THE UNIVERSITY of York

York

HEALTH ECONOMICS CONSORTIUM

National Health Service Executive

Patient Movements and Patient Choice

Report

PAUL DIXON, Centre for Health Economics
HUGH GRAVELLE, Centre for Health Economics, National Primary Care Research and Development Centre
ROY CARR-HILL, Centre for Health Economics
JOHN POSNETT, York Health Economics Consortium

DECEMBER 1997

York HEALTH ECONOMICS CONSORTIUM
University of York, Heslington, YORK YO1 5DD Tel: 01904 433620; Fax: 01904 433628; E-Mail: irss25@york.ac.uk

Contents

	Page
Section 1: Introduction	**1**
Objectives of project	1
Background	1
Choice of practices and patient movements	2
Patient selection by GPs	3
Cartelisation	4
Use of patient registration data	5
Levels of analysis	7
Content of the report	7
Section 2: The Data	**8**
Data collection	8
Choice of Health Authorities	9
Number of practices	11
Number of patient transfers and registrations in the selected HAs	11
Section 3: The Health Authorities	**16**
Socio-demographic composition	16
Access to primary care in the HAs	17
Practice characteristics	20
Section 4: Practice Level Analyses	**22**
Practice transfer rate	22
Correlation amongst practice transfer rates	24
Possible influences on transfer rates	25
Practice size	25
Practice characteristics	26
Analysis of practice transfer rates	32
Transfers without change of address	33
Transfers in from another HA and with local address change	40
Transfers out with local change of address	41
Impact of socio-economic variables on transfer rates	43
Conclusions	46

Section 5: Impact of socio-economic variables on transfer rates 48

Cartelisation 48
Restrictions on patient registration 48
Creamskimming and reregistrations 52
Creamskimming and new registrations 56
Conclusions 58

Section 6: Patient Level Analyses 59

Why do patients leave practices? 59
Logistic regression analyses 59
Discriminant function analyses 65
Multi-level logisitic regression 66
Effects of socio-economic variables 68
Distance and access 71
Distance to practice 71
Choice of nearest practice 75
Distance to practice and patient age 76
Capitation and quality 80
Conclusions 82

Section 7: General Conclusions 84

References 86

Appendices

A Data collection and preparation
B Variables in the patient level data set
C Variables in the practice level data set
D Language and ethnicity
E Distance to practice
F Supplementary Tables

Acknowledgements

This project was funded by the NHS Executive, Economic Regulation Branch. We are grateful to Andrew Lloyd in particular for his advice throughout the work and for useful comments on an earlier draft of this report. We are also grateful to Nigel Rice and Matthew Sutton for assistance and advice.

We are also indebted to the staff of three Health Authorities (Doncaster, Kingston & Richmond and Rotherham) who agreed to cooperate in this work. Their support has been invaluable.

The authors alone are responsible for the views expressed in this report.

Executive Summary

Patient Movements and Patient Choice

INTRODUCTION

There has been increased interest in recent years in the determinants of individual choice of general practice. The 1990 contract increased the importance of the capitation element in GP remuneration in order to give practices an incentive to improve the range of services they offer, on the assumption that this would be an important determinant of individual choice. At the same time the growth of devolved budgeting and the creation of multifunds and total purchasing consortia has led to concerns about restriction of individual choice.

The objectives of this project are: (i) to investigate the determinants of differences between practices in their rates of patient transfer; (ii) to investigate the extent to which characteristics of individuals are correlated with the probability of changing practice; (iii) to test the hypothesis that practices discriminate against individuals who are expected to be relatively costly to treat and (iv) to test the hypothesis that practices in a multifund restrict choice by acting collectively to discriminate against patients wishing to transfer between practices in the same Fund.

The results reported here are based on a sample of three Health Authorities in England. Authorities were not selected randomly, but on the basis that their information systems were known (from previous work) to be relatively good. Although the data-set is large, covering 191 practices with approximately 800,000 registered patients and almost 23,000 transfers without change of address, the generalisability of results is limited to some extent by the small number of Health Authorities covered.

SOURCES OF DATA

The first stage in the project was to create a data-set of practice registrations, transfers between practices and the characteristics of practices for a sample of three Health Authorities. The result is probably the most comprehensive and detailed registration data-set available anywhere in the NHS.

Despite the fact that the Authorities were selected from among those known (from a previous study, Posnett, et al, 1996) to have the best information systems, and despite their unqualified cooperation, the task of assembling the data-set took several months.

Previous work covering a much larger sample of Authorities highlighted a number of problems in the systems used to record patient registration and transfer details and the characteristics of individual practices. Some of the most relevant are:

* Medical Directories, which contain information on practices and GPs, are rarely standardised and are updated at irregular intervals. Given the importance of Medical Directories as a source of information for prospective patients, it would be valuable to extend the range of information included (see below) and to ensure that entries are up-to-date and in a standardised format.

* The way in which Authorities hold information on patient transfers is often unnecessarily detailed and difficult to link to other records. There would be merit in simplifying the range of variables included in the transfer file.

* There is a high degree of variability between Authorities in the completeness and accuracy of postcode information, both of individuals and practices. Similarly, there are acknowledged problems in linking different sources of information because patient identifiers are often missing or incomplete.

PRACTICE TRANSFER RATES

Analysis of differences in transfer rates between practices, particularly the rates of transfer-out without change of address, may be an indicator of the characteristics of practices which are important to individuals. Three variables appear to be important influences on rates of transfer out with no change of address:

* Practice size. Single-handed practices have higher rates of transfer; practices with 4 or more partners have lower rates.

* Types of clinics offered. The greater the number of different types of clinic offered by the practice, the lower the rate of transfer.

* Purchasing type. Practices which are standard fundholders have higher rates of transfer than non-fundholders.

In general, rates of in-transfer of patients are correlated with rates of out-transfer, primarily because leavers create vacancies which are filled. Thus, small practices have a higher rate of in-transfer than larger practices, and this is almost certainly a reflection of the fact that vacancies occur more frequently in smaller practices. One factor, however, does appear to influence the rate of in-transfer independently of other considerations:

* Average age of GPs. The higher is the average age of GPs in a practice, the lower is the rate of in-transfer to the practice.

CHARACTERISTICS OF INDIVIDUALS

We have also carried out a separate analysis of the characteristics of individuals who transferred in the period without change of address, and the characteristics of the practices they left. Results are consistent across a number of different techniques of analysis.

* Older individuals are less likely to transfer than younger, and women are more likely to transfer than men.

* Individuals who transferred were more likely to have left practices which were small, were further from their home address, and which had shorter opening hours. They were less likely to have left a practice which is a multifund. They were less likely to transfer the smaller the number of alternative practices available within 3Kms of their home.

DISTANCE FROM PRACTICE

Distance is a powerful influence on practice choice, although it is not the dominant influence.

* Approximately one third of individuals choose the practice nearest to their home address.

* More than half of patients choose a practice within 1Km of their home, and more than 85% choose a practice within 3Km.

CREAMSKIMMING

Creamskimming refers to the incentive which a practice might have to discriminate against individuals who may be expected to be costly. Although there are non-financial motives for patient selection for all types of practice, the incentive is likely to be more powerful for practices which are fundholders or are part of a total purchasing pilot

We have only been able to test this in a limited way by looking at the proportion of individuals joining a practice who are 65 or over. If there is financially motivated creamskimming we expect to find that the older age groups are a smaller proportion of new registrations in fundholding and total purchasing practices. The evidence is mixed.

* For individuals changing practice without change of address, those aged 65 and over account for a higher proportion of new registrations in fundholding and total purchasing practices than they do in non-fundholding practices. This is counter to the hypothesis.

* For individuals moving after change of address within the same Health Authority there is no clear relationship.

* For individuals moving into the Health Authority there is some evidence compatible with creamskimming. Those aged 65 and over account for a higher proportion of new registrations with non-fundholding practices than with fundholders or total purchasing practices.

The evidence of creamskimming is by no means conclusive, but it is consistent with the hypothesis that if practices do seek to discriminate against potentially costly patients, this will be easier to achieve for individuals moving from outside the area whose information about the practice is relatively poor.

RESTRICTIONS ON REGISTRATION

The development of multifunds and other practice groupings raises the possibility that practices may act collectively to exclude certain types of individuals and, effectively, to restrict individual choice. We have examined this hypothesis by analysing out-transfers (without change of address) from multifund practices.

* Analysis of the age distribution of individuals leaving a multifund practice who are subsequently re-registered with another practice in the same Fund offers no support to the hypothesis that those who are re-registered will be relatively younger (and less expensive). There is no evidence of discrimination in re-registration by either age or gender.

* There is no evidence of discrimination against leavers. Of those registered in multifund practices who changed practice without change of address, the majority (57%) moved to another practice in the same Fund.

PRACTICE INFORMATION

One of the costs facing individuals in selecting a practice is the cost of search: the cost of obtaining relevant information about practice characteristics. Our work has confirmed the expectation that factors in addition to distance to the surgery are important to individuals. Practice choice is not random but is systematically related to practice characteristics.

We have been able to identify some of the factors which are relevant for patient choice: practice size, types of clinics offered, age of GPs and purchasing type. Research carried out by MORI suggests that individuals are concerned about the attitude, professional competence and accessibility of GPs. Variables such as practice size and average age of GPs may simply be proxies for some or all of these characteristics. This raises a question about how individuals are to obtain relevent information when choosing a practice.

Most people obtain information about practices either from personal experience or from family and friends (MORI, 1997). For those moving into an area information may be limited to practice leaflets and the local Medical Directory. There is a case for relevant information to be easily accessible in a standardised form. Apart from the obvious factors discussed above, the challenge is to develop robust indicators of the quality and accessibility of primary care which could be useful for patients and managers.

Section 1: Introduction

1.1 OBJECTIVES OF THE PROJECT

The main objectives of the work documented in this report were to

- collect and collate information from a sample of Health Authorities on patient registrations, transfers between practices and characteristics of practices; and to use the data to:
- investigate the extent to which patient characteristics (age, gender, post code, imputed socio-economic attributes) and practice characteristics (age, gender, number of GPs, location, services offered, purchasing modality) can predict whether a patient will change practice;
- investigate how practice characteristics, including purchasing modality, are associated with variations in practice transfer rates;
- explore the evidence for cartelisation amongst multifund practices in terms of its influence on practice transfer rates;
- examine whether there was evidence of cream skimming in the transfer data of different types of practice.

1.2 BACKGROUND

In recent years there has been increased interest in patients' choices of practice and in particular their movements between practices.

- The 1990 GP contract increased the relative importance of the capitation component of GP remuneration. The intention was to complement other developments in the internal market by giving GPs a greater incentive to attract patients onto their lists by improving the services they offered. At the same time the regulations governing patient transfers were relaxed so that patients did not have to seek the permission of the practice they wished to leave to transfer to another practice.

- The spread of fundholding has led to suggestions that fundholding practices may select patients on the basis of their expected impact on the fundholders budget and encourage relatively expensive patients to move to other practices.

- Increasing cooperation amongst groups of practices in purchasing consortia has led to concern about the possibility that practices in such consortia may collude to restrict the choices available to their patients and to prevent troublesome or expensive patients from moving to another member of the consortium.

Because GP remuneration is in part based on the number of patients on a GP's list, data are routinely collected on the practice with which a patient is registered and thus on a patient's movements between practices. This raises the possibility of using such data to answer questions about the reasons why patients leave practices and choose practices and whether the purchasing modality of a practice has any effect on its mixture of patients and the rate of transfer of patients onto and off its list.

1.3 CHOICE OF PRACTICES AND PATIENT MOVEMENTS

A patient's ranking of alternative practices will be made by comparing their perceived attractiveness, in terms of the facilities and services provided, and the costs and convenience of utilising them. Perceived attractiveness will depend on the characteristics of the patient as well as the practice. For example, the elderly or housebound may place a higher value on the practice's willingness to make home visits or their distance the nearest practice surgery. Younger patients may care more about a practice's child health facilities.

Patients will move from their current practices if its perceived attractiveness relative to other practices declines sufficiently. This can occur for a variety of reasons

(a) changes in patients' circumstances or preferences. The most common reason is that patients move to another address, so that the distance to their current practice increases. Patients may also change their valuation of different mixes of services, for example, if they start a family or if they become increasingly frail.

(b) the characteristics of current and alternative practices may change. For example, practices may alter the range of services or clinics they offer, or a female GP may join a previously all male practice.

(c) practices are experience goods (Nelson, 1970, Gravelle and Masiero, 1997). Patients choose them initially on the basis of imperfect information and then acquire better knowledge about the quality and extent of services from their experiences with the practice. If they revise their views of the attractiveness of their current practice downward they may wish to change practices.

Patients incur costs in switching between practices in the form of the time and trouble involved in reregistering. Such switching costs imply that their perceptions of the relative attractiveness of alternative practices are not necessarily reflected by their current choices. Thus inferring what factors individuals find attractive in practices from the characteristics of their current practice may be misleading. With sufficient inertia or switching costs, current choice will be in part conveying information about their past, rather than their current perceptions.

1.4 PATIENT SELECTION BY GPs

Different types of patients impose different types and levels of costs on GPs. The costs may be incurred in the form of additional effort and workload or, in the case of fundholding practices, in the form of greater expenditure on certain types of service which are charged against the fundholder's budget. Although capitation fees are differentiated by age and by the area of residence of the patient, the costs a GP expects to incur from any particular patient will in general differ from the capitation fee. First, the capitation fee for a broad class of patients may not be equal to the expected cost for that class. Second, GPs can make more accurate estimates of the expected costs of some patients within a broad class on the basis of superior information. To the extent that GPs can influence the mix of the patients in their practice they have an incentive to do so. The incentive will be greater for fundholders than for non-fundholders.

Since the costs that patients impose on practices include time, effort and general inconvenience

as well as financial expenditure, both fundholding and non-fundholding practices will have some incentive to select less costly patients. However, the incentives to select will tend to be greater for fundholders that non-fundholders since they will take account of differences in expenditure as well as in time and trouble associated with different types of patients.

GPs can attempt to influence patient mix by encouraging certain types of patient to leave their list or by refusing to register them as new patients. Discouraging current patients would seem to be obviously at variance with systems of professional ethics which stress duty to existing patients. It will be also be more difficult or unpleasant to remove existing patients than merely not to register potential new patients. Consequently cream skimming is more likely to take the form of differential willingness to accept different types of patients.

One can attempt to test for cream skimming by examining the mix of patients in a practice, for example by comparing the proportion of patients who are expensive relative to their capitation fees. However, if the probability of relatively expensive patients leaving a practice is low (and it may be if they fear that they will find it difficult to join another practice of their choice), any difference between patient mixes between fundholding and non-fundholding practices due to differences in their willingness to accept particular types of patient may not be evident for many years.

It appears therefore that any tests for cream skimming are better directed at the inflow of new patients to practices. If there is cream skimming and fundholding and nonfundholding practices differ in their propensity to accept expensive patients then this should be apparent in differences in the proportion of patients accepted who are expensive.

1.5 CARTELISATION

The potential impact of consortia of practices on patients may take two possible forms. Practices within a consortium may impose constraints on referral choices for their patients by agreeing to common contracts with providers and they may impose constraints on patients wishing to transfer across practices within the consortium (Carr-Hill et al, 1996). In effect they may act as a cartel.

The uniform purchasing arrangements made by a consortium for its member practices may result in benefits for patients. For example, cost savings may lead to an increase in throughput and a reduction in waiting times. If this is so, the net effect of restricted choice but reduced waiting

times may lead to some patients placing a higher value on the services provided by a consortium member. Other patients may feel they are worse off. Patients will also differ in their perceived difficulty of switching between practices.

The overall effect of consortia on patient movements will reflect the distribution of the net benefits and switching costs across practice populations. The overall level of patient movements into and out of multifund practices may be no different from those for other practice types for a variety of reasons: patients may not feel that their referral choice is restricted, or they may on balance find the benefits are just offsetting and so have no incentive to move, or they may be made worse off but not sufficiently so to induce them to switch.

1.6 USE OF PATIENT REGISTRATION DATA

The implication of switching costs is that the pattern of choices by patients moving practices is likely to be different from those not moving. Those moving will be influenced by their current circumstances and practice characteristics at the time of their move so that it may be most fruitful to examine the characteristics of movers and the practices they join or leave, rather than patients who do not move.

The aim of the project was to examine how far it would be possible to investigate the issues discussed above using data derived from the records of patients' changes of registration held by Health Authorities. HA records contain information on some 27 types of change of registration (see the full listing in section 2). Most of these are clearly not relevant for our purposes (for example, births, deaths, removal to another HA) but several were of potential use. We decided to concentrate on the following categories

(a) *movements into and out of a practice in a Health Authority without a change of address.* Patients who change practice without changing address may be doing so because they have become dissatisfied with the practice relative to the other practices available locally. They are also arguably better informed about the characteristics of local practices than other types of movers. The MORI (1997) survey indicated that families and friends were the main source of information about practices when patients choose a practice. Those who already live in an area and have built up a network in their neighbourhood will have access to better information about the characteristics of both their current and alternative practices. Hence, by relating the movements of those patients changing practice without change of address to practice characteristics, we may be able to infer something about the features of practices, including purchasing modality, which are attractive or

unattractive to patients. Since such movements are relatively infrequent (around 1% to 1.5% per annum of patients move without change of address) we decided to include two other types of transfer.

(b) *movements into and out of practices in a Health Authority with a local change of address*. Clearly one of the major influences on such patients' decisions to leave a practice is the change (presumably an increase) in the distance to the practice. However, such patients will have some local knowledge of practices and their decisions again may convey information about the features which make practices attractive.

(c) *transfers into a Health Authority from outside*. Such patients are likely to have less local knowledge than the other movers we examine. There are many more of them so that even though one could argue that their responses may be more subject to random variation, we may be able to get some information on practice characteristics which affect patient choice. In combination with the other types of movers we consider they may also provide a means of testing hypotheses about the implications of differential local knowledge on patient choices.

Several other possible categories of patient might be expected throw some light on the issues raised above:

- *patients allocated by the Health Authority*. Patients who cannot find a practice willing to accept them can ask their HA to allocate them to a practice. The characteristics of such patients might indicate whether creamskimming was taking place. Unfortunately such patients appear to be relatively few in number and are not separately identified in routine HA transfer records;

- *patients removed from practice lists* are separately categorised in HA records but they are a very small proportion of patients (around 0.2% per annum) so that it would be difficult to reach reliable conclusions based on analysis of differences between practices' rates of removal;

- *patients refused registration*. If some practices creamskim this should have an impact on the mix of patients refused registration. Since neither patients nor practices routinely report refusal of registration the only means of obtaining such information is by population survey.

A complementary means of collecting information on patient choice and patient movements is by survey of patients. The MORI (1997) survey on patient choice of practices commissioned by NHSE was a nationally representative quota sample of nearly 4000 individuals. It complements the current study based on patient registration data in that it provides direct evidence on the reasons why patients choose and move practices. Because it is a sample of the general population only some 16% of those interviewed had been with their current practice for less than three years, so that a relatively small proportion have recently made the kinds of choices we are interested in. Only 6% (n = 39) of these had been unable to register with their first choice practice. It is therefore likely to be expensive to obtain a sample of individuals who have been refused registration which would be large enough to permit more direct tests of creamskimming hypotheses since there does not appear to be a means of differentially sampling such patients.

1.7 LEVELS OF ANALYSIS

The patient registration data, plus the separately collected information on practices permits two levels of analysis. We examine patient decisions to leave or join practices using the data on individual patients and their practices. This can provide answers to questions about the factors which influence the attractiveness of practices (including purchasing modality) to different types of patient. We also aggregate the data by practice to calculate rates of transfer of various types of patient. This can also shed some light on the features of practices which patients appear to value and it will also enable us to address issues concerning cartelisation and creamskimming.

Given the size and complexity of the patient registration data set which was originally collected for routine administrative purposes and the need to link patient registration data with information from other data sets, the project was seen as essentially an exploratory feasibility study, especially as the data collection was limited to three Health Authorities.

1.8 CONTENT OF THE REPORT

Section 2 briefly describes the data sources and methods used to construct the basic data set for analysis. Section 3 uses the data collected to describe some features of general practice in the three participating Health Authorities. Section 4 contains the practice level analysis of variations in practice referral rates. Section 5 examines the evidence for cartelization and creamskimming. Section 6 contains the patient level analysis. The concluding parts of Sections 4, 5 and 6 summarise the results of the practice level and patient level analysis, whilst Section 7 draws out some broader conclusions. Separate appendices provide details of the data sources, the collection, cleaning and collation of the data and the variables constructed.

Section 2: The Data

2.1 DATA COLLECTION

We required data on patients registered in the three HAs, changes of registration and on the practices with which they were registered. The full description of the data, the methods used in the formidable task of collecting, checking, cleaning and collating the data and a full list of variables are in Appendix A. Here we give a brief account necessary for interpreting the results of the analyses and understanding the types of questions which the data can and cannot answer.

The HAs provided us with a patient registration file containing patient age, sex, post code and current GP or practice and a registration transaction file which is the main source of information on patient transfers. All three authorities supplied details of all changes of patient registrations from April 1995 to mid 1997. The standard transaction record in the system used by the authorities has approximately 30 data fields, some of which are rarely or never used. For the purposes of the research the following were of special interest.

- GP or practice prior to transfer
- HA/FHSA prior to transfer
- GP or practice following transfer
- HA/FHSA following transfer
- Date of transfer/registration change
- Reason for/type of change

The scanty patient individual level data held by HAs was supplemented by linking each patient to information from the 1991 Census on the socio-economic characteristics of the Enumeration District containing his or her post-code.

The characteristics of practices in HAs were obtained from the medical directories, though none of the HAs were able for reasons of confidentiality or practicality to supply the information in format that could be mechanically convered to a data file. From these paper medical directories the project constructed its own database of practice characteristics, including details such as the gender balance of the partners, the range of clinics, the surgery opening hours and the postcodes of the main and branch surgeries. In order to link patients to the practice details it was necessary to reconcile the practices described in the directory with the practice and GP codes in the registration and transaction files. Matching was complicated by changes in the composition of

partnerships and by practices where the senior partnership was rotated. Health authority lists did not always include all the partners in a practice, especially when the authority only has patients registered with a subset of partners or when one or more partners are dormant. HAs may not only lack a full list of all the partners in all the practices but the details held may be contradictory. For example, the partnership-GP relation in the registration file can differ from that in the medical directory and/or the GP look-up tables. The issue is further complicated, especially when trying to merge data from adjoining HAs, because HAs only use local codes to identify GPs and practices. Even after manual construction and checking of lists of practice memberships, several thousand patients in each HA had to be excluded from the analyses as there are incomplete details on their practice or GP.

Given the aims of the project it was crucial to be able to identify the purchasing modality (non fundholding, standard fundholding, multifund, total purchasing pilot) of practices in the three HAs. After compiling the list of practices we could then attach information on purchasing modality we collected as part of an earlier project on Primary Care Consortia and Patient Choice (Posnett et. al., 1996) We attempted to identify the purchasing type on three dates: 1/4/95, 1/4/96 and 1/4/97. The details were then checked by the HAs.

Since it is likely that distances to practices are an influence on a patient's choice of practice and on their decision to change practices, it was necessary to compute practice-patient distances. We converted surgery and patient post-codes to grid references to compute distances from the patient's post-code to the nearest surgery of their current practice. In addition we constructed ED level measures of accessibility by calculating the distance from the centroids of EDs to practices.

2.2 CHOICE OF HEALTH AUTHORITIES

Three health authorities were involved in the research. They were chosen after consultation with NHSE on the basis of two prior pieces of work: a survey of health authority experience in handling and down-loading patient registration data; and an analysis of access to, and the purchasing characteristics of, all English general practices (Posnett et al, 1996; Carr-Hill et. al., 1996). The aim was to select HAs with extensive IT skills and a range of GP purchasing types. With three out of 100 HAs the sample did not aim to be nationally representative. The project was intended as a pilot exercise which might be followed by a larger sample of HAs.

Doncaster was chosen as the first authority because it was already well known to the researchers and had a highly competent and cooperative IT section. As such, it was ideal for testing the feasibility of the exercise and for gaining experience in methods of data extraction that could be recommended elsewhere.

