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Stafford, Mai; Becares, Laia; Hayanga, Brenda; Ashworth, Mark; Fisher, Rebecca

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Running head: continuity of care and ethnicity

**Mai Stafford, PhD, Senior Analytical Manager, The Health Foundation, 8 Salisbury Square, London; ORCID 0000-0001-8411-1653

Laia Bécares, PhD, Professor of Social Science and Health, King's College London, London

Brenda Hayanga, PhD, Research Fellow, King's College London, London

Mark Ashworth, DM, FRCGP, Professor of Primary Care, Kings College London, London; ORCID **0000-0001-6514-9904**

Rebecca Fisher, MA (Cantab), MB BChir, MRCP, MRCGP, PGDip Health Res, Senior Policy Fellow, The Health Foundation, 8 Salisbury Square, London

**Corresponding author:
Mai Stafford
email Mai.Stafford@health.org.uk

Abstract

Background: General practitioners (GPs) and patients value continuity of care. Ethnic differences in continuity could contribute to inequalities in experience and outcomes.
Aim: Describe relational continuity of care in general practice by ethnicity and long-term conditions.
Design and Setting: 381,474 patients in England from a random sample from Clinical Practice Research Datalink, January 2016 to December 2019.
Method: Face-to-face, telephone and online consultations with a general practitioner were included. Continuity, measured by the Usual Provider of Care and Bice-Boxerman indices, was calculated for patients with ≥3 consultations. Ethnicity was taken from the GP record or linked Hospital Episode Statistics and long-term conditions were counted at baseline. Multilevel regression models described continuity by ethnicity sequentially adjusted for i) number of consultations, follow-up time, age, sex and practice-level random intercept, ii) socioeconomic deprivation in the patient's residential area, iii) long-term conditions.
Results: On full adjustment, five of ten ethnic minority groups (Bangladeshi, Pakistani, African, Caribbean, and other Black) had lower continuity of care compared to white patients. Continuity was lower for patients in more deprived areas and younger patients but this did not account for ethnic differences in continuity. Similar ethnic differences were seen for patients with ≥2 long-term conditions.
Conclusion: Ethnic minority identity and socioeconomic deprivation have additive associations with lower continuity of care. Structural factors affecting demand for, and supply of, general practitioners should be assessed for their contribution to ethnic inequalities in relational continuity and other care quality domains.

Keywords
General practice; ethnicity; inequalities; relational continuity of care

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How this fits in

Nationally representative survey data shows lower continuity of care for most ethnic minority groups. To the authors' knowledge, this is the first national study to examine ethnic inequalities in continuity of care using GP records. The study finds that relational continuity of care is lower for people from Black African, Black Caribbean, other Black, Bangladeshi and Pakistani ethnic groups. These ethnic inequalities are not accounted for by socioeconomic deprivation and are seen for people with and without multiple long-term conditions.

Introduction

Relational continuity of care – understood to mean an ongoing therapeutic relationship between patient and practitioner – is associated with a range of positive outcomes. These include lower mortality, fewer hospital admissions, fewer condition-related complications and higher patient satisfaction (1)(2)(3)(4). Relational continuity of care may be particularly important for people with multiple long-term conditions (5) as it has also been associated with lower risk of unscheduled hospital care and slower progression to additional conditions.(6,7). UK evidence on the association between number of long-term conditions and relational continuity is mixed. One national study found that having more long-term conditions was associated with lower continuity.(8) This was primarily driven by their higher number of consultations, as continuity of care indices tend to be negatively correlated with total number of consultations.(3,9). One study set in London found no association between number of long-term conditions and continuity.(10)

Evidence indicates a higher prevalence of multiple long-term conditions in people from ethnic minority backgrounds in the UK.(11) Among people with multiple long-term conditions, there is evidence of poorer outcomes including higher mortality and more emergency admissions to hospital(12,13) for some ethnic minority groups compared with the white majority. (11,12) One possibility is that ethnic inequalities in health care, such as continuity of care, contribute to these poorer outcomes.

