Inequalities in health due to ethnicity and social deprivation – an analysis of primary care data from one inner-city area over a three year period

Report to the National Audit Office

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Introduction

The burden of cardiovascular disease (CVD) is not evenly spread within the general population. Several sectors of society have a higher incidence of CVD. For example, myocardial infarction (MI) has a consistently higher incidence among South Asians while stroke (CVA) mortality rates are twice as high in African Caribbeans compared to the white population (1). Furthermore, socio-economically deprived populations experience higher rates of both MI and CVA (2; 3).

Differences in the incidence of CVD are largely related to the social distribution of CVD risk factors. The four risk factors of greatest importance are smoking, high serum cholesterol, hypertension and diabetes:

- Smoking rates are higher in deprived populations and generally lower in ethnic minority communities (4).
- Cholesterol levels are not significantly higher in the South Asian population. However, South Asians have an atherogenic lipid profile (high triglycerides; low HDL cholesterol)(5;6).
- Hypertension is 3-4 times more prevalent in African Caribbeans than in the white British population (7-9).
- White British and South Asian rates of hypertension are similar (10).
- Diabetes has been consistently shown to be more prevalent among African Caribbeans and South Asians, when compared with the white population (11-13).

Health inequalities based on differential incidence of CVD events are therefore related to both ethnicity and social deprivation. Recent initiatives, such as the Quality and Outcomes Framework (QOF) and the Spearhead programme, have been implemented to improve both the quality of health care and reduce health inequalities. However, there is a conspicuous absence of studies looking at changing inequalities over time with most studies relying on cross sectional data measured at one time point only (14).

We set out to examine health inequalities in one inner London borough using a range of patient level indicators measured at two time points, 2006 and 2009. This allowed us both to assess the extent of current inequality and also to examine changes over the three year period.

Method

We used the Lambeth DataNet to explore health inequalities, comparing African Caribbean and white patients and patients in the most deprived and least deprived areas. We looked at treatment outcomes for patients suffering from any of the following four chronic diseases: diabetes, hypertension, coronary heart disease (CHD) and stroke.

Study design

The dataset comprises electronic patient records (the Lambeth DataNet) taken from practices in Lambeth, South East London. Lambeth is characterised by high levels of social deprivation (it is the 19th

most deprived out of 354 boroughs in England) and has the second highest proportion of 'Black or Black British' residents in the UK at 25.8% (neighbouring Southwark has the highest proportion at 25.9%) (15). Lambeth is also a designated Spearhead Primary Care Trust which gives us the opportunity to assess how health inequalities might have changed during the course of this initiative.

The dataset was originally set up to improve both the level and quality of ethnicity coding in GP data in order to facilitate ethnic monitoring of health inequalities (16). Measures taken to achieve this included: postal surveys of registered patients, surveying new patients on registration and flagging up cases lacking ethnicity data. Patients were asked their self-ascribed ethnicity, based on 2001 national census categories, and this was recorded in a structured (Read coded) format.

A further advantage of the dataset is that it includes individual patient postcodes which allows other data, such as area deprivation indices, to be added to patients' health records.

Study sample

The study sample covered all patients from just over half the GP practices in Lambeth (27 out of a total of 53 practices in 2009 and 29 of 54 practices in 2006). Data were extracted from local practice computer systems in November 2006 (records for 206,097 patients) and March 2009 (192,432 patients) using MIQUEST software. A majority of patients had their ethnicity coded, including 129,700 (67.3%) patients in 2009 and 105,155 (51%) patients in 2006. Patients in the Black or Black British census category made up the largest minority ethnic group, comprising 26% of patients in 2009 and 25% in 2006 (see table 1).

Table 1 Ethnicity of patients in the Lambeth DataNet

	Year	
Ethnicity	**2006 (percentage)**	**2009 (percentage)**
White	61.6	58.2
Mixed	3.9	5.3
Asian or Asian British	4.4	5.4
Black or Black British	25.2	26.0
Chinese or Other Chinese	5.0	5.1
Total (N) with ethnicity recorded	105,155	129,700

Outcome measures

We assessed health care outcomes using QOF indicators for monitoring and target achievement of: blood pressure, cholesterol and Hba1c. We also examined smoking status over the past fifteen months.