Experience in Doncaster made it clear that choosing geographically non-contiguous HAs was a relatively inefficient sampling method. Patients resident in one HA may be registered with practices which have the bulk of their patients resident in another authority. Choosing non-contiguous HAs would have maximised the number of peripheral practices that had to be dropped from the practice level analysis because there were insufficient registrations from the host HA to provide reliable estimates of practice level transfer rates. Accordingly we chose Rotherham as our second HA because it was the contiguous HA which maximised the number of usable practices. Table 2.1 shows the impact of the choice of contiguous HAs on the number of usable practices

Table 2.1: Effect of contiguity on number of usable practices

	Doncaster	**Rotherham**	**Kingston & Richmond**
No. of GPs with whom patients are registered	320	256	344
No. of practices holding these registrations	93	100	165
No. of practices with >150 patients from host HA	49	61	81
No. of practices with >150 patients after merging Donc and Roth HA data	69	71	81

It was felt that the third authority should provide a socio-demographic contrast to Doncaster and Rotherham - which are similar in many respects - even at the cost of reducing the number of practices which could be included because of non-contiguity. Moreover it had to be an area where joint purchasing arrangements were sufficiently extensive to potentially limit patient choice. Accordingly we selected Kingston and Richmond. Because it was not contiguous with either of the other two HAs, 84 of the 165 practices with patients registered in Kingston and Richmond had fewer than 150 Kingston and Richmond patients.

The final sample of HAs provides a number of contrasts that are essential to the analyses, but make no claims to be nationally representative. In particular it under-represents city centre areas, areas with large ethnic minority populations and rural areas with low population densities.

2.3 NUMBERS OF PRACTICES

The number of practices usable in our different analyses differs depending on the purpose in hand and the type of data required. For example:

Practices with patients registered from the three HAs	358
Practices which could be recognised from the various GP and practice codes:	319
Practices on which there was postcode/distance information	215
Practices with over 150 patient registrations	191
Practices with over 150 patient registrations and available practice details	171

2.4 NUMBER OF PATIENT TRANSFERS AND REGISTRATIONS IN THE SELECTED HAs

Table 2.2 shows the number of registrations available for analysis in the three authorities, although some analyses will contain fewer cases due to missing values for individual variables.

Missing data is the main reason why some transfers are excluded from the analyses. More details of the exclusions are provided in Appendix A. In order to maximise the numbers, cases are dropped on a piecemeal basis when they lack valid data for a specific analysis. Total numbers will vary between the analyses. Because of the large numbers of variables in the data set it is impossible to give a simple summary of the numbers involved. Nevertheless, there are some common causes of exclusions:

- missing or ambiguous NHS numbers preventing transaction records being linked to patient details

- missing or unconvertible postcodes, making it impossible to assign a grid reference or ED to the patient's address; this voids a large number of variables relating to socio-economic circumstances, distance to current practice and access to other practices.

- unrecognisable GP or practice codes
- being registered with a practice that has too few registrations in the participating HAs to reliably calculate transfer rates
- being registered with a practice for which the participating HAs cannot supply medical register details.

Table 2.2: Numbers of registrations

	Doncaster	Rotherham	Kingston & Richmond	Total
Patients in registration file	327387	317945	338897	984229
Patients with current GP and postcode convertible to ED	289419	248179	325431	863029
Patients in basic analysis file after most exclusions	277966	234345	310032	822343

Table 2.3 shows the number and type of registration changes in the three HAs since January 1995; the transfers used in the analyses are those from April 1995.

Table 2.3: Summary of registration changes: January 1995 - mid 1997

Transfer code	Reason for transfer	Dirn of transfer		All transfers since 1/1/95					
				Doncaster		Rotherham		Kingston & Richmond	
		In	Out	N	%	N	%	N	%
1	Birth	x		6778	6.6	6210	8.8	6408	3.5
2	First acceptance	x		2220	2.2	2348	3.3	5469	3.0
4	Immigrant	x		505	0.5	471	0.7	11065	6.1
5	Ex Services	x		53	0.1	27	0.03	36	0.02
D	Death		x	6887	6.8	7139	10.1	7066	3.9
DDR	Deduction at GPs request		x	1269	1.2	1412	2.0	1812	1.0
DPR	Deducted at persons request		x	36	0.04	10	0.01	19	0.01
E	Embarkation		x	220	0.2	295	0.4	2677	1.5
M/H	Mental Hospital		x	8	0.01	1	0.0	1	0.0
O/R	Other reasons		x	1640	1.6	568	0.8	8511	4.7
PT	Int trans in p'ship	x	x	1951	1.9	87	0.1	2457	1.3
PX	Int trans in p'ship by address	x	x	123	0.1	6	0.01	170	0.1
R	Removal to another area		x	14541	14.3	14967	21.2	43125	23.6
R/A	New FHSA/same GP			735	0.7	1337	1.9	2641	1.4
R/C	Registration cancelled		x	504	0.5	1019	1.4	711	0.4
R/U	Returned undelivered		x	858	0.8	456	0.6	9497	5.2
RIN	Re-instated person		x	2	0.002	0	0	0	0
S/D	Services dependent		x	175	0.2	55	0.1	103	0.1
SER	Services		x	141	0.1	147	0.2	38	0.02
T	Internal transfer	x	x	8153	8.0	7853	11.1	12362	6.8
TA3	Transfer in	x		16650	16.3	14859	21.1	54110	29.6
X	Int Trans by Addr Change	x	x	14475	14.2	11217	15.9	14528	7.9
Z	Changes of record keeping in HA	x		24001	23.5	4	0.0	1	0.0
All transaction types				101925	100.0	70498	100.0	182816	100.0
Number of currently registered patients mid 1997				327387		317945		338897	

Table covers all transactions since 1/1/95 recorded in files supplied by the participating Health Authorities. Code Z transfers refer to the bulk movement of records due to changes in internal record keeping practice. They are largely confined to Doncaster and are not relevant to the project as they do not involve changes of practice.

Differences between the HAs become clearer when the annual number of transfers are expressed as a percentage of the total number of people registered at mid 1997 (Table 2.4). Kingston and Richmond stands out as having much higher rates of transfers associated with population movements in and out of its area: 5.6% per annum moving to other HAs compared with 2.0% and 2.1% in Doncaster and Rotherham; and 7.1% moved into Kingston and Richmond compared with 2.3% into Doncaster and 2.1% into Rotherham. There is however no obvious difference between Kingston and Richmond and the other HAs in terms of the proportions changing address within the HAs: Doncaster 2.0%, Rotherham 1.6%; Kingston and Richmond 1.9%. It appears that most changes of address in Kingston and Richmond area involve a move of sufficient distance to take people to a new HA.

The proportion of people deducted at the GP's request is somewhat higher in Kingston and Richmond (0.24%) than in Doncaster (0.17%) and Rotherham (0.20%). Kingston and Richmond also has a slightly higher proportion of transfers without change of address than both Doncaster and Rotherham.

Table 2.4: Annual transfer rates (as percentage of number of registrations)

Transfer code	**Reason for transfer**	**Dirn of transfer**				
				Doncaster	**Rotherham**	**Kingston and Richmond**
		In	**Out**	**%**	**%**	**%**
DDR	Deduction at GP request		x	0.17	0.20	0.24
R	Removal to another area		x	2.0	2.1	5.6
T	Internal transfer no change of address	x	x	1.5	1.1	1.6
TA3	Transfer in	x		2.3	2.1	7.1
X	Internal transfer by address change	x	x	2.0	1.6	1.9
Total number of people registered in HA				327387	317945	338897

Not all the transfers from these tables can be included in the analyses. Transfers before 1 April 1995 are excluded because current details on practice composition and characteristics may not be relevant to these earlier transfers. Where people have moved practice more than once since April 1995 only the details of the last move are used. (One individual recorded twenty two amendments to their registration details in this period, though most of these will have been less significant than changes of GP or practice.)

Relatively few transfers are excluded by limiting the analysis to the most recent change. Table 2.5 gives the number of transfers for the 1098 individuals who have changed practice without change of address more than once in the period 1/4/95 to mid 1997. Details of 1225 transfers are lost if the analysis is restricted to the most recent changes. There are fewer transfers without change of address in Table 2.5 than in Table 2.3 because some 5467 transfers are excluded from Table 2.5 because they are transfers before 1/4/95, or because of a missing or invalid NHS number in the transaction file.

Table 2.5: ***Patients who transfer without change of address***

Number of transfers without change of address	**Health authority**			**All 3 HAs**
	Doncaster	**Rotherham**	**Kingston & Richmond**	
1	5360	5461	10982	21803
2	209	272	502	983
3	21	13	57	91
4	3	6	5	14
5	1	0	6	7
6	0	1	1	2
11			1	1
	5594	5753	11554	22901

Section 3: The Health Authorities

3.1 SOCIO-DEMOGRAPHIC COMPOSITION

The three authorities each have 320-340 thousand people registered with GPs, but there are major differences in their socio-economic composition and the provision of primary care.

The social composition of the authorities was represented by several deprivation indices computed at ED level. (The method of computation is described in Appendix A). The indices are based on 1991 Census data, which also provided an estimate of the proportion of people with limiting long-standing illness. Table 3.1 displays the characteristics of the populations of the three health authorities (based on ED values).

On all the measures, Kingston and Richmond is less deprived than the other two HAs. Doncaster and Rotherham are similar: Doncaster is more deprived on three of the indices, Rotherham is more deprived on the other two.

Table 3.1: ***Standardised deprivation measures of the registered populations in the three Health Authorities***

	Doncaster	**Rotherham**	**Kingston & Richmond**	**Average across all 3 HAs**
Jarman	19.4	15.5	-12.7	5.8
Dept of Environment Index	0.86	-.16	-.35	0.1
Proportion with long-standing illness (standardised)	.42	.36	-.54	0.03
Carstair index	1.1	1.2	-1.7	0.06
Average social class	.45	.53	-.67	.04

The variables have been standardised across the EDs containing the postcodes of registered patients. Each person is assigned the socio-economic characteristics of their ED of resident. The means and standard errors used in the standardisation were simple averages across the EDs, unweighted by either the number of registrations or the number of residents. The overall means in Table 3.1 are non-zero because they are based on the numbers of persons registered from each ED. Average social class is calculated by assigning numbers (prior to standardisation) to the Registrar General's Social Class groupings: I = 1, II = 2, IIIN = 3, IV = 5, V = 6.

3.2 ACCESS TO PRIMARY CARE IN THE HAs

Access to primary care also varies between the areas. Kingston and Richmond (with the highest population density) has the greatest concentration of practices (Table 3.2). On average Kingston and Richmond patients are only 0.5km from the nearest practice. The number of close practices (within 0.75km) and the number within the distance that most people are prepared to travel to their practice (3kms) are similar in Doncaster and Rotherham - though access is slightly better in Rotherham. The choice of practices is much greater in Kingston and Richmond, both in terms of the number of practices and the number of types (non-fundholding, standard fundholding, total purchasing pilot and multi-fund) available.

Table 3.2: Patient access

	Doncaster	Rotherham	Kingston & Richmond	Average across all 3 HAs
Average distance to nearest practice	0.88km	0.92km	0.53km	0.75km
Number of practices within 0.75km	1.04	1.01	1.89	1.36
Number of practices within 3km	5.87	7.69	15.1	9.96
Number of types of practice within 0.75km	0.77	0.95	1.6	1.13
Number of types of practice within 3km	3.6	4.7	6.0	4.8

The number of practice types is arrived at by a formula agreed in an earlier project.

- Non-fundholders are assumed to all have a common purchasing strategy: any number of non-fundholders within the specifed distance counts as a single type
- Standard fundholders are each assumed to have separate purchasing strategies: n standard fundholders count as n purchasing types.
- Practices in total purchasing pilots: any number of practices in each pilot scheme count as a single purchasing type

- Practices in multifunds: any number of practices in each fund count as a single purchasing type.

To simplify some presentations we have let multifund membership take precedence over belonging to a total purchasing pilot: practices which are in both are shown as only belonging to a multifund.

Table 3.3 gives the distribution of patients registered in the HAs across the type of practice purchasing modalities.

Table 3.3: Distribution of patients across practice purchasing types

N **% of all in HA**	**Doncaster**	**Rotherham**	**Kingston & Richmond**	**Average across all 3 HAs**
Non-fundholding	140812 50.7	121064 51.7	80105 25.8	341981 41.6
Stdard fundholding	136775 49.2	89687 38.3	54215 17.5	280677 34.1
TPP	283 0.1	23954 10.1	0	23877 2.9
Multifund	0	0	139610 45.0	139610 17.0
Multifund & TPP	96 0.0	0	36102 11.6	36198 4.4
All types N /%	277966 33.8	234345 28.5	310032 37.7	822343 100.0

Table 3.4 gives the numbers of practices of different purchasing types with patients registered with the three HAs for whom it was possible to obtain details of purchasing modalities. Note that the number of practices of each purchasing type is different from the distribution of patients across the purchasing modalities (Table 3.3). The second column in Table 3.4 is indicative of some of the problems of trying to compile practice based statistics for health authority populations. The column headed "Doncaster and Rotherham" refers to practices that have at least 150 registered patients from both of these health authorities, but have a majority of their patients based in health authorities that are not in the study, such as Sheffield, Barnsley and

Wakefield. We could not include a similar column for Kingston and Richmond patients registered with practices outside the HA because Kingston and Richmond did not have detailed information on such practices. The fact that general practice and health authority boundaries are not coterminus presents major problems for projects concerned with the organisation and delivery of primary health care across health authority populations.

Table 3.4: ***Numbers of practices of different purchasing types with patients from the participating HAs***

	Doncaster		**Doncaster & Rotherham**		**Rotherham**		**Kingston & Richmond**		**All**	
Purchasing status at 1/4/96	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Non-fundholder	35	63	23	70	44	68	22	36	124	58
Std fundholder	18	32	4	12	16	25	7	12	45	21
Member of TPP	1	2			1	2				1
Part of Multifund			6	18	4	6	27	44	37	17
MF+TPP	2	4					5	8	7	3
All at 1/4/96 (N)	56		33		65		61		215	
All at 1/4/96 (%)		26		15		30		29		100

To avoid these difficulties, most of the presentations in this report refer to the characteristics of practices which serve the populations of the three participating HAs, regardless of where the practices are based or whether their main administrative links are with HAs in or outside of the project. The tables which are "patient weighted" report the average practice characteristics experienced by the registered population of each authority. Although three HAs participated in the study, the tables which report individual practice characteristics by health authority have four groupings: three of these practices refer to practices for whom each of the three HAs feels it has prime responsibility, and the fourth refers to practices which provide for both the populations of Doncaster and Rotherham but which are the responsibility of other HAs.

From the above discussion it is clear that the populations of the three participating authorities will be served by many practices which the authorities do not regard as their prime responsibility. Such outlying practices will generally be excluded from the analyses, either because they have too few registrations to compute reliable transfer rates, or because the three participating HAs were unable to supply details of the practice characteristics.

3.3 PRACTICE CHARACTERISTICS

Table 3.5 shows the average characteristics of practices with which patients of the three HAs' are registered according to the latest versions of their medical directories (circa March 1997). We have had to assume that these characteristics have been constant since 1/4/95 since medical directory information is both complex and rarely dated.

The figures are weighted by the numbers of registrations at each practice in order to reflect the fact that patients are not equally distributed between practices. For example, if a majority of patients in an authority choose practices in which the average age of GPs is lower than the average for all GPs, the patient-weighted average GP age will be lower than the unadjusted average for the Authority.

It will be noted that the number of GPs is the measure of practice size in Table 3.5. This is not the number of full time equivalent GPs, but the number of doctors listed in the medical directory. In some of the analyses it would have been preferable to use either list size or the number of FTEs, but health authorities were either reluctant to disclose these figures on the grounds of confidentiality or did not know the full list sizes of practices serving several Has.

On average, people in the three HAs are registered with GPs aged 45.2 years. Patients in Kingston and Richmond belong to practices with fewer GPs, with a higher proportion of female partners and slightly younger GPs. They also belong to practices with lower average opening hours and fewer services.

Table 3.5: Characteristics of practices (patient weighted)

	Doncaster	Rotherham	Kingston & Richmond	Average across all 3 HAs
Average practice size (no. of GPs)	4.1	4.4	3.5	4.0
Average GP gender (1=all male practice 2=all female)	1.2	1.2	1.4	1.3
Average GP age	46.2	45.6	43.9	45.2
Average weekday surgery hours	47.0	42.1	28.7	38.7
Average number of clinic types	3.4	3.3	1.3	2.6
Average number of clinics (of all types)	5.3	14.9	2.5	7.0
% of practices with dispensing	7.4	5.1	0.0	3.9
% of practices providing full maternity and obstetric care	9.7	9.6	3.3	7.3
% of practices providing IUD contraception	9.7	8.5	9.5	9.2

Figures are based on patients not practices - e.g. % of practices with dispensing is the % of patients who are registered with dispensing practices.

Section 4: Practice Level Analyses

4.1 PRACTICE TRANSFER RATES

In this section we examine the factors which influence transfer rates for practices. Transfer rates for practices are computed as the ratio of the total number of transfers of each type to the number of patients registered at the practice from the participating HAs. Only transfers since April 1995 are included and the analysis considers the most recent transfer for any individual with more than one transfer.

Some 319 practices can be identified as either the source or destination of transfers. Nearly 50% have to be excluded from the transfer rate analyses either because it has been impossible to get details on the characteristics of the practice or because the numbers of registrations from the participating HA are too small to reliably compute the transfer rates - practices with less than 150 registrations are excluded.

Table 4.1: Exclusion of practices from the analysis

	Doncaster	Doncaster & Rotherham	Rotherham	Kingston & Richmond	Total
Practices included in analyses that require details of practices	42	31	37	61	171
Excluded for having <150 registrations	14	2	28	84	128
Excluded for having no practice details but >150 registrations	0	0	0	20	20
Total	56	33	65	165	319

Although some 27 transfer rates can be computed for each practice, only 5 were considered as throwing some light on the research questions (see Section 1). Table 4.2 gives the practice transfer rates for the five transfer rates of interest and Table 4.3 gives the breakdown by purchasing modality. The figures in Tables 4.2 and 4.3 are the ratio of the total numbers of transfers per practice in the period between 1/4/95 and the middle of 1997 to the current numbers of registrations at each practice. Only patients known to the participating HAs are

included so many of the rates are based on part of a practice's population. The tables are limited to practices with at least 150 registrations to reduce the number of practices with very high rates caused by small denominators. A few very high rates are still recorded in practices with slightly higher numbers of registrations.

Table 4.2: Practice transfer rates

Rate (number of transfers since 1/4/95 as proportion of total registrations in each practice)	**Mean**	**SD**	**Min value**	**Max value**	**N**
Rate of transfer in without change of address	.03	.04	0.0	.33	191
Rate of transfer out without change of address	.03	.06	0.0	.53	191
Rate of transfer in due to change of address into present HA	.08	.06	0.0	.39	191
Rate of transfer in due to change of address within present HA	.03	.02	0.0	.18	191
Rate of transfer out due to change of address within present HA	.03	.02	0.0	.23	191

Table 4.3: Practice transfer rates by purchasing type

Purchasing type at 1/4/96	**Non FH**		**Std FH**		**TPP**		**MF**		**MF+TPP**	
Rate (number of transfers since 1/4/95 as percentage of total registrations in each practice)	**Mean rate**	**sd**	**Mean rate**	**sd**	**Mean rate**	**sd**	**Mean rate**	**sd**	**Mean rate**	**sd**
Rate of transfer in without change of address	3.8	5.3	2.7	3.2	1.7	0.0	3.2	3.2	2.5	1.0
Rate of transfer out without change of address	3.2	3.3	3.3	6.4	0.7	0.5	2.7	2.0	1.4	0.8
Rate of transfer in due to change of address into present HA	6.9	5.3	6.1	4.1	8.1	6.5	10.4	5.7	11.1	1.2
Rate of transfer in due to change of address within present HA	3.6	3.0	3.1	1.3	2.9	0.1	3.9	1.6	4.1	0.8
Rate of transfer out due to change of address within present HA	3.0	1.4	3.0	1.6	3.2	0.5	3.4	1.5	2.8	0.3
Number of practices	87		40		2		37		5	

4.2 CORRELATION AMONGST PRACTICE TRANSFER RATES

We argued in Section 1 that the rates of outflow from practices, which aggregate the decisions of individual patients, will be related to the characteristics of the practice and provide information about patients' perceptions of the attractiveness of different characteristics.

Rates of inflow may convey less information about perceived attractiveness. Although there has been long term downward trend in list sizes since the founding of the NHS, on average the practices in our sample will have had stable list sizes over the relatively short period since April 1995. On average the total transfer into a practice will be equal to the total number of transfers out of the practice. It seems more plausible that the mechanism at work is that patients search for new practices and that practices admit patients to keep their lists roughly constant. Patients will have less information about practices they have not yet experienced than about those they are leaving, so that less may be inferred about the perceived attractiveness of practice characteristics from their rates of inflow into practices. Inflows may be primarily a balancing item, especially those inflows where the incomers are unlikely to have local knowledge.

Table 4.4: Correlations between transfer rates: first order correlations (top) and correlations after controlling for HA (bottom)

Rate (number of transfers since 1/4/95 as proportion of total registrations in each practice (n=191)	**Rate in w/o change of address**	**Rate out w/o change of address**	**Rate in due to change of HA**	**Rate in due to local address change**
Rate of transfer out without change of address	.41** .40**			
Rate of transfer in due to change of address into present HA	.17** .17**	.06 .00		
Rate of transfer in due to change of address within present HA	.53** .53**	.09 .09	.03 .05	
Rate of transfer out due to change of address within present HA	.16* .16*	.74** .73**	.04 -.03	.11 .12

**Significant at <1% *Significant at 1-5%

As Table 4.4 shows the transfer rates are significantly inter-correlated. The most significant correlation is between the rates of transfer out with change of address within the HA and the rates of transfer out with no change of address. This suggests that patients who have some experience of a practice may view practice characteristics in the same way. Although the actual rates of outflow with and without change of address differ, since the major driving force behind the decision to leave after a change of address is the increased distance to the practice, at the

margin the decision will depend on the other practice characteristics. The fact that the practice outflow rates for these two types of patient are so strongly positively correlated suggests that the same characteristics influence the outflow rates across different practices.

The correlation between rates of transfer in without change of address and transfer in with change of address is also significant, though rather smaller than for outflow rates for these types of patient. That there is no significant correlation between rates of leaving without change of address and the high volume inflows due to population movements tends to endorse the key premise of the project, that the motives of people changing practice without change of address are crucial to understanding the factors which influence practice choice. The following analysis of transfer rates and their correlates tries to identify the main characteristics of practices that encourage people to stay with their existing practice or to move elsewhere.

4.3 POSSIBLE INFLUENCES ON TRANSFER RATES

Patient movements into and out of a practice will in part be influenced by the characteristics of the practice since these affect the perceived attractiveness of the practice. The data available enable us to examine some potentially relevant characteristics.

4.3.1 Practice Size

We have measured practice size by the number of GPs because the project did not have access to practice (or GP) list sizes. The average number of GPs in the practices in our sample is 2.9. The largest has 9 GPs and 31.6% (54/171) are single handers. (Note that in contrast with some of the descriptive statistics in section 3, except where indicated, the statistics reported in this section are not patient weighted. There will therefore be minor differences between the sections in reported average values of some of the statistics.)

It is plausible that practices with more GPs will be more attractive. Patients in the practice who do not get on with one GP are more likely to remain with a practice with more GPs since there is a greater likelihood that they can find a suitable GP from within the practice; similarly with new patients who are searching for GPs with particular characteristics. Larger practices also tend to offer a greater range of services (see section 4.3.2).

