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Access to GPs:

How to estimate weighted populations from models of utilisation

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EXECUTIVE SUMMARY

Introduction

Achieving a reasonably equitable distribution of GPs across Britain has been widely seen as one of the great successes of the NHS. Since the second world war the variation between areas in the number of people per GP has been dramatically reduced. However, there is an increasing recognition that the need for GPs is influenced by much more than the number of people living in an area.

GP utilisation varies with age and gender. Consultations are higher amongst women than men and increase with age. In addition, having standardised for age and sex, a significant range of factors are associated with GP utilisation such as morbidity, ethnicity, tenure and car ownership.

To date a number of incentives have been offered to encourage GPs to practice in underdoctored areas. However, what is now needed is much more radical reform; the development of a weighted capitation formulae for GP services based on estimates of the relative needs of small areas.

Aims

The aim of this paper is to develop statistical models which explain the utilisation of GP services and which can also subsequently be linked to the 1991 Census data to calculate weighted population estimates for areas based on their need for health care.

The analysis is based on the assumption that the utilisation of GP services is determined by four key groups of factors:

- Demographic characteristics
- Health status
- Socio-economic circumstances
- Local availability of services

Data

The dataset available for analysis is based on information collected by the Office of Population Censuses and Surveys as part of its monthly Omnibus survey and administrative data from the DoH performance indicator package.

The OPCS Omnibus Survey is a monthly random sample of approximately 2,000 adults who are representative of the British population. The paper is based on six months of Omnibus data; a total sample of 10,935 English responents. The Omnibus survey contains a core set of questions which overlap with large parts of the Census questionnaire. In addition, the Institute requested the insertion of three health status questions - including the Census health question - and three health care utilisation questions.

Primary care availability data was included in individual models of utilisation at GHS regional level. This regional categorisation splits standard regions into metropolitan and non-metropolitan areas. These are

characterised by substantial variation in the availability of NHS resources. The hypothesis to be tested is that all other things being equal, such variation influences utilisation.

Methods

The variable of interest - whether or not individuals utilised GP services - is a dichotomous one; it takes the value 0 or 1. The most appropriate statistical technique to use, therefore, is logistic regression.

Models were developed which best explained the variation in GP utilisation for both the whole sample and three sub-groups: women under 45, men under 45, and all people over 45.

Results

In all of the models the single most important determinant of GP utilisation is health status; the Census health question about limiting long-standing illness and being permanently unable to work due to illness.

Having controlled for health status, a number of different age/sex groups had additional utilisation. Women are more likely to consult their GP than men. This was particularly true for young women, women with children and women aged 45-59. In addition, all people over 60 have raised utilisation rates.

Over and above health and age/gender characteristics, people who classified themselves as Asians were significantly more likely to consult their GPs.

There was some evidence to suggest that individuals with higher socio-economic status - owning more than one car and being an owner occupier - were less likely to consult. *Ceteris paribus*, married men under 45 were more likely to consult than others. In addition, there are some complicated associations between gender, employment and GP utilisation.

Finally, a number of primary care indicators were negatively associated with GP utilisation. This suggests that at an area level the inverse care law may be in operation.

Synthetic estimations

Odds ratios derived from the models in this paper can be used to calculate weighted population estimates. First, judgements must be made about which of the significant variables are legitimate *need* indicators. Second, weighting factors are calculated for each of the selected variables by combining their odds ratios with the population's characteristics. Third, a need indicator is calculated which is the product of the weighting factors for each characteristic. Finally, the need indicator is applied to the number of people living in the area to derive a weighted population estimate.

1. INTRODUCTION

1.1 One of the original objectives of the National Health Service was to achieve more equitable access to medical services. Before the second world war there were gross disparities between different areas in the number of GPs. For example, the number of people per doctor was 3.4 times higher in South Shields than in Hastings. During the second reading debate of the NHS Bill in 1946 Aneurin Bevan described the distribution as 'entirely unfair'.

1.2 Bevan's way of tackling this was to establish the Medical Practices Committee, which - through a process of negative direction - has ensured that the distribution of GPs corresponds much more closely to the size of local populations. For example in 1990/91, Rotherham had the most people per doctor, but this was only 1.5 times greater than Kensington, Chelsea and Westminster, which had the least.

1.3 This more equitable distribution of GPs has been widely seen as one of the great success stories of the NHS. But in recent years there has been growing recognition that the need for General Medical Services (GMS) is influenced by much more than the unweighted size of the local population.

1.4 It is widely recognised that age and gender influence consultation rates. Figure 1 shows that at most ages adult women consult more frequently than men and people over 75 are twice as likely to have seen a doctor in the previous two weeks than people aged 16-44. In addition,

a wider range of demographic, morbidity and socio-economic characteristics are associated with variations in consultation rates. Figure 2 shows age and sex standardised consultations by ethnicity and morbidity. People self-classified as Asian or with a limiting long-standing illness have significantly high consulting rates. Interestingly, there appear to be no statistically significant differences between social classes in GP contacts, but there is other evidence of socio-economic variation. Figure 3 shows that people living in local authority housing are more likely to consult than owner-occupiers. Similarly, the lack of access to car is also positively associated with consulting.