Each outcome was operationalised as a binary variable. Where the QOF requirement had been met this was recorded as a positive outcome. For smoking, where patients had no record of smoking in the past fifteen months then this was coded as a positive outcome.

Predictors

Relative social deprivation was assessed by mapping patient postcodes to the lower super output area and assigning the index of multiple deprivation (IMD 07) score for that area. Scores were then grouped into five categories and health outcomes for the most deprived category were compared with those for the least deprived quintile.

Patient ethnicity codes were mapped on to UK census ethnic categories. Our analysis compared health outcomes for black (predominantly African and Afro-Caribbean) patients with white patients. We also adjusted for patients' gender and age.

Statistical Analysis

We compared the effect of ethnicity and relative social deprivation on each health outcome in turn using logistic regression in Stata 10. The analysis was conducted in two stages:

1) Regressions were carried out within each year.

2) The analysis was then re-run pooling all the data and testing for interactions between the inequality variables and the year in which the data was extracted. In this way we could determine the statistical significance of any changes in health inequality over time.

Results

Looking at table 2 it is apparent that inequality in health care outcomes based on area deprivation is limited mostly to smoking status and that this has remained largely unchanged over the study period. Smoking status is consistently poorer for those in deprived areas in all chronic disease groups. There is some inequality in Hba1c control, although this is only statistically significant in the 2006 extraction, and this only applies to the less stringent definition (less than or equal to 10 percent). There is also some evidence of better blood pressure monitoring for those in more deprived areas although, again, this only reaches statistical significance in the 2006 extraction.

A very different picture emerges when looking at ethnic inequalities in health (see table 3). Here, black patients are significantly less likely to smoke than white patients and, typically, BP measurement is improved. However, BP and Hba1c control is, in most instances, poorer for black patients compared to white. While some of these results are attenuated over the study period there is little significant change in the overall pattern of ethnic health inequalities.

Discussion

The study results demonstrate relatively little health inequality in Lambeth in terms of social deprivation, other than for smoking status. However, there is clear ethnic inequality in the results for BP and Hba1c control and this remains unchanged over the study period. Health inequalities, therefore, were more strongly related to ethnicity than to social deprivation and these inequalities have not

diminished over time. This further confirms the results of previous studies showing persistent ethnic inequalities in these health care outcomes (14;17).

This study benefits from a very large sample of patient records documenting a range of health outcomes. Furthermore, the sample is particularly suited to a study of this kind as it is taken from an area of contrasting social deprivation that includes a large ethnic minority population.

Unusually for a study of this kind we were able to compare outcomes for patients from similar populations at two time points. However, it should be noted that patient records are not linked therefore the analysis is not strictly longitudinal. We were, though, able to pool the data in our analysis to test the significance of any overall change in inequality over the three year period.

A common problem for studies of this kind is that measures of social deprivation and ethnicity risk either being too broad, and thus not truly reflecting the intended social groups, or too specific, and the analysis loses statistical power. So in order to test the relevance of the measures used a number of different approaches were adopted. For social deprivation, in addition to the comparison of deprivation quintiles, we also conducted an analysis of deprivation deciles (comparing those in the least and most deprived 10% areas) (see appendix 1). This showed a very similar picture to the main analysis. For ethnicity, in addition to comparing black patients ('Black or Black British') with white patients ('White British', 'White Irish' and 'White other'), we also looked at a broader definition comparing health outcomes for non-white patients and white patients (see appendix 2). Again this made little difference to the results. It is also possible that ethnic differences may reflect differences in acculturation and therefore differences in access and use of health care and, possibly, treatment adherence. To explore this we also looked at inequalities based on language preference (see appendix 3) but smoking status was the only significant inequality in this analysis.