Practices with larger average list sizes per GP might be hypothesised to be less attractive to patients. However we do not have data on the total number of patients registered with either the practice as a whole, or its individual GPs. Only the number of patients resident in the health

authorities in our sample is known. There is a relatively complex relation between total practice lists, individual GP lists and the number of GPs working from the practice. Using data from the 1994 GMS GP census data base which covers 9600 practices we found that the number of whole time equivalent GPs in a practice was significantly negatively correlated with the average list size per GP in the practice (r = -.172). This implies that there may a problem of omitted variable bias in that some of the effects of list size in a practice may be attributed to the number of GPs. Since we hypothesise that both reductions in list size and increases in the number of GPs increase the attractiveness of a practice, the effect of the omitted variable will be to increase the estimated effect of GPs on transfer rates. However we found that the linear relationship between the number of GPs and practice list size was very flat: an additional GP in a practice is associated with a reduction in list size per GP of 52 patients. We believe therefore that the problem of the omitted list size variable biasing the estimated effect of the number of GPs is likely to be small.

4.3.2 Practice Characteristics

Only a limited set of GP characteristics are available from the medical directories and these have been averaged across all GPs in the practice. Those used in the analysis were

Gender of GPs. The average GP gender across all 171 practices is 1.25 (sd= 0.31) (male GPs are coded 1 and female GPs are coded 2 for the purpose of calculating average gender). 108 of the practices have only male GPs and 15 have only female.

Average age. The average age of GPs in the sample is 46.5 (sd=7.1). (This may be something of an underestimate as some of the ages have to be approximated from date of first qualification and age at first qualification has been assumed to be 26.)

Non-European language. 29% of practices offer at least one non-European language (see Appendix D).

The characteristics of the practice's GP and practice size are correlated, as Table 4.5 shows. Larger practices tend to have a larger proportion of female GPs, and to have younger GPs. The practice is also more likely to offer a non-European language the older are its GPs, perhaps because older GPs are more likely to be overseas born.

Table 4.5: Correlations amongst GP characteristics

	Number of GPs in practice	Average GP gender	Average GP age
Average GP gender	.19*		
Average GP age	-.28**	-.20**	
Whether non-European language offered	-.08	-.07	.16*

**Significant at <1% *Significant at 1-5%

Services. The medical directories give details of two groups of services: clinics and specific services, such as child surveillance and dispensing. Since practices are generally free to describe clinics in their own terms there is a great variety of titles. We have grouped them as in Table 4.6

Table 4.6: Clinics provided by practices

	Percentage of practices providing these clinics
clinics providing alternative therapies	3
clinics relating to child-birth post and ante natal care	71
clinics relating to drug misuse	7
clinics concerned with chronic disease monitoring and care	38
clinics dealing with cardio-vascular problems	11
well woman/man/person clinics	36
diet and weight control clinics	11
family planning clinics	14
other types of clinics	42

We constructed two summary measures: the number of types of clinics; and total number of all clinics. Since the two measures are highly inter-correlated (Table 4.7) we generally used the number of types of clinics in the analyses. It arguably is a better measure of attractiveness than the number of clinics since it indicates the width of choice available to patients whereas the number of clinics might also reflect the number of patients in the practice.

Table 4.7: ***Number and types of clinics***

	Mean	SD	Min value	Max value	N
Number of types of clinic (per practice)	2.61	1.95	0.0	8.0	171
Numbers of clinic (per practice)	6.36	7.87	0.0	49.0	171

r=.88 (<.001%) n=171

There was much more standardisation in the descriptions of the medical services provided. The number of practices providing these services are reported in Table 4.8.

Table 4.8: ***Medical services provided***

	Percentage of practices providing these services	Correlation with number of clinic types	Correlation with number of clinics
Minor surgery	93	-.14	.17*
Child surveillance	96	-.08	.26**
Dispensing	4	.14	.14
Maternity	99	-.02	.39**
Maternity and obstetrics	73	.30**	.41**
Contraception	100	-.12	.41**
IUDs	92	-.07	.26**

**Significant at <1% *Significant at 1-5%

Rather than construct a summary measure we entered these medical services separately in the analysis. Again the supposition is that practices which offer a particular service are on average more attractive to patients than those which do not.

Hours. Two attributes of surgery opening hours will affect the attractiveness of the practice to patients. The first is the number of hours for which the surgery is open. The second is the convenience of the opening hours. There is no obvious measure of convenience. Patients who work standard 9-5 hours find evening or Saturday opening more convenient, those with pre school age children may prefer day time surgeries. We attempted to capture this aspect by distinguishing between weekday and weekend surgeries. The number of weekday surgery hours

may be an underestimate where the medical directory for an HA only lists a branch surgery with limited opening hours in reach of its patients, whereas the main surgery for the practice, located in another HA for which we do not have details, may have longer hours.

Table 4.9: Surgery hours

	Mean	SD	Min value	Max value	Correlation with practice size	N
Number of week days open	4.8	0.67	1	5	.11	171
Whether or not open at weekend	0.80	0.40	0	1	.17*	171
Total surgery hours (Mon-Fri)	36.4	15.3	5	58.8	.29**	171

**Significant at <1% *Significant at 1-5%

As one might expect practices with more GPs are more likely to be open at weekends and to provide more weekday surgery hours.

Context. Since patients choose amongst practices, a practice's transfer rates will be affected by the availability of alternative practices. Availability is defined in terms of distance: Section 6 shows that over 80% of patients choose practices within 3kms of their address. The range of alternative practices is measured in two ways: the number of practices within a given distance; and the number of practice purchasing modality types within the same distance.

Table 4.10 shows the average availability of practices for the patients registered with each practice. This is calculated as follows: for each practice we calculate for every patient in the HA registered with the practice the distance from the centroid of the patient's ED to practices in the HA and surrounding HAs, count the number of practices within specified distances of the centroid of the patient's ED and then average across all patients registered with the practice. The resulting average is a measure of the availability of alternative practices. The figures in Table 4.10 are the unweighted averages of these practice averages. They are slightly different from the values in Section 3 which are averaged across the EDs where at least one registered person was resident.

Table 4.10: Availability of practices to patients

	Mean	SD	Min value	Max value	N
Number of practices within 1.5km	3.6	1.8	.05	8.5	191
Number of practice types within 1.5km	2.4	1.3	.05	5.7	191
Number of practices within 3km	10.9	6.3	.84	28.4	191
Number of practice types within 3km	4.8	2.6	.54	10.0	191

Environmental variables. The attractiveness of a practice to a patient depends on the characteristics of the patient as well as the practice. For the practice level analysis considered in this section we do not have data on the characteristics of individual patients, only on average characteristics of patients registered with the practice and even then only for a limited range of patient characteristics: age, sex and those ED level Census characteristics we can impute from the patient's post code.

We have included two types of possible ED level environmental influences on transfer rates: the local level of long-standing illness and the local level of deprivation as captured by a number of indices. Table 4.11 summarises the values of these environmental variables. In this section they are averages for each practice. That is, each registered patient is associated with the socio-demographic characteristics of their ED of residence and these values are averaged across each practice population. The figures in Table 4.11 are the average of these practice averages for the sample of 191 practices whereas the values in Section 3 are averages across all EDs .

Again, average social class is calculated by coding the Registrar General Social Class groupings so that I = 1,...,V = 6 so that a higher social class score for the practice indicates lower social class. In Table 4.11 social class is standardised with a mean of zero.

Table 4.11: Deprivation indices and environmental variables

	Mean	SD	Min value	Max value	N
Jarman	3.42	23.73	-33.65	103.24	191
Dept of Environment Index	-.24	2.35	-8.01	6.81	191
Standardised proportion with long-standing illness	-.02	.55	-.78	1.14	191
Carstair index	-.13	2.09	-3.01	9.45	191
Average social class	0.00	0.66	-1.27	1.51	191

Table 4.12 reports the inter-correlations of the practice level environmental variables. As might be expected the deprivation indices (DoE, Jarman, Carstairs), limiting longstanding illness (LLI) and social class are highly inter-correlated. This reflects the fact that the indices are measuring phenomena which are correlated and that there are common elements in the indices (see Appendix A, Table A2). In much of the analysis we have used the DoE index and LLI which have the lowest inter correlations (except for DoE Index and social class). Sections 4.4.4 and 6.1.4 examine the effects of the separate variables which comprise these indices.

Table 4.12: Inter correlations of environmental variables

	Jarman	DoE Index	Illness	Carstair
Dept of Environment Index	.80**			
Standardised proportion with long-standing illness	.86**	.55**		
Carstair index	.98**	.74**	.87**	
Average social class	.76**	.32**	.84**	.83**

**Significant at <1% *Significant at 1-5%

4.4 ANALYSIS OF PRACTICE TRANSFER RATES

4.4.1 Transfers Without Change of Address

The distribution of the rates of transfer without change of address is shown in Figures 4.1and 4.2. Figure 4.1 represents the percentage of the total registrations who have transferred out without change of address in two years; Figure 4.2 shows the rates of transfers in. These data are consistent with an annual average transfer rate (without change of address) of 1% to 1.5%.

We examined the relationship between the rates of transfer without change of address and the potential influences on transfer rates for both transfers into and out of practices. Table 4.13 gives the simple correlations between the transfer rates into and out of practices and the potential explanatory variables. We also report the partial correlations after removing HA level effects.

The simple correlations are broadly in accordance with our expectations: practice size, weekday surgery hours, numbers of types of clinics offered, and whether the practice offers minor surgery appear to increase the attractiveness of a practice. They are all significantly negatively associated with the rate of transfer out without change of address. The significant positive association of the number of alternative practices and types of practice available withing 3km is also as expected. Practices which offer a non-European language have higher rates of transfer out.

Whereas transfers out of a practice without a change of address may be an indicator of patient dissatisfaction and are a relatively small proportion of all transfers out, transfers into a practice are more likely to be a balancing item resulting from GP decisions to keep the number of patients roughly constant. This would imply that the same factors which are associated with a high outflow of patients are likely to be associated with a high inflow since practice inflows and outflows will be equal on average. Again this expectation is in accordance with the results in Table 4.13.

Figures 4.1: Transfer rates out of practices without change of address

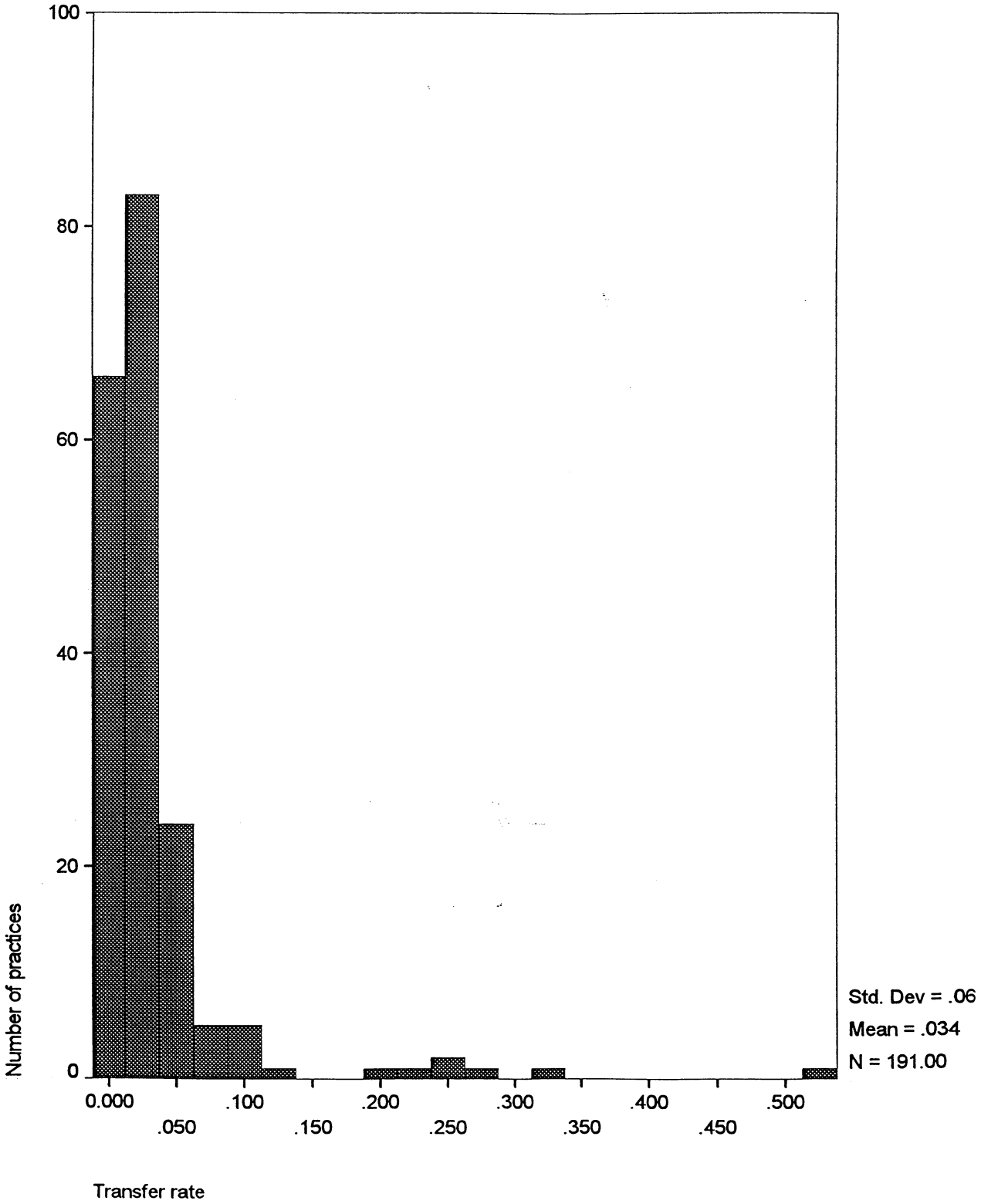


Figure 4.2 Transfer rates into practice without change of address

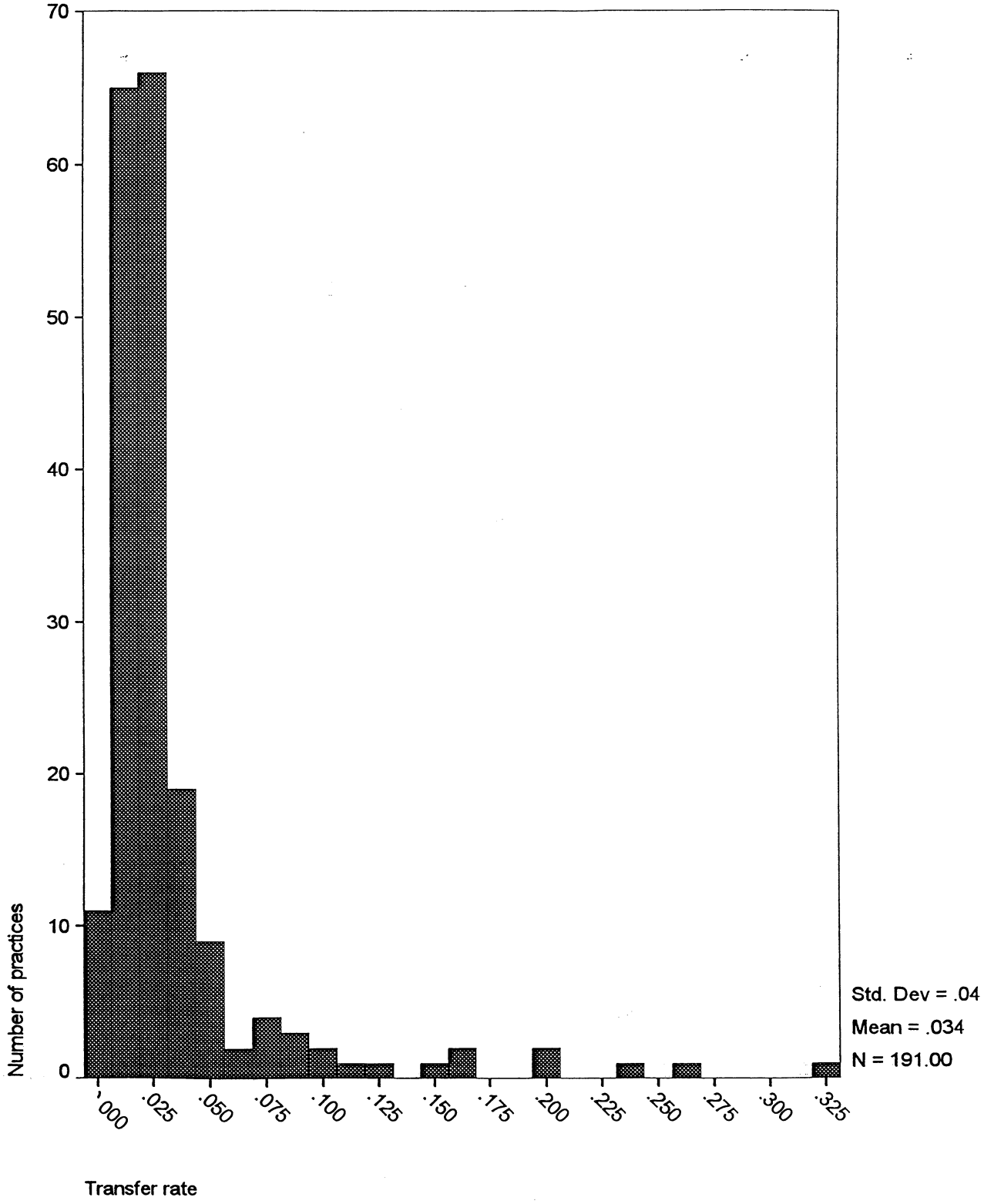


Table 4.13: ***Correlations (simple and HA controlled) of transfer rates without address change and potential explanatory variables***

Correlation coeff Partial corr coeff - controlling for HA	**Transfers out without change of address**	**Transfers in without change of address**
Practice size	-.36** -.36**	-.27** -.27**
Average gender of GPs	-.12 -.15	-.11 -.15
Average age of GPs	.11 .13	-.10 -.09
Total weekday surgery hours	-.20** -.20**	-.14 -.11
Number of types of clinic	-.18* -.17*	-.10 -.07
Number of practices within 1.5km	.13 .09	.14 .12
Number of practice types within 1.5km	.12 0.3	.08 .05
Number of practices within 3km	.19** .11	.18* .17*
Number of practice types within 3km	.17* .07	.08 .04
DoE deprivation index	.04 .03	.03 .04
Long-standing illness	-.08 -.02	-.04 -.00
Practice provides minor surgery	-.16* -.07	.03 .06
Non-European language offered	.07 .18*	.05 .05
Practice type: non-fundholder	-.04 .05	.09 .13
Practice type: std fundholder	-.01 .05	-.08 -.07
Practice type: TP pilot	-.05 -.06	-.04 -.04
Practice type: multi-fund	-.08 -.11	-.03 -.08

** Significant at 1%, * significant at 1-5%

Simple correlations between transfer rates and potential explanatory variables do not allow for the confounding effects of other variables and may be misleading. Multiple regression is a method of removing confounding effects and Table 4.14 reports the results of regressing transfer rates on the explanatory variables.

Practice size as measured by the number of GPs has the greatest explanatory power for transfer rates without change of address. Practice size is significantly related to the rate of transfer out without change of address. Thus single handed practices have significantly higher rates of outflow and practices with 4 or more partners have significantly smaller rates of outflow compared to other practices. Patients are therefore less likely to leave practices with more GPs. The range of clinic types offered is also significantly associated with a reduction in the rate of outflow.

Comparing the simple correlations in Table 4.13 and the regression coefficients in Table 4.14 shows that removing confounding effects has a marked effect for some of the potential explanatory variables. Surgery hours, practices available within 3km and the availability of minor surgery are no longer significantly associated with practice transfer rates once confounding effects are allowed for.

Interestingly, Table 4.14 shows that there is significant variation outflow rates by purchasing modality once the effects of other variable are allowed for. Standard fundholders have significantly higher rates of transfer out without change of address compared to non-fundholders.

Table 4.14: Regression of transfer rates without address change

	Transfers out without change of address		Transfers in without change of address	
	Coeff	**t**	**Coeff**	**t**
Practice size - single hander	.51	4.6**	.52	2.7**
Practice size - 4 or more partners	-.31	-2.8**	-.41	-2.1*
Average gender of GPs	-.06	-.92	-.08	.7
Average age of GPs	.06	.78	-.22	-2.6**
Total weekday surgery hours	-.08	-1.1	-.08	-1.0
Number of types of clinic	-.13	-2.9**	-.06	-.8
Number of practices within 3K	-.02	-.2	.10	1.4
DoE deprivation index	.002	.03	-.00	-.02
Long-standing illness	-.05	-.67	-.05	-.6
Practice provides minor surgery	.07	.95	.15	1.9
Non-European language offered	.12	1.8	.05	.7
Practice type: std fundholder	.36	3.2**	.02	.2
Practice type: TP pilot	.02	.4	-.002	-.03
Practice type: multi-fund	-.09	-1.2	-.06	-.9
Health authority dummy	-.01	-.15	.05	.7
Constant	-.15	-1.9	.05	.4
Adj R^2	.23		.10	
SS regression (df)	19.0 (4)		23.8 (3)	
SS residual (df)	56.8 (166)		176.3 (167)	
F regression	13.9**		7.5**	

