

The influence of rurality and remoteness on the provision of Primary Medical Services in Scotland

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Abstract

The influence of rurality and remoteness on the delivery and utilisation of primary health care has attracted little research, despite having a considerable prominence in policy and NHS funding in Scotland. In this paper we review the literature on defining rurality and remoteness and their effects on health care and health policy. We then present comparisons of the current features of primary care, and accessibility (in terms of need-adjusted utilisation) and patient satisfaction, between urban and rural areas in Scotland.

We find significant differences in many structural variables. Practices in very remote areas are generally smaller and are more likely to have vacancies, be staffed by male and older GPs, and have salaried contracts than in urban areas. There is a two-fold difference between urban and remote areas in the number of GPs per capita and a more than two-fold difference in total payments for the most remote group. Despite these additional resources, populations in remote and rural areas still face higher access costs. Populations in accessible rural areas are older but enjoy better health status and less material deprivation than in urban areas. In remote small towns and rural areas, the population tends to be older still, and there is some evidence that their health is less good and their deprivation more pronounced than their more accessible counterparts. Controlling only for demographic differences, people in rural areas visit their GP significantly less often. However, when we control for health and economic status, we find that people in very remote areas have significantly more visits. People report higher satisfaction with their GPs outside of the primary cities, particularly in the more accessible rural areas.

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1 INTRODUCTION

Equity in health and health care is a key policy objective in the UK. Much of the literature on equity focuses on socio-economic status. There has been relatively little research on equity with respect to rurality and remoteness, yet these factors have profound effects on the supply of health care services.

Ensuring access to good-quality primary care services is a key component of comprehensive health care systems such as the NHS. Primary care has a pivotal role in using resources in an equitable and efficient manner to maintain and improve the health of local populations. For instance, it has an important role in minimising the risk of premature mortality and in managing chronic or minor acute conditions in the community to avoid unnecessary contact with secondary care services.

Rurality and remoteness are explicitly taken into account in the allocation of hospital and community health service resources in Scotland (but not England). The workload formula in the new GMS contract is different in Scotland than in England but both include adjustments for rurality. In both cases adjustments are based on differences in expenditure per capita resulting from the previous payment system. Little is known, however, about how rurality affects costs, whether the adjustments are appropriate or whether there are important relationships between health and place of residency.

One of the inevitable consequences of remoteness, restricted geographical access to services, is increasingly recognised as an aspect of deprivation. For example, the Indices of Deprivation that have been produced by a research team at Oxford University for all countries within the UK include a domain to reflect access deprivation.¹ Access to general practice surgeries is one of the variables included in the domain. However, despite its new prominence, little is known about the health consequences of reduced geographical access to services.

The effects of rurality and remoteness are of particular interest in Scotland, where the landmass is approximately 60% of that of England, whilst the population is one-tenth. Thus, much of Scotland is sparsely populated; 32% of the Scottish population live in settlements of less than 10,000 people. There is therefore much variation in rurality and remoteness within Scotland to be explored.

Dispersed populations pose a problem for healthcare planners. Inputs to the production of health care are not perfectly divisible. In concentrated areas it is possible to be flexible about the number, size and location of delivery points if the effects within the possible range of access costs are judged to be low. In sparse areas, planners must decide where to locate delivery points of a minimum possible size. For example, while the average GP in Scotland is responsible for 1,390 patients, there is a full-time GP on North Ronaldsay caring for just 70 people. A better understanding of the association between geographical location of residence and the provision and utilisation of primary medical services is a major objective of this study.

Variations within remote and rural areas are also of interest. In contrast to North Ronaldsay, there is no practice on the island of Raasay. The 192 residents travel by ferry to Skye and on to multi-partner practices either in Portree (16 miles) or Kyle of Lochalsh (19 miles). These arrangements involve high costs to residents both in terms of travelling time (the ferry departs hourly) and cost (~£5 per trip). Evaluating the outcomes of these arrangements, and comparing them both within and between urban and rural areas, may offer important insights into the provision of primary care services in Scotland.

This paper reports on the first eighteen months of a PhD Studentship examining the influences of rurality and remoteness on primary care in Scotland. The aims of *the studentship* are:

- ## To review literature for the definition and measurement of remoteness and rurality, and thus to identify the most appropriate definition for this study
- ## To describe the characteristics of practices providing primary health care to the population in rural and remote areas of Scotland
- ## To describe the characteristics of patients served by rural and remote practices
- ## To compare the provision of primary health care across practices categorised by their degree of remoteness and rurality
- ## To examine variations in health status, patients' satisfaction, premature mortality and selected morbidity in urban-rural areas of Scotland, and consider factors that may be related to these variations.

This paper reports on four key elements of the project: (I) a review of the literature on how rurality is defined and measured, its influence on health care services, and its policy implications in Scotland; (II) a brief description of the framework that will be adopted for analysing relationships about remoteness/rurality; (III) a comparison of the structural characteristics of rural and urban general practices using national datasets; and (IV) an analysis of the equity of GP service use across rural and urban areas.

The structure of the paper is as follows. Part 2 of the paper reviews the literature on rurality. Part 3 deals with the conceptual framework of the study. Part 4 describes and compares the characteristics of general practitioners, practices and the population served in rural-urban areas of Scotland. Part 5 examines differences between rural and urban areas in GP contact rates and patients' satisfaction for 42,700 respondents in the Scottish Household Survey (1999-2001). Part 6 summarises the findings and suggests ideas for future research.