The present study concentrates on inequalities in intermediate outcomes related to cardio-vascular disease. We also considered other chronic disease domains such as chronic obstructive pulmonary disease, asthma, mental health and cancer. However, the dataset we used was based primarily on routinely collected QOF data which has limited value in what it can tell us about treatment outcomes for these disease domains.

Lambeth DataNet, like most GP databases, was unable to provide detailed information on smoking cessation ('quit') rates. Routine data collection in primary care encourages recording of smoking status and whether smoking cessation advice or treatment has been offered. Coding of smoking outcomes is poorly documented and tends, in practice, to be confined to a selected cohort of patients who see a specialist smoking cessation adviser, or equivalent, within a primary care setting.

It would also have been useful to examine cardiovascular prescribing data which could have complemented the present study on cardiovascular intermediate outcomes. However, using prescribing data in this way is problematic. Firstly, records of GP prescribing do not necessarily translate into medication dispensed nor into medication concordance. Many prescriptions never result in medication consumed. Secondly, records of scripts issued may give a false picture of prescribing patterns unless the prescribing volume data is standardised. Without this a practice which routinely issues prescriptions for

28 days may appear to be prescribing double the volume of medication as a neighbouring practice issuing the same prescriptions but for a 56 day supply of medication. Thirdly, the prescription has to be linked to the prescribing indication. Thus beta-blockers are predominantly used as a treatment of hypertension but they may be used in a variety of other clinical settings in patients with normal blood pressure, such as for the treatment of anxiety, thyrotoxicosis, palpitations, migraine etc. Future research on the relationship between variations in prescribing patterns and the variation in intermediate outcomes would be of great interest. In particular, a valuable addition to the present study would be further research exploring whether poor cardiovascular risk factor control (blood pressure, cholesterol etc) is linked with low prescribing volumes for these medications.

Lambeth DataNet provides a representative sample of the patient population in Lambeth. However care should be taken when extrapolating results to suburban or rural areas where the range of social and ethnic variation is likely to be considerably less. Similarly, our data refer to an African-Caribbean ethnic minority population and the inequalities experienced by other ethnic minority communities such as South Asians may differ.

Lastly it should be emphasised that the health inequalities which we studied were differences in 'intermediate outcomes'. These are objective bio-medical measures and represent healthcare goals. Nevertheless, intermediate outcomes refer to risk factors for the development of disease, rather than disease itself. Smoking, blood pressure, HbA1c and cholesterol are all risk factors for the subsequent development of cardiovascular disease or, in the case of HbA1c, the complications of diabetes. Much larger population studies are required to determine health inequalities in true outcomes such as the incidence of strokes and heart attacks.

Conclusion

Based on primary care data from an inner city population, our findings suggest that health inequalities in intermediate outcome measures are more strongly related to ethnicity than to social deprivation. Particularly significant shortfalls were found for BP and HbA1c control in the black population with no significant difference in smoking status. Smoking status was the most important difference which related to social deprivation. In spite of some evidence that performance monitoring of primary care has reduced health inequalities, we found that these inequalities remained largely unchanged between 2006 and 2009.

Table 2. Social deprivation and inequalities in BP, cholesterol and Hba1c control and smoking status for patients with chronic conditions in Lambeth (patients in deprived areas vs those in least deprived areas)