**Significant at <1% *Significant at 1-5%

Figure 4.3 Transfers in from outside the health authority

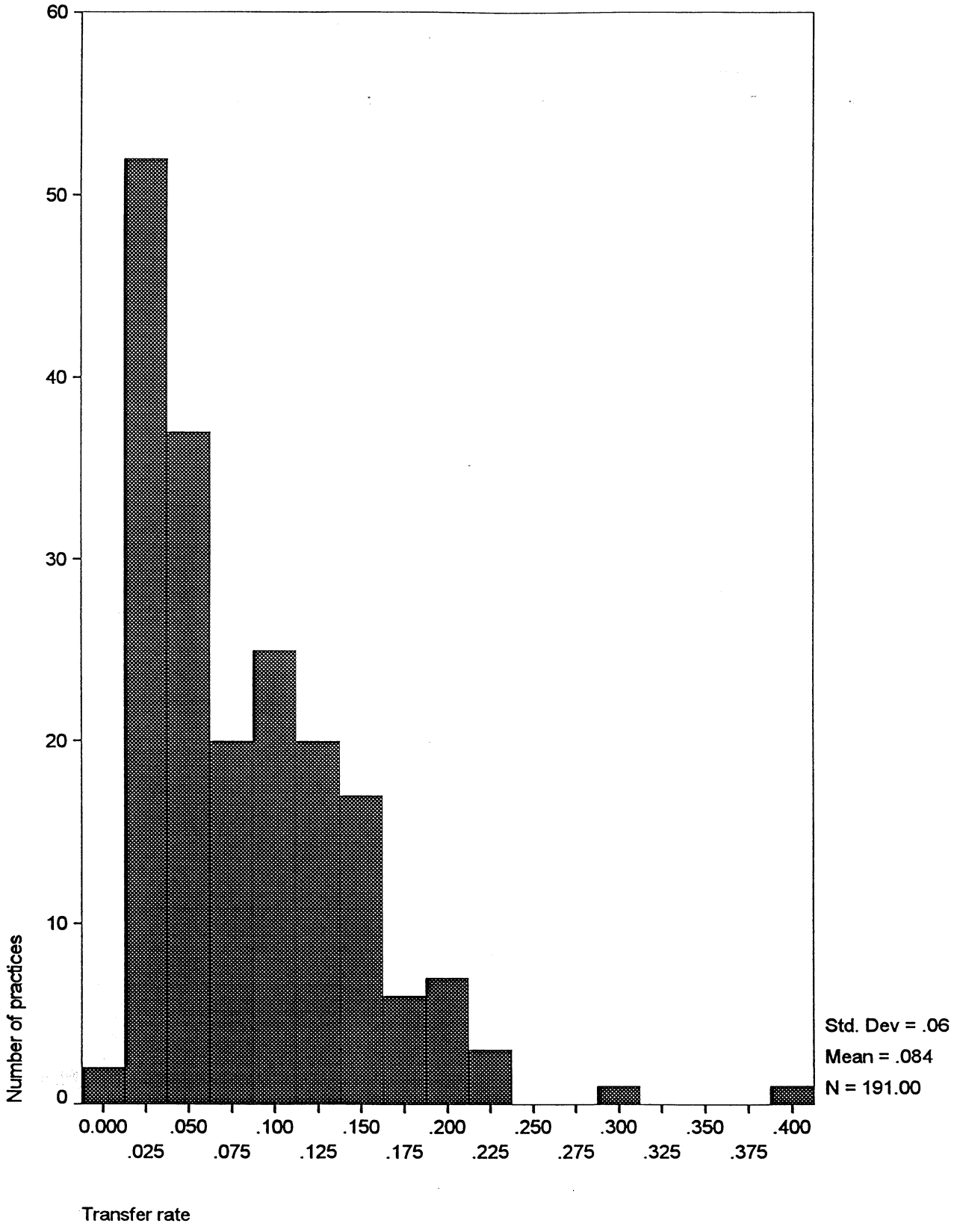
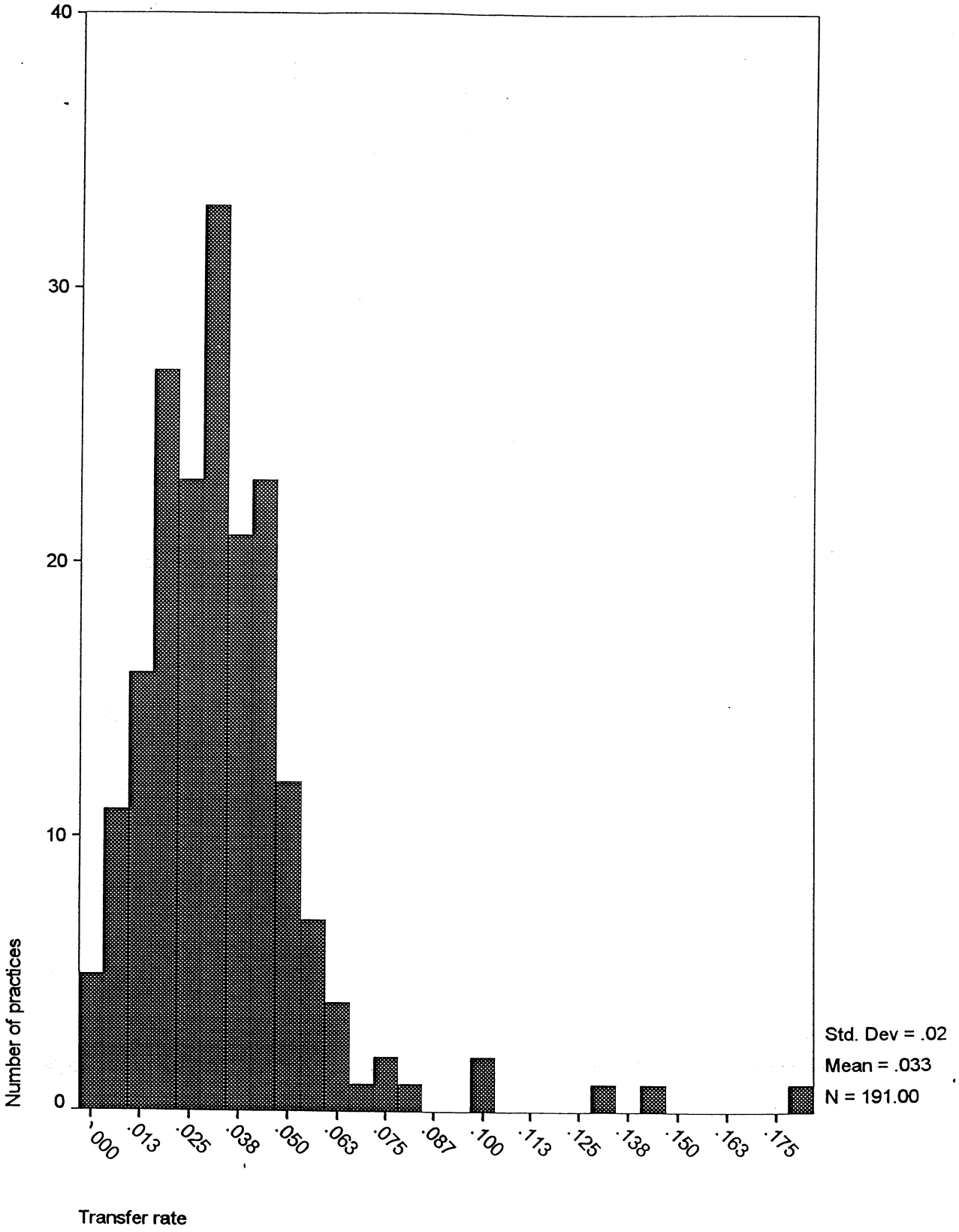


Figure 4.4 Transfers into practice following local change of address



4.4.2 Transfers in From Another HA and with Local Address Change

Table 4.15 reports two regression results for rates of transfer into a practice: those where patients were previously registered with another HA and those where they have been previously resident with the current HA but have changed practice and their address.

The only factor significantly negatively associated with inflows from another HA is the average levels of long-standing illness in the EDs of all patients registered with the practice. We have argued that the impact of such environmental variables is difficult to predict *a priori* and that inflow rates may be largely determined by outflows. Thus the fact that inflows from other HAs is negatively associated with the long-standing illness environmental variable may merely be a reflection of its effect on practice outflows, though no association between the environmental variable and rates of transfer out without change of address was found.

The health authority dummy variable included in the regression is coded 1 for Kingston and Richmond and 0 for the other two HAs. The fact that it is significantly related to the rate of transfer in from other HAs is likely to be a reflection of the generally higher rates of population movement in Kingston and Richmond compared to the other two authorities.

The results for the regression of rates of transfer in after a local address change are rather similar to those for transfers in without an address change. For example single handed practices have significantly higher rates of inflow than practices with more than one partner. The explanation for the similarity may be the balancing argument: inflows are higher because outflows are higher. The significance of the DoE index may simply indicate high rates of population movement in more deprived areas. (See Appendix F).

Table 4.15: Regression of transfers in from other HA and after local address change

	Transfers in from other HA		Transfers in after local change of address	
	Coeff	**t**	**Coeff**	**t**
Practice size - single hander	.03	.56	.87	4.5**
Practice size - 4 or more partners	-.06	.26	-.06	.43
Average gender of GPs	-.07	.21	.03	.68
Average age of GPs	-.07	.16	-.29	-3.3**
Total weekday surgery hours	-.08	.18	-.06	.38
Number of types of clinic	-.03	.65	-.07	.32
Number of practices within 3K	.12	.17	-.03	.67
DoE deprivation index	.11	.17	.18	2.2*
Long-standing illness	-.30	-4.1**	-.13	.13
Practice provides minor surgery	.08	.11	.64	2.6*
Non-European language offered	-.08	.08	.02	.75
Practice type: std fundholder	-.05	.34	-.05	.47
Practice type: TP pilot	.05	.31	-.01	.83
Practice type: multi-fund	-.05	.36	.05	.81
Health authority dummy	.85	5.7**	.12	1.7
Constant	-.34	-4.6**	-.55	-2.2*
Adjusted R^2	.57		.17	
SS regression (df)	76.3 (2)		44.2 (4)	
SS residual (df)	56.4 (168)		188.7 (166)	
F regression	113.6**		9.7**	

**Significant at <1% *Significant at 1-5%

4.4.3 Transfers Out with Local Change of Address

Although the decision to leave a practice by patients who transfer with a change of address is likely to be driven mainly by the increased distance between their new address and their previous practice, the decisions of some patients may be affected by the kinds of influences considered for other types of movers. Those who are less affected by distance or for whom the increase in

distance is not large will take account of other features of practices in deciding whether to quit a practice.

Table 4.16: Regression of transfers out accompanied by local change of address

	Transfers out with local change of address	
	Coeff	**t**
Practice size - single hander	.148	1.96
Practice size - 4 or more partners	-0.334	-3.16**
Average gender of GPs	-0.097	-1.33
Average age of GPs	.101	1.42
Total weekday surgery hours	-0.086	-1.11
Number of types of clinic	-0.024	-.316
Number of practices within 3K	-0.138	-1.19
DoE deprivation index	0.552	6.88**
Long-standing illness	-0.701	-5.27**
Practice provides minor surgery	-0.074	-1.06
Non-European language offered	0.074	1.11
Practice type: std fundholder	0.074	1.00
Practice type: TP pilot	0.028	0.409
Practice type: multi-fund	-0.061	-0.78
Health authority dummy	-0.831	-3.63**
Constant	0.489	4.28**
Adjusted R^2	.248	
SS regression (df)	24.1 (4)	
SS residual (df)	66.6 (166)	
F regression	15.0 **	

**Significant at <1% *Significant at 1-5%

Table 4.16 reports the regression analsysis for transfer rates for those leaving practices with a local change of address. Some of the results are broadly in line with those for the other movers, in particular the rate of transfer out is lower for larger practices. The main and puzzling

differences are the roles of the environmental variables: practices with more patients living in EDs with high levels of deprivation (DoE index) are more likely to have a high rate of transfer out by patients moving locally. However, those with patients living in areas with high levels of limiting longstanding illness will have lower rates of transfer out. The HA dummy is also significantly negative indicating that Kingston and Richmond practices have lower rates of outflow for patients moving locally..

4.4.4 Impact of Socio-economic Variables on Transfer Rates

The role of the socio-economic (environmental) variables may be better understood by including the separate components of the deprivation indices in the analyses. The components of the indices in the study are listed in Table A2 (Appendix A). The practice level analyses were re-run using all ten of the components in place of the indices. The values of the components are averages across the practice population, where each registered patient is attributed the values of their ED of residence.

Including the ten socio-economic variables separately in the equations to predict the rates of transfer without change of address had no effect on the results in Table 4.14. The significant variables and their coefficients were identical to those in the analysis using the Jarman index. For movements without change of address, separating out the components of the previously insignificant deprivation indices does not introduce new significant variables. Such movements would seem to be a consequence of practice characteristics and individual preferences that are not significantly affected by prevailing social conditions.

However, the separate inclusion of the socio-economic variables did affect the results for transfers into practices following a change of address - either within or from outside the HA. The results using the original equations including the DoE index are in Table 4.15. The results of replacing the index by separate socio-economic variables are shown in Table 4.17. In respect of movements from another HA, the DoE index was not significant in the original equation, but the dummy health authority variable was (the dummy represents the contrast between Kingston and Richmond and the other two HAs). We see from Table 4.17 that including the separate socio-economic variables has caused some of them to replace the dummy HA variable. The three that are significant are the proportions of under fives, the proportion unemployed and the proportion who moved into the LA in the past year. Each represents rather different aspects of social conditions and the earlier discussion of the three HAs suggests these are particularly important in distinguishing Kingston and Richmond from the other two. A fourth variable has also entered as significant: the number of practices within 3kms of the centroid of the individual's ED of residence. Again, this

introduces a contrast that would have been subsumed in the health authority dummy because Kingston and Richmond has a much higher density of practices than the other two authorities.

The second set of coefficients in Table 4.17 are from the equations predicting rates of patient transfer into a practice after a change of address within the current HA. The HA dummy was not significant in the original equation, but the DoE deprivation index was. Including the separate socio-economic variables displaces the DoE index although the two variables that replace it are not components of the index. Their inclusion suggests that the rates of movement after local address changes will be highest in areas of low social class (areas with low skill employment) and areas of higher than average population movement.

The variables that are significant in predicting rates of people who will transfer out of a practice due to a change of address are shown in Table 4.18. In the original equation in Table 4.16 both the DoE index and health authority dummy are highly significant. Again, when the DoE index is replaced by separate deprivation variables some of these variables displace the HA dummy. The separate variables that are significant in the new equation are the proportion of under 5s and the proportion moving into the local authority area in the year before the census.

Introducing the separate variables has helped identify the types of social conditions that predict whether practices will have high transfer rates. Transfers without change of address are predominately determined by characteristics of the practice (and its GPs) and individual experiences and preferences that are not significantly shaped by local social conditions. These transfers seem to be different phenomenon from those associated with changes of address which tend to be influenced by local levels of unemployment and social class and by the general level of local population movement.

Table 4.17: ***Regression of transfers in from other HA and after local address change - coefficients in analysis using separate variables in place of DoE index***

	Transfers in from other HA		Transfers in after local change of address	
	Coeff	**t**	**Coeff**	**t**
Practice size - single hander	ns	ns	.84	4.4**
Average age of GPs	ns	ns	-.25	-2.8**
Long-standing illness	-.63	-5.1**	ns	ns
Practice provides minor surgery	ns	ns	.59	2.4*
Health authority dummy	ns	ns	ns	ns
No. of practices within 3km	.22	3.6**	ns	ns
Proportion of under 5s	-.34	-5.2**	ns	ns
Proportion in social class IV and V	ns	ns	.26	2.6**
Proportion unemployed	.30	2.6**	ns	ns
Proportion moving into LA in past year	.18	2.6**	.34	3.3**
Adjusted R^2	.57		.20	
SS regression (df)	76.3 (2)		52.5 (5)	
SS residual (df)	56.4 (168)		180.4 (165)	
F regression	113.6**		9.6**	

**Significant at <1% *Significant at 5%

Table lists all variables that are significant in the analysis with separate components and those that were significant in the previous analyses.

Table 4.18: ***Regression of rates of transfers associated with local change of address - coefficients of significant variables from an analysis replacing the DoE index with separate variables***

	Transfers out with local change of address	
	Coeff	**t**
Practice size - 4 or more partners	-0.25	-2.41**
Long-standing illness	-0.60	-2.80**
Health authority dummy	ns	ns
Proportion under 5s	-.22	-2.8**
Proportion unemployed	.71	5.0**
Proportion moving into HA in past year	.18	2.5**
Adjusted R^2	.244	
SS regression (df)	24.2 (5)	
SS residual (df)	66.5 (165)	
F regression	12.0 **	

**Significant at <1% *Significant at 1-5%

4.5 CONCLUSIONS

1. There are strong theoretical grounds for considering the rate of transfer out of a practice by patients as conveying information about patient preferences concerning practice characteristics. Rates of transfer out with no change of address:

- are higher in small practices and smaller in large practices
- are lower in practices with a greater range of clinics
- are higher in standard fundholding practices than in non-fundholders

2. Cross practice variations in the other types of transfer provide less guidance about patients' attitudes to practice characteristics since patients have less information (in the case of patients transferring in) or may be dominated by distance considerations

(in the case of patients transferring out with a change of address). Rates of transfer into practices may also be affected by patient outflows since practices on average have constant list sizes.

3. Socio-economic variables are not significant predictors of transfers without change of address. Transfers with change of address appear to be linked to local levels of unemployment, social class and geographical mobility.

4. In addition to further investigation of the positive findings, there is one other area which merits more detailed analysis than the time allowed. The extent to which patient inflow rates are balancing itesm in unclear and a fuller understanding would require examination of patient movements which were not the focus of the present study, such as those due to the death of the patient and removals to another area.

Section 5: Do Practices Restrict Patient Choice?

5.1 CARTELISATION

5.1.1 Restrictions on Patient Reregistration

The development of joint purchasing arrangements such as multifunds and total purchasing pilots raises the possibility that practices may act collectively to exclude certain individuals or types of patients - in effect a form of cartelisation with respect to patient registration. Clearly this could restrict patient choice in areas where a significant proportion of practices belong to joint purchase schemes. It raises the spectre of two-tier primary care, with certain types of patients excluded from substantial groups of practices.

Direct evidence of this type of cartelisation has to come from individual patient accounts of difficulties with registration. Nevertheless, statistical information on patient transfers may be able to confirm whether this is a substantial phenomenon and a cause for concern.

Cartelisation will only impact on patient choice where linked practices are a substantial proportion of all the locally available practices. Although there are many joint funding and purchasing schemes in England, they are not a large proportion of all general practices. Moreover most schemes are quite small and the few practices they contain do not have overlapping catchment areas - nor are they in areas where low population densities would mean that there will be no other practices to choose from. Rotherham and Doncaster are both cases in point. Although they contain some multifund and TPP practices these are widely spread and never a local majority of practices. The situation is different in Kingston and Richmond which includes one of England's largest multifunds accounting for 59% of the registered population. The following tests for cartelisation are based on the Kingston and Richmond data and its one large multifund.

Two signs of cartelisation are tested for: first, whether there is less reregistration within the multifund of patients leaving multifund practices; second, whether the multifund seems to exclude certain types of patient who might require high cost care.

It follows from the general premise of the project that the patients most at risk from cartelisation are those who are changing practice without changing address - as they are most likely to have expressed some dissatisfaction with their previous practice. There are 6190 of these patients in

Kingston and Richmond for whom it has been possible to establish the purchasing type of the source and destination practices. The types of transfers they made are shown in Table 5.1

Table 5.1: ***Type of current practice by type of previous practice for people changing practice without change of address (Kingston and Richmond)***

N **col %** **total %**	**Type of previous practice**			
Current practice	**Non-fh**	**Std FH**	**MF**	**All**
Non fundholder	923 41.8 14.9	65 4.9 1.1	769 29.0 12.4	1757 28.4
Std fundholder	164 7.4 2.6	972 73.2 15.7	382 14.4 6.2	1518 24.5
MF	1121 50.8 18.1	291 21.9 4.7	1503 56.6 24.3	2915 47.1
	2208 35.7	1328 21.5	2654 42.9	6190 100.0

Table 5.1 shows that those who were registered in a multifund practice and who change practice without changing address are more likely to be transferring between practices in the fund rather than between practices of other types: 56.6% went to other practices in the same fund. Of all transfers without change of address in Kingston and Richmond, 24.3% were between practices in the fund.

The figures in Table 5.1 may give a misleading picture because practices in multifunds are on average larger than those of other purchasing types and may accept more registrations because of their greater size. Table 5.2 re-presents the data in Table 5.1, but weights each transfer by the size of the destination practice; that is, a transfer into a single hander counts as 1, but a transfer into a four partner practice counts as .25. Even after this correction, other practices in the multifund are still the largest destination for people leaving a fund practice without change of address

Table 5.2: Type of current practice by type of previous practice for people changing practice without change of address (Kingston and Richmond) - cases weighted by number of GPs in current practice

N col % total %	Type of previous practice			
Current practice	**Non-fh**	**Std FH**	**MF**	**All**
Non fundholder	573 52.6 20.8	45 9.6 1.6	436 36.4 15.9	1045 38.3
Std fundholder	52 4.8 1.9	258 55.8 9.4	113 9.4 4.1	423 15.4
MF	465 42.7 16.9	160 34.5 5.8	650 54.2 23.6	1275 46.3
	1090 39.6	463 16.8	1199 43.6	2751 100.0

A related test compares the destinations after a transfer with the practice types of non-transferees (Table 5.3). Although the distributions are significantly different statistically, the difference between the proportion of those leaving multifunds who remain in multifunds and the proportion of patients in multifunds is small. Neither this, nor the results in the two previous tables, suggest that multifund practices are routinely blocking the re-reregistration of patients from other fund practices.

Table 5.3: ***Comparison of type of current practice for those who have transferred (without change of address) from a multifund in Kingston and Richmond since 1/4/95 with type of practice for all other people registered in Kingston and Richmond HA***

Current practice	Transferees from multifund	All other registrations	All
	N (%)	N (%)	
Non fundholder	769 (29.0)	80105 (25.8)	80874
Std fundholder	382 (14.4)	47464 (15.3)	47846
Multifund	1503 (56.6)	182463 (58.9)	183966
All	2654	310032	312686
Chisq=13.7 Signif <.01 (2 df)			

A more indirect test of cartelisation examines the distances between the previous and current practices of those who have changed practice without change of address. It is premised on the assumption that if there is cartelisation people from a multifund will have to travel further to find a new practice than those who moved from other types of practice. Table 5.4 shows that, on average, people leaving a multifund do choose a practice that is further away from their original practice than those leaving other types of practice. However, Table 5.5 suggests that this should not be interpreteted as a sign of cartelisation because the people who moved to a new practice in the same multifund moved to closer practices than those who moved from a multifund to other practice types. Clearly there are intervening factors at work, such as differences in the densities of practices in areas served by the different types of practice. A detailed investigation of the spatial configuration of practices is necessary if one is to use distance information of this type at the level of an individual HA.

The main conclusion from the results presented here is that there are no signs of cartelisation leading to restrictions on reregistration in Kingston and Richmond, even with respect those who have sought a new practice without change of address and who might be thought to be expressing dissatisfaction with their previous practice in the multifund.

Table 5.4: ***Average distances between the previous and current practice of people transferring out of different types of practice***

Previous practice type	Average distance km	sd (km)	N
Non fundholder	1.07	1.0	2219
Std fundholder	0.64	0.96	1328
Practice in same multifund	1.50	1.3	2720
All	1.17	1.2	6267

Table 5.5: ***Average distances between the previous and current practice of people transferring out of multifunds to different types of practice***

Current practice type	Average distance km	sd (km)	N
Non fundholder	1.5	1.3	769
Std fundholder	1.7	1.4	382
Practice in same multifund	1.4	1.2	1503
All	1.5	1.3	2654

5.1.2 Creamskimming and Re-registration in Multifunds

A second and related concern is that patients with more expensive or problematic conditions may be discouraged from re-registration in the same fund. The registration data gives no information on morbidity, but it does contain details of patient gender and age.

Table 5.6 gives no support to the hypothesis that people who are able to re-register at a multifund are younger (and by implication healthier) than those who have left the fund for other types of practice. There is no significant difference in the average ages of people who register with the different types of practice after transferring without change of address out of a practice in a multifund. If a multifund was limiting the ability of older patients to transfer between practices within the multifund compared with less expensive patients then we would expect to observe that patients accepted into the multifund after leaving a practice in the same multifund were younger than those accepted into other types of practice.

Table 5.7 provides a more detailed analysis of age and sex of those transferring out of a multifund practice without change of address. Reading down a column gives the age and sex distribution of patients transferring into that type of practice from a multifund without change of address. If multifunds were better able to limit the acceptance of expensive patients we would expect to see that the patients accepted by multifunds were disproportionately younger than for the other types of practice. Again there is no significant difference between the columns.

The conclusion is that the registration evidence does not support the suggestion that multifunds are better able to select patients leaving practices in the same multifund than other types of practice. Table 5.7 suggests there is no discrimination by either age or gender.

There appears to be some evidence (see Table 5.8) that people re-registering with the multifund after a transfer without change of address are slightly less affluent than those registering with standard fundholders. Table 5.9 suggests that this is more likely to be due the location of the practices. In Kingston and Richmond the standard fundholders seem to be in the more affluent areas, suggesting that people who are able to switch from a multi-fund to a standard fundholder will be living in areas with lower Jarman scores.

5.6: *Average ages of people transferring out of multifund practices without change of address by type of destination practice (Kingston and Richmond)*

Destination practice	Average age	sd	N
Non fundholder	33.24	21.1	769
Std fundholder	33.06	21.8	382
Multifund	33.97	21.7	1503
All	33.63	21.5	2654
F value for difference between average age of those in multifunds (33.97) and those in other practice types (33.18) =0.88ns			

5.7: *Age and gender of people who have transferred practices without change of address, by type of destination practice (Kingston and Richmond HA)*

	Type of destination practice			
	Non FH	**Std FH**	**MF**	**All**
Men aged 0-15	83 10.8	48 12.6	192 12.8	323 12.2
Men aged 16-45	166 21.6	78 20.4	307 20.4	551 20.8
Men aged 46-64	65 8.5	31 8.1	117 7.8	213 8.0
Men aged 65+	22 2.9	8 2.1	56 3.7	86 3.2
Women aged 0-15	96 12.5	49 12.8	171 11.4	316 11.9
Women aged 16-45	218 28.3	105 27.5	420 27.9	743 28.0
Women aged 46-64	71 9.2	35 9.2	130 8.6	236 8.9
Women aged 65+	48 6.2	28 7.3	110 7.3	186 7.0
All	769 29.0	382 14.4	1503 56.6	2654 100.0

Table 5.8: ***Average ED based Jarman scores of people transferring out of multifund practices without change of address by type of destination practice (Kingston and Richmond)***

Destination practice	Average Jarman score	sd	N
Non fundholder	-9.2	22.5	711
Std fundholder	-17.6	19.7	365
Multifund	-9.4	24.4	1427
All	-10.5	23.2	2503
F value for difference between average Jarman score of those in multifunds (-9.4) and those in other practice types (-12.04) =7.7 signif=.0055			

Table 5.9: ***Average ED based Jarman scores of practice populations in Kingston and Richmond - by purchasing modality***

Destination practice	Average Jarman score	sd	N
Non fundholder	-13.2	20.2	75540
Std fundholder	-15.4	18.8	45956
Multifund	-11.3	21.9	176093
All	-12.4	21.1	297589

5.2 CREAMSKIMMING AND NEW REGISTRATIONS

We now investigate whether it is possible to utilise data on new patient registrations to detect cream skimming by practices. We argued in Section 1 that creamskimming was most likely to manifest itself in the selection of new patients, rather than the discouragement of existing ones. We have also suggested that total inflows into practices may be mainly driven by outflows, so that the appropriate test for creamskimming is to examine whether practices with a greater incentive to creamskim will have an inflow of patients which contains a smaller proportion of expensive patients than practices with a smaller incentive. With current data we have limited information on patients but it is likely that practices would regard patients of 65 and over as more expensive in terms of time and financial outlay than those under 65. Accordingly we examine the proportion of inflowing patients who are elderly for the four purchasing types. If there is creamskimming we would expect that fundholding practices would have a smaller proportion of new patients who are elderly.