1.5 It is for these kinds of reasons that when the MPC considers applications for admission to the Medical List it examines each one "individually in the light of the particular local circumstances".

1.6 The strength of this approach is that it ensures a considerable degree of procedural fairness in the treatment of individual applications. What it cannot easily do is to produce aggregated national assessments of need or facilitate general judgements about the equitable distribution of GPs.

1.7 In addition to the negative controls exercised by the MPC there have been numerous attempts since 1948 to provide positive financial inducements to practice in under-doctored areas. One recent innovation has been the introduction of deprivation payments to support GPs working in the most hard-pressed areas. There has been considerable criticism

of these payments not least because they are not linked in any way to the level or quality of service provided. Nevertheless, the basic principle of allocating additional resources to deprived areas to reflect the greater level of need is a valid one.

1.8 In their critique of the reliance on Jarman's UPA score as the basis for determining deprivation payments Professor Balarajan and his colleagues (1992) have demonstrated one possible way forward. By linking evidence about individual variations in the use of GP services with the characteristics of small areas they have shown how it is possible to estimate the relative needs of different populations.

1.9 Unfortunately, the full policy implications of this work have not yet been addressed. What is now needed is much more radical reform; the development of a weighted capitation formula to ensure the fairer distribution of GMS expenditure between FHSAs having taken account of health needs and the availability of other resources to meet them.

2. AIMS

2.1 The aim of this report is to describe the development of statistical models which both explain the utilisation of GP services and can be subsequently linked to the 1991 Census data to calculate weighted population estimates for areas on the basis of their need for health care.

2.2 Previous work (Puffer, 1986; Evandrou *et al.* 1992) suggests that the utilisation of GP services is determined by a wide range of different factors including:

- Demographic characteristics
- Morbidity
- Socio-economic circumstances
- Availability of local services

2.3 What we want to know is what combination of Census variables best predicts the usage of services? The logic of our approach can perhaps be best illustrated as follows:

if utilisation = f (illness + socio-economic and demographic characteristics + supply side factors)

and health care needs = f (utilisation adjusted for supply side factors)

then health care needs = f (illness + socio-economic and demographic factors).

What this means in practice is that the odds ratios derived from robust statistical models which are good predictors of health care utilisation can be used to estimate weighted populations.

2.4 The remainder of this report has four parts. First, it describes the dataset used and its representativeness. Second, it discusses the methodology employed to develop the utilisation models from a complex array of determinants. Third, it presents the results of the modelling.

Finally, it explains the synthetic estimation technique which uses the results of the models to develop weighted population estimates.

3. DATA

3.1 The dataset used for this analysis is based on information collected by the Office of Population Censuses and Surveys (OPCS) as part of its monthly Omnibus Survey and administrative data about the availability of services from the Department of Health's performance indicator package.

OPCS Omnibus Survey

3.2 The Omnibus Survey is a relatively new survey service for government departments and public bodies. It aims to provide a fast, effective and reliable way of obtaining information about the characteristics, behaviour and attitudes of the general population or of particular groups of people. The survey is conducted monthly for approximately 2,000 adults, the average response rate is approximately 80 per cent. Fieldwork takes place over a two week period and the results are made available to clients in the form of a report and computer file about one month later.

3.3 The Omnibus Survey is based on a random sample of the general British population (OPCS, 1991a). The sample addresses for the OPCS Omnibus Survey come from the Postcode Address File, an up-to-date sampling frame of the addresses of private households in Great Britain. Each month a random sample of 100 sampling areas (postcode sectors) in England, Wales

and Scotland (excluding the Scottish Islands) is selected, stratified to ensure that all regions are included and that, within each region, the basic tenure and occupation types are correctly represented.

3.4 In each area, 30 addresses are selected at random for visit by interviewers. About 12 per cent of the addresses visited each month will not be eligible for the survey in that they will not contain a resident private household. At the remaining addresses the interviewers establish what households live at the address, and, if necessary, randomly select one household for the survey. They then list all adult members of that household in age order and select one of them, at random, as the informant.

3.5 No substitutes are taken, either for addresses or households or informants. Interviewing is carried out face-to-face with the designated informant. No proxy interviewing takes place, because of the large opinion component in Omnibus questions, although questions may be asked about other people in the household.

3.6 Since only one household member is interviewed, people in households containing few adults have a greater chance of selection than those in households with many. Responses are weighted to correct for this unequal probability of selection. First, responses are weighted by the number of adults in the household, to correct the proportions, and then adjusted to give a total sample size equal to the number of informants actually interviewed.

3.7 The analyses in this report are based on data collected in six different months over the last two years: April, August, November 1991, February, May and November 1992. The achieved sample size is 12,766 from 15,848 eligible addresses - a response rate of 80.5 per cent.