		Deprivation effect in 2006[a]		Deprivation effect in 2009[a]		Change over time[b]	
Disease domain	**Outcome**	**Odds ratio**	**Confidence interval (95%)**	**Odds ratio**	**Confidence interval (95%)**	**Odds ratio**	**Confidence interval (95%)**
Diabetes	BP measured in past 15 months	**1.46***	(1.06 - 2.02)	1.42	(0.99 - 2.04)	0.96	(0.59 - 1.55)
	BP <=145/85	0.84	(0.69 - 1.02)	0.92	(0.76 - 1.12)	1.09	(0.83 - 1.44)
	Cholesterol measured in past 15 months	1.23	(0.98 - 1.55)	1.03	(0.80 - 1.33)	0.83	(0.59 - 1.17)
	Cholesterol <=5 mmol/l	0.96	(0.77 - 1.19)	0.84	(0.67 - 1.05)	0.87	(0.64 - 1.18)
	HBA1C recorded in past 15 months	0.87	(0.68 - 1.11)	0.82	(0.62 - 1.07)	0.94	(0.65 - 1.36)
	HBA1C <=10	**0.58***	(0.42 - 0.80)	0.79	(0.58 - 1.08)	1.37	(0.87 - 2.15)
	HBA1C <=7.5	0.86	(0.72 - 1.03)	0.97	(0.81 - 1.16)	1.12	(0.87 - 1.44)
	Smoking status in past 15 months	**0.68***	(0.55 - 0.84)	**0.65***	(0.51 - 0.82)	0.96	(0.70 - 1.31)
Hypertension	BP measured in past 9 months	**1.34***	(1.18 - 1.53)	**1.16***	(1.02 - 1.32)	0.87	(0.72 - 1.04)
	BP <=150/90	1.04	(0.92 - 1.19)	1.00	(0.87 - 1.14)	0.94	(0.78 - 1.13)
	Smoking status in past 15 months	**0.78***	(0.69 - 0.89)	**0.70***	(0.61 - 0.80)	0.89	(0.74 - 1.07)
CHD	BP measured in past 15 months	1.09	(0.68 - 1.74)	1.19	(0.67 - 2.12)	1.11	(0.53 - 2.34)
	BP <=150/90	1.08	(0.78 - 1.49)	1.35	(0.87 - 2.10)	1.24	(0.72 - 2.14)
	Cholesterol measured in past 15 months	0.85	(0.63 - 1.15)	1.06	(0.73 - 1.54)	1.26	(0.78 - 2.03)
	Cholesterol <=5 mmol/l	1.19	(0.88 - 1.59)	1.06	(0.75 - 1.49)	0.89	(0.56 - 1.39)
	Smoking status in past 15 months	**0.60***	(0.46 - 0.80)	**0.55***	(0.39 - 0.78)	0.92	(0.59 - 1.43)
Stroke	BP measured in past 15 months	**1.56***	(1.04 - 2.35)	1.56	(0.86 - 2.83)	1.09	(0.53 - 2.24)
	BP <=150/90	1.07	(0.73 - 1.56)	1.19	(0.76 - 1.87)	1.07	(0.60 - 1.93)
	Cholesterol measured in past 15 months	1.21	(0.90 - 1.62)	1.17	(0.81 - 1.68)	1.07	(0.67 - 1.71)
	Cholesterol <=5 mmol/l	1.18	(0.83 - 1.67)	1.17	(0.80 - 1.72)	0.98	(0.58 - 1.64)
	Smoking status in past 15 months	**0.67***	(0.48 - 0.92)	**0.56***	(0.38 - 0.85)	0.83	(0.50 - 1.39)

Note: Coefficients adjusted for age and gender. An odds ratio greater than one indicates improved treatment and less than one indicates poorer treatment.

[a] Comparing the odds for patients in deprived areas (poorest 20% imd scores) of a good treatment outcome compared to patients in less deprived areas (best 20% imd scores)

[b] Measures the interaction between deprivation and time – showing changes in the effect of deprivation between 2006 and 2009.

Table 3. Ethnicity and inequalities in BP, cholesterol and Hba1c control and smoking status for patients with chronic conditions in Lambeth between 2006 and 2009 (black patients vs white)