Few UK studies describe continuity of care by ethnicity. Data from the General Practice Patient Survey shows a decline in relational continuity between 2011-17 across most sociodemographic groups(14)(15) but with a greater decline for ethnic minority groups than for patients of white ethnicity.(16) The same data shows patients from some ethnic minority groups have a higher preference to see a particular General Practitioner (GP) but less success in doing so.(17) The association between ethnicity and poorer experience of continuity with GPs has persisted over time(18,19) and has been found in a recent study triangulating survey data and GP records.(20) These studies have not focused on possible ethnic inequalities in care for people with multiple long-term conditions.

The study aims were to describe relational continuity of care in general practice by ethnicity at differing levels and types of long-term conditions. Although there are other dimensions of continuity of care including management continuity, relating to whether care is managed in a consistent and coordinated way, and informational continuity, relating to how the information held about a patient is shared and draws upon their preferences and health goals, we focus on relational continuity. We considered the total count of conditions and combinations of mental and physical conditions. Mental health conditions are common among people with multiple conditions and those with mental-physical multimorbidity are at greater risk of poor outcomes than those with only physical or only mental health conditions.(21–24) They may particularly benefit from relational continuity for support to manage their complex care needs.(25) Existing evidence suggests that mental-physical multimorbidity is less prevalent in the health care records of some ethnic minority groups.(26,27) We hypothesise that people from ethnic minority backgrounds will have lower continuity than those of white ethnicity. We hypothesise that these patterns will be seen for people with multiple physical health conditions and those with a combination of physical and mental health conditions. Given the greater levels of socioeconomic deprivation experienced by many ethnic minority groups and the negative association between deprivation and continuity,(16) we hypothesise that area deprivation will be on the explanatory pathway – so adjustment for deprivation will partly explain ethnic inequalities in continuity of care.

Methods
Participants
A random sample of 690,000 patients was drawn from the Clinical Practice Research Datalink (CPRD Aurum (28)). CPRD includes pseudonymised primary care records for over 40 million patients. Patients eligible for the current study met the following criteria on 1st January 2016: registered in a CPRD practice; age 18 or over; eligible for linkage to Hospital Episode Statistics (Admitted Patient Care) and Office for National Statistics area deprivation data (2015 Index of Multiple Deprivation based on patient's residential Lower Super Output Area); and with acceptable data quality.

All consultations with a GP (including locums and sessional GPs) that took place between 1st January 2016 and 31st December 2019 and were face-to-face, telephone or online were included.(29)

Measures
Continuity of care was captured on two widely used indices. The two indices are positively correlated but are differently affected by the total number of GPs that a patient sees. The Usual Provider of Care (UPC) index captures the concentration of care with a specified GP.(30) It is calculated as the maximum number of visits to the same GP divided by the total number of visits over a specified time period. Although the UPC is straightforward to interpret, it does not account for the fact that a patient may have high relational continuity with more than one GP. For example, a patient with 5 visits to the same GP plus 5 visits to 5 different GPs would have the same UPC (0.5) as a patient with 10 visits spread equally across only 2 GPs. The Bice-Boxerman (COC) index captures the concentration of visits across all the GPs seen.(31) It is calculated as the square of the number of visits with a GP, summed across all GPs and divided by the product of the total number of visits and the total number of visits minus 1. Here, the COC index would be 0.22 and 0.44 respectively for the two scenarios above. Patients with a minimum of three consultations during follow-up from 2016 to 2019 were included in the main analysis. Shorter follow-up was also considered in sensitivity analysis.

Ethnicity was taken from SNOMED codes in the primary care record or, if missing, from the Hospital Episode Statistics Admitted Patient Care record, using a previously published algorithm for dealing with multiple observations of ethnicity.(32) The England and Wales 2011 Census categories were used but we combined white British and other white ethnic groups to reduce the number of missing values in the main analysis. In sensitivity analysis, we disaggregated the white ethnicity group and the mixed ethnicity group.

