigned to a class (though Pakistani social renters overlap with their peers in private rentals) compared to all other ethnic groups across all tenures and social classes. The significant health penalty experienced by Indians and White groups (disaggregated to White British and White Other) continues into 2001 and 2011, though Black Caribbeans fare relatively better in these later years. At the top of the social class spectrum in 1991, probability of LLIT is also significantly higher for Indian, White, Black Caribbean, and Mixed and Other social renters compared to owner-occupiers or private renters when assigned to classes I & II. Differences in probability of LLTI within ethnic groups tend to narrow across classes IIIN & IIIM, and IV & V. For Chinese and Black Africans, differences in health are marginal within each social class by tenure. For Pakistani, Black Caribbean, Mixed and Other and Bangladeshi groups, belonging to the higher social classes is more likely to differentiate risk of poor health than tenure though this is less apparent in the lower social classes.

In contrast, social class and tenure more clearly differentiates risk of poor health for all ethnic groups in 2001 (Fig. 3), though this is most apparent for owner-occupiers. For example, White British, White Other, Pakistani, Black Caribbean and Mixed and Other owner-occupiers assigned to a class have significantly lower probabilities of LLTI than their peers in the rental sector. Conversely, declining social status sees a convergence of the probabilities of LLTI between private

Table 2
Comparing Odds Ratios by ethnic group, adjusted and unadjusted models by tenure and year.