		Ethnicity effect in 2006[a]		Ethnicity effect in 2009 [a]		Change over time[b]	
Disease domain	**Outcome**	**Odds ratio**	**Confidence interval (95%)**	**Odds ratio**	**Confidence interval (95%)**	**Odds ratio**	**Confidence interval (95%)**
Diabetes	BP measured in past 15 months	1.13	(0.81 - 1.59)	1.48	(1.10 - 1.97)	1.28	(0.82 - 2.00)
	BP <=145/85	**0.68***	(0.58 - 0.80)	**0.76***	(0.65 - 0.87)	1.11	(0.90 - 1.37)
	Cholesterol measured in past 15 months	**1.33***	(1.08 - 1.65)	**1.27***	(1.05 - 1.53)	0.96	(0.72 - 1.27)
	Cholesterol <=5 mmol/l	0.87	(0.74 - 1.03)	1.08	(0.93 - 1.27)	1.25	(0.99 - 1.57)
	HBA1C recorded in past 15 months	**1.26***	(1.01 - 1.57)	1.15	(0.94 - 1.41)	0.91	(0.68 - 1.23)
	HBA1C <=10	**0.47***	(0.37 - 0.61)	**0.65***	(0.52 - 0.81)	1.35	(0.97 - 1.89)
	HBA1C <=7.5	**0.81***	(0.70 - 0.94)	0.99	(0.86 - 1.13)	**1.22***	(1.00 - 1.49)
	Smoking status in past 15 months	**1.73***	(1.46 - 2.06)	**1.54***	(1.32 - 1.80)	0.89	(0.71 - 1.13)
Hypertension	BP measured in past 9 months	**1.65***	(1.46 - 1.88)	**1.29***	(1.16 - 1.43)	**0.78***	(0.67 - 0.92)
	BP <=150/90	0.91	(0.82 - 1.01)	**0.83***	(0.75 - 0.92)	0.90	(0.78 - 1.04)
	Smoking status in past 15 months	**2.10***	(1.88 - 2.35)	**1.70***	(1.53 - 1.88)	**0.80***	(0.69 - 0.93)
CHD	BP measured in past 15 months	1.00	(0.55 - 1.83)	**2.44***	(1.04 - 5.72)	2.40	(0.85 - 6.76)
	BP <=150/90	0.80	(0.57 - 1.14)	**0.51***	(0.36 - 0.73)	0.62	(0.38 - 1.01)
	Cholesterol measured in past 15 months	1.22	(0.84 - 1.77)	**1.53***	(1.01 - 2.32)	1.22	(0.70 - 2.13)
	Cholesterol <=5 mmol/l	**1.42***	(1.01 - 1.99)	1.07	(0.75 - 1.53)	0.74	(0.46 - 1.21)
	Smoking status in past 15 months	**1.65***	(1.20 - 2.27)	**1.68***	(1.18 - 2.40)	1.01	(0.63 - 1.62)
Stroke	BP measured in past 15 months	1.36	(0.85 - 2.20)	1.39	(0.81 - 2.41)	1.19	(0.57 - 2.45)
	BP <=150/90	**0.68***	(0.48 - 0.96)	**0.69***	(0.49 - 0.97)	0.98	(0.61 - 1.57)
	Cholesterol measured in past 15 months	**1.42***	(1.04 - 1.95)	0.87	(0.64 - 1.18)	0.69	(0.45 - 1.07)
	Cholesterol <=5 mmol/l	1.40	(0.99 - 1.97)	1.28	(0.92 - 1.79)	0.93	(0.58 - 1.49)
	Smoking status in past 15 months	**1.80***	(1.30 - 2.49)	**1.62***	(1.16 - 2.26)	0.87	(0.55 - 1.38)

Note: Coefficients adjusted for age and gender. An odds ratio greater than one indicates improved treatment and less than one indicates poorer treatment.

[a] Comparing the odds for black patients of a good treatment outcome compared to white patients

[b] Measures the interaction between deprivation and time – showing changes in the effect of ethnicity between 2006 and 2009.

Appendix 1.