3.8 The representativeness of the survey can be assessed by comparing it to the 1991 Census (OPCS, 1992). It should be noted, however, that the Omnibus Survey includes people over the age of 16 only, whereas the Census includes children and young people. In addition, information on car ownership and tenure are not strictly comparable, since the 1991 Census is based on household data and the Omnibus Survey on individual responses. As can be seen in Table 1 the Omnibus Survey has a slightly higher proportion of women respondents, owner occupiers and households with 2 or more cars. It has fewer individuals from minority ethnic groups, those aged over 75 and households with no car. Otherwise the regional and age distributions of the populations are similar.

3.9 One of the key features of the Omnibus Survey is that each month a set of basic classificatory data is collected in addition to any questions requested by clients. These data cover many of the characteristics of individual respondents and their household circumstances which were included in the 1991 Census. Table 2 shows the items of information collected in the 1991 Census and their availability in the Omnibus Survey. As can be seen from the Table the only relevant omissions from the Omnibus Survey are: type of accommodation; country of birth; daily journey to work; qualifications; and household amenities.

3.10 In addition to the basic module, the King's Fund Institute requested the insertion of three questions about health status - the Census health question, subjective assessment of health and recent acute illness; and three utilisation questions - for accident & emergency and out-patient attendance, in-patient stays and general practitioner consultations. All of the questions, except that about GP consultations, were identical to those asked in the General Household Survey (GHS). On the advice of OPCS, the GP consultation question had to be modified slightly to simplify it from a series of questions in the GHS to a single question in the Omnibus survey.

3.11 Table 3 compares some of the results from the 1991/1992 Omnibus Surveys with similar questions asked in the 1990 GHS (Smyth and Browne, 1992). There are a number of differences, and two of them are particularly worthy of note. The Census question on limiting long-term illness has a lower prevalence rate in the Omnibus Survey, although this may reflect the alterations made to the question for the Census (see Benzeval and Judge, 1993). GP utilisation during the previous two weeks is lower in GHS than in the Omnibus Survey, but it is known that GP use varies from year to year and sample to sample.

Service availability indicators

3.12 Service availability factors were obtained from the DoH performance indicator package for 1990/91 (DoH, 1992). It is important to note that supply variables are only available for England, reducing the Omnibus sample to 10,935. We considered the utility of a wide range of

indicators. For the primary care sector the number of GPs per capita is clearly of importance. However, as outlined above, the success of the MPC policy to equalise the number of GPs per head between areas means that there is very little variation in this variable. Nevertheless, it is widely believed that the quality of primary care varies considerably between areas and this may impact on individuals' access to services and utilisation in the same way as physical resources. A number of more qualitative indicators - which are shown in Table 4 - were included in the analysis.

3.13 The OPCS Omnibus Survey data contain Regional Health Authority (RHA) codes for England. However, it is well known that the variation in the availability of resources at the regional level is much smaller than at lower levels of aggregation and hence the impact of service availability may not be picked by the RHA level data.

3.14 For confidentiality reasons OPCS will not allow the local authority or district health authority of an individual to be identified. However the survey does include GHS region codes which divide regions between metropolitan and non-metropolitan areas as shown in Table 5. Although there are a similar number of regions to RHAs, the metropolitan split should enable the identification of more extreme areas of high supply than RHA data allows.

3.15 Table 6 shows the mean, standard deviation and coefficient of variation for each of the service availability indicators for both RHAs and GHS regions. Both the standard deviations and coefficients of variation are

much greater amongst GHS regions than RHAs. There is very little variation in the availability of GPs between areas. However, there are substantial variations in the more qualitative indicators such as the number of single handed GPs or the proportion of practices which fall below the minimum standards.

4. METHODS

4.1 The purpose of this paper is to explore the relationships between GP utilisation, the Census health question, other demographic, social and economic variables available in the 1991 Census and regional measures of service availability, using the multivariate statistical technique logistic regression. This is the most appropriate method when the dependent variable is dichotomous, i.e. takes the value 0 or 1 (Hosmer and Lemshow, 1989). It estimates the probability of an individual using GP services based on the set of statistically significant explanatory variables included in the model. This is expressed algebraically as:

$$\text{Probability of } (y=1) = \frac{e^{(BX)}}{1+e^{(BX)}}$$

where y is the dependent variable, e is the natural log and BX is the linear combination of coefficients and explanatory variables.

4.2 The explanatory variables used in the modelling covered the four groups of factors identified earlier as important determinants of GP utilisation. A detailed list of the precise variables which were

included is shown in Table 7. All the demographic, morbidity and socio-economic variables will be available in the 1991 Census dataset. The supply variables are included at GHS Region level for the reasons outlined in Section 3. The inclusion of supply factors restricted the modelling to the English respondents only.

4.3 To improve our understanding of the complex determinants of hospital utilisation, we modelled the data in a number of different ways. The aim being to ensure that all the variables have every chance of entering the model if they were important despite the high level of multicollinearity which exists between them.

4.4 First, utilisation was modelled on the four groups of factors separately using both forward and backward stepwise logistic regression. Second, all possible variables were included in one single model, again using both forward and backward stepwise regression techniques.