		Owner-occupied ORs (95% CI)		Privately Rented ORs (95% CI)		Socially Rented ORs (95% CI)	
		Unadjusted*	**Adjusted****	**Unadjusted***	**Adjusted****	**Unadjusted***	**Adjusted****
1991	White	**REF**	**REF**	**REF**	**REF**	**REF**	**REF**
	Black Caribbean	1.32 (1.19, 1.46)	1.24 (1.11, 1.38)	0.98 (0.65, 1.43)	1.04 (0.68, 1.52)	0.92 (0.82, 1.03)	0.95 (0.84, 1.07)
	Black African	1.11 (0.82, 1.46)	1.06 (0.78, 1.41)	0.72 (0.42, 1.16)	0.75 (0.43, 1.21)	0.53 (0.42, 0.65)	0.48 (0.38, 0.61)
	Indian	1.63 (1.52, 1.75)	1.38 (1.27, 1.49)	0.87 (0.64, 1.15)	0.98 (0.71, 1.32)	1.25 (1.04, 1.49)	1.14 (0.93, 1.38)
	Pakistani	2.43 (2.20, 2.68)	1.51 (1.35, 1.67)	1.95 (1.41, 2.64)	1.53 (1.08, 2.11)	1.32 (1.03, 1.67)	1.00 (0.77, 1.28)
	Bangladeshi	2.18 (1.71, 2.75)	1.41 (1.10, 1.79)	1.62 (0.99, 2.52)	1.43 (0.87, 2.27)	1.09 (0.89, 1.34)	0.82 (0.66, 1.02)
	Chinese	0.80 (0.61, 1.01)	0.73 (0.56, 0.93)	0.25 (0.10, 0.51)	0.29 (0.11, 0.60)	0.37 (0.24, 0.56)	0.30 (0.19, 0.46)
	Mixed & Other	1.09 (0.96, 1.24)	1.07 (0.93, 1.22)	0.81 (0.61, 1.05)	0.88 (0.66, 1.16)	0.94 (0.81, 1.10)	0.90 (0.76, 1.05)
2001	White British	**REF**	**REF**	**REF**	**REF**	**REF**	**REF**
	White Other	0.96 (0.92, 0.99)	0.97 (0.93, 1.02)	0.65 (0.60, 0.70)	0.90 (0.81, 0.99)	1.05 (1.00, 1.11)	1.03 (0.95, 1.10)
	Black Caribbean	1.20 (1.12, 1.29)	1.21 (1.12, 1.31)	1.24 (1.05, 1.47)	1.44 (1.20, 1.71)	0.79 (0.74, 0.85)	0.81 (0.74, 0.88)
	Black African	0.82 (0.71, 0.93)	0.82 (0.71, 0.94)	0.60 (0.51, 0.71)	0.67 (0.56, 0.81)	0.46 (0.42, 0.50)	0.45 (0.40, 0.50)
	Indian	1.53 (1.47, 1.60)	1.34 (1.27, 1.41)	0.94 (0.83, 1.06)	1.08 (0.94, 1.24)	1.15 (1.03, 1.29)	1.11 (0.98, 1.25)
	Pakistani	2.14 (2.02, 2.26)	1.29 (1.21, 1.37)	1.49 (1.31, 1.69)	1.23 (1.06, 1.42)	1.11 (0.99, 1.24)	0.85 (0.75, 0.96)
	Bangladeshi	1.94 (1.71, 2.20)	1.26 (1.10, 1.44)	1.63 (1.32, 2.00)	1.48 (1.18, 1.85)	0.86 (0.77, 0.96)	0.68 (0.60, 0.77)
	Chinese	0.69 (0.60, 0.78)	0.64 (0.56, 0.73)	0.43 (0.32, 0.56)	0.48 (0.36, 0.63)	0.59 (0.47, 0.74)	0.50 (0.40, 0.63)
	Mixed & Other	1.09 (1.02, 1.16)	1.04 (0.97, 1.11)	0.93 (0.85, 1.03)	1.01 (0.90, 1.14)	0.88 (0.82, 0.95)	0.80 (0.74, 0.87)
2011	White British	**REF**	**REF**	**REF**	**REF**	**REF**	**REF**
	White Other	0.82 (0.80, 0.85)	0.90 (0.87, 9.94)	0.46 (0.44, 0.48)	0.74 (0.70, 0.79)	0.82 (0.78, 0.85)	0.95 (0.90, 1.00)
	Black Caribbean	0.97 (0.92, 1.03)	0.99 (0.93, 1.05)	0.73 (0.65, 0.81)	0.91 (0.80, 1.02)	0.60 (0.57, 0.64)	0.65 (0.61, 0.69)
	Black African	0.64 (0.58, 0.69)	0.66 (0.60, 0.72)	0.48 (0.44, 0.52)	0.65 (0.59, 0.71)	0.38 (0.36, 0.40)	0.42 (0.39, 0.45)
	Indian	1.34 (1.30, 1.38)	1.32 (1.27, 1.37)	0.64 (0.59, 0.69)	0.92 (0.84, 1.00)	0.95 (0.87, 1.04)	1.06 (0.97, 1.16)
	Pakistani	2.18 (2.10, 2.26)	1.64 (1.57, 1.71)	1.29 (1.19, 1.38)	1.47 (1.35, 1.60)	1.08 (1.00, 1.17)	1.05 (0.97, 1.14)
	Bangladeshi	1.85 (1.72, 1.99)	1.47 (1.36, 1.59)	1.07 (0.94, 1.21)	1.30 (1.13, 1.49)	0.82 (0.76, 0.89)	0.83 (0.76, 0.90)
	Chinese	0.56 (0.51, 0.62)	0.60 (0.54, 0.66)	0.29 (0.24, 0.34)	0.41 (0.34, 0.48)	0.46 (0.39, 0.53)	0.48 (0.41, 0.57)
	Mixed & Other	1.05 (1.02, 1.09)	1.06 (1.01, 1.10)	0.82 (0.79, 0.86)	1.08 (1.02, 1.14)	0.79 (0.76, 0.81)	0.82 (0.79, 0.86)

Note
* Models adjust for age, sex and ethnicity.
** Fully adjusted models (age, sex, ethnicity, country of birth, region, social class, educational attainment).

and social renters for Black Caribbean, Mixed and Other, Bangladeshi and Pakistani groups. These changes sit alongside an increase in the probability of LLTI for all ethnic groups across all classes and tenures from 1991. For those not assigned to a social class, Indian, White British, White Other and Pakistani have significantly higher probabilities of LLTI regardless of tenure when compared to all groups assigned to a class. The health advantage of Chinese and Black Africans is sustained from 1991: for example, Chinese and Black African social renters consistently have significantly better health than Indian or White British social renters. Chinese owner-occupiers are also in significantly better health than Indian or White British owner-occupiers. Of particular interest is the degree of homogeneity in the White groups when disaggregated to White British and White Other: there are no significant differences between these groups when in comparable housing and socioeconomic status (defined here by social class).