The number of long-term conditions was counted on 1st January 2016 from a list adapted from previous analysis of CPRD(33) and Scottish primary care data(34) (Supplementary Table S1) based on published SNOMED code lists.(35) In addition to the total count, we identified patients with four different combinations of conditions: 0-1 condition / 2 or more physical health conditions / 2 or more mental health conditions / 1 or more physical and 1 or more mental health condition.

Statistical analysis
All analyses were adjusted for number of consultations and for length of follow-up to account for some patients leaving the practice or dying before 31st December 2019, or the practice

ceasing contributions to CPRD. Using multilevel linear regression models to allow for the clustering of patients within the same GP practice, we first estimated bivariate associations between each covariate and the two continuity of care indexes. We then estimated differences in continuity of care across ethnic minority groups compared to the majority white ethnic group with adjustment for i) age and sex, ii) index of multiple deprivation based on the residential postcode of the patient, iii) number or combination of long-term conditions.

In sensitivity analysis, we calculated continuity of care over a period of 12 months and limited the sample to patients with at least three consultations between 1st January 2016 and 31st December 2016. We also examined more detailed ethnic groups for the subset of patients where this was available, breaking down the white ethnic group as British / Irish / other white, and the mixed ethnic group as white & Asian / white & African / white & Caribbean / other mixed.

Results:
From the initial sample, we excluded patients with fewer than three GP consultations during follow-up (Figure 1). Men and younger patients were over-represented in those excluded. A further 32,233 patients with missing data were excluded. Men, younger patients and those living in the least deprived areas were over-represented in those excluded because of missing ethnicity data (Supplementary Table S2).

Women and patients living in the least deprived fifth of areas were over-represented in the analytical sample (Table 1). Over a maximum of four years of follow-up, continuity on the UPC index ranged from 0.42 for those aged 18-29 years to 0.48 for those aged 70-79 years and the COC index ranged from 0.21 to 0.30 in the same age groups. One third of patients had two or more long-term conditions. This ranged from under 15% in people of Chinese ethnicity to over 35% in people of white ethnicity (Supplementary Table S3). The UPC index was lowest for people of Bangladeshi ethnicity (0.41) and was 0.45 for people of white ethnicity. This difference translates to one additional consultation with the most frequently seen GP for every 25 visits for the white ethnic group compared with the Bangladeshi ethnic group.

Minimally adjusted models
Analysis adjusted for length of follow-up and total number of consultations confirmed a positive association between advancing age and continuity of care captured by the UPC index (Table 2; Model 1). Women experienced lower continuity of care. Patients living in more deprived areas had lower continuity of care. Patients with more long-term conditions had higher continuity of care.

Multiply adjusted model - covariates
Multiply adjusted associations between continuity of care and demographic and clinical covariates were in the same direction as for the bivariate analysis, with the exception of long-term conditions. In the multiply adjusted analysis, patients with more long-term conditions had lower continuity of care. When the combination of long-term conditions was considered, we found that patients with two or more physical health conditions had lower continuity of care. However, patients with two or more mental health conditions or a combination of physical and mental health conditions had higher continuity of care.

Multiply adjusted model – differences across ethnic groups

In multiply adjusted analysis, five of the ten ethnic minority groups (Bangladeshi, Pakistani, African, Caribbean, and any other Black background) had lower continuity of care than patients of white ethnicity (Table 2, models 2 and 3, and Figure 2). Patients of Indian or Chinese ethnicity had higher continuity than patients of white ethnicity. These differences in continuity across ethnic groups remained after adjustment for socioeconomic deprivation in the patient's local area; being from an ethnic minority group and living in an area with greater deprivation were independently associated with lower continuity.

There was no evidence of an interaction between ethnicity and long-term conditions. The same ethnic differences in UPC were seen for all patients and for the subgroup of patients with two or more long-term conditions (Table 2, model 4).

Sensitivity analyses
The same patterns of ethnic inequalities in continuity were seen for the COC index (Supplementary Table S4).