4.5 Both of these approaches were employed for different population groups from the survey: the sample as a whole; men under 45; women under 45 and all people over 45. After preliminary investigation these appeared to provide the most intuitively appealing categories which are consistent with the classification used in the SAS tabulations in the 1991 Census and previous studies (OPCS, 1991b; Evandrou *et al.*, 1992).

4.6 Any variable which was either significant in any of the models identified above or might be of special interest from a policy or theoretical perspective was then included in a second modelling stage.

Once again, models were developed by both forward and backward stepwise logistic regression.

4.7 Final models were chosen on the basis of statistical significance, *a priori* reasoning and parsimony. Statistical significance was established at 95 per cent by comparing the change in scaled deviance for the model as a whole to a chi-square distribution to test the null hypothesis that the coefficients for all the terms in the model, except the constant, are zero. The significance of individual variables was tested by comparing the Wald statistic (square of the ratio of the coefficient to standard error) to the chi-square distribution. At this stage variables were considered for inclusion if they were significant at 90 per cent.

5. RESULTS

5.1 Before presenting the final models it is worth highlighting the relative importance of the different groups of factors in determining utilisation. This can be done by comparing the change in scaled deviance calculated from separate models for each of the four groups of factors. As can be seen in Table 8, all of the models are significantly different to the constant only model.

5.2 The larger the change in scaled deviance the better the model is in accounting for variations in GP utilisation. In this respect morbidity factors are clearly very important. Demographic and socio-economic factors each account for less than half of the change in scaled deviance

of the morbidity variables. However, it is impossible to ascertain at this stage whether these factors are independent of health status or merely confounding. Supply factors have a very low change in scaled deviance in comparison to the other three groups. This may or may not be a consequence of their relative imprecision.

Whole Sample

5.3 Table 9 shows the final explanatory model for GP consultations for the whole sample. The first thing to note is that it contains variables from each of the four groups identified as important. The single most important factor is limiting long-standing illness. Being permanently unable to work due to illness is also highly significant.

5.4 Age and gender are also important factors. Women are significantly more likely to have consulted their GP in the last two weeks than men. This is particularly true for young women, women with a young child and women aged 45-59. This high consultation almost certainly reflects family planning, pregnancy and menopausal concerns. Men under 29 are, *ceteris paribus*, less likely to consult than other men and women. Having controlled for these factors, individuals who classified themselves as Asian are 1.6 times more likely to have consulted their GP than other ethnic groups.

5.5 There are four different significant socio-economic factors; three associated with employment and one with car ownership. Individuals who have access to more than one car or those in full time employment are less likely to consult than others. However, women in full time employment are more likely to consult their GP, while women working part time are less likely to. The latter may reflect the difficulties such women have getting time of work to consult in part time jobs, while having other responsibilities which prevent them consulting in their 'free time'.

5.6 The two supply side factors are at first sight counter-intuitive. Having controlled for all of the other significant factors, the number of GPs per 1,000 population and the proportion of practices with nurses, are negatively associated with individual consulting behaviour. This suggests that the inverse care law may be in operation; areas with the most need have the least resources.

Women under 45

5.7 The model for women under 45 is shown in Table 10 and reflects many of the factors identified above. The two most important factors are having a limiting long-standing illness and being permanently unable to work due to illness. Younger women within the group and those with a child under four are more likely to have consulted their GP in the last two weeks than others, as are those who classified themselves as Asian.

5.8 There are two significant socio-economic factors. Women who are owner occupiers and those who work part time are both less likely to consult their GP than other women. Finally, there is a significant negative association between living in a metropolitan area and using GP services. This may suggest that areas with higher need use less services.

Men under 45

5.9 Table 11 shows the final explanatory model for men under 45. The only significant variable which has not been previously mentioned is being married. Having controlled for health status and other relevant factors married men under 45 consult their GP more than unmarried men. This appears to contradict the literature in this area (Morgan, 1980) which generally supports the notion that married people are more healthy and use fewer services than single, widowed or divorced people. We investigated this variable with considerable care and cannot find a convincing explanation. However, it may be that the previous literature is not limited to this young age group nor does it control for health status.

People over 45

5.10 The final model for individuals over 45 - Table 12 - has many of the features identified above. Individuals with a limiting illness or who are permanently unable to work due to illness are more likely to have consulted their GP in the last two weeks. Utilisation is higher amongst individuals aged over 60. In addition, women aged 45-59 also have extra

use.

5.11 The final significant variable in this model- metropolitan areas - provides conflicting evidence to the area characteristics significant in the other models above. This suggests that there is increased utilisation in more 'needy' areas. Clearly the contradiction between these area characteristics requires further investigation.

6. SYNTHETIC ESTIMATIONS

6.1 The purpose of this section is to describe how the results of the modelling reported earlier in this paper can be used to estimate weighted populations.

6.2 The methodology employed to calculate weighted population estimates has been adapted from the work of Balarajan and his colleagues and involves four distinct stages. First, judgements must be made about which of the significant explanatory variables are 'legitimate' *need* factors and hence should be included in the calculation of weighted population estimates. Second, weighting factors for each selected explanatory factor are calculated. These combine the odds ratios for each factor with the characteristics of area populations. Third, a need indicator is calculated which is the product of the weighting factor for each characteristic. Finally, the need indicator is applied to the number of people living in the area to calculate the area's weighted population.