By 2011 (Fig. 4), there is far less differentiation between private renters and owner-occupiers for classes I to V, comparable to the patterns observed in 1991 (albeit with smaller confidence intervals, likely reflecting the large sample sizes). There is more variation for the unclassified groups. The probability of LLTI for the unclassified also notably reduces from 2001 for those in owner-occupation or social rentals, varying to the increases in the probability of LLTI in these tenures for classes I to V. In contrast, probabilities of LLTI decrease across the classes in private rentals. Indian, White British, White Other and Pakistani social renters have similarly poor health, significantly poorer than the other ethnic groups or their peers in owner-occupation or private rentals. For Pakistani groups, this health penalty is also apparent for owner-occupiers and private renters. It is worth highlighting the relatively poorer health of Indian, White British and White Other when in socially rented accommodation compared to the health advantage these groups tend to experience in either owner-occupation or the private rental sector (though this advantage for Indians in owner-occupation does not emerge until 2011). This contrasts with the sustained health penalty experienced by Pakistanis across all tenures, and to a lesser extent, that of Black Caribbeans and Bangladeshis.

While not always significant, it is also interesting to note signs of a reversal of the typical social gradient to health by tenure: private renters have for some ethnic groups significantly lower probabilities of LLTI than owner-occupiers (Indian, White Other, Chinese), though this is only significant for those not assigned to a social class. Though less pertinent to efforts to address health inequalities than the distance between private renters, owner-occupiers and social renters, this is an interesting finding deserving further investigation in the context of access to and experience of different housing markets. Despite high concentrations of Black Africans and Black Caribbeans in social housing (Finney and Harries, 2013), these groups have notably low probabilities of LLTI compared to all other ethnic groups in equivalent circumstances. For example, probability of LLTI for Black Africans ranges from 1.8% to 5.4% (1991) and 1.1% to 3.5% (2011) when in social housing. This contrasts with the probabilities for Whites in 1991 (3.6% to 10.6%) or White British (1.7% to 5.2%) and White Other (1.5% to 4.8%) in 2011.

Before concluding, it is worth considering overall change in the relative social differences in health by tenure. Firstly, relative social differences in health within ethnic groups by tenure peaked in 2001 when calculating the ratio of the probabilities of LLTI by social class (I & II relative to those not assigned to a class) both within tenures and between owner-occupiers relative to social renters. Despite an overall decline, the greatest degree of inequality across all tenures is consistently experienced by the White (1991), or White British and White Other (2001 and 2011) groups suggesting a greater homogeneity of experience within the other ethnic groups.