Analysis was repeated with continuity of care measured over the first 12 months of follow-up from 1st January to 31st December 2016. The subset of patients with at least three consultations during this shorter follow-up period were older, more likely to be women, more likely to live in deprived areas and more likely to have two or more long-term conditions compared with the main analytical sample (Supplementary Table S2). Mean UPC (0.57; sd 0.23) and COC (0.35; sd 0.29) were higher for this sub-sample, as expected given the shorter follow-up time. For both indices, the associations between continuity of care over 12 months and covariates were of similar magnitude and same direction to the main analyses (Supplementary Table S5). Differences in continuity of care over 12 months across ethnic groups were also similar. Statistically significant lower levels of continuity of care were seen for patients from Bangladeshi, Pakistani, Black African and Black Caribbean ethnic groups compared with patients of white ethnicity.

When the white ethnic group was disaggregated, lower continuity of care was seen for patients in the Irish ethnic group and higher continuity of care in the other white ethnic group compared to the white British ethnic group on both continuity of care indices (Supplementary Table S6). Mixed ethnic groups did not differ significantly from those in the white British ethnic group. As with the main analysis, people of Bangladeshi, Pakistani, Black African, Black Caribbean and other Black ethnic groups had lower continuity of care.

Discussion
Summary
Continuity of care is lower for all Black ethnic groups and for Pakistani and Bangladeshi ethnic groups than for the white ethnic group. In the slightly smaller sample where it was possible to disaggregate the white ethnic group, white Irish people are seen to have lower continuity than white British people. Ethnic inequalities in continuity of care persist on adjustment for the number and type of long-term conditions present and for socioeconomic deprivation. Being from an ethnic minority group and living in a socioeconomically deprived area have additive associations with lower continuity of care.

Associations are consistent for different indices of continuity of care and different lengths of follow-up. The differences between ethnic minority groups and the white ethnic group are similar in size to the differences between the most and least deprived fifth of areas. Differences of this size likely have a modest impact on outcomes; previous studies (set

outside the UK) suggest a 0.1 difference in either the UPC(36) or the COC(37) index is associated with a modest reduction in mortality risk.

Strengths and limitations
The study used a large sample of general practice data. With over 95% of the England population registered with a GP, the sample is nationally representative. We used two indices that capture different aspects of continuity of care and considered continuity over one to four years of follow-up. We were able to disaggregate ethnicity, although the main analysis used all white ethnic groups as the comparator to minimise loss due to missing detailed ethnicity data. The main analysis may underestimate ethnic inequalities because the white Irish ethnic group had lower continuity than the white British group.

As with most previous studies, we only considered consultations with GPs. There are increasing numbers of consultations with practice nurses and allied health professionals so it would be of interest to additionally examine ethnic and other differences in continuity in those relationships.

Our study controlled for key patient factors, including the presence or absence of more than 30 long-term conditions and combinations of physical and mental health conditions. However, data on practice factors was not available to us. Several practice level factors, including those relating to the supply of and demand for GP appointments are modifiable features that can promote or inhibit opportunities to provide continuity of care.

Comparison with other studies
Previous studies of patients in England have used cross-sectional survey data to examine preferences for and experience of relational continuity of care across ethnic groups. A study of over two million respondents to the 2009/2010 General Practice Patient Survey described continuity across detailed ethnic groups.(17) All ethnic minority groups were less likely to see their preferred doctor most of the time compared with those of white British ethnicity. Our findings align with that study for Black, Bangladeshi and Pakistani groups but not for patients of Indian or Chinese ethnicity. That study adjusted for a similar set of covariates including sex, age group, deprivation quintile and presence of long-term medical and psychological conditions. They additionally adjusted for number of GPs in the practice and the urgency of appointments the patient had recently sought, but these adjustments did not alter the direction of differences in continuity across ethnic groups.

Several other analyses of surveys of general practice have shown poorer experience of primary health care, including experience of making appointments, communication, interpersonal care and continuity of care, in most ethnic minority groups.(19,38,39) Our study and one other (20) using routine health data indicates that differences in expectations and other aspects of self-reporting bias (16,40) are not feasible explanations for these ethnic inequalities.