Table 5.10 shows the proportions of new patients joining practices without a change of address, with a local address change and from outside the HA, who are elderly (aged 65 and over).

Table 5.10: ***Transfer rates by age and practice purchasing type - proportion of people aged 65 and over in these groups transferring***

	Proportion of 65 years and older amongst those transferring into these practices:		
	after changing practice without change of address	**after moving into the HA**	**after change of address within the HA**
Non-fundholder	.1026 n=8498	.0545 n=19776	.0801 n=10769
Std fundholder	.1079 n=6229	.0451 n=14354	.0781 n=9508
Part of multifund and /or TPP	.1494 n=4491	.0398 n=21591	.0893 n=6252
All types	.1153 n=19218	.0464 n=55721	.0816 n=26529
F test for linearity	55.1 p=.0000	50.0 p=.0000	3.3 p=.0690
F test for dev from linearity	13.2 p=.0003	1.1 p=.3034	3.4 p=.0652

Reading along the rows, the table indicates that the elderly as a proportion of those transferring into a practice declines with the distance moved: they account for a higher proportion of those moving without an address change, and a lower proportion of those moving into the HA. For indications of creamskimming we need to read down the columns. Fundholders have a greater incentive to creamskim than non-fundholders. It could also be argued that total purchasing pilots will have an even greater incentive to creamskim. Hence if there is creamskimming, the proportion of patients transferring into a practice who are elderly should be lower for fundholders than non-fundholders and, possibly, lower for multifund and TPP practices than standard fundholders.

Results are mixed. For patients moving within the same health authority there is no evidence that fundholding or total purchasing practice discriminate against patients over 65. If anything, total purchasing practices tend to receive a slightly higher proportion of these patients. There is some indication, however, that elderly patients moving into the health authority are a smaller proportion of new registrations with fundholding or total purchasing practices. The pattern across practice types is more varied at HA level (see Appendix F, Tables F3, F4, F5).

For a patient to join a practice requires the patient to express a wish to do so and the practice to agree. Hence what we observe (patient inflows) will be determined by patient and GP decisions. It is possible that any difference across practice types in the proportion of new patients who are elderly will be the result of elderly patients having systematically different preferences for practice purchasing types than the non-elderly. It is however difficult to explain why patient preferences would generate the pattern observed in Table 5.10.

One possible explanation for the results is that practices find it more difficult to discriminate against those moving locally with a change of address or with no change of address because such patients have better knowledge of local conditions and are more likely to dispute if told that a practice is full.

5.3 CONCLUSIONS

1. The investigation of transfers out of multifund practices by patients who do no change address suggested that:

- there is no evidence of multifund practices restricting the reregistration of such patients with other members of the multifund

Analysis of the age and sex distribution of patients leaving a mutltifund practice with no change of address produced no evidence of multifund practices discriminating against elderly, and therefore more expensive, patients:

- there is no difference in the average age of patients who leave a multifund practice and are allowed to reregister with another practice in the multifund compared with those who reregister with other types of practice

- the age distribution of patients leaving a multifund practice is similar across all the types of practice joined, including other members of the multifund

2. Creamskimming incentives are greater for fundholding than non-fundholding practices. If practices discriminate against elderly patients when admitting patients to their lists, the proportion of patients admitted who are elderly would be greater for non-fundholding practices than for fundholders. The evidence is mixed:

- the proportion of patients transferring into practices without change of address who are elderly is greater for fundholding practices than for non-fundholders

- the proportion of patients transferring into practices from outside the HA who are elderly is greater for non-fundholding practices than for fundholders.

The difference may be accounted for by the greater local knowledge of patients transferring without address change which makes refusal of registration to elderly patients more difficult for fundholding practices.

Section 6: Patient Level Analyses

6.1 WHY DO PEOPLE LEAVE THEIR PRACTICES?

Section 4 explored factors that potentially predicted the rates of transfer of patients between practices. The current section explores similar issues at a lower level of analysis by asking what characteristics of practices and individuals can be used to predict whether a particular patient will leave a practice.

The factors that we discussed in section 4 as influences on practice transfer rates will clearly still be relevant as explanatory variables for choices by individual patients. New hypotheses that can be tested at this level are whether the propensity to change practice is influenced by the patient's age and gender and whether the socio-economic characteristics of the area in which a person lives also influences their propensity to change.

We concentrate on patients changing practice without change of address and the variable to be explained is whether or not the person has changed practice. Although nearly 17000 people made such a change in the period covered by the research, they represent only 2% of all the people registered. The characteristics of this group are more easily identified when they are part of a more balanced sample. Such a sample is constructed by adding a 15% random sample of all those who did not transfer without change of address to the 17,000 who did. There are just under 60,000 usable cases in the sample, making it sufficiently small to be analysed by multilevel techniques.

Three methods were used to examine choice of practices and reasons for moving: logistic regression discriminant function analysis, and multilevel logistic regression. Because they use different estimation procedures and some of the variables are multicollinear they will not produce identical results. We expected, correctly, that they would suggest broadly similar conclusions.

6.1.1 Logistic Regressions

Logistic regression is a means of estimating the relationship between a categorical variable which takes on one of two values (did or did not transfer practice without change of address) and a set of explanatory variables. In Table 6.1 we report two sets of results, one in which we did not include measures of the alternative practices available and one in which we did. A positive coefficient on a variable indicates that an increase in the variable is associated with an increase in

the probability that a patient will leave their practice without change of address. Higher values of the Wald statistic means that the effect is more significant (indicated by a lower value in the Sig. column which indicates the probabilility that the true value of the estimated coefficient is zero). Given the large number of observations used in the regressions one would expect to find that many coefficients are non-zero at conventional significance levels, even when the overall explanatory power of a regression is small.

The explanatory variables are similar to those in the practice level runs except that we have included some variables which measure characteristics of the individual, such as their age, sex and the Jarman score of the ED in which they live. The remaining variables are similar to those in the practice level analyses of section 4 which aimed to examine practice transfer rates. Notice, however, that practice characteristics refer to the practice which the patient has left. We are interested in the factors which might drive an individual away from a practice.

The most significant influences on the probability that an individual will leave their practices are, in order of significance: size of previous practice (-ve), distance to previous practice (+ve); patient age (-ve); opening hours of previous practice (-ve); gender (women are more likely to change than men); the number of types of clinics provided (-ve) and whether the practice is a multifund (-ve). The results for practice size and number of clinics are in line with our previous results on practice transfer rates out of practices by patients without change of address. Here the fact that these characteristics of the former practice have a negative impact on the probability of leaving confirms that they are attractive features of practices for those patients who are most likely to be well informed about them.

We also found in section 4 that fundholding practices had larger outflow rates with no address change than nonfundholders and the unattractiveness of fundholders compared with nonfundholders is again shown. Conversely, and perhaps somewhat surprisingly, patients are less likely to leave total purchasing pilots and multifunds.

The fact that older patients are less likely to leave a practice is not unexpected: the costs of switching are likely to be greater for older patients. It is also likely that since on average they will have been in their practice for longer they will have had more opportunities to leave if dissatisfied.

Table 6.1: ***Characteristics of individuals and their former practice used to predict who will leave a practice without change of address***

N=57242	Equation excluding number of practices/practice types in vicinity			Equation including number of practice types		
	Coeff	**Wald**	**Sig.**	**Coeff**	**Wald**	**Sig.**
Patient's age	-.23	536.7	.00	-.23	553.3	.00
Patient's gender	.27	201.1	.00	.27	197.1	.00
Jarman score of patient's ED	.09	57.2	.00	.08	41.2	.00
Average age of GPs	.00	0.1	.71	.01	1.1	.30
Practice size	-.52	2189.5	.00	-.49	1885.2	.00
Distance to prev practice	.24	585.1	.00	.28	701.3	.00
Average GP gender	-.03	11.7	.01	-.05	31.5	.00
Surgery opening hours	-.16	235.4	.00	-.12	137.1	.00
No. of types of clinic	-.14	165.9	.00	-.09	72.3	.00
Proportion in ED with long-standing illness	-.03	7.6	.01	-.015	1.4	.23
No. of practices within 3km	x	x	x	.22	180.4	.00
No. of practice types within 3kms	x	x	x	-.03	4.0	.04
Practice is a std. fundholder	.08	14.5	.00	.09	14.7	.00
Practice is in a TPP	-.65	41.8	.00	-.66	43.7	.00
Practice is in a multifund	-.32	119.0	.00	-.41	180.7	.00
Constant	-1.1	3714.6	.00	-1.32	1626.6	.00

Women are more likely to move than men, though the reasons are not obvious. It may be related to the fact that patients are more likely to leave a practice with a smaller proportion of female doctors. Women may be more concerned to find doctors of the same sex. We discuss this point below.

The probability of leaving a practice without address change is greater the further the practice is from the patient. Distance between practice and home is one of the practice characteristics which are relatively easy to judge when initially choosing a practice. It seems likely that effect of distance interacts with other features of a practice so that when these turn out to be worse than expected patients are more likely to leave the further away they live.

As a measure of how well the model performs in predicting which individuals will change practice we use the count R^2 : the proportion of individuals who are correctly predicted to change or not to change practice (Table 6.2). Both equations perform reasonably well on this criterion.

Table 6.2: ***Goodness of fit for prediction of individuals leaving practice without change of address: excluding availability of local practices***

	People predicted to not change practice	**People predicted to change practice**	**Percent correct**
People who did not change practice	31229	7842	79.9
People who changed practice	10051	8120	44.7
Overall percent correct: 68.7			

Including a measure of the local choice of practices (the number, and number of types of practice within 3kms) has little impact on the significance of the other factors. Although the coefficient for the number of alternative practices is highly significant, the overall effect of adding these variables is negligible: the percentage of correctly predicted decisions decreases very slightly from 68.7-68.0% (Table 6.3). The number of practices, though not the number of types, is positively associated with the probability of moving. This is again in line with our initial hypothesis: if there are more alternatives to the chosen practice and the experience leads the patient to revise their estimate of its merits downward, then it is more likely that they will now perceive another practice as better.

Table 6.3: ***Goodness of fit for prediction of individuals leaving practice without change of address: including availability of other practices***

	People predicted to not change practice	**People predicted to change practice**	**Percent correct**
People who did not change practice	30015	9056	76.8
People who changed practice	9113	9058	49.8
Overall percent correct: 68.0			

Since gender is an important influence on the probability of leaving a practice we repeated the analysis for men and women to see if the relative significance of factors alters and especially to test whether GP gender is more important for women (Table 6.4). The coefficients are very similar for both groups, so that it appears that influences on the attractiveness of practices for men and women are very similar. GP gender is slightly more significant for women but for both groups it is never more than the 8th or 9th most significant factor. The equation for men performs somewhat better than than for women predicting 69.1% of cases compared to 67.3%(Tables 6.5, 6.6).

Table 6.4: ***Characteristics of individuals and their former practice used to predict who will leave a practice without change of address: men and women***

	Men (n=27415)			Women (n=29826)		
	Coeff	**Wald**	**Sig.**	**Coeff**	**Wald**	**Sig.**
Patient's age	-.26	305.0	.00	-.21	253.5	.00
Jarman score of patient's ED	.08	23.1	.00	.07	18.2	.00
Average age of GPs	.003	.03	.86	.02	1.6	.21
Practice size	-.46	749.3	.00	-.52	1141.2	.00
Distance to prev practice	.27	311.0	.00	.28	392.1	.00
Average GP gender	-.05	11.7	.00	-.06	20.6	.00
Surgery opening hours	-.13	73.5	.00	-.11	64.9	.00
No. of types of clinic	-.11	47.2	.00	-.08	27.0	.00
No. of practices within 3km	.22	80.3	.00	.23	100.4	.00
No. of practice types within 3kms	-.03	3.3	.07	-.02	1.1	.28
Proportion in ED with long-standing illness	-.004	0.05	.82	-.02	2.1	.15
Practice is a std. fundholder	.09	7.0	.01	.09	7.9	.01
Practice is in a TPP	-.46	11.8	.00	-.89	34.3	.00
Practice is in a multifund	-.44	97.2	.00	-.38	83.3	.00
Constant	-1.04	2439.0	.00	-.80	1687.7	.00

Table 6.5: ***Goodness of fit of prediction of men leaving practice without change of address***

	People predicted to not change practice	**People predicted to change practice**	**Percent correct**
People who did not change practice	15234	4249	78.2
People who changed practice	4227	3705	46.7
Overall percent correct: 69.1			

Table 6.6: ***Goodness of fit of prediction of women leaving practice without change of address***

	People predicted to not change practice	People predicted to change practice	Percent correct
People who did not change practice	14692	4895	75.0
People who changed practice	4852	5387	52.6
Overall percent correct: 67.3			

6.1.2 Discriminant Function Analyses

Linear discriminant analysis attempts to find a linear function of the explanatory variables which best discriminates between the two groups (those who move and those who do not). The coefficients on the explanatory variable are chosen to maximise the variance of the linear function between the two groups relative to its variance within groups. Linear discriminant analysis has the attraction that we do not need to make any assumptions about distributions in order to calculate the coefficients, although we do need to assume normality to conduct significance tests.

We found that results of discriminant function analysis were in line with those from the logistic regressions. Table 6.7 compares the rankings of the explanatory variables by their significance levels. The two estimation methods yield broadly similar results. The major difference in the rankings being for two variables: GP age and whether or not the practice is a multifund.

Table 6.7: ***Comparison of logistic regression and discriminant function analysis: characteristics of individuals and former practices affecting whether patient leaves practice without address change***

	Discriminant analysis		Logistic regression		Comparison
	1	2	3	4	5
	Corr. between vars and discrim fn	**Ranking of corrs in col. (1)**	**Ranking of Wald values for logistic regressio n**	**Wald value**	**Diff between ranking in cols 2 & 3.**
Patient's age	-.31	3	3	536.7	0
Patient's gender	.19	8	5	201.1	3
Jarman score of patient's ED	.06	10	8	57.2	2
Average age of GPs	.20	7	12	0.13	-5
Practice size	-.78	1	1	2189.5	0
Distance to prev practice	.24	4	2	585.1	2
Average GP gender	-.11	9	10	11.7	-1
Surgery opening hours	-.39	2	4	235.4	-2
No. of types of clinic	-.23	5	6	165.9	-1
Proportion in ED with long-standing illness	-.04	12	11	7.6	1
Practice is a std. fundholder	-.06	11	10	14.5	1
Practice is in a TPP	-.22	6	9	41.8	-3
Practice is in a multifund	-.04	13	7	119.0	6

6.1.3 Multilevel Logistic Regression

The analyses described so far apply conventional regression techniques to a data set where each case represents a person. To describe the data in this way is slightly misleading as the cases not only include variables that genuinely refer to an individual (their age, gender and changes in general practice since April 1995) but variables that describe the ED in which they live and the general practices at which they are registered. There are thus three levels of data. Strictly, it is possible to include two further levels - that of the individual general practitioner and the

postcode where the patient lives. Dummy variables may also be used to control for HA level effects but there are no other HA level variables in the data set.

One consequence of the multi-level structure is that there will be large blocks of identical values - for example - the same practice characteristics may recur on more than 10,000 cases. Such blocking can distort the analysis, as can the possibility that rather different relationships may pertain in different types of area or practice.

In conventional regression, some of these problems can be addressed by introducing dummy variables for the separate groupings, but this is impractical in the present context. Multivariate modelling techniques provide various approaches to investigating overall relationships whilst acknowledging the hierarchical nature of the data.

There are two limits to these analysis. The first relates to the number of cases that can be analysed. Because of the intensive calculation involved in the repeated estimation of parameters, the multi-level software (MLN) keeps all its worksheets and matrices in RAM - so the size of available memory limits the size of the data set that can be handled. The working limit on the available systems seems to be approx 100,000 cases, so it is necessary to sample from the data.

The second difficulty results from the data structures which are not a simple hierarchy. There is interweaving of the second and third levels - all patients of a general practice will not come from the same ED, nor will all the population of an ED be registered at the same practice. The data could be re-structured, by explicitly identifying all the practice/ED combinations, but this greatly magnifies the work space requirements. The only practical alternative is to ignore one of the levels (in this case the enumeration district) and include two levels: the individual and the practice in the analyses.

We experimented with multi-level analyses on the both the Doncaster data set and a sample from the full data set. The initial results on the Doncaster data were unpromising with few significant results.The results with the full data set were much more encouraging, probably because there was more variation in the full data.

The same set of variables was used for the multi-level analysis as the uni-level work, but several variables were dropped during the runs. Some, such as the level of illness in each ED were consistently insignificant and were slowing the iterations. Others such as whether or not the person was registered at a TPP caused the analysis to become unstable. The instability is probably due to the presence of binary variables with highly skewed distributions (especially TPP membership) and the multicollinearity. Table 6.8 reports the results for a sample from the full

data set. The sample is constructed from all those people who changed practice without change of address and a 15% sample from the remainder.

The pattern of coefficients is encouragingly similar to the uni-level logisitic regressions and The three most significant variables are the same as in the uni-level logistic regression - distance to previous practice, practice size and patient's gender. The Jarman score of the patient's ED is now even more significant than in the uni-level results. The fact that patients in EDs with higher Jarman scores are more likely to leave a practice without change of address could be interpreted in a variety of ways. For example, individuals in deprived areas may be more sensitive to the practice quality so that if practice quality turns out to be lower than they anticipated they are more likely to leave.

The only important difference between the multi-level results the uni-level results is that the effects of the number of practices available within 3km is no longer significant. This may be because there are unobserved practice specific variables affecting the probability of patients leaving which are correlated with the number of practices within 3km. The multi-level analysis allows for these practice level effects and thus reduces the estimated impact of the number of alternative practices. The highly significant coefficient for the reset term indicates that the linear model is not well specified and that the predictive power of the model is likely to be increased by the addition of non-linear terms.

6.1.4 Effects of socio-economic variables

Attempts in Section 4.4.4 to unpack the effects of separate socio-economic variables in practice level analyses are repeated here at the patient level. The same ten socio-economic variables are used as in the practice level runs and they are listed in Table A2 (Appendix A). In the patient level runs each person is assigned the average value of the variables for their ED of residence.

The results of repeating the discriminant function analysis of section 6.1.2 with ten separate variables rather than the Jarman index are shown in Table F1 (Appendix F). The new variables replace the Jarman score in the original order of significance. The coefficients of the nine significant variables in the original equation are little affected, but there are some minor rearrangements of the less significant variables. Three of the new variables (the proportion moving into the LA in the past year, the proportion born in the New Commonwealth and the proportion of lone parent households), displace GP gender from 8th to 12th place. Three more (the proportion of under 5s, the proportion of elderly living alone and the proportion with no car) shift the significance of a practice being a fundholder from 11th the 16th place. The results

Table 6.8: Characteristics of individuals and their former practice used to predict who will leave a practice without change of address: results of multilevel logistic regression analyses using Jarman index and separate components

	Analysis including Jarman index			**Analysis using separate components**		
	Coeff	SE	Coeff /se	Coeff	S Error	Coeff/ se
Patient's gender	0.19	.020	9.6	.19	.020	9.7
Patient's age	-.16	.010	15.3	-.16	.010	15.1
Average age of GPs	0.050	.012	3.97	.053	.013	4.2
Practice size	-.47	.013	3.6	-.47	.013	36.0
Distance to prev practice	0.20	.012	16.4	.20	.012	16.3
Average GP gender	-.054	.011	4.6	-.054	.011	4.7
No. of types of clinic	-.11	.013	8.0	-.11	.014	7.8
ED Jarman value	0.11	.011	10.0	x	x	x
No. of practices within 3km	0.059	.021	2.9	.067	.021	3.2
No. of practice types within 3kms	-.056	.018	3.1	-.056	.018	3.1
Practice is a std. fundholder	0.21	.029	7.3	.21	.029	7.2
Practice is in a multifund	-.40	0.36	11.2	-.40	.036	11.1
Proportion unemployed	x	x	x	.094	.017	5.6
Proportion overcrowded	x	x	x	-.091	.014	6.5
Proportion lone parents	x	x	x	.11	.015	7.2
Proportion lacking amenities	x	x	x	.037	.011	3.2
Constant	-.94	.035	27.1	-.94	.035	26.7
Reset test - square of predicted value entered as indep var.	-.19	.023	8.3	-.18	.024	7.5
Random component		Estimate	se		Estimate	se
Level 1		1	0		1	0
Level 2		1.38	0.36		1.38	.036
Likelihood for current model excluding square of pred value multifund			60828.8			60619.7
Likelihood for current model including square of pred value			60010.5			59956.1

confirm the relative unimportance of the Jarman index and suggest that the propensity to move practice without change of address is not significantly affected by local socio-economic environment: a conclusion that is consistent with the results of the practice level runs.

The single level logistic regression repeated with separate variables does not fully replicate the detail of the discriminant function analysis: there are some differences in the order of the less significant variables (see Table F2). But it confirms the generally low significance of socio-economic factors. Again, none of the separate socio-economic variables is more significant than the Jarman index.

The differences between the results of the discriminant and logistic analyses are most likely due to the multicollinearity amongst the socio-economic variable and differences in the methods of estimation. The multi-level analysis was repeated with the separate component variables in order to try to resolve these differences. The regression was run in manual stepwise mode which gives greater control over decisions to include or remove variables that are insignificant or have counter intuitive signs. Moreover, a multi-level approach should give a clearer picture of the overall significance of socio-economic variables by controlling for the confounding effects of within practice variations. This may explain why the Jarman index is more significant in the original multilevel equation than in either the single level logistic or discriminant analyses.

Replacing the Jarman value with a set of 10 socio-economic variables in the multi-level model, followed by stepwise manual elimination of the least significant variable, gives the results shown in the right hand columns of Table 6.8. All of the original variables retain very similar coefficients and significance levels: the missing variable, the Jarman index, was not included in the analysis. Four of the new variables are retained as significant: the proportion of lone parents; the proportion overcrowded, the proportion unemployed and the proportion in housing lacking amenities.

The four variables represent rather different features of social conditions and could be responsible for separate effects. Three of the variables act in the same direction: people are more likely to move out of a practice without change of address in areas where there are higher levels of: unemployment, lack of amenities and proportion of lone parents. The variable acting in the opposite direction is the proportion of people living in overcrowded accommodation. In the three health authorities overcrowding is strongly correlated with levels of unemployment (r=.573) and lone parents(r=.531) and less strongly with lack of amenities (r=.1362). All three correlations are highly significant at less than .001% (n>800000). In the multi-level model the four variables do not seem to be as strongly inter-correlated as these figures suggest: removing any one, or combinations of the variables does not have a marked impact on the coefficients of those

remaining. It suggests that these four are relatively independent once the various controls of the model are applied. The negative relation with overcrowding is likely to be due to the nature of the housing stock in the three HAs where high living densities may not necessarily coincide with high deprivation once other factors are controlled for.