Choosing 'legitimate' need factors

6.3 The purpose of calculating weighted populations is to estimate each area's relative need for health care services. The utilisation models presented above include some variables which clearly represent an individual's need for GP services such as morbidity or age and gender. These should be included in the estimate of weighted populations. However, some of the significant variables are supply side factors or represent higher or lower utilisation amongst specific sub-groups of the population which may not be considered legitimate. Such factors should not be included in the calculation of the need indicators. A judgement has to be made about the underlying associations that such variables are picking up and whether or not they should be excluded. For example, if poorly educated people living in council housing were discovered, *ceteris paribus*, to consult less frequently than might be expected this could be an example of the inverse care law at work and should be ignored for resource allocation purposes.

Weighting factors

6.4 Once a decision has been made about which variables to include in the need indicator, a weighting factor is calculated for each variable which combines the odds ratios derived from the models with the population characteristics. The odds ratio indicates how much more likely an individual with a given characteristic is to use GP services than someone without the characteristic. This is applied to the proportion of the population with the characteristic in the area and added to the

proportion of the population without the characteristic to give the weighting factor.

For example, if the odds ratio for limiting longstanding illness is 3 and its prevalence in an area is 20 per cent, then the weighting factor is 1.4, i.e. (3 X 0.2) + 0.8.

Need indicator and weighted populations

6.5 The need indicator for each area is the product of weighting factors for each of the significant and 'legitimate' characteristics. Once calculated it is applied to the actual number of people resident in the area to estimate the weighted population based on the need for GP services.

6.6 Box 1 shows a hypothetical example for two contrasting areas. It illustrates how both the value of the odds ratio and the characteristics of the area are important in calculating the final weighted population estimates, which reflect the area's relative need for GP services.

6.7 When the full results of the 1991 Census are available we will be able to actually produce weighted populations for each of the FHSAs in England. These can then be compared with the existing distribution of GPs across FHSAs to consider the levels of inequality in access to GPs which exists in England, once need factors have been taken into account.

7. REFERENCES

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BOX 1

CALCULATING WEIGHTED POPULATIONS FOR GP SERVICES

In this example there are two hypothetical areas: District A and District B. District A has a high level of morbidity and poor socio-economic status. District B, on the other hand, has a low level of morbidity and is relatively affluent. Assuming there were only two significant variables in our model of GP utilisation, limiting long-standing illness (odds ratio = 3) and owning two or more cars (odds ratio = 0.5), then the weighted populations for the two areas would be calculated as follows:

District A

Population	100,000
Proportion with limiting long-standing illness	0.2
Weighting factor	3 x 0.2 + 0.8 = 1.4
Proportion with two or more cars	0.1
Weighting factor	0.5 x 0.1 + 0.9 = 0.95
Need indicator	1.4 x 0.95 = 1.33
Weighted population	100,000 x 1.33 = 133,000

District B

Population	100,000
Proportion with limiting long-standing illness	0.1
Weighting factor	3 x 0.1 + 0.9 = 1.2
Proportion with two or more cars	0.5 x 0.3 + 0.7 = 0.85
Need indicator	12 x 0.85 = 1.02
Weighted population	100,000 x 1.02 = 102,000

Thus it can be seen that District A - the area with high morbidity and poor socio-economic status - would have a larger weighted population than District B, and should, therefore, receive proportionately more GP resources.