Table 4. Social deprivation and inequalities in BP, cholesterol and Hba1c control and smoking status for patients with chronic conditions in Lambeth (patients in deprived areas vs those in least deprived areas – deciles version)

		Deprivation effect in 2006[a]		Deprivation effect in 2009[a]		Change over time[b]	
Disease domain	**Outcome**	**Odds ratio**	**Confidence interval (95%)**	**Odds ratio**	**Confidence interval (95%)**	**Odds ratio**	**Confidence interval (95%)**
Diabetes	BP measured in past 15 months	**1.81***	(1.13 - 2.90)	**1.94***	(1.13 - 3.34)	1.04	(0.51 - 2.11)
	BP <=145/85	**0.74***	(0.56 - 0.99)	0.91	(0.68 - 1.22)	1.20	(0.80 - 1.81)
	Cholesterol measured in past 15 months	1.29	(0.94 - 1.77)	1.18	(0.82 - 1.71)	0.90	(0.56 - 1.45)
	Cholesterol <=5 mmol/l	0.94	(0.69 - 1.29)	0.77	(0.55 - 1.09)	0.82	(0.52 - 1.29)
	HBA1C recorded in past 15 months	0.89	(0.64 - 1.26)	0.81	(0.54 - 1.20)	0.91	(0.54 - 1.54)
	HBA1C <=10	**0.60***	(0.37 - 0.97)	0.77	(0.48 - 1.24)	1.33	(0.68 - 2.60)
	HBA1C <=7.5	1.05	(0.81 - 1.37)	1.04	(0.79 - 1.36)	0.97	(0.67 - 1.41)
	Smoking status in past 15 months	**0.64***	(0.47 - 0.89)	**0.53***	(0.37 - 0.76)	0.81	(0.50 - 1.31)
Hypertension	BP measured in past 9 months	**1.46***	(1.22 - 1.74)	1.00	(0.83 - 1.21)	0.70	(0.54 - 0.90)
	BP <=150/90	0.94	(0.78 - 1.13)	**0.81***	(0.67 - 0.98)	0.85	(0.66 - 1.11)
	Smoking status in past 15 months	**0.78***	(0.65 - 0.93)	**0.60***	(0.49 - 0.73)	0.77	(0.59 - 1.00)
CHD	BP measured in past 15 months	1.18	(0.62 - 2.24)	1.09	(0.51 - 2.33)	0.95	(0.35 - 2.55)
	BP <=150/90	1.13	(0.69 - 1.84)	1.31	(0.68 - 2.51)	1.07	(0.48 - 2.39)
	Cholesterol measured in past 15 months	0.81	(0.53 - 1.24)	0.86	(0.50 - 1.48)	1.11	(0.56 - 2.21)
	Cholesterol <=5 mmol/l	1.20	(0.78 - 1.85)	0.82	(0.50 - 1.35)	0.69	(0.36 - 1.31)
	Smoking status in past 15 months	**0.52***	(0.35 - 0.78)	**0.38***	(0.23 - 0.63)	0.72	(0.38 - 1.36)
Stroke	BP measured in past 15 months	1.45	(0.81 - 2.59)	1.61	(0.66 - 3.93)	1.20	(0.42 - 3.44)
	BP <=150/90	1.14	(0.63 - 2.05)	0.93	(0.48 - 1.77)	0.73	(0.31 - 1.72)
	Cholesterol measured in past 15 months	0.84	(0.55 - 1.28)	1.34	(0.78 - 2.29)	1.83	(0.93 - 3.60)
	Cholesterol <=5 mmol/l	1.25	(0.75 - 2.09)	1.27	(0.73 - 2.22)	0.93	(0.44 - 1.94)
	Smoking status in past 15 months	**0.55***	(0.34 - 0.88)	0.39	(0.21 - 0.74)	0.70	(0.32 - 1.53)

Note: Coefficients adjusted for age and gender. An odds ratio greater than one indicates improved treatment and less than one indicates poorer treatment.

[a] Comparing the odds for patients in deprived areas (poorest 10% imd scores) of a good treatment outcome compared to patients in less deprived areas (best 10% imd scores)

[b] Measures the interaction between deprivation and time – showing changes in the effect of deprivation between 2006 and 2009.

Appendix 2.