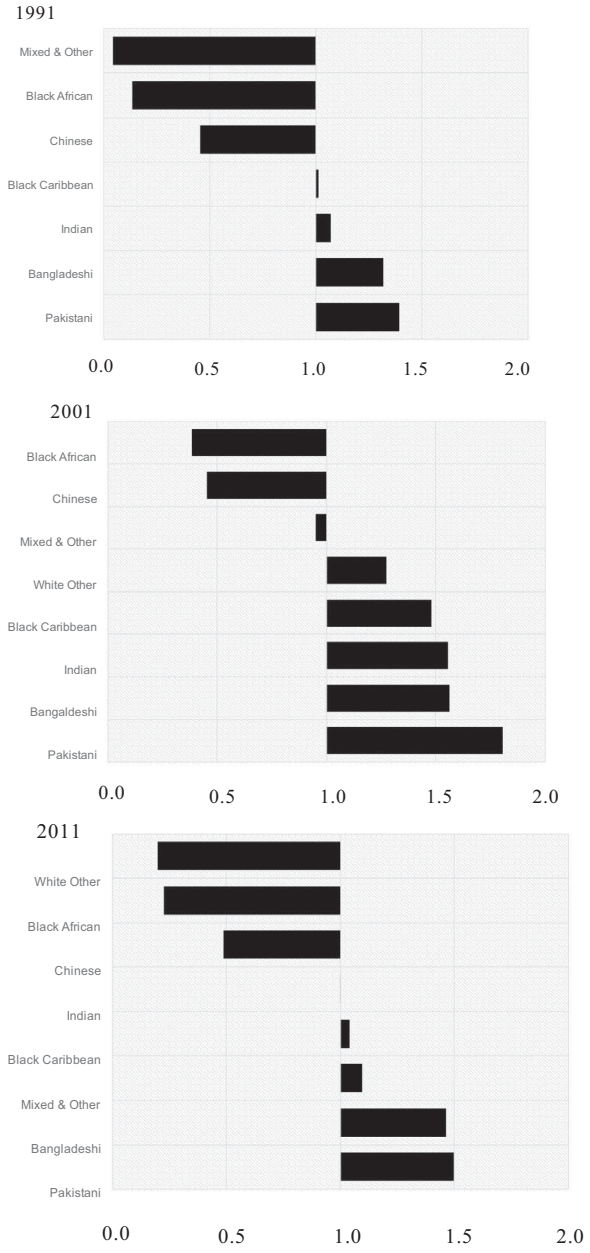

Fig. 1. Rate ratio of Standardised Illness Ratios (SIRs) (limiting long-term illness) for ethnic minority groups relative to White (1991) and White British (2001/2011.

6. Discussion

In this paper, we quantified relative inequalities in health between ethnic minorities and the majority in 1991, 2001 and 2011 before examining the patterning to health by ethnic groups in different tenures, evaluating whether these relationships were attenuated by social class while adjusting for wider determinants of health. We addressed two related research questions, the first questioning whether the relationship between health and tenure is ethnically differentiated, and second, whether these relationships were consistent over time. It might be hoped that where experiences are ethnically differentiated, these have arisen from contrasting migration histories shaping settlement patterns and access to housing markets. However, experiences and health statuses of first generation migrants should converge with the native population through social and spatial assimilation over time. Where health inequalities are sustained, it might be assumed that processes of assimilation and integration are thwarted, whether prevented through constraints, limited resources and discrimination or

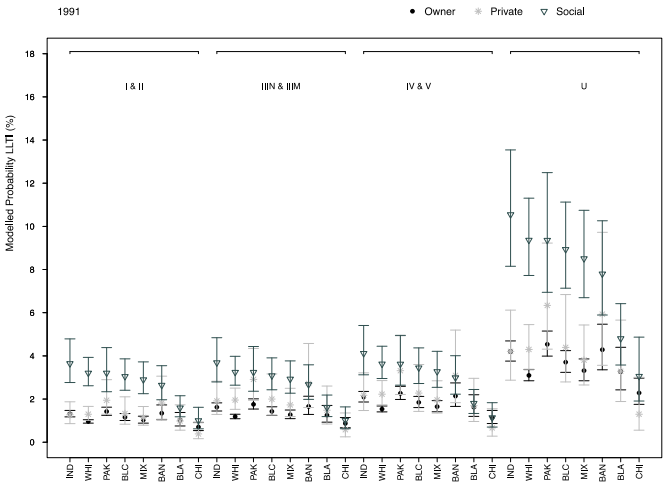

Fig. 2. Modelled Probability of LLTI by ethnic group and social class, subset by tenure, 1991, Note: IND – Indian, WHI – White, PAK – Pakistani, BLC – Black Caribbean, MIX – Mixed & Other, BAN – Bangladeshi, BLA – Black African, CHI – Chinese.