FIGURE 1

GP Consultations by Age and Sex

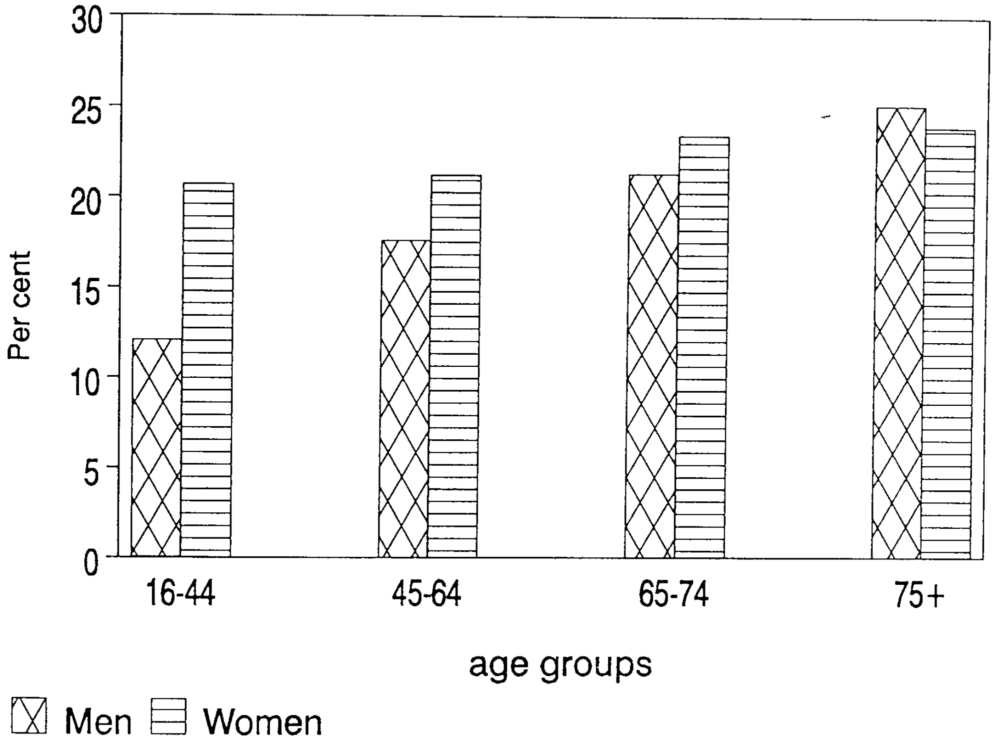

FIGURE 2

Standardised GP Consultation Rates by Ethnicity and LSI

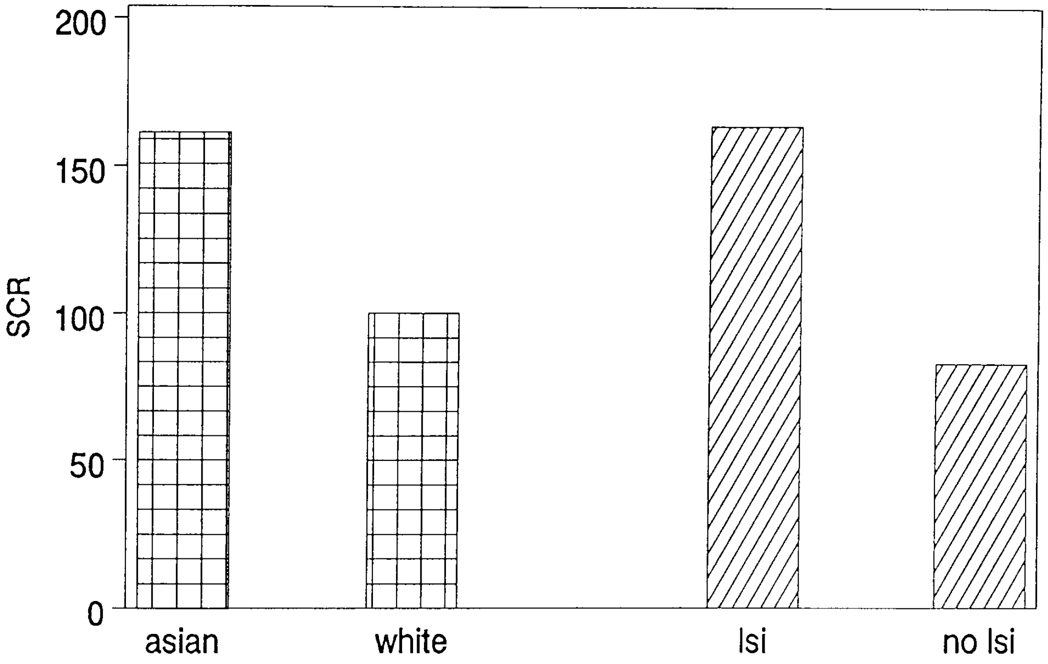

FIGURE 3

Standardised GP Consultation Rates by Tenure and Car Ownership

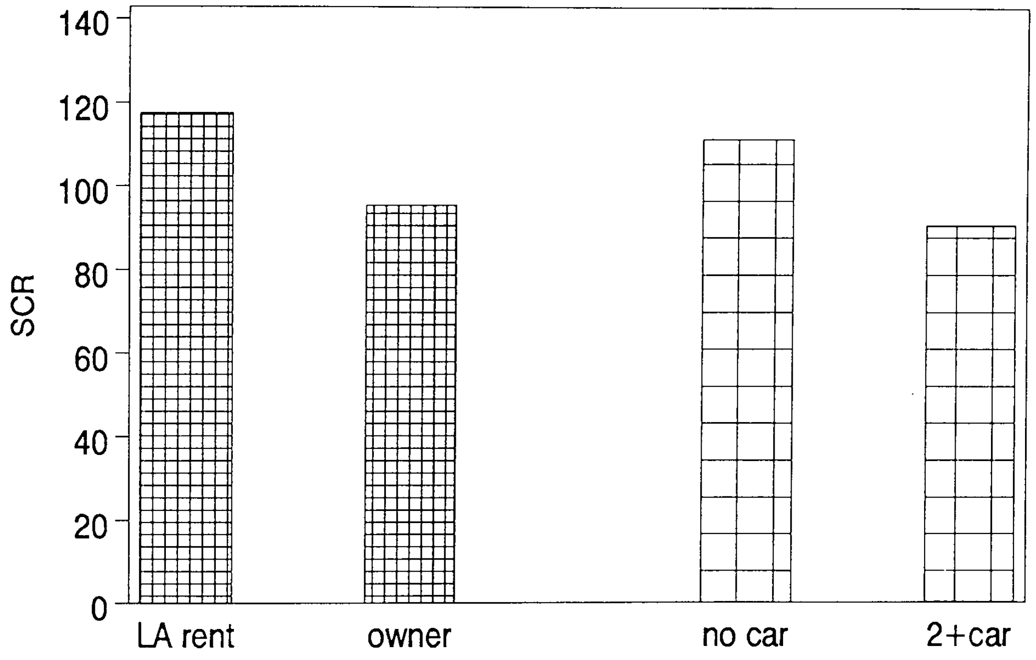

TABLE 1

REPRESENTATIVENESS OF OMNIBUS SURVEY 1991/92 IN COMPARISON TO 1991 CENSUS

	1991 Census	Omnibus Survey 1991/92
	%	%
Women	51.6	53.5
Aged		
- Under 30	25.9	24.2
- 30-44	26.5	26.6
- 44 - pensionable age	24.2	25.8
- Pensionable age - 74	14.6	16.2
- 75+	8.8	7.1
Ethnic Group		
- White	94.5	95.6
- Afro-Caribbean	1.6	1.0
- Asian	2.7	1.8
- Other	1.2	1.3
Tenure		
- Owner occupier	66.4	71.5
- Local authority rent	21.4	21.6
Car Ownership		
- 0	33.4	21.6
- 2+	23.1	33.6
Region		
- North	5.5	5.4
- Yorkshire & Humberside	8.8	9.2
- East Midlands	7.2	7.9
- East Anglia	3.7	3.5
- Greater London	12.2	11.3
- South East	19.2	19.5
- South West	8.4	8.8
- West Midlands	9.4	9.2
- North West	11.4	10.9
- Wales	5.2	5.1
- Scotland	9.1	9.2

TABLE 2

1991 CENSUS VARIABLES AVAILABLE IN THE OPCS OMNIBUS SURVEY

	1991 Census	Omnibus Survey
H1	Number of rooms	4 months only
H2	Type of accommodation	No
1	Name	No
2	Gender	Yes
3	Date of birth	No (age - yes)
	Number of adults in household	Yes
	Number of children in household	Yes
	Type of household	Yes
4	Marital status	Yes (slightly different categories)
5	Relationship in household	Yes
6	Location on night of 21/22 April	No
7	Usual address	No
8	Term address of students	No
9	At address a year ago	4 months only
10	Country of birth	No