Implications
Continuity of care is valued by patients and GPs (41) but this research shows that it is less available to some ethnic minority groups, including for people with MLTCs. It is plausible that aspects of health care delivery, including lower continuity of care, could contribute to poorer outcomes for people with multiple long-term conditions from ethnic minority groups though this was not directly tested in the current study. Insufficient local service support to help manage long-term conditions has been described in the lived experience of people from ethnic minority groups.(42) Given the established associations between continuity of care and adverse outcomes including higher mortality, unplanned admissions and complications (1, 2, 3), further analysis is required to test and quantify continuity as a possible link between

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ethnicity and these outcomes. Continuity of care has been identified as one way of tackling inequalities in other medical specialties. For example, the NHS long-term plan committed to improving continuity of care during pregnancy as one approach to tackling ethnic inequalities in maternity outcomes.(43) Our findings suggest that there could be a need to tackle inequalities in continuity of care in primary care, with possible implications for improving outcomes for people from ethnic minority groups with long-term conditions.

We did not explore barriers and enablers to continuity of care in this study. There are several practice-level factors that may affect continuity and may result in differences across ethnic groups. These include aspects of demand for general practice such as the size of the practice (with practices with a larger list size having lower continuity(14,44)), the number of new registrations, the health of the practice catchment area population, and local socioeconomic deprivation.(16)

Aspects of supply may also be related to continuity. Practices differ in how they balance rapid access to GPs with promoting higher continuity of care. GP staffing patterns, booking systems, and the total number of appointments available to book are also likely to affect patients' ability to see a preferred GP. Continuity of care is lower where there are more part-time GPs or more GPs in the practice and is higher in single-handed practices. (17,45,46) There are also national drivers that likely affect access and the ability of practices to offer higher continuity. General practice in deprived areas is under-funded and under-doctored relative to need.(47) Making the distribution of funding between general practices more equitable, and developing workforce initiatives to attract and retain general practice staff in under-doctored areas (48) may reduce inequalities in continuity of care by increasing supply.

Several of the factors discussed above - the health of the practice catchment area population, under-funding and under-doctoring relative to need, and area-level socioeconomic deprivation – are unequally distributed across ethnic groups. These are manifestations of structural racism. Structural racism refers to the way in which societies foster racial discrimination through mutually reinforcing systems of health care, housing, education, employment, criminal justice, earnings, and benefits, among others. These patterns and practices in turn reinforce discriminatory beliefs, values, and the distribution of resources.(49) The structural factors operating across the life course (50) that lead to over-representation of ethnic minority groups in more socioeconomically deprived areas will therefore make a contribution to the inequalities in continuity of care seen in this and other studies. The persistence of the association between ethnicity and continuity even after statistically controlling for area deprivation indicates that additional pathways may be operating. Racism may have additional effects on continuity of care through differences in the way that people from ethnic minority groups are treated in GP practices or experience barriers in living near and accessing the highest level of GP services. Socio-cultural norms and language barriers may also contribute to ethnic differences in what patients expect or feel they can influence, and this could affect the extent to which people from some ethnic minority groups seek continuity of care.(51,52)

Further research is needed to understand why some ethnic minority groups have poorer continuity of care and to identify initiatives that could be made to improve services to meet their needs. The patient-practitioner relationship that is developed through higher continuity of care could help bridge cultural differences and reduce the lack of trust, experiences of insensitive behaviour, and lack of listening that is more commonly experienced in healthcare settings by people from some ethnic minority groups.(52)

Studies show that continuity of care has been declining in England in recent years.(14,15) It is not yet clear how the introduction of primary care networks, the chronic shortage of GPs,

the increasing use of remote consultations, and other changes in general practice will affect continuity,(53,54) and inequalities in continuity, as we recover from the long-term effects of the pandemic. Ongoing monitoring will be needed.

Conclusion

This analysis of routine health record data on a large sample of patients followed over four years shows that relational continuity of care is lower for people from Black African, Black Caribbean, other Black, Bangladeshi and Pakistani ethnic groups. These ethnic inequalities are not accounted for by socioeconomic deprivation and are seen for people with and without multiple long-term conditions.