Table 5. Ethnicity and inequalities in BP, cholesterol and Hba1c control and smoking status for patients with chronic conditions in Lambeth between 2006 and 2009 (non-white patients vs white)

		Ethnicity effect in 2006[a]		Ethnicity effect in 2009 [a]		Change over time[b]	
Disease domain	**Outcome**	**Odds ratio**	**Confidence interval (95%)**	**Odds ratio**	**Confidence interval (95%)**	**Odds ratio**	**Confidence interval (95%)**
Diabetes	BP measured in past 15 months	1.06	(0.78 - 1.44)	1.21	(0.93 - 1.56)	1.13	(0.76 - 1.68)
	BP <=145/85	**0.71***	(0.61 - 0.82)	**0.81***	(0.71 - 0.93)	1.15	(0.94 - 1.40)
	Cholesterol measured in past 15 months	**1.26***	(1.04 - 1.53)	**1.24***	(1.05 - 1.47)	0.99	(0.76 - 1.28)
	Cholesterol <=5 mmol/l	0.92	(0.78 - 1.08)	**1.17***	(1.01 - 1.36)	**1.29***	(1.04 - 1.59)
	HBA1C recorded in past 15 months	**1.27***	(1.03 - 1.56)	1.16	(0.96 - 1.39)	0.91	(0.69 - 1.21)
	HBA1C <=10	**0.52***	(0.41 - 0.67)	**0.73***	(0.59 - 0.90)	1.37	(1.00 - 1.89)
	HBA1C <=7.5	**0.81***	(0.71 - 0.93)	1.00	(0.89 - 1.13)	**1.23***	(1.02 - 1.48)
	Smoking status in past 15 months	**1.73***	(1.47 - 2.03)	**1.55***	(1.35 - 1.80)	0.90	(0.73 - 1.12)
Hypertension	BP measured in past 9 months	**1.62***	(1.44 - 1.83)	**1.27***	(1.15 - 1.40)	**0.79***	(0.68 - 0.92)
	BP <=150/90	0.92	(0.83 - 1.02)	**0.88***	(0.80 - 0.96)	0.92	(0.81 - 1.05)
	Smoking status in past 15 months	**2.11***	(1.90 - 2.34)	**1.67***	(1.52 - 1.83)	**0.78***	(0.68 - 0.90)
CHD	BP measured in past 15 months	0.93	(0.58 - 1.50)	**1.99***	(1.12 - 3.54)	2.09	(1.00 - 4.38)
	BP <=150/90	0.78	(0.58 - 1.05)	**0.64***	(0.48 - 0.86)	0.74	(0.50 - 1.12)
	Cholesterol measured in past 15 months	1.17	(0.86 - 1.57)	**1.68***	(1.21 - 2.31)	1.36	(0.88 - 2.10)
	Cholesterol <=5 mmol/l	1.20	(0.92 - 1.56)	1.12	(0.85 - 1.47)	0.90	(0.62 - 1.31)
	Smoking status in past 15 months	**1.93***	(1.48 - 2.52)	**1.89***	(1.44 - 2.48)	0.98	(0.68 - 1.43)
Stroke	BP measured in past 15 months	1.42	(0.93 - 2.19)	1.54	(0.93 - 2.54)	1.35	(0.71 - 2.58)
	BP <=150/90	**0.67***	(0.49 - 0.92)	0.76	(0.56 - 1.04)	1.06	(0.69 - 1.63)
	Cholesterol measured in past 15 months	**1.73***	(1.29 - 2.31)	1.01	(0.76 - 1.34)	0.76	(0.51 - 1.14)
	Cholesterol <=5 mmol/l	**1.40***	(1.03 - 1.91)	1.33	(0.99 - 1.80)	0.96	(0.63 - 1.46)
	Smoking status in past 15 months	**1.77***	(1.33 - 2.35)	**1.80***	(1.32 - 2.44)	0.93	(0.62 - 1.40)

Note: Coefficients adjusted for age and gender. An odds ratio greater than one indicates improved treatment and less than one indicates poorer treatment.

[a] Comparing the odds for non-white patients of a good treatment outcome compared to white patients

[b] Measures the interaction between deprivation and time – showing changes in the effect of ethnicity between 2006 and 2009.

Appendix 3.