6.2 DISTANCE AND ACCESS

6.2.1 Distance to Practice

Distance from one's home to the surgery is likely to be major factor when choosing a GP and will influence the decision to change practice without changing address. We have explored the impact of distance in some of the previous analyses and in this section we present some descriptive statistics related to distances of patients from practices.

We computed the distances from the home address of the people registered with the three HAs to their current, and any recent former practice. We also computed the distance from the patient's home to the nearest general practice in order to estimate whether a patient registered with their nearest practice.

Apart from the errors in the OPCS conversion file and the general limits to the accuracy of postcode to grid reference mappings, it should be borne in mind when interpreting the tables below that the two set of distances are computed from rather different data. Distance to the current practice is calculated as the distance to the nearest surgery of the current practice (which could be a branch surgery). Distance to the nearest practice is computed with a data set that is in part compiled from a national list which only contains postcodes for the main practice surgery. The list was used to ensure that all the practices on the margin of the three HAs are included even though they may not have any current registrations from these HAs. It is therefore possible for someone to be registered with a branch surgery that is nearer than the main surgery reported as closest in the minimum distance calculations. This is most likely to be the case on the margins of the HAs and applies to just under 5% of the people in the data set.

Table 6.9 shows the distribution of patients by distance to current and nearest practice the resulting distance information and Figures 6.1 and 6.2 give a graphical summary. Note that there are some patients for whom we can calculate distance to nearest practice but not distance to current practice because we cannot identify their current practice or because of inadequate practice information.

Figure 6.1 **No. of patients at this distance from their current practice (10% sample from the 3 HAs)**

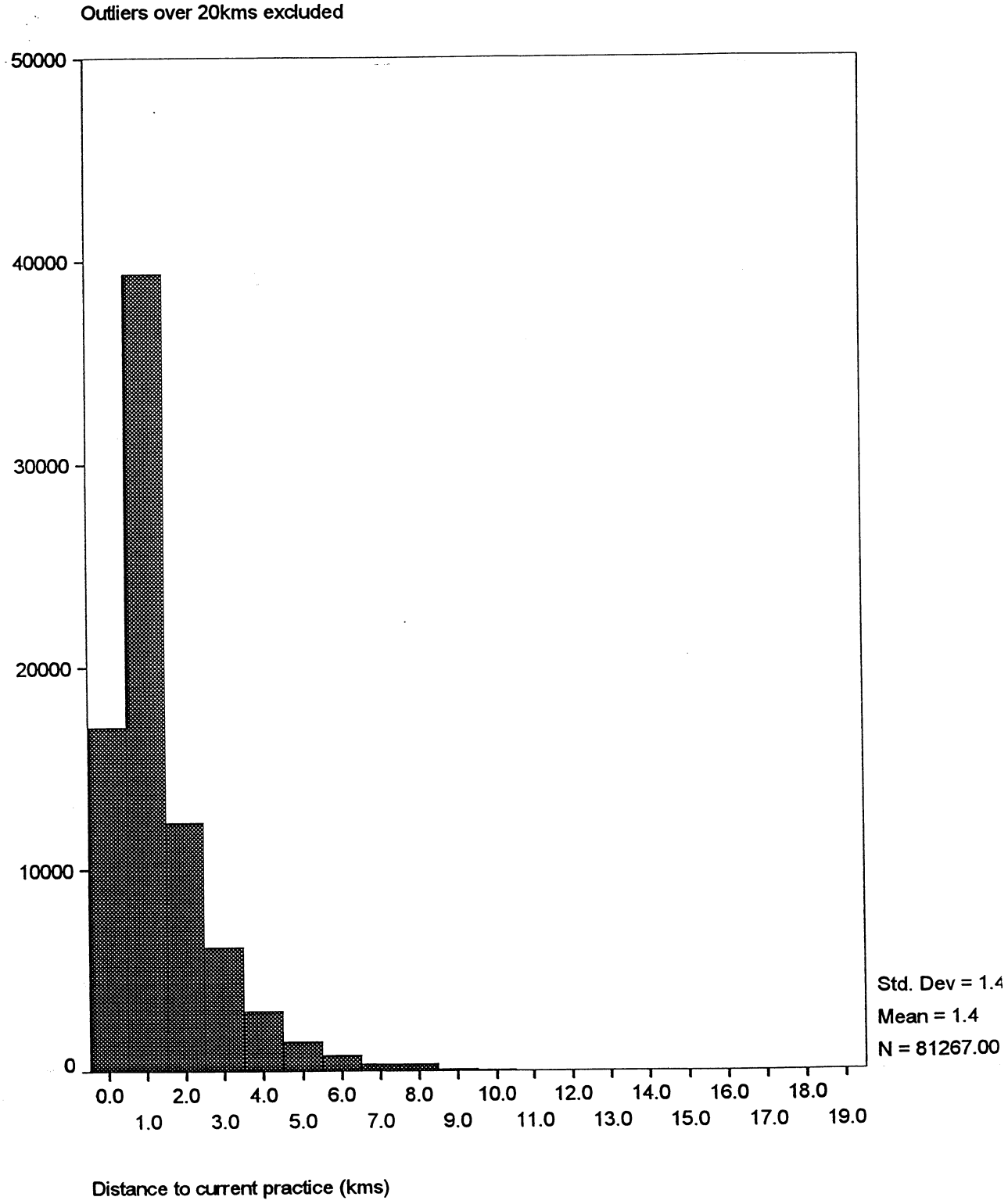


Figure 6.2 Distance to nearest practice (kms) (10% sample from the 3 HAs)

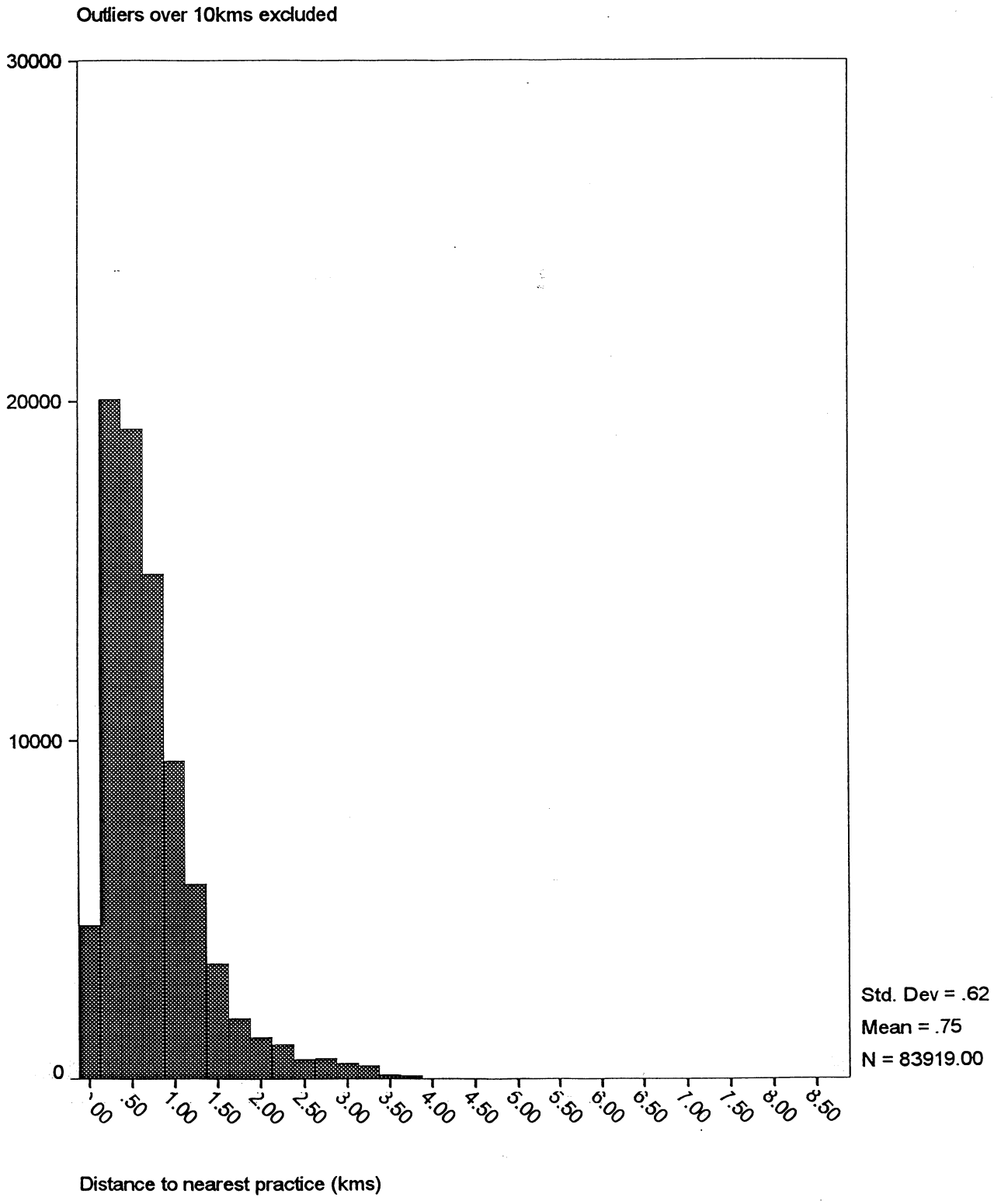


Table 6.9 : ***Distances from patient's postcode and ED centroid to current and nearest practice***

Distance	**Patients with this distance to nearest surgery of current practice**		**Patients with this distance from centroid of their ED to nearest practice**	
	N	**%**	**N**	**%**
under 250 metres	72744	9.0	146379	17.5
250-499 metres	97632	12.1	177162	21.2
500-749 metres	140908	17.4	196515	23.5
750-999metres	106137	13.1	112920	13.5
1000-1499 metres	143474	17.7	120416	14.4
1.5-1.99kms	74442	9.2	42091	5.0
2.0-2.99kms	81502	10.1	30932	3.7
3.0-4.99kms	68257	8.4	10291	1.2
5.0-7.49kms	17377	2.1	308	0.0
7.5-9.99kms	4815	0.6	21	0.0
10.0-14.99kms	941	0.1	3	0.0
15kms and further	350	0.0	147	0.0
All patients	808579	100	837185	100
Mean distance (all patients)	1.42		0.75	
Standard errors	1.64		0.67	

In constructing indicators of access and practice choice we needed to specify a radius within which people would regard a practice as local and accessible. The table shows that our choice of 3km seems reasonable as over 85% of patients choose a practice within this range.

6.2.2 Choice of Nearest Practice

Comparison of the distributions of patients' distances to their current practice and their nearest practice shows that the distribution of distances to current practice has a longer and thicker tail than the distribution of distances to nearest practice. Martin and Williams (1992) found a similar result in their study of 8 practices in Bristol. Although the table demonstrates that not all individuals choose their nearest practice it does not indicate how important distance is relative to the other factors influencing choice of practice.

Table 6.10 is a more direct indicator of the importance of distance in choice of practice since it shows the proportions of patients who have registered with their nearest practice. It clearly demonstrates that distance is not the only determinant of practice choice since only around one third of patients choose the nearest practice. Note that the proportion of patients choosing the nearest practice is smallest in Kingston and Richmond, probably because it has a greater density of practices than the other HAs. Patients in Kingston and Richmond who reject their nearest practice incur on average a smaller distance cost in choosing a more distant practice with features they value more highly.

Table 6.10: ***Distances from patient's postcode and ED centroid to current and nearest practice; and proportion of people registered with nearest practice, by health authority***

Distance	N	Patients with this distance to nearest surgery of current practice		Patients with this distance from centroid of their ED to nearest practice		Proportion of patients registered with nearest practice.	
		Mean dist (km)	sd (km)	Mean dist (km)	sd (km)	Mean	sd
Doncaster	277966	1.655	2.02	0.877	0.78	38.5	48.7
Rotherham	234345	1.739	1.78	0.923	0.73	33.2	23.4
Kingston & Richmond	297589	0.952	0.80	0.522	0.42	29.9	45.8
All 3 areas	809900	1.421	1.64	0.760	0.68	33.8	47.3

Further discussion of distance and practice choice is contained in Appendix E.

6.2.3 Distance to Practice and Patient Age

Distance and accessibility of practices may be more important for elderly patients and policy might be more concerned with ensuring access for the elderly than other groups. We have examined the relationship between age and distance to current practice, nearest practice and proportion registered with nearest practice.

The very large numbers of observations in these analyses can result in statistical significance being attached to very minor associations. There is a small but significant trend for older people to live further from their GP (Tables 6.11 and 6.12). Similarly, the relation between age and distance to the nearest practice is positive and statistically significant (r=.0101 p=.000) though one is hard pressed to tell the direction of the association from Table 6.13 Consistent with these correlations, there is a small negative association between age and the proportion of people registered with their nearest practice (r=-.0052 p=.000) in Table 6.14. Finally, the distances to the current and nearest practice, and the proportion registered with the nearest practice are not significantly different for the group aged 65 to those for the rest of the sample (Table 6.15).

Table 6.11: ***Distances from patient's postcode to the nearest surgery of their current general practice***

Distance	Patients with this distance to nearest surgery of current practice		
	Aged 0-64	Aged 65 & over	All ages
	%	%	%
under 250 metres	8.9	9.4	9.0
250-499 metres	12.0	12.2	12.1
500-749 metres	17.5	17.2	17.4
750-999metres	13.2	12.7	13.1
1000-1499 metres	17.8	17.6	17.7
1.5-1.99kms	9.2	9.1	9.2
2.0-2.99kms	10.0	10.3	10.1
3.0-4.99kms	8.4	8.8	8.4
5.0-7.49kms	2.2	2.1	2.1
7.5-9.99kms	0.6	0.4	0.6
10.0-14.99kms	0.1	0.1	0.1
15kms and further	0.04	0.05	0.04
N (All patients)	683807	124772	808579

Table 6.12: ***Distances from patient's postcode to the nearest surgery of their current general practice - by age***

	Average distance to current practice		
	Mean (kms)	**Sd (kms)**	**N**
0-15	1.399	1.60	157385
16-25	1.380	1.79	97822
26-44	1.386	1.55	240492
45-64	1.509	1.70	189218
65 & over	1.419	1.63	124983
All ages	1.421	1.64	809900
F test for linearity		193.7 (.0000)	
F test for deviation from linearity		184.4 (.0000)	

Table 6.13: ***Distance to the nearest practice from patient's postcode - by age***

	Average distance to nearest practice		
Age groups	**Mean (kms)**	**Sd (kms)**	**N**
0-15	.758	.676	162326
16-25	.751	.704	100943
26-44	.726	.642	249163
45-64	.787	.667	196162
65 & over	.755	.690	129144
All ages	.754	.670	837738
F test for linearity		48.3 (.0000)	
F test for deviation from linearity		291.8 (.0000)	

Table 6.14: Percentage of people registered with their nearest general practice - by age

	Percentage registered with nearest practice		
	Mean	**Sd**	**N**
0-15	33.7	47.3	165068
16-25	30.7	46.1	103045
26-44	32.2	46.7	254814
45-64	31.5	46.5	197956
65 & over	32.5	46.9	130324
All ages	32.2	46.7	851207
F test for linearity		44.5 (.0000)	
F test for deviation from linearity		93.2 (.0000)	

Table 6.15: Distance to current and nearest general practice, and proportion of people registered with their nearest GP - by age

Age groups	**N**	**Distance to nearest surgery of current practice**		**Distance to main surgery of nearest practice**		**Proportion of patients registered with nearest practice**	
		Mean (kms)	**sd (kms)**	**Mean (kms)**	**Sd (kms)**	**Mean (kms)**	**sd (kms)**
All ages	809900	1.421	1.64	0.760	0.68	33.8	47.3
Age 0-64	684917	1.422	1.64	0.760	0.67	33.8	47.3
Age 65 and over	124983	1.419	1.63	0.761	0.70	33.9	47.3
F value of SS between groups aged 0-64 and 65 and over		0.73 (p=.54 ns)		0.17(p=.68 ns)		0.14(p=.43 ns)	

6.3 CAPITATION AND QUALITY

The changes to the GP contract in 1990 included an increased emphasis on capitation fees for GPs. At the same time the regulations for patient registration were changed to make it easier for patients to change their GP in that it was no longer necessary for a patient wishing to change GP to seek the consent of the practice they were leaving as well as the practice they were joining. One rationale for the changes was to provide an increased incentive for GPs to improve the quality of services they offered to patients. It was also hoped that this would be complementary to the introduction of fundholding which it was argued gave practices an additional means of improving services.

It was hoped that patients would vote with their feet for better quality practices and that it would be more worthwhile for GPs to compete for patients via the quality of service provided. The aim was to strengthen the exit mechanism compared to the voice mechanism as a means of improving the quality of publically funded services (Hirschman, 1970).

A number of objections can be raised to the suggestion that capitation fees will act as an incentive for quality.

1. Patients may not place a very high weight on quality compared with other aspects of the practice, particularly its accessability. There are two counter arguments. Although distance has an effect on patient choice of practice (MORI, 1997) it is not clear that it is the dominant influence. Our results show that only about one third of patients register with their nearest practice. These findings are confirmed by other studies (Martin and Williams, 1992; MORI, 1997.) Our results also show that patient movements between practices are systematically related to variables, such as the number of clinics, which could be argued to reflect some aspects of practice quality.

2. It can be argued that patients are poor judges of quality: they make errors in observing the quality of service of a practice. However, what matters for the incentives of the practices is the effect of an increase in actual quality on the quality perceived by patients as a whole, not whether individual patients make errors in assessing practice quality.

3. Quality is multi dimensional and patients may by better able to judge some aspects of quality than others. This may distort the quality mix chosen by GPs in an attempt to attract patients, but it will not remove their incentive to increase some aspects of quality. It will difficult for policy-makers to monitor all dimensions of service which are important to patients. In such cases capitation fees may be the only means of indirectly regulating quality. Those aspects of quality where patients are very poor judges of quality may be better influenced by other means.

4. Some aspects of GP services are "experience goods" (Nelson, 1970): patients acquire better information about them after they have used the service. Hence movements of patients changing practices without change of address can provide some evidence on whether capitation is an incentive for quality.

The fourth objection to capitation fees as an incentive for quality is that patients incur switching costs: once they have registered with a practice they will incur costs in joining some other practice. The MORI survey indicates that around one in twelve of patients who had been with a practice for more than three years had considered switching to another practice but had not done so. One third of these said that they had just not got round to doing so and one in eight said that it was too difficult or time consuming (MORI, 1997).

The industrial economics literature shows that such switching cost can reduce the amount of competition in markets (Klemperer, 1995; Dranove and White, 1996). However, some intitial theoretical modelling of switching costs in the context of choice of GP suggests that whilst switching costs reduce the gains from patients moving between practices they do not destroy the incentive to improve quality to attract patients (Gravelle and Masiero, 1997; Masiero, 1996). In such models GPs will compete to increase their "installed base" of patients. Provided that patients' perceptions of quality are not entirely erroneous, GPs are led to increase quality in response to increases in capitation fees.

5. Relatively few patients (1% to 1.5% per year) change their GP without changing their address. Hence, it could be argued, there can be little effective pressure to increase quality from competition between practices. However, if practice quality levels do not change substantially in equilibrium then there would be no reason for patients to move if they do not change address. The analogy is with consumers purchasing competing brands of a commodity. The fact that market shares are

constant and consumers loyal to their chosen brand when relative prices of competing brands and their other characteristics do not change would not be taken as evidence to suggest that the firms are not competing and that brand characteristics and prices had no effect on demand.

The difficulties of identifying changes in practice characteristics over the fairly short time horizon of the current study meant that we were unable to examine the responses of patients to changes in quality. Such a study would not in any case be straightforward. It would be necessary to take account of the reactions of competing practices: if an increase in quality by one practice leads its rivals to increase their quality, we could observe an increase in quality without any increase in movements of patients between practices.

6.4 CONCLUSIONS

1. The results of regression analyses of patients who left practices without change of address were broadly similar across different methods of estimation (logistic, discriminant function and multi-level logistic) and were compatible with the results of the practice level analysis of the rates of outflow without change of address. Many more of the variables used to explain the decision to leave a practice were significant in the patient level analysis because of the much larger number of observations (over 52,000 versus 171), though many of the effects are small.

   - older patients are less likely to leave practices
   - female patients are more likely to leave
   - patients are less likely to leave practices with more GPs, more clinics, longer opening hours
   - relative to non-fundholding practices, patients are more likely to leave standard fundholding practices and less likely to leave multifund practices
   - patients are more likely to leave practices which are further away

- patients living in EDs with greater proportions of individuals who are lone parents, unemployed or living in poor housing are more likely to leave practices; those living in EDs with greater proportions of individuals living in overcrowded conditions were less likely to leave.

2. Distance is a powerful influence on practice choice but is clearly not the dominant influence:

- one third of patients choose their nearest practice

- over half of patients choose a practice within 1km of their postcode address and over 85% of patients choose one within 3km

Age does not appear to have much impact on the effect of distance on practice choice:

- the proportion of those aged 65 and over choosing their nearest practice is not significantly different from those aged under 65

- there is a very slight tendency for those of 65 and over to live further from their practice

3. The project has concentrated on fairly straightforward analyses of patients changing practice. The obvious next step is to make more intensive use of the information in the data set both on such patients and on patients who have not changed practice to further examine the factors influencing practice choice.

Section 7: General Conclusions

Since summaries of the substantive results of the patient level and practice level analyses patient registration data are contained in the conclusions to Section 4, 5 and 6 we do not repeat them here. Instead we draw some broad conclusions.

1. The project was essentially exploratory, since there had been no previous attempt to utilise routinely generated patient registration data on this scale and to combine it with information on practice characteristics, location of practices and patients and Census derived socio-economic indicators. There were significant obstacles

- the main patient registration data base was designed primarily with a view to payment of GPs on a capitation basis, not as a managerial or research tool
- data bases on practice characteristics are held in differing formats by different health authorities and they were unable to supply them in forms that could be mechanically converted to the analysis format
- data on several relevant variables, such as practice purchasing modalities, has to be specially collected
- there is relatively little information on individual patients, apart from their age, gender and postcode

The project has demonstrated that it possible to overcome these difficulties.

2. The data set constructed by the project has been used to help provide answers to policy relevant questions concerning patients' choice of practices and practices' selection of patients. A study based on a non-random sample of three out of 100 HAs clearly cannot claim to yield precise results which are nationally generalisable.

However, the broad thrust of the empirical results on the influence of practice and patient characteristics on patient transfers is plausible and appears to be robust across levels and methods of analysis.

3. The bulk of the work on the project has been addressed to producing the data set. The analyses reported have been fairly simple attempts to address the research questions posed within the time and resources available. More detailed and sophisticated analyses of what is now a rather rich data set will yield more policy relevant insights into the choice of practices by patients and of patients by practices.

REFERENCES

Posnett, J., Gravelle, H., Carr-Hill, R., Dixon, P., Piercy, J. *Consortia and Patient Choice*, Report to National Health Service Executive, May 1996.

Carr-Hill, R., Dixon, P., Gravelle, H. and Posnett, J.*Consortia and Patient Choice, New Summary Access Measures*, Report to National Health Service Executive, October 1996.

Gravelle, H. and Masiero, G. "Switching costs, imperfect information and quality", *mimeo*, Centre for Health Economics, October 1997

Martin, D. and Williams, H. C. W. L. "Market-area analysis and accessibility to primary health-care centres", *Environment and Planning A*, 24, 1992, 1009-1019.

Nelson, P. "Information and consumer behaviour", *Journal of Political Economy*, 1970, 78, 311-329.

Dranove, D. and White, W. D. "Specialization, option demand, and the pricing of medical specialities", *Journal of Economics and Management Strategy*, 5, 2, 1996, 277-306.

Hirschman, A. O. *Exit, Voice and Loyalty: Responses to Decline in Firms, Organisations and States*, 1970

Klemperer, P. "Competition when consumers have switching costs: an overview with applications to industrial organization, macroeconomics and international trade", *Review of Economic Studies*, 62, 1995, 515-539.