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Table 1. Continuity of care by demographic characteristics

	Total patients; n (%)	UPC[a]; mean (sd)	COC[b]; mean (sd)
Age			
18-29y	58920 (15.4)	0.42 (0.20)	0.21 (0.21)
30-39y	64348 (16.9)	0.42 (0.20)	0.22 (0.21)
40-49y	62563 (16.4)	0.44 (0.20)	0.24 (0.22)
50-59y	66207 (17.4)	0.45 (0.21)	0.26 (0.22)
60-69y	53925 (14.1)	0.47 (0.21)	0.28 (0.23)
70-79y	44370 (11.6)	0.48 (0.21)	0.30 (0.23)
80+y	31141 (8.2)	0.47 (0.21)	0.30 (0.22)
Sex			
Women	217592 (57.0)	0.43 (0.20)	0.24 (0.21)
Men	163882 (43.0)	0.47 (0.21)	0.27 (0.23)
Area deprivation			
Most deprived[c]	71416 (18.7)	0.43 (0.20)	0.24 (0.21)
Least deprived	81362 (21.3)	0.46 (0.21)	0.26 (0.22)
Ethnicity			
Bangladeshi	2901 (0.8)	0.41 (0.19)	0.21 (0.19)
Pakistani	7050 (1.8)	0.43 (0.20)	0.24 (0.21)
Indian	10459 (2.7)	0.46 (0.21)	0.27 (0.23)
Any other Asian background	6407 (1.7)	0.45 (0.21)	0.26 (0.23)
Black African	7978 (2.1)	0.42 (0.20)	0.22 (0.21)
Black Caribbean	5399 (1.4)	0.42 (0.21)	0.24 (0.22)
Any other Black background	2272 (0.6)	0.42 (0.21)	0.22 (0.21)
Chinese	1891 (0.5)	0.45 (0.21)	0.24 (0.22)
Mixed	5183 (1.4)	0.43 (0.20)	0.23 (0.21)
All other ethnic groups	5466 (1.4)	0.44 (0.21)	0.24 (0.22)
White	326468 (85.6)	0.45 (0.21)	0.25 (0.22)
Number of Long-Term Conditions			
0-1	253137 (66.4)	0.45 (0.21)	0.24 (0.22)
2+	128337 (33.6)	0.45 (0.21)	0.27 (0.21)
For those with 2+ Long-Term Conditions			
2+ physical LTCs	91031 (23.9)	0.45 (0.21)	0.27 (0.22)
2+ mental LTCs	583 (0.2)	0.45 (0.22)	0.28 (0.24)
2+ physical and mental LTCs	36723 (9.6)	0.44 (0.21)	0.26 (0.21)

[a]UPC is Usual Provider of Care Index; [b]COC is Bice-Boxerman continuity of care index; [c]Patient resident in one of the 20% most deprived areas of England;

Table 2 Association between Usual Provider of Care Index (UPC) and demographic characteristics