2 LITERATURE REVIEW

This review has three sections. The first section considers how rurality is conceptualised and defined – a key stage in formulating this research. The second section discusses research studies that have examined the influence of remoteness and rurality on the provision of health care. The final section summarises policy responses to remoteness and rurality in Scotland.

Literature published between 1986 and 2003 was gathered using 'rural', 'general practice', 'family practice', 'remote', 'access', 'distance' and 'primary care' as search terms. The following electronic databases were searched: Medline, Social Science Citation Index, EMBASE, CINHALL, and we searched five leading journals in more detail: Journal of Health Economics, Health Economics, British Journal of General Practice, Journal of the American Medical Association, and The Lancet.

2.1 Measurement of rurality

Authors from various fields have debated the nature of rurality for the last five decades.²⁻⁹ This discussion has mostly taken place between geographers and sociologists.¹⁰ The discussion of definitions of rurality is relatively new in health-related research,¹¹⁻¹⁶ and has been largely neglected compared to other specialties.¹⁷ The different ways that rurality has been defined by scholars indicates considerable heterogeneity in understanding the concept of rurality.

There is no single, internationally, accepted definition of the term 'rural'. Rurality is hard to define because it is not a single phenomenon but a complex issue⁷. As a result, definitions adopted have depended on the objective of the study, and have varied from very subjective assessments¹⁵ to indices formulated using different variables believed to capture major 'rural' characteristics.¹⁸⁻²² Most scholars emphasise that rural areas are not homogeneous, instead they consist of a wide range of communities.

However, to examine associations related to rurality and remoteness requires a conceptually sound and explicit definition. Many studies in health care and other fields discuss services in rural areas without defining the concept. For example, in their review of rural mental health care and sociology, Bosak and Perlman²³ examined 178 articles and found 43% of them did not include a formal definition of rurality. This problem is not restricted to the research community but also afflicts policy-making, where different definitions of rurality have been used by different government ministries. In a study of general practitioner location, recruitment and retention, Ricketts and Johnson-Webb²⁴ reviewed articles published between 1993 and 1995 in the *Journal of Rural Health*. They found various definitions of rurality had been used and noted that policy makers in the US, be they in federal, state or local governments, had not been able to reach a consensus about how to define 'rural'. To some extent the task of developing a single, all-purpose definition may be neither feasible nor desirable.⁵ The most appropriate definition depends on the purpose of the study, as each definition has its own attractions and limitations.

The degree of urbanisation, population density and sparsity, and distance from major metropolitan areas, are some of the factors that have been used to define rurality. Economic criteria (e.g. land-based activities and dependence on agriculture), social and demographic criteria (e.g. population size), geographical criteria (e.g. remoteness from urban and mainland settlements) and other criteria have also been adopted (see appendix A for examples of rural definitions used in Scotland based on these different characteristics).

Generally, definitions of rurality can be grouped into two broad categories, depending on whether they include single or multiple variables to classify areas. The main criticism of using a single variable is that it does not capture the multifactorial nature of rural areas. An example of the multi-variable approach to defining rurality is that of Cloke²⁵, and Cloke and Edwards²⁶, in England and Wales. Eight variables representing transport, social class and asset-holding characteristics taken from the census were combined using factor analysis. Urban areas, however, were excluded, so this definition is actually a measure of the degree of rurality in places already considered to be non-urban, rather than a general classification of areas according to their degree of rurality/urbanity.

Another important consideration when defining rurality is the number of strata within the classification. In some cases, areas considered to be non-urban have been classified as rural.²⁷ This approach, however, tends to include suburbs within the rural category and it has been argued that this does not reflect the true nature of areas because '...rural cannot be defined as non-urban, and underserved does not necessarily mean rural'.²⁸ More than two categories are required to reflect the diverse nature of rurality.

Population density is often used as a measure of rurality.²⁹⁻³⁰ Being a continuous variable, it can be used to rank and compare geographical units, and create any number of strata. It is also transparent and easy to calculate. There are, however, two crucial considerations. First, the size of the geographical units, since variations in population density within areas are ignored if the units become too large. For instance, rural neighbourhoods within a large urban area may be missed (i.e., not be classed as rural).³¹ In practice, the size of geographical units used has varied considerably - the Oxfordshire Health Promotion Unit (OHPU) used parishes, while enumeration districts were used in Shropshire and electoral wards in Worcestershire Health Authority.³¹ Second, the cut-off points used differ from study to study. OHPU used a density of 3 or less people per hectare, Shropshire used 1.5 or less people per hectare and Worcestershire used 5 people or less per hectare as the cut-off.

Another major characteristic used to define rurality, has been distance from, or access to, services. Accessibility relates to the ability of residents in a particular area to get to, or be reached by,

relevant activities, services or facilities.² The distinction between *potential* and *revealed* access to health care has been studied widely³². Potential accessibility relates to the opportunity to use health care facilities, while revealed accessibility relates to the actual utilisation. The use of accessibility as a measure of rurality/remoteness, however, makes the definition service- and context-specific. Residents in one rural area may have a good access to a general practice surgery, whereas those in another rural areas may have relatively poor access. Furthermore, one, or both, area(s) may