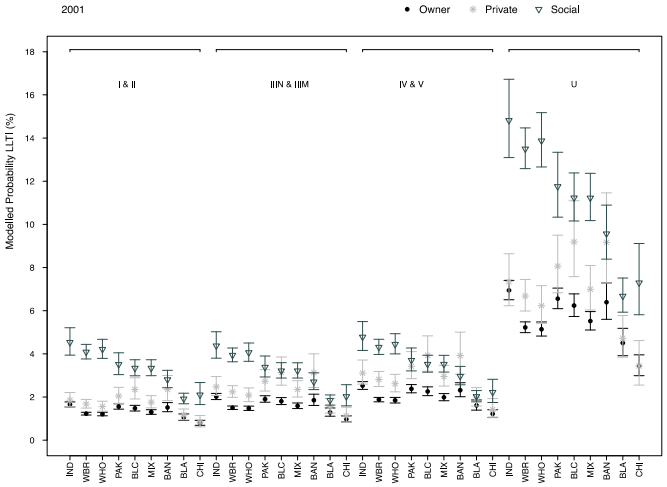

Fig. 3. Probability of LLTI by ethnic group and social class, subset by tenure, 2001, Note: IND – Indian, WBR – White British, WHO – White Other, PAK – Pakistani, BLC – Black Caribbean, MIX – Mixed & Other, BAN – Bangladeshi, BLA – Black African, CHI – Chinese.

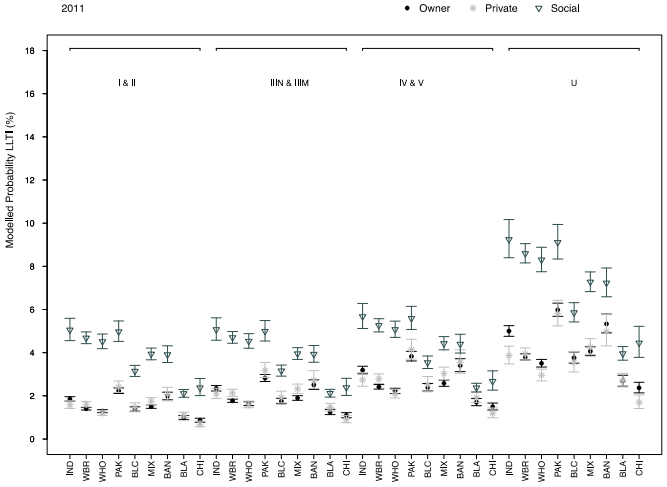

Fig. 4. Probability of LLTI by ethnic group and social class, subset by tenure, 2011, Note: IND – Indian, WBR – White British, WHO – White Other, PAK – Pakistani, BLC – Black Caribbean, MIX – Mixed & Other, BAN – Bangladeshi, BLA – Black African, CHI – Chinese.

marginalisation, or resisted by the choice exercised by ethnic minorities. However, experiences of diverse ethnic groups are, unsurprisingly, not homogenous. The results of our analysis reflect the diversity within ethnic groups as well as their diverse experiences. In particular, it also raises questions as to the value of defining ethnically differentiated experiences of the housing market by tenure, or indeed whether the causal pathways linking tenure and health hold for all population subgroups.

Our results echo wider research documenting persisting ethnic inequalities in health over time (Nazroo, 1997; Cooper, 2002; Sproston and Mindell, 2006; Salway et al., 2007a; Bécares, 2015; Darlington et al., 2015). In particular, South Asian ethnic groups (Indians, Bangladeshis and Pakistanis) and Black Caribbeans consistently fare worse relative to the majority ethnic group, contrasting with the relatively better health of Black Africans and Chinese. Probabilities of LLTI increased for all ethnic groups from 1991 to 2001, consistent with wider literature (Smith and Grundy, 2011), falling in 2011 for those in private renting but increasing for those in owner-occupied and socially rented accommodation. However, the 2011 increases were limited to those assigned to a class. Smith and Grundy (2011) attribute increases in prevalence of LLTI amongst ethnic minorities to longer environmental exposure: as length of residency in the UK increases, so does group exposure to local health hazards. Given that the deteriorating poor health in 2011 was limited to those assigned to a class, this may support the hypothesis that this is a consequence of the greater exposure to the local environments. Ethnic minorities assigned to a class are employed and therefore (likely) mixing with the native majority, sharing in their exposure to the environment. Future research should explore the relationship between length of residency, ethnicity, tenure and health, perhaps using longitudinal data. Despite the absolute changes in probability of LLTI, it is interesting that relative social differences in health were greatest in 2001 within ethnic groups by tenure. It is difficult to establish why this occurred within the parameters of this study, but future research should explore whether such a finding is replicated with alternative measures of social class/socioeconomic status and the extent to which this reflects changing ethnic diversity in society. Notwithstanding this peak in 2001, relative social differences in health decrease for all ethnic groups, though are consistently high for the White British or White Other groups (highest also for White in 1991).