	Model 1 Follow-up time + number of consultations + each covariate separately n=381,474		Model 2 Multiply adjusted n=381,474		Model 3 Multiply adjusted n=381,474		Model 4 Subgroup with 2+ LTCs n=128,337	
	Coeff	95% CI	Coeff	95% CI	Coeff	95% CI	Coeff	95% CI
Follow-up time in years	**-0.015**	(-0.016,-0.014)	**-0.018**	(-0.019,-0.017)	**-0.018**	(-0.019,-0.017)	**-0.016**	(-0.018,-0.015)
Total consultations	**-0.001**	(-0.002,-0.001)	**-0.002**	(-0.002,-0.002)	**-0.002**	(-0.002,-0.002)	**-0.001**	(-0.001,-0.001)
Age (ref 18-29y)								
30-39y	**0.007**	(0.005,0.009)	**0.007**	(0.005,0.009)	**0.007**	(0.005,0.009)	**0.010**	(0.004,0.016)
40-49y	**0.027**	(0.025,0.029)	**0.026**	(0.024,0.028)	**0.025**	(0.023,0.027)	**0.032**	(0.026,0.037)
50-59y	**0.043**	(0.041,0.045)	**0.041**	(0.039,0.043)	**0.041**	(0.039,0.043)	**0.044**	(0.039,0.049)
60-69y	**0.059**	(0.057,0.061)	**0.056**	(0.054,0.058)	**0.056**	(0.054,0.058)	**0.060**	(0.055,0.065)
70-79y	**0.075**	(0.073,0.077)	**0.072**	(0.069,0.074)	**0.073**	(0.071,0.076)	**0.071**	(0.066,0.076)
80+y	**0.075**	(0.072,0.078)	**0.074**	(0.071,0.076)	**0.075**	(0.073,0.078)	**0.069**	(0.064,0.074)
Women	**-0.031**	(-0.033,-0.029)	**-0.027**	(-0.028,-0.026)	**-0.027**	(-0.028,-0.026)	**-0.020**	(-0.022,-0.018)
Area deprivation (ref Q1)								
Q2	**-0.003**	(-0.005,-0.001)	-0.002	(-0.004,0.000)	-0.002	(-0.004,0.000)	-0.002	(-0.006,0.001)
Q3	**-0.007**	(-0.009,-0.005)	**-0.003**	(-0.005,-0.001)	**-0.003**	(-0.005,-0.001)	-0.003	(-0.007,0.000)
Q4	**-0.013**	(-0.015,-0.011)	**-0.007**	(-0.009,-0.005)	**-0.007**	(-0.010,-0.005)	**-0.010**	(-0.014,-0.006)
Q5 (most deprived)	**-0.018**	(-0.020,-0.015)	**-0.009**	(-0.011,-0.007)	**-0.010**	(-0.012,-0.007)	**-0.010**	(-0.014,-0.006)
Ethnicity								
Bangladeshi	**-0.040**	(-0.047,-0.032)	**-0.026**	(-0.033,-0.019)	**-0.025**	(-0.032,-0.018)	**-0.030**	(-0.045,-0.015)
Pakistani	**-0.022**	(-0.027,-0.017)	**-0.010**	(-0.014,-0.005)	**-0.009**	(-0.014,-0.004)	**-0.014**	(-0.024,-0.004)
Indian	0.000	(-0.003,0.005)	**0.006**	(0.002,0.009)	**0.006**	(0.002,0.010)	**0.011**	(0.004,0.019)
Any other Asian background	-0.004	(-0.008,0.001)	0.004	(-0.001,0.008)	0.004	(0.000,0.009)	**0.011**	(0.001,0.021)
Black African	**-0.024**	(-0.028,-0.019)	**-0.016**	(-0.020,-0.012)	**-0.015**	(-0.019,-0.011)	-0.010	(-0.020,0.000)
Black Caribbean	**-0.011**	(-0.016,-0.006)	**-0.013**	(-0.018,-0.008)	**-0.012**	(-0.017,-0.007)	**-0.015**	(-0.024,-0.006)

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Any other Black background	**-0.026**	(-0.033,-0.018)	**-0.015**	(-0.023,-0.008)	**-0.015**	(-0.022,-0.007)	**-0.015**	(-0.033,-0.003)
Chinese	**0.010**	(0.001,0.018)	**0.015**	(0.007,0.023)	**0.016**	(0.007,0.024)	**0.025**	(0.004,0.046)
Mixed	**-0.016**	(-0.021,-0.011)	-0.004	(-0.009,0.001)	-0.004	(-0.009,0.001)	0.000	(-0.011,0.011)
All other ethnic groups	**-0.014**	(-0.019,-0.009)	-0.005	(-0.010,0.000)	-0.004	(-0.006,0.001)	0.009	(-0.003,0.021)
Each additional LTC	**0.007**	(0.007,0.008)	**-0.001**	(-0.002,-0.001)				
2+ physical LTCs	**0.021**	(0.019,0.022)			**-0.007**	(-0.009,-0.006)		
2+ physical and mental LTCs	**0.018**	(0.016,0.020)			**0.008**	(0.006,0.010)		
2+ mental LTCs	**0.026**	(0.011,0.041)			**0.027**	(0.012,0.041)		