Table 6. Language and inequalities in BP, cholesterol and Hba1c control and smoking status for patients with chronic conditions in Lambeth between 2006 and 2009 (English not primary language vs native English speakers)

		Language effect in 2006[a]		Language effect in 2009[a]		Change over time[b]	
Disease domain	**Outcome**	**Odds ratio**	**Confidence interval (95%)**	**Odds ratio**	**Confidence interval (95%)**	**Odds ratio**	**Confidence interval (95%)**
Diabetes	BP measured in past 15 months	0.74	(0.50 - 1.09)	0.72	(0.52 - 1.01)	0.97	(0.58 - 1.63)
	BP <=145/85	1.09	(0.88 - 1.34)	1.10	(0.91 - 1.34)	1.00	(0.75 - 1.32)
	Cholesterol measured in past 15 months	0.97	(0.73 - 1.28)	1.01	(0.80 - 1.29)	1.06	(0.73 - 1.53)
	Cholesterol <=5 mmol/l	1.09	(0.87 - 1.36)	1.09	(0.89 - 1.34)	1.00	(0.75 - 1.35)
	HBA1C recorded in past 15 months	0.82	(0.62 - 1.08)	0.93	(0.72 - 1.20)	1.14	(0.78 - 1.66)
	HBA1C <=10	1.34	(0.96 - 1.88)	1.15	(0.87 - 1.53)	0.86	(0.56 - 1.33)
	HBA1C <=7.5	0.85	(0.70 - 1.03)	1.00	(0.85 - 1.19)	1.17	(0.90 - 1.51)
	Smoking status in past 15 months	**1.56***	(1.22 - 1.99)	**1.28***	(1.04 - 1.58)	0.83	(0.61 - 1.15)
Hypertension	BP measured in past 9 months	1.07	(0.88 - 1.30)	0.94	(0.81 - 1.09)	0.88	(0.69 - 1.12)
	BP <=150/90	**1.21***	(1.02 - 1.43)	1.10	(0.95 - 1.27)	0.89	(0.71 - 1.12)
	Smoking status in past 15 months	**2.24***	(1.84 - 2.74)	**1.82***	(1.55 - 2.14)	0.80	(0.62 - 1.03)
CHD	BP measured in past 15 months	0.68	(0.37 - 1.23)	1.08	(0.55 - 2.15)	1.64	(0.67 - 4.05)
	BP <=150/90	0.87	(0.55 - 1.36)	1.11	(0.70 - 1.75)	1.18	(0.62 - 2.23)
	Cholesterol measured in past 15 months	0.79	(0.53 - 1.18)	1.33	(0.84 - 2.09)	1.65	(0.90 - 3.00)
	Cholesterol <=5 mmol/l	1.15	(0.77 - 1.72)	1.22	(0.82 - 1.81)	1.05	(0.60 - 1.83)
	Smoking status in past 15 months	**1.52***	(1.04 - 2.23)	**1.60***	(1.09 - 2.35)	1.04	(0.61 - 1.77)
Stroke	BP measured in past 15 months	1.23	(0.65 - 2.32)	2.50	(0.89 - 7.06)	2.60	(0.78 - 8.68)
	BP <=150/90	0.98	(0.58 - 1.66)	1.24	(0.72 - 2.13)	1.15	(0.54 - 2.44)
	Cholesterol measured in past 15 months	1.26	(0.80 - 1.99)	1.45	(0.88 - 2.39)	1.48	(0.76 - 2.87)
	Cholesterol <=5 mmol/l	1.05	(0.65 - 1.70)	1.60	(0.97 - 2.66)	1.55	(0.77 - 3.09)
	Smoking status in past 15 months	**2.13***	(1.31 - 3.46)	**3.38***	(1.80 - 6.36)	1.38	(0.63 - 3.04)

Note: Coefficients adjusted for age and gender. An odds ratio greater than one indicates improved treatment and less than one indicates poorer treatment.

[a] Comparing the odds of a good treatment outcome for those who do not speak English as their first language compared to primary English speakers

[b] Measures the interaction between deprivation and time – showing changes in the effect of language between 2006 and 2009.

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