Changing health by tenure and ethnic group over time must be understood in the context of the changing composition of the housing market. Between 1991 and 2011 all groups experience a decline in owner-occupation. A similar decline is seen in social housing for most ethnic groups. However, the proportion of White Other social renters more than doubles between 2001 (16%) and 2011 (36%). In contrast, all ethnic groups see growth in the private rental sector, but this is more marked for ethnic minorities than for the White/White British group. Thus, while there are some commonalities in the ways in which ethnic groups are experiencing the changing housing sector, the rate of change varies. This is important for our understanding of ethnic differentiations in the relationship between tenure and health and the implications for broader inequalities.

At the population level, the patterning to health by tenure is generally consistent within ethnic groups, with the poorest health observed amongst renters (with the poorest for social renters) and the best health amongst owners. However, the gaps between private renters and owner-occupiers vary over time. In 1991, these gaps are small within ethnic groups and generally not significant, particularly amongst those assigned to a class. This contrasts with greater differences between owners and private renters in 2001 across all classes. However, by 2011 not only does the gap narrow once again between private renters and owners, but these data suggest the social gradient to health by tenure *may* be changing. Private renters for certain ethnic groups have lower probabilities of LLTI than their peers in owner-occupation, though these are only significant for Indian, White Other and Chinese groups not assigned to a social class. The departure from an established hierarchy to the patterning of health by housing tenure is of interest and should be further examined. Despite the (generally) consistent patterning to health, the health advantage of owner-occupation is not equal between ethnic groups, nor are the consequences of private or social rentals.

By 2011, 74% and 70% of Indians and Pakistanis respectively are owner-occupiers. Despite this concentration in a tenure widely associated with better health outcomes, Pakistanis and Indians (in the lower social classes) have some of the highest probabilities of LLTI in this tenure, generally significantly higher than either White British or White Other owner-occupiers. Black Africans, despite their (declining) concentration in social housing (49.2% (1991), 48.8% (2001) and 39.5% (2011)) consistently had some of the lowest probabilities of LLTI in this tenure. The variations in health between and within ethnic groups by tenure, sometimes in unexpected ways, suggest that the relationships between tenure and health may in some way be ethnically differentiated.

The relatively poorer health of certain ethnic minorities as owner-occupiers and private renters (particularly in 1991 and 2001 for the latter tenure), can be interpreted in two ways. Importantly, both are shaped by the migration histories, settlement patterns and subsequent internal migration trajectories of ethnic minorities in England. Whether driven by choice, determined by resources, or restricted by constraints and discriminatory practices (Peach, 1998; Özüekren and van Kempen, 2002), these processes differently shape experiences of the housing market. Housing supply varies spatially, depending on local availability and prevailing need. If ethnic minorities migrate away from traditional settlement areas, their trajectory will be determined by a mixture of personal preferences, employment or educational opportunities, but also strongly governed by housing need or choice. Pakistanis have shown a strong preference for multi-family households, requiring larger housing space: such demand cannot readily be met within the social rented sector and the limited resources often available to Pakistani families therefore restricts their choices to poorer quality options in the owner-occupied sector (Bowes et al., 2002: 388). Whilst Pakistanis may exercise choice for larger, owner-occupied dwellings this is done so within the parameters of constraints and resources (availability of affordable dwellings outside the social rented sector). Despite their concentration in owner-occupation, the housing quality and local environment are not health enabling. Where supply outstrips demand or prices become prohibitively high, the only alternative is private rental. Here, limited resources and the desire to live near established groups who have become concentrated in less desirable areas restricts choices to the lower rungs of the private rental sector.