11	Ethnic Group	Yes (identical groups)
12	Long-term illness	Yes (identical)
13	Employment status	Yes (same categories)
14	Hours worked per week	Under & over 10 & 30 only
15	Occupation	Yes
16	Industry	Yes
17	Address of place of work	No
18	Daily journey to work	No
19	Qualifications	No
H3	Tenure	Yes (same categories)
H4	Amenities	No
H5	Cars and vans	Yes

TABLE 3

OMNIBUS SURVEY RESPONSES
COMPARED WITH THE GENERAL HOUSEHOLD SURVEY 1990+

Variables	GHS 1990[4]	Omnibus Survey 1991/1992
	%	%
Health		
- Limiting long-standing illness	24.4	20.0
- Acute sickness	14.2	13.3
- Subjective health assessment		
Good	60.0	63.3
Fairly good	28.0	27.3
Not good	12.0	9.4
Utilisation		
- GP consultation	15.8	18.9
- Out-patient	14.5	16.3
- In-patient	10.8	14.5

+ all persons aged 16+

TABLE 4

PRIMARY CARE INDICATORS

INDICATORS
GMPs per 10,000 resident population
Per cent of GPs with list size < 1,000
Per cent of GPs with list size > 2,500
Per cent of GPs in single handed practices
Per cent of GPs over the age of 65
Per cent of practices without a practice nurse
Per cent of practices which fall below the minimum standard

TABLE 5

GHS STANDARD REGIONS

REGIONS

- North
  - metropolitan
  - non-metropolitan
- Yorkshire and Humberside
  - metropolitan
  - non-metropolitan
- North West
  - metropolitan
  - non-metropolitan
- East Midlands
- West Midlands
  - metropolitan
  - non-metropolitan
- East Anglia
- London
  - inner
  - outer
- South East
- South West

A detailed explanation of the composition of these regions can be found in Smythe and Browne (1992, Appendix C).