Masierio, G. *Economic Analyis of Primary Care with Consumer Switching Costs and Imperfect Information*, MSc Health Economics Dissertation, 1996.

MORI. *The Extent and Determinants of Patient Choice of GP Practice*, Report for NHSE, May 1997

APPENDIX A

Data Collection and Preparation

The stages in collecting and collating the information required are summarised in Table 1.

Table A.1	Section No.
Specify data requirements; collect registration and transaction files from HA; read and restructure data	1
Collect medical register data from HA; transform and re-enter practice profile details	2
Collect GP look-up table from HA; combine with all other available sources to produce best estimate of practice memberships.	3
Link transaction and registration files, excluding transfers before 1/4/95 and all but last transfer	4
Aggregate transfer details to compute transfer rates per practice and ask HA for clarification of exceptional transfer rates	5
Construct list of practices with purchasing types; send practice/purchasing type list to HA for checking	6
Convert patient's postcodes to EDs and grid refs	7
Retrieve ED level census info - compute deprivation indices for each ED	8
Obtain surgery postcodes and convert to grid refs; calculate distance to nearest surgery/practice for each patient	9
Combine purchasing type, grid references of practices and ED grid references to compute practice choice/access indicators for each ED	10
Add collated ED details to the patient file and aggregate patient level file to produce practice level file	11

These are the key phases of the basic data construction, other stages, such as the preparation of data for particular analyses, are described in the relevant results sections.

1. DATA COLLECTION AND TRANSLATION - REGISTRATION AND TRANSACTION DATA

All three HAs supplied the registration data as two files: one containing details of all people registered, the other listing registration 'transactions', i.e. new registrations and changes. The first file typically contains 300,000-400,000 records with 6 fields per record. The second has 100,000-150,000 records with 23 fields per record. Although these files have been as large as 73Mb, they have all been transportable on floppy discs after compression.

These files were relatively easily converted into a suitable form for analysis. Generally they were supplied in comma delimited (CDL) format, converted into fixed ASCII format, and read into SPSS. (Direct reading of CDL files by SPSS is unreliable).

2. DATA COLLECTION AND TRANSLATION - MEDICAL DIRECTORIES (PRACTICE PROFILE DATA)

All three HAs hold information on their practices in a machine readable form, but none was able or prepared to supply this in a format that was mechanically convertible to the one we required. Two of the authorities keep practice information on local databases, but would not supply us with down loads for reasons of confidentiality. Instead they provided machine readable versions of the public medical directory. The other health authority maintained its medical directory as a set of (163) word-processor files, all of which they supplied. There was no efficient method of directly converting the details from any of the authorities into an appropriate format so all the files had to be printed, summarised, coded and re-entered. This has been a labourious task as none of the information listings was shorter than 180 pages.

3. DATA COLLECTION AND TRANSLATION - GP/PRACTICE MEMBERSHIP

Trying to establish where each GP is based has been one of the most time consuming parts of the data collection. The information is required to link patient registrations to practice details, and to construct summary measures of the GP characteristics of a practice. However, it was difficult to precisely assign GPs to practices/partnerships from the information supplied by the HAs. This is because HAs may not record all the GPs names, as, for example, when they have patients registered with a subset of the GPs in a partnership; when one or more partners are dormant, or, more often, when the practice predominately services patients in another HA. Consequently HAs may not have a full list of all the partners and the details held may be contradictory. For example, the partnership-GP relation in the registration file may differ from that in the medical directory and/or the GP look-up tables. Even though a great deal of time has been spent on manually constructing lists of practice memberships, a few thousand patients in each HA will have to be

excluded from the analyses as there are incomplete details on their practice or GP. The issue is further complicated when trying to merge data from adjoining HAs, because HAs only use local codes to identify GPs and practices.

4. LINKING TRANSACTION AND REGISTRATION FILES

The transaction file contains details of patient transfers but not basic information on individuals such as age, gender and postcode which are only held on the registration file. The two files are merged by adding the transfer details to the patient records in the registration file. The NHS number is the basis for this merger. The procedure is as follows:

- transfers before 1/4/95 are excluded from the transaction file;

- the transfers are sorted by NHS number and date to find each person's most recent transfer; where someone has transferred more than once without change of address the number of these transfers are counted;

- the transaction file is aggregated by NHS number to produce a new file with one record for each person, containing the details of the latest transfer and the number of changes without change of address;

- the transactions file can be merged into the registration file so long as the NHS number in the transaction file is complete and matches an identical number in the registration file. Some transfers will be dropped at this stage due to incomplete or invalid NHS numbers, but the largest groups of exclusions are transfers relating to people who are no longer registered with the HA - principally those who have died or have moved to another HA.

5. COMPUTING PRACTICE TRANSFER RATES

The merged transaction and registration file described above is the basis for computing the practice transfer rates. There are four stages:

- 27 dummy transfer variables are added to each patient record; each representing a unique combination of direction and type of transfer.(The combinations are shown in Table 2.3 of the main report);

- the file with these additional variables is aggregated by the code for the destination practice to give the raw numbers of transfers into these practices;

- the same file is aggregated by the source practice references code to give the raw numbers of transfers out of these practices;

- the results of the two aggregations are combined to give a single file with the numbers of transfers in both directions for each practice. The raw numbers are then translated to rates by dividing by the number of registrations per practice;

It is worth noting that the numbers of transfers and numbers of registrations in our data set will only be part of the full practice registrations and patient movements in many practices that also have patients based in health authorities other than those in the study. This should not bias the calculation of transfer rates, though it is conceivable that the part of the practice population not covered by the anticipating HAs behaves in a way that is different from those included. However, it can lead to instability in the estimates computed from practices on the borders of the HAs, where we have data on only a small part of the total registrations. Inspection of the distributions of the rates suggested excluding those rates computed for practices with less than 150 registrations. Other exceptional transfer rates were found to be due to groups of transfers being incorrectly coded or changes in the organisation of the practices, such as practice splits or Gps

moving to neighbouring practices and retaining some of their patients. Health authorities were asked to explain these anomalies and the data was amended accordingly.

There is more discussion of transfer rates in section 4 of the main report.

6. DATA COLLECTION AND TRANSLATION - PURCHASING TYPE

Given the aims of the project it is crucial to be able to identify the purchasing strategy of every practice in the three HAs. An earlier project had collected information on purchasing status in order to map access to purchasing types across all English HAs . The sources were lists of practices in multifunds and total purchasing pilots supplied by both the health authorities and the local fund and purchasing coordinators. In addition, details of which practices were fundholders were obtained from several national directories. The information collected for the earlier project was inadequate in two respects for the current exercise. Firstly it lacked details of partners names and full practice address; making it difficult to distinguish several practices with the same postcode. Secondly, it only recorded current purchasing status whereas we now needed purchasing status on three dates: 1/4/95 1/4/96 and 1/4/97. Nevertheless, having these details to hand enabled us to reduce the burden on HAs by asking them to amend a provisional list of purchasing status rather than having to compile a list from scratch. The penalty for the project was the very considerable effort involved in constructing these provisional lists.

7. CONVERTING POSTCODES TO EDS AND GRID REFS

The postcodes in the patient registration file provide both the grid reference and electoral district for the patient's home address. The former is used in various distance calculations and the latter to link individuals with the local socio-economic conditions.

There are two main reasons why this conversion could not be carried out for some of the people registered: their postcodes are either missing or obviously invalid; their postcodes cannot be found in the conversion file.

The second of these may be a consequence of incorrect or invalid postcoding, but it may also be due to the limitations of the conversion file. It is the OPCS "frozen" postcode file, specifically designed to convert postcodes to the electoral boundaries current at the time of the 1991 census rather than the current boundaries. Because of its limited interest, this file has not been maintained since approximately 1993 and will not accept more recent postcodes. The consequences are locally variable. Areas with major recent developments and many new postcodes are worst affected, but these are also the areas where socio-economic conditions are most likely to have changed since the last census. Without re-running the postcodes against a current directory it is impossible to say how many codes are invalid or too recent for the conversion file. However, a comparison of the first part of the codes that were successfully converted with those that failed to convert suggests there were no local concentrations of codes that could systematically distort the results.

8. RETRIEVING ED LEVEL CENSUS DATA AND COMPUTING DEPRIVATION INDICES

The project makes several uses of census data, not least in attributing local socio-economic characteristics to individuals . Such attribution is often carried out at ward level, but to achieve greater accuracy the project chose to work at the level of electoral districts (there are generally between 10 and 40 EDs in each ward).

The penalties of working at ED rather than ward level are the greater volume of data to retrieve from the census, the size of the data files and the problems of working with small numbers when constructing indices. Pseudo EDs were used in those cases where small ED populations resulted in zero denominators in calculating indices. Pseudo EDs were constructed specifically for the project. Each is built up from adjoining EDs until the numbers in relevant census cells are sufficient to calculate the indices. There is some loss of accuracy in working with these aggregates, but they were always smaller than the surrounding wards.

Three standard indices were constructed from these data: Carstairs, DoE, and the Jarman Underprivileged Area Index. Two further indices were constructed for the project: the proportion

of people with limiting long-standing illness and the average social class score. The description of the the indices is described below is adapted from notes by Eimermann and Lovett attached to the census data base package at University of Manchester Regional Computer centre.

The components of the deprivation indices:

The Carstairs Index (Carstairs & Morris 1989, Carstairs & Morris 1991) is a based on four variables:-

i. Unemployment - unemployed male residents over 16 as a proportion of all economically active male residents aged over 16.

ii. Overcrowding - persons in households with 1 and more persons per room as a proportion of all residents in households.

iii. Non car ownership - residents in households with no car as a proportion of all residents in households.

iv. Low social class - residents in households with an economically active head of household in social class IV or V as a proportion of all residents in households.

The DoE Index (DoE 1983) uses six variables:-

i. Unemployment - unemployed residents aged 16+ as a percentage of all economically active residents aged 16+.

ii. Overcrowding - households with 1 and more persons per room as a percentage of all households.

iii. Lone pensioners - lone pensioner households as a percentage of all households.

iv. Single parents - lone parent households as a percentage of all residents in households.

v. Born in New Commonwealth - residents born in the New Commonwealth as a percentage of all residents.

vi. Households lacking basic amenities - households lacking exclusive use of bath or shower and inside toilet as a percentage of all households.

The Jarman Underprivileged Area (UPA) Index (Jarman 1984) is based on eight variables:-

i. Unemployment - unemployed residents aged 16+ as a proportion of all economically active residents aged 16+.

ii. Overcrowding - persons in households with 1 and more persons per room as a proportion of all residents in households.

iii. Lone pensioners - lone pensioner households as a proportion of all residents in households .

iv. Single parents - lone 'parents' as a proportion of all residents in households.

v. Born in New Commonwealth - residents born in the New Commonwealth as a proportion of all residents.

vi. Children aged under 5 - children aged 0-4 years of age as a proportion of all residents.

vii. Low social class - persons in households with economically active head of household in socio-economic group 11 (unskilled manual workers) as a proportion of all persons in households.

viii. One year migrants - residents with a different address one year before the Census as a proportion of all residents.

Table A.2: ***Summary of the components of deprivation indices***

Component	**Jarman**	**Carstairs**	**DoE**
No car		x	
Migrants (into LA in prev year)	x		
Low social class	x	x	
Overcrowding	x	x	x
Unemployment	x	x	x
Single parents	x		x
Lone pensioners	x		x
New Commonwealth	x		x
Lack bath & internal wc			x
Children < 5 in h/hold	x		

These indices are standardised across all the EDs in the study - that is, all EDs corresponding to the postcodes in the registration file; in this standardisation the means are not weighted by the numbers of registrations in each ED. Consequently the indicators will not have zero values when averaged across the registered population. Local standardisation precludes comparisons with deprivation values for other parts of England, but maximises the variability within the data set. The indices are highly intercorrelated (Report Table 4.12). More details of their calculation are shown in a note to this appendix.

9. SURGERY POSTCODES AND GRID REFERENCES AND DISTANCE TO CURRENT PRACTICE

Medical directories were the usual source of postcodes for the practices and their branch surgeries, but some practices had to be contacted for their postcodes. Post codes were converted to grid references by the methods described in section 7 of this Appendix . When postcodes were missing from the conversion file, grid references were obtained from street plans and OS maps.

The distance between a patient's postcode and all surgeries of a practice was computed for all people in the data set. The smallest of these distance was taken as the distance to their practice.

10. ACCESS INDICATORS

Calculating access indicators proved to be one of the more difficult aspects of the data preparation. Three types of indicators were computed:

- the number of practices within a fixed radius of each ED centroid

- the number of practice types within a fixed radius of each ED centroid

- the distance of the nearest practice/surgery to each patient's address

The first two of these were computed from ED centroids rather than grid references of all the individual postcodes in order to reduce the computational effort.

The practices included in this exercise were not just those with patients registered at the participant HAs. Data from the previous mapping exercise was used to supply postcodes and grid references for practices in neighbouring HAs so the density of available practices did not artificially decline in the periphery of the participating HAs. The first set of indicators were based on the number of practices within .75, 1.5 and 3km of the centroid of each ED. The second set were similarly constructed, but in this case the number of practice types were counted. The rules for counting practice types were as agreed in the project specification, that is:

Finally, distances were computed from the centroid of each ED to all surgeries and branch surgeries where patients were registered and all main surgeries for other nearby practices. The minimum of these distances was taken as the distance to the nearest practice.

11. COMBINING THE PATIENT LEVEL FILES AND CONSTRUCTING THE FINAL PRACTICE LEVEL FILE

Most of the previous data manipulation was carried out separately for each HA because their data arrived in different formats and in different orders. Practice details such as information from the medical directory, transfer rates and purchasing type were added to the combined registrations and transaction file for each HA as they became available.

Once these details were added the three HA files were converted to a common format and combined into a single file. Merging the three data sets was not entirely trivial, especially in the case of Doncaster and Rotherham, where new codes and certain details had to be inserted for practices with registrations in both HAs.

Finally, most of the final corrections from the HAs were applied to this combined file rather than its earlier components as they arrived too late to rebuild the data structure from amended components. The amended patient level file was used for the relevant analyses; it was also aggregated by practice code to produce the file for the practice level work.

REFERENCES

Carstairs V, Morris R (1989) Deprivation, mortality and resource allocation. Comm Med 11:364-372.

Carstairs V, Morris R (1991) Deprivation and health in Scotland. Aberdeen University Press.

Department of the Environment (1983) Urban Deprivation. Information Note 2, Inner Cities Directorate, Department of the Environment, London.

Jarman (1984) Underprivileged areas: validation and distribution of scores. Brit Med J 289: 1587-1592.

Morris R, Carstairs V (1991) Which deprivation? A comparison of selected deprivation indexes. J Public Health Med 13:318-326.

Note 1: Cells numbers and values used in constructing deprivation indices from 1991 Small Area Statistics

**Jarman (Underpriviledged area index - UPA8).

Ratios

compute eldalo=arsin(sqrt((s47c15+s47c29+s47c43+s47c57+s47c71+s47c85)/s01c65)).
compute under5=arsin(sqrt((s38c4+s38c7+s38c10+s38c13+s38c16)/s01c65)).
compute unemp=arsin(sqrt((s08c78+s08c232)/(s08c12+s08c166))).
compute ovcr=arsin(sqrt((s23c43+s23c44)/s23c41)).
compute onepar=arsin(sqrt((s40c1+s40c61)/s01c65)).
compute ethnic=arsin(sqrt(s50c113/s50c1)).
compute unskilld=arsin(sqrt(s86c164/s86c8)).
compute moved=arsin(sqrt(s15c1/s01c64)).

Standardised ratios

compute eldalos=6.62*((eldalo-.242086)/.090169).
compute under5s=4.64*((under5-.251649)/.058963).
compute unemps=3.34*((unemp-.297335)/.0119143).
compute ovcrs=2.88*((ovcr-.175110)/.129517).
compute onepars=3.01*((onepar-.173470)/.101859).
compute ethnics=2.50*((ethnic-.172494)/.176301).
compute unskills=3.74*((unskilld-.091611)/.140077).
compute moveds=2.68*((moved-.316437)/.102903).
compute upa8=eldalos+under5s+unemps+ovcrs+onepars+ethnics+unskills+moveds.

***DoE index.

Ratios

compute unemp=ln((s08c78+s08c232+1)/(s08c12+s08c166)).
compute ovcr=ln((s23c43+s23c44+1)/s23c45).
compute eldalo=(s47c15+s47c29+s47c43+s47c57+s47c71+s47c85)/s01c65.
compute ethnic=ln(s50c113+1/s50c1).

```
compute onepar=ln((s40c1+s40c61+1)/s01c65).
compute amenity=ln((1+(s20c1+s20c9)-(s20c11+s20c19))/s01c65).

Standardised ratios

compute unemps=(unemp+2.41)/0.6184.
compute ovcrs=(ovcr+3.3737)/1.2317.
compute eldalos=(eldalo-.0639)/0.0442.
compute ethnics=(ethnic+.9036)/3.6478.
compute onepars=(onepar+3.656)/0.9280.
compute amenitys=(amenity+5.298)/1.0530.
compute doe=2*unemps+ovcrs+2*eldalos+ethnics+2*onepars+amenitys.
```

***Carstair index

Ratios

```
compute carunem=s08c78/s08c12.
compute carnocar=s21c45/s21c44.
compute carocrwd=(s23c43+s23c44)/s23c45.
compute carsc45=(s90c27+s90c32)/s90c2.
```

Standardised ratios

```
compute scunem=(carunem-.1264)/.0931.
compute scnocar=(carnocar-.2590)/.1627.
compute sccrowd=(carocrwd-.0392)/.0401.
compute scclass=(carsc45-.1737)/.1663.
compute carstair=scunem+scnocar+sccrowd+scclass.
```

Average social Class

```
compute avclass=(1*(s90c7/s90c2)+2*(s90c12/s90c2)+3*(s90c17/s90c2)+
 4*(s90c22/s90c2)+5*(s90c27/s90c2)+6*(s90c32/s90c2)).
compute avclass=(avclass-3.0815)/.7614.
```

Proportion with limiting long-standing illness

```
compute illness=(s12c1+s13c1)/s01c65.
compute illness=(illness-.1389)/.0687.
```

APPENDIX B

Variables in Patient Level Data Set

Appendix B - Variables in the patient level data set		
Variable name in data file	**Definition of variable**	**Coding or examples of codes**
Sex	Gender	1=Male 2-Female
Age	Age in years	0-108
Edcode	6 character code for ED	
Easting	Grid ref of patient's postcode (easting)	
Northing	Grid ref of patient's postcode (northing)	
GP_curre	Current GP (Local codes)	
Prac_loc	Local practice (Local code)	
NDHA	DHA with prime responsiblity for GP	
TRCASE	Indicates cases that are in transfer file but not live - i.e. have left DHA	0
Month	Month of last change of GP	1-12
Year	Year of last change of GP	95-97
RSN_Code	Reason for transfer (Exeter codes)	
DATNUM	Ref no for sorting data	
GPC	Current GP - from transfer file	
GPP	Previous GP - from transfer file	
CURR_PRAC	Current practice - from transfer file	
CURDHA	Current DHA resp for patient - from transfer file (Applies to patient who have transferred out of Doncaster)	
PR_PRAC	Previous practice - from transfer file	
PREDHA	Previous DHA - patient who have transferred into Doncaster	
GPCX	Current GP (merged from registration and transfer files - can be regarded as equivalent to GP_CURRE)	
TNCODE	Whether or not patient has changed practice since April 1995	
PRDPRC	Probability that patient would have randonmly chosen their current practice given the range of practice types in the locality	
NPRACT	Number of practice nearest to centroid of pateint's ED	

NPRDIST	**Distance from ED centroid to nearest practice**	
Pracnear	**Is patient registered at practice nearest to centroid of their ED**	**1=Yes** **2=No**
NPTINED	**Number of patients in ED**	
Carstair	**Carstair index for ED**	
Avclass	**Average social class value for ED**	
UPA8	**Jarman value for ED**	
DOE	**Dept of Environment Index for ED**	
Illness	**Standardised proportion of ED residents with limituing long-standing illness**	
NPR75DM	**Number of practices within 750M of patient's postcode**	
NPR150DM	**Number of practices within 1500M of patient's postcode**	
NPR300DM	**Number of practices within 3000M of patient's postcode**	
NPT75DM	**Number of practice purchasing types within 750M of patient's postcode**	
NPT150DM	**Number of practice purchasing types within 1500M of patient's postcode**	
NPT300DM	**Number of practice purchasing types within 3000M of patient's postcode**	
ANYNFH	**Any non-fundholder within 3000M of patient's postcode**	**0=None** **1=At least one practice**
ANYSFH	**Any standard fundholder within 3000M of patient's postcode**	
ANYMF	**Any multi-fund within 3000M of patient's postcode**	
ANYTPP	**Any total purchasing pilot practice within 3000M of patient's postcode**	
PTMA	**Purchasing type of current practice at 1/4/95**	**1=non-fh** **2=std fh** **3=TPP** **4=MF**
PTMB	**Purchasing type of current practice at 1/4/96**	
PTMC	**Purchasing type of current practice at 1/4/97**	
Details of current practice		
PRACGP	**No. of GPS in practice**	

GPSEX	**Average sex of GPs across practice**	**1=all male 2=all female**
Avage	**Average age of GPs in practice**	
NWKDAYS	**Max no. of days surgery in open during week**	
NWKEND	**Does Surgery open at weekends**	
WKHOURS	**Average weekly surgery opening hours**	
CLNALT	**Number of alternative therapy clinics run by practice**	
CLNCB	**Number of childbirth and baby care clinics**	
CLNDRUG	**Number of drug dependency clinics**	
CLNCHRON	**Number of chronic illness support/management clinics**	
CLNVSC	**Number of clinics relating to cardio-vascular problems**	
CLNOTH	**Number of other clinics**	
CLNDW	**Number of diet and weight control clinics**	
CLNWP	**Number of well-person clinics**	
CLNFP	**Number of family planning clinics**	
CLNTYPES	**Number of types of clinic**	
CLNMUN	**Total number of clinics**	
SERVMIN	**Does practice offer minor surgery**	
SERVCHI	**Does practice offer child health surveillance**	
SERVDISP	**Does practice offer dispensing service**	
MATERNIT	**Maternity Medical Services Provided**	
MATERNOB	**On obstetric list**	
CONTRA	**Contraceptive Services Provided**	
CONTRIUD	**Provides IUDs**	
TRAINNUM	**Number of trainnee GPs**	
LEAFLET	**Is there a practice info leaflet**	
NUMLANGS	**Number of non-English languages spoken by GPs**	
NONEURO	**Any non-European languages spoken by GPs**	
East1	**Easting of postcode of main surgery**	
North1	**Northing of postcode of main surgery**	

East2	Easting of postcode of first branch surgery	
North2	Northing of postcode of first branch surgery	
East3	Easting of postcode of second branch surgery	
North3	Northing of postcode of second branch surgery	
Details of previous practice		
PR_FROM	Local code of practice from which patient tranferred	
PTMAF	Purchasing type of previous practice at 1/4/95	1=non-fh 2=std fh 3=TPP 4=MF 5=MF+TPP
PTMBF	Purchasing type of previous practice at 1/4/96	
PTMCF	Purchasing type of previous practice at 1/4/97	
PRACGPF	No. of GPS in practice	
GPSEXF	Average sex of GPs across practice	1=all male 2=all female
Avagef	Average age of GPs in practice	
NWKDAYSF	Max no. of days surgery in open during week	
NWKENDF	Does Surgery open at weekends	
WKHOURSF	Average weekly surgery opening hours	
CLNALTF	Number of alternative therapy clinics run by practice	
CLNCBF	Number of childbirth and baby care clinics	
CLNDRUGF	Number of drug dependency clinics	
CLNCHRNF	Number of chronic illness support/management clinics	
CLNVSCF	Number of clinics relating to cardio-vascular problems	
CLNOTHF	Number of other clinics	
CLNDWF	Number of diet and weight control clinics	
CLNWPF	Number of well-person clinics	
CLNFPF	Number of family planning clinics	
CLNTYPSF	Number of types of clinic	
CLNMUNF	Total number of clinics	

SERVMINF	**Does practice offer minor surgery**	
SERVCHIF	**Does practice offer child health surveillance**	
SERVDSPF	**Does practice offer dispensing service**	
MATERNF	**Maternity Medical Services Provided**	
MATOBF	**On obstetric list**	
CONTRAF	**Contraceptive Services Provided**	
CONIUDF	**Provides IUDs**	
TRAINMF	**Number of trainnee GPs**	
LEAFLETF	**Is there a practice info leaflet**	
NUMLANGF	**Number of non-English languages spoken by GPs**	
NONEUROF	**Any non-European languages spoken by GPs**	
Eastf1	**Easting of postcode of main surgery**	
Northf1	**Northing of postcode of main surgery**	
Eastf2	**Easting of postcode of first branch surgery**	
Northf2	**Northing of postcode of first branch surgery**	
Eastf3	**Easting of postcode of second branch surgery**	
Northf3	**Northing of postcode of second branch surgery**	
DC1	**Distance from patient's postcode to main surgery of current practice**	
DC2	**Distance from patient's postcode to first branch surgery of current practice**	
DC3	**Distance from patient's postcode to second branch surgery of current practice**	
DP1	**Distance from patient's postcode to main surgery of previous practice**	
DP2	**Distance from patient's postcode to first branch surgery of previous practice**	
DP3	**Distance from patient's postcode to second branch surgery of previous practice**	
DCPRAC	**Distance to nearest surgery of current practice**	
DPPRAC	**Distance to nearest surgery of previous practice**	
MSINCE94	**Date of last transfer - months since Dec 94**	
PTPREV	**Purchasing type of previous practice**	
PTCURR	**Purchasing type of current practice**	

RSNNEW	**Transfer codes - edited to include details of transfer splits**	
Reasons for transfer into current practice **0=no transfer or not this reason** **1= this reason for transfer**		
TIN1	**Birth**	
TIN2	**First aceptance**	
TIN3	**Immigration**	
TIN4	**Ex service**	
TIN5	**Internal transfer in partnership**	
TIN6	**Internal transfer in partnership by address**	
TIN7	**Reinstated**	
TIN8	**Internal transfer (no address change)**	
TIN9	**Transfer into DHA**	
TIN10	**Internal transfer by address change**	
TIN11	**Registration details transferred from paper to computer record**	
Reasons for transfer out of previous practice **0=no transfer or not this reason** **1= this reason for transfer**		
TOUT1	**Death**	
TOUT2	**Deducted at GPs request**	
TOUT3	**Deducted at patient's request**	
TOUT4	**Embarkation**	
TOUT5	**Entered mental hospital**	
TOUT6	**Other reasons**	
TOUT7	**Internal transfer in partnership**	
TOUT8	**Internal transfer in partnership by address**	
TOUT9	**Removal to another area**	
TOUT10	**Registration cancelled**	
TOUT11	**Registration documents returned undelivered**	
TOUT12	**Re-instated**	
TOUT13	**Services dependent**	

TOUT14	**Services**	
TOUT15	**Internal transfer (no address change)**	
TOUT16	**Internal transfer with address change**	

APPENDIX C

Variables in Practice Level Data Set

Appendix C - Variables used in the practice level analyses

Many other variables, such as surgery grid references and a full set of transfer rates are contained in the intermediate files used to build the final data set. Those listed here are from the corrected patient level data that have been aggregated to construct the working practice level data.