Bold indicates p<0.05

Figure 1 Analytical sample flow chart


```
Random sample
n=690,000 patients
```
→ Excluded patients with <3 consultations

```
With at least 3
consultations during
follow-up
n=413,707 patients
```
→ Excluded patients with missing age, sex, IMD score

```
With complete
covariate data
n=412,722 patients
```
→ Excluded patients with missing ethnicity
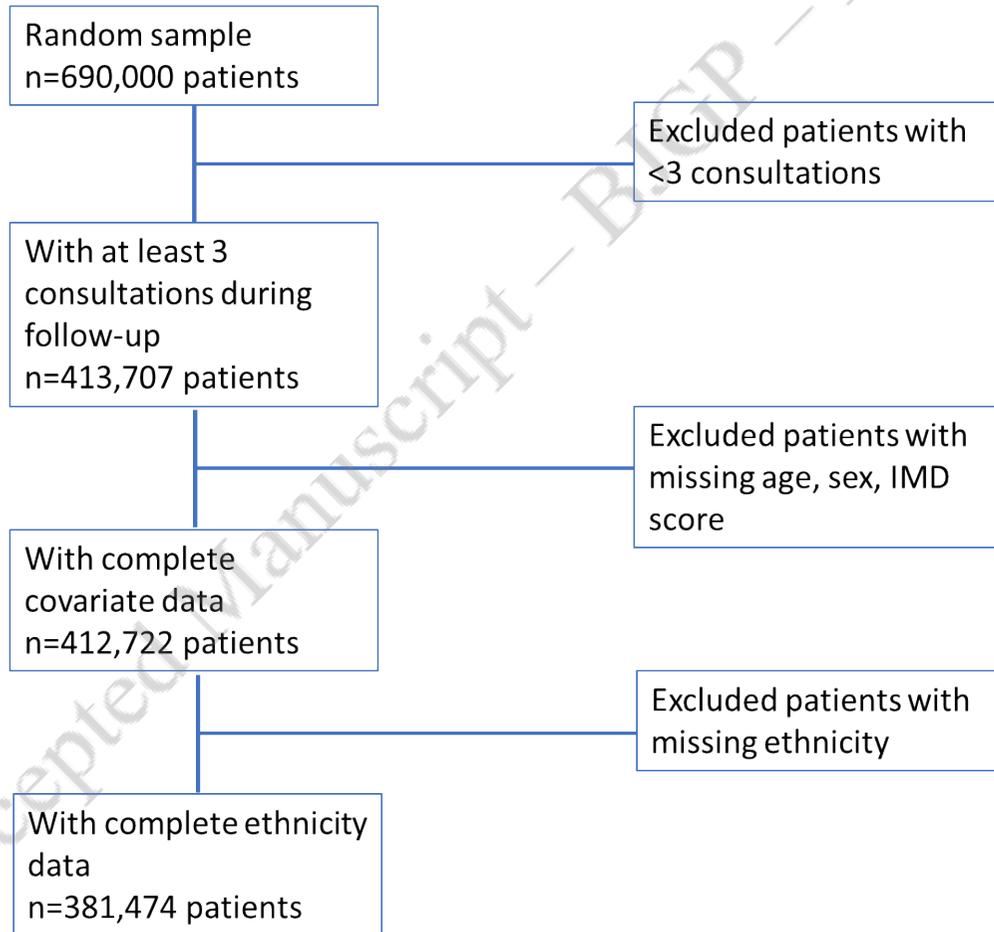
```
With complete ethnicity
data
n=381,474 patients
```

Figure 2 Difference in continuity of care across ethnic groups
Legend: White ethnic group is used as the reference.
Model 1: Adjusted for follow-up time, number of consultations and GP practice random intercept; Model 3: Adjusted for follow-up time, number of consultations, GP practice random intercept, age, sex, area deprivation, number of long-term conditions