TABLE 6

PRIMARY CARE DATA, 1990/91

Indicator	Regional Health Authority			GHS Standard Regions		
	mean	standard deviation	coefficient of variation	mean	standard deviation	coefficient of variation
GMPs per 10,000 population	5.37	0.25	4.7	5.36	0.25	4.7
Percent GPs with lists <1,000	0.89	0.44	49.4	0.93	0.54	58.1
Percent GPs with lists >2,500	3.57	2.06	57.7	4.11	3.04	74.0
Percent GPs single handed	4.22	2.59	61.4	4.73	3.67	77.6
Percent GPs over 65	1.00	0.58	58.0	1.11	1.00	90.1
Percent practices without nurse	12.23	6.07	49.6	13.32	9.66	72.5
Percent practice premises below minimum standard	4.22	4.51	106.9	4.85	7.49	154.4

TABLE 7

VARIABLES TESTED IN MODELS

Demography

Age

Gender

Men under 30

Men 30-44

Men 45-64

Men 65-74

Men 75+

Women under 30

Women 30-44

Women 45-59

Women 60-74

Women 75+

Women with children under 4

Non-white

Afro-Caribbean

Asian

Other ethnic group

Morbidity

Limiting longstanding illness

Permanently unable to work due to illness

Social-economic factors

Unemployed

Looks after home

Still at school

Part-time employment

Full-time employment

TABLE 7 (Cont'd/.....)

VARIABLES TESTED IN MODELS

Owner occupier

Rents from local authority

Does not own a car or van

Has more than 1 car

Single parent

Lives alone

Married

Pensioner living alone

Social class I and II

Social class IV and V

Area/Supply Side Factors (Standard Region Level)

Metropolitan areas

Non-London metropolitan aras

Inner London

Outer London

Percentage of GPs with lists <1,000

Percentage of GPs with lists >2,500

Percentage of GPs over 65

Percentage of GPs single-handed

Percentage of practices without a nurse

Percentage of practices below minimum standards

GPs per 1,000 resident population

TABLE 8

CHANGE IN SCALED DEVIANCE
ENGLISH SAMPLE

Groups of Independent Variables	Change in Scaled Deviance	
	X^2	Number of Sig. Variables
Demographic characteristics	137	8
Women with children under 4	23	1
Morbidity	316	2
Socio-economic circumstances	66	3
Supply factors	28	3

* See Table 7 for definition of variables included in the groups

TABLE 9

GP MODEL - WHOLE SAMPLE

VARIABLE	COEFFICIENT	WALD	SIGNIFICANCE LEVEL	ODDS RATIO
Constant	0.61	0.9	-	-
Limiting longstanding illness	0.88	183.6	***	2.40
Permanently unable to work due to illness	0.50	13.5	***	1.65
Men aged under 29	-0.27	7.1	***	0.76
Women aged under 29	0.33	16.0	***	1.40
Women aged 45-59	0.20	5.4	**	1.27
Women with children under 4	0.37	15.1	***	1.44
Asian	0.47	8.5	***	1.59
More than 1 car	-0.11	3.5	*	0.90
Full-time employment	-0.32	18.8	***	0.72
Women in full-time employment	0.38	15.1	***	1.46
Women in part-time employment	-0.22	5.8	**	0.81
GPs per 1,000 population	-0.29	9.1	***	0.75
Percentage of practices with nurse	-0.008	5.2	**	0.99

X^2 = 468 with 13 degrees of freedom

N = 10,712

*** Significant at 99 per cent level
** Significant at 95 per cent level
* Significant at 90 per cent level

TABLE 10

GP MODEL - WOMEN UNDER 45

VARIABLE	COEFFICIENT	WALD	SIGNIFICANCE LEVEL	ODDS RATIO
Constant	-1.28	112.5	***	-
Limiting longstanding illness	0.80	25.2	***	2.23
Permanently unable to work due to illness	1.07	4.08	**	2.92
Aged under 29	0.25	6.79	***	1.28
Women with children under 4	0.30	8.60	***	1.34
Asian	0.58	4.92	**	1.79
Owner occupier	-0.28	7.79	***	0.75
Part-time employment	-0.35	9.47	***	0.70
Metropolitan areas	-0.22	5.01	**	0.81

X^2 = 92 with 8 degrees of freedom

N = 2,808

*** Significant at 99 per cent level
** Significant at 95 per cent level
* Significant at 90 per cent level

TABLE 11

GP MODEL - MEN UNDER 45

VARIABLE	COEFFICIENT	WALD	SIGNIFICANCE LEVEL	ODDS RATIO
Constant	0.87	0.5	-	-
Limiting longstanding illness	1.14	39.3	***	3.13
Permanently unable to work due to illness	1.15	8.5	***	3.17
Asian	0.65	5.5	**	1.91
Married	0.25	3.9	**	1.29
GPs per 1,000 population	-0.59	6.0	**	0.55

X^2 = 82 with 5 degrees of freedom

N = 2,281

*** Significant at 99 per cent level
** Significant at 95 per cent level
* Significant at 90 per cent level

TABLE 12

GP MODEL - PEOPLE OVER 45

VARIABLE	COEFFICIENT	WALD	SIGNIFICANCE LEVEL	ODDS RATIO
Constant	-2.14	518.0	***	-
Limiting longstanding illness	0.90	135.8	***	2.47
Permanently unable to work due to illness	0.49	10.1	***	1.63
Women aged 44-59	0.47	17.4	***	1.59
Aged over 60	0.29	8.3	***	1.33
Metropolitan areas	0.34	21.9	***	1.40

X^2 = 239 with 5 degrees of freedom

N = 5,657

*** Significant at 99 per cent level
** Significant at 95 per cent level
* Significant at 90 per cent level