Variable name in data file	Definition of variable	Coding or examples of codes
Nspnum	Senior partner/practice code	
Hha1	Health authority code	1=Doncaster 2=Rotherham 3=Rotherham & Doncaster 4=Kingston & Richmond
Nptsnew	Number of patients registered at the practice from the participating HAs	
Average values for practice population		
Sexn	Average gender of practice population	
Age	Average age of practice population	
Numtrn	Average number of transfers without change of address	
Dcprac	Average distance to patient's homes	
Nprdist	Average distance to nearest practice	
Pracnear	Proportion of patients for whom this is the nearest practice	
Carstair	Carstair index for practice	
Avclass	Average social class value for practice	
UPA8	Jarman value for practice	
DOE	Dept of Environment Index for practice	
Illness	Standardised proportion with limituing long-standing illness	
Number and type of neighbouring practices		
NPR150DM	Number of practices within 1500M of patient's postcode	
NPR300DM	Number of practices within 3000M of patient's postcode	

NPT150DM	**Number of practice purchasing types within 1500M of patient's postcode**	
NPT300DM	**Number of practice purchasing types within 3000M of patient's postcode**	
NNFC	**Any non-fundholder within 3000M of patient's postcode**	**0=None** **1=At least one practice**
NSFHC	**Any standard fundholder within 3000M of patient's postcode**	
NSPECC		
NMFC	**Any multi-fund within 3000M of patient's postcode**	
NTPPC	**Any total purchasing pilot practice within 3000M of patient's postcode**	
Details of practice		
PTMA	**Purchasing type at 1/4/95**	**1=non-fh** **2=std fh** **3=TPP** **4=MF**
PTMB	**Purchasing type at 1/4/96**	
PTMC	**Purchasing type at 1/4/97**	
PRACGP	**No. of GPS in practice**	
GPSEX	**Average sex of GPs across practice**	**1=all male** **2=all female**
Avage	**Average age of GPs in practice**	
NWKDAYS	**Max no. of days surgery in open during week**	
NWKEND	**Does Surgery open at weekends**	
WKHOURS	**Average weekly surgery opening hours**	
CLNALT	**Number of alternative therapy clinics run by practice**	
CLNCB	**Number of childbirth and baby care clinics**	
CLNDRUG	**Number of drug dependency clinics**	
CLNCHRON	**Number of chronic illness support/management clinics**	
CLNVSC	**Number of clinics relating to cardio-vascular problems**	
CLNOTH	**Number of other clinics**	
CLNDW	**Number of diet and weight control clinics**	
CLNWP	**Number of well-person clinics**	

CLNFP	**Number of family planning clinics**	
CLNTYPES	**Number of types of clinic**	
CLNMUN	**Total number of clinics**	
SERVMIN	**Does practice offer minor surgery**	
SERVCHI	**Does practice offer child health surveillance**	
SERVDISP	**Does practice offer dispensing service**	
MATERNIT	**Maternity Medical Services Provided**	
MATERNOB	**On obstetric list**	
CONTRA	**Contraceptive Services Provided**	
CONTRIUD	**Provides IUDs**	
TRAINNUM	**Number of trainnee GPs**	
LEAFLET	**Is there a practice info leaflet**	
NUMLANGS	**Number of non-English languages spoken by GPs**	
NONEURO	**Any non-European languages spoken by GPs**	
Transfer rates (the working files contain many other transfer variables, from raw numbers to standardised rates)		
Rinncad	**Transfers in without change of address**	
Routncad	**Transfers out without change of address**	
Rinha	**Transfers into the HA**	
Rinadc	**Transfers into the practice by address change within the HA**	
Routadc	**Transfers out of the practice by address change within the HA**	

APPENDIX D

Language and Ethnicity

LANGUAGE AND ETHNICITY

The research remit included the question of whether GP ethnicity influenced patient choice of GP. There are two difficulties in addressing this question with the data to hand. The first problem is identifying GP ethnicity and the second is of attributing patient ethnicity from the average characteristics of an enumeration district.

GP ethnicity may be recorded in health authority files but this information was not made available to the project. Ethnicity had to be estimated either from GP names or from the languages offered by the practice - both are listed in public medical directories. Language was thought to be the more reliable guide to ethnicity, and every language offered by every practice was recorded for the first authority in the study. The numbers of practices providing each language in Doncaster are listed in Table D1.

Table D1: Languages available in Doncaster practices

Language	Number of practices	% of practices (n=89)
Urdu	13	14
Punjabi	10	11
Hindi	18	19
Gujarati	4	4
French	5	5
Bengali	8	9
Pushto	1	1
Swahili	1	1
Arabic	4	4
Russian	1	1
Tamil	4	4
Malay	1	1
Singhalese	1	1
Persian	1	1
Marathi	1	1
German	1	1

Because the detail was both laborious to record and was not being fully used in the analyses, only two pieces of information relating to language were noted for practices in the remaining two HAs: the total number of non-English languages and whether at least one of these was non-European. The details are summarised in Table D2 where it can be seen that Kingston and Richmond has the highest percentage of practices (56.7%) providing one or more languages other than English. The comparable figures for Doncaster and Rotherham are 37.6% and 37.3%. There is much less difference between the authorities in the proportion of practices providing a non-European language: Kingston and Richmond 31.1%, Doncaster 33.3%, Rotherham 30.4%. When the figures are recomputed on the patient weighted basis shown in Table 3.5, Rotherham is found to have the highest proportion of its population (32%) registered at practices offering a non-European language; the figures for Rotherham and Kingston and Richmond are 25.7% and 27.7%. By contrast there are much larger differences in the proportion of non-white residents in the health authority populations: Doncaster 1.6%, Rotherham 2.1% Kingston and Richmond 6.9%. This suggests a disparity between the ethnic mix of a population and the ethnic mix of GPs at a health authority level. The disparity may be less at a more local level, but there is little evidence of this at ward level in the three authorities studied (see Figure D1).

Figure D1: ***Ethnicity and availability of non-european languages - by ward***

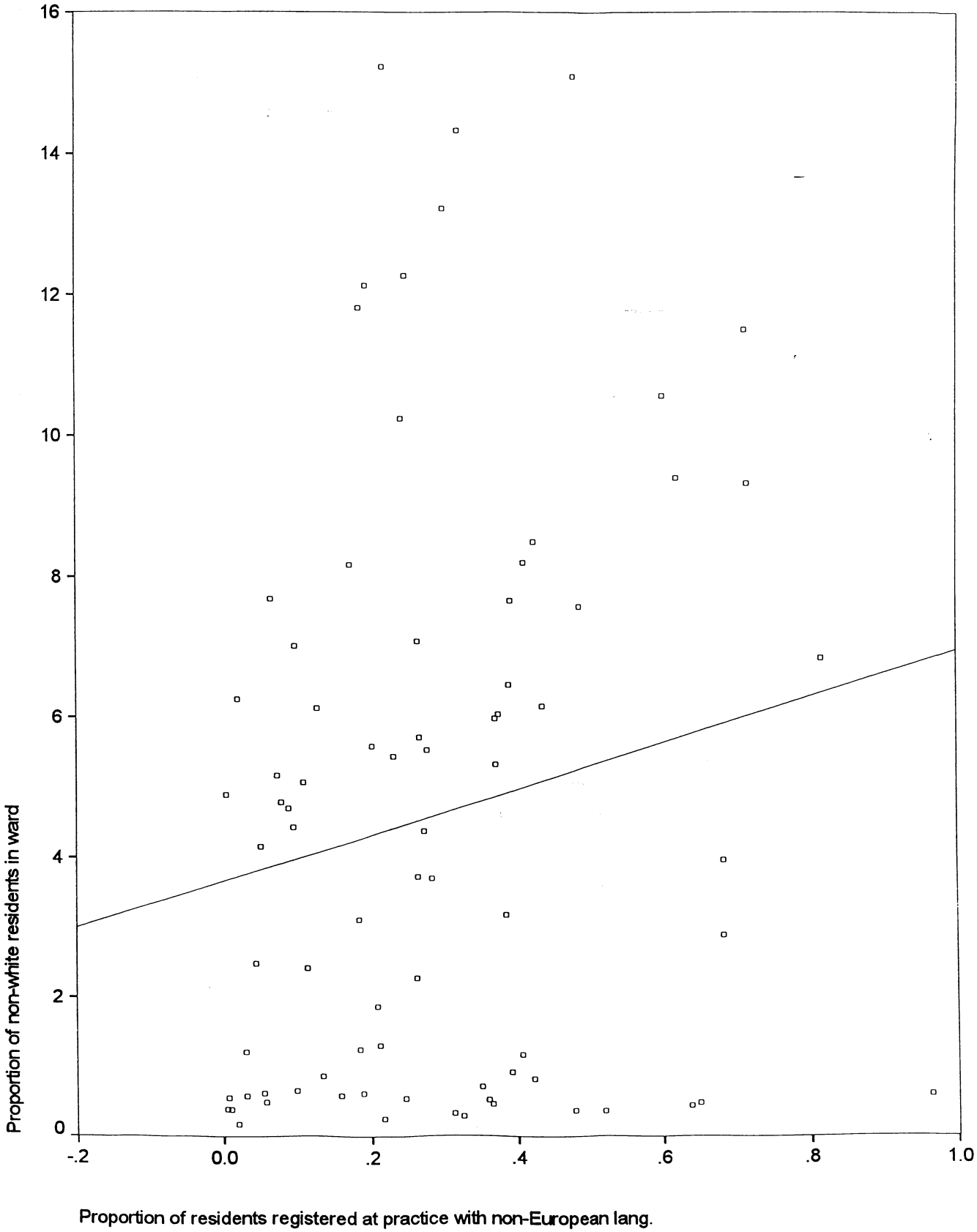


Table D2: Proportion of practices in each HA offering this number of languages (columns A)
Proportion of these practices where one or more of these languages is non-European (columns B)

	Doncaster		Rotherham		Kingston & Richmond		All three HAs	
	A(% of all practices in HA)	**B (%of practices in col A)**	**A(% of all practices in HA)**	**B (%of practices in col A)**	**A(% of all practices in HA)**	**B (%of practices in col A)**	**A(% of all practices in HAs)**	**B (%of practices in col A)**
0	62.4	na	62.7	na	44.3	na	58.2	na
1	9.7	56.0	11.8	58.3	23.0	35.7	13.7	48.6
2	15.1	100.0	9.8	90.0	13.1	62.5	12.5	90.1
3	5.54	100.0	9.8	90.0	4.9	66.7	7.0	88.9
4	5.4	100.0	2.9	100.0	6.6	75.0	4.7	91.7
5	1.1	100.0	1.0	100.0	4.9	66.7	1.9	80.0
6	0.0	na	2.0	100.0	1.6	100.0	1.2	100.0
7	1.1	100.0	0.0	na	0.0	na	0.4	100.0
8	0.0	na	0.0	na	1.6	100.0	0.4	100.0
n practices	93		102		61		256	

APPENDIX E

Distance to Practice

DISTANCE TO PRACTICE

The distance a person has to travel to see a GP will be affected not only by the local density of practices, but the availability of branch surgeries. The numbers of branch surgeries varied between the three particpating authorities and there was no simple relation with population density. Amongst the three authorities, Doncaster, with a lower population density than Kingston and Richmond, has a lower proportion of people registered at practices with branch surgeries (18.8%) than the London authority (29.0%) and a very different proportion from its neighbour Rotherham (47.4%) - Table E1.

The asumption that more branch surgeries will bring practices nearer to the population is also not fully endorsed by these data. Table E2 shows the numbers of people for whom a branch of their local practice is nearer than the main surgery: only 10.7% overall. The possibility that branch surgeries may encourage people to register with their nearest practice is contradicted by Table E3 which reports the percentages of people for whom at least one of the surgeries of their current practice is nearer than any other practice. The figure is highest in Doncaster, where fewest people are registered with practices that have branch surgeries.

Table E1: ***Proportions of local populations registered at practices with branch surgeries***

Percentage of people registered at practices with these nos. of branch surgeries	Doncaster	Rotherham	Kingston & Richmond	All 3 HAs
0	81.2	52.6	71.0	69.2
1	16.7	36.5	28.3	26.7
2	2.1	10.9	0.66	4.1
N (people)	277966	234345	310032	822343

Table E2: ***Which surgery of their current practice is nearest to the patient's home address?***

Percentage who are nearest to this surgery of their current practice (1):	Doncaster	Rotherham	Kingston & Richmond	All 3 HAs
Main	94.7	84.2	88.6	89.3
1st branch	4.9	12.1	11.3	9.4
2nd branch	0.4	3.6	0.1	1.3
N	264911	237091	307443	809445

Note (1) Table only refers to the nearest surgery of the patient's own practice. Surgeries of

Table E3: ***For people whose current practice is nearer than any others, which surgery of their current practice is nearest***

Percentage who are nearest to this surgery of their current practice :	Doncaster	Rotherham	Kingston & Richmond	All 3 HAs
Main	38.7	25.1	23.2	29.2
1st branch	0.7	6.0	5.6	4.1
2nd branch	0.0	2.0	0.05	0.6
All surgeries	39.4	33.1	28.85	33.9
N	264911	237091	307443	809445

(The figures in this Table are slightly different from those in Table 6.10 as a few practices have had to be dropped when there were not full details of branch surgery postcodes or grid references).

There are two main approximations which affect these estimates of distance to practice and the numbers who are registered with their nearest practice. The first was introduced because the project lacked details on practices at the margins of the particpating HAs. These were either practices that had patients registered with the HAs, but whose details did not appear in the

medical directories, or practices that had no registrations with the authorities, but were sufficiently close to the authority boundaries to be potential choices for people living within the boundaries. In both cases, the practice postcodes could not be obtained from medical directories and were extracted from a national file of practice postcodes used in an earlier phase of the project. The information from this national file was of a lower quality than that from the medical directories. It was considerably older (lacking details of any changes since early 1995) it has no information on branch surgeries, and does not always distinguish practices with the same postcode. Having to work with these data will tend to underestimate the availability of practices and inflate the estimate of the number of people for whom their own practice is the nearest.

The second approximation was necessary to reduce the computational burden of calculating the distance from every available practice to the grid references (based on the postcode) of each of the 850000 people in the data set in order to establish which is the nearest practice. Instead of computing the distance from every residential postcode, the nearest practice was taken as the one closest to the centroid of a person's electoral district. This approximation should have fewest implications in urban areas with geographically small EDs; though these are also the areas with the smallest distances between practices. In sparser populated areas with larger EDs it may tend to inflate the distance to other practices and increase the proportion for whom their own appears to be the nearest practice.

The scale of these effects is unknown, and as they operate in opposite directions it is difficult to comment further on the reliability of the figures for the proportion of people registered with the nearest practice. However, the difference between the distance to the current practice and the distance from the centroid of the patient's ED to the nearest practice - the approximate measure of the practice nearest to the patient's home - is often no more than the width of an ED. These differences in distance are summarised in Table E4 where it can be seen that for just under half the people (48.5%) whose own practice is not the nearest, the distance between the nearest surgery of their own practice and the practice nearest to the centroid of their ED is less than 500 metres. Because this is less than the width of many EDs, the estimates will be sensitive to the method of calculation and the related approximations. Although the present data makes it possible to estimate the scale of any effects by recalculating the distances from individual postcodes rather than ED centroids this would be a major exercise beyond the scale of the original project.

Table D4: ***Distances from patient's postcode to the nearest surgery of their current general practice***

Distance	**Patients with this distance to nearest surgery of current practice**			
	Doncaster	**Rotherham**	**Kingston & Richmond**	**All 3 HAs**
	%	**%**	**%**	**%**
under 250 metres	34.6	28.2	35.0	32.9
250-499 metres	12.1	10.7	22.2	15.6
500-749 metres	8.7	10.1	13.8	11.1
750-999metres	6.1	7.5	7.1	6.9
1000-1499 metres	7.3	10.6	9.6	9.2
1.5 and over	31.2	32.8	12.2	24.3
N (All patients whose own practice is not the nearest)	170266	155892	207502	533660

APPENDIX F

Supplementary Tables

Table F1: ***Characteristics of individuals and their former practice used to distinguish those who will, and will not, leave a practice without change of address: results of analyses using Jarman index and separate components***

	Discriminant analysis		Discriminant analyses	
	1	2	3	4
	Corr. between vars and discrim fn	Ranking of corrs in col. (1)	Corr. between vars and discrim fn	Ranking of corrs in col. (3)
Practice size	-.78	1	-.77	1
Surgery opening hours	.-39	2	-.38	2
Patient's age	-.31	3	-.30	3
Distance to prev practice	.24	4	.24	4
No. of types of clinic	-.23	5	-.22	5
Practiceis in a TPP	-.22	6	-.21	6
Average age of GPs	-.04	7	-.19	7
Patient's gender	.06	8	-.18	8
Average GP gender	-.11	9	-.11	12
Jarman score patient's ED	.06	10	x	x
Practice is a std. fundholder	-.06	11	-.06	16
Proportion in ED with long-standing illness	-.04	12	-.04	18
Practice is in a multifund	-.04	13	-.04	19
Proportion moving into LA in past year	x	x	.13	9
Prop born in New Commonwealth	x	x	.17	10
Prop lone parent h/holds	x	x	.11	11
Proportion under 5s	x	x	.08	13
Prop of lederly living alone	x	x	.07	14
Proportion with no car	x	x	.07	15
Proportion overcrowded	x	x	.06	17
Prop with long-standing illness	x	x	.04	18
Proportion in SClass IV & V	x	x	.03	20
Proportion unemployed	x	x	.02	21
Prop lacking amenities	x	x	.02	22

Table F2: ***Characteristics of individuals and their former practice used to predict who will leave a practice without change of address: results of logistic regression analyses using Jarman index and separate components***

	Logistic regression		Logistic regression	
	1	2	3	4
	Wald value	**Ranking of Wald**	**Wald value**	**Ranking of Wald value**
Practice size	-.78	1	1865.5	1
Diatnce to previous practice	.-39	2	705.4	2
Patient's age	-.31	3	545.5	3
Surgery opening hours	.24	4	129.1	7
Patient's gender	-.23	5	193.4	4
No. of types of clinic	-.22	6	69.4	8
Practice is in a multifund	.06	7	187.5	5
Jarman score patient's ED	-.11	8	x	x
Practice is in a TPP		9	43.5	9
Practice is a std. fundholder	.06	10	13.4	17
Average GP gender	-.06	11	30.8	11
Proportion in ED with long-standing illness	-.04	12	1.9	21
Average age of GPs	-.04	13	2.2	20
Proportion moving into LA in past year	x	x	27.2	13
Prop born in New Commonwealth	x	x	1.4	22
Prop lone parent h/holds	x	x	33.8	10
Proportion under 5s	x	x	20.4	15
Prop of elderly living alone	x	x	22.0	14
Proportion with no car	x	x	0.22	23
Proportion overcrowded	x	x	14.3	16
Proportion in SClass IV & V	x	x	7.1	18
Proportion unemployed	x	x	.045	24
Prop lacking amenities	x	x	29.6	12

Table F3: ***Transfer rates by age and practice purchasing type - proportion of people aged 65 and over in these groups transferring - Doncaster***

	Proportion of 65 years olds and older amongst those transferring into these practices:		
	after changing practice without change of address	**after moving into the HA**	**after change of address with the HA**
Non-fundholder	.0963 n=3127	.0592 n=5606	.0716 n=4863
Std fundholder	.1000 n=2161	.0517 n=4800	.0677 n=4786
Part of multifund and /or TPP	.0909 n=11	.0642 n=109	.1250 n=8
All types	.0978 n=5299	.0558 n=10515	.0697 p=9657

Table F4: ***Transfer rates by age and practice purchasing type - proportion of people aged 65 and over in these groups transferring - Rotherham***

	Proportion of 65 years olds and older amongst those transferring into these practices:		
	after changing practice without change of address	**after moving into the HA**	**after change of address with the HA**
Non-fundholder	.0855 n=2829	.0655 n=4581	.0795 n=3107
Std fundholder	.0680 n=2103	.0505 n=3126	.0804 n=2650
Part of multifund and /or TPP	.0444 n=135	.0479 n=584	.0607 n=445
All types	.0772 n=5067	.0586 n=8291	.0785 p=6202

Table F5: ***Transfer rates by age and practice purchasing type - proportion of people aged 65 and over in these groups transferring - Kingston & Richmond***

	Proportion of 65 years olds and older amongst those transferring into these practices:		
	after changing practice without change of address	**after moving into the HA**	**after change of address with the HA**
Non-fundholder	.1294 n=2542	.0465 n=9589	.0957 n=2799
Std fundholder	.1593 n=1965	.0375 n=6428	.0994 n=2072
Part of multifund and /or TPP	.1528 n=4345	.0395 n=20898	.0914 n=5799
All types	.1475 n=8852	.0410 n=36915	.0941 p=10670