Choice may be further constrained through discriminatory practices and processes of 'bad segregation' (Peach, 1996). Difficulties in securing appropriate mortgages or less favourable lending terms (Williams et al., 2005) may channel ethnic minorities into less desirable areas. Similarly, more active discrimination from estate agents and so called 'gate-keepers' can influence the type of housing or tenures available to different ethnic groups. Such discrimination extends beyond home-ownership and private rentals. Whites and White British, despite their relative health advantage, are in poorer health than Bangladeshis and Black Caribbeans from 2001 when in social rentals. Do higher probabilities of LLTI for White British reflect greater need, or are ethnic minorities experiencing barriers in accessing appropriate social housing when in need? In the UK, data from the Department for Communities and Local Governments suggest that social lettings to ethnic minorities have fallen while the proportion allocated to Whites has risen by nearly 10% (Douglas, 2014).

If ethnic minorities in the poorest health are less able or willing to access social housing, they may be restricted to inappropriate, high cost private rentals or poor quality owner-occupied dwellings which may exacerbate poor health. Further, as experience of discrimination or racial harassment is widely associated with poorer health outcomes

(Nazroo, 2003; Williams and Mohammed, 2009; Harris et al., 2012) this may also help explain the relatively poorer health of ethnic minorities in tenures otherwise associated with better health amongst the majority population. This interpretation paints a bleak picture of society where discrimination in the housing sector analogous to the landscape delineated by Smith and Easterlow (2005) in their discussion of the 'strange geography of health inequalities', perhaps interacts multiplicatively with a wider ethnic penalty and racial prejudice? However, such an interpretation masks the diversity within and between ethnic groups, and may overstate the importance of tenure as a population level indicator of health, rather than one capable of revealing more nuanced group differences.

An alternative should also be considered, one that reflects possible changes in the way in which housing choice is exercised by ethnic minority groups. Are housing careers less likely to be shaped by an attachment to traditional culturally informed residential preferences (as discussed by Bowes et al., 2002) over time? Length of residency may not only bring about increased exposure to the health hazards shaping the health of the native population (Smith and Grundy, 2011), but also the values and ideas that shape housing careers. By 2011, the lower probabilities of LLTI amongst a number of ethnic minorities as private renters compared to those as owner-occupiers, although not significant, may demonstrate increasing convergence with the population level growth in private rentals, and also different mechanisms by which tenure may, or may not, influence health.

The relationship between housing and health is multi-faceted, manifesting through area characteristics, housing quality and housing tenure (e.g. Avecedo-Garcia et al., 2004). However, the pathways by which tenure determines health are not necessarily comparable across ethnic groups. Tenure may mean different things for different ethnic groups. As has been argued in relation to social class (e.g. Nazroo, 2001), tenure may not be sufficient to capture the multitude of factors influencing the health of different ethnic groups in different homes. Should tenure be dismissed as a proxy for socioeconomic status in favour of broader measures of housing relating to quality, overcrowding and local health hazards? This seems particularly important given the gap in probability of poor health between certain ethnic groups in social housing compared to their peers in other housing sectors (e.g. within Indian, White British and Pakistani), and their similarly housed counterparts.

Complex migration histories and subsequent internal trajectories, contrasting household requirements and the dynamics of choice, resources, discrimination and constraint differently shape the housing careers of ethnic minorities contributing to ethnic inequalities. Whilst this clearly connects with health differences due to the inter-relationships between health and tenure, it is possible that the causal pathways linking health to tenure are not sufficient to describe ethnic differences. Tenure may be inadequately capturing differences in the housing sector: for example, the experience of one owner-occupier in a detached large house will be very different from those of an owner-occupier in a small terraced dwelling. Future work combining qualitative analyses of ethnic-specific experiences of the housing sector with multi-level modelling to identify area-level and individual-level influences will provide more insight into the patterns revealed here.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.healthplace.2017.04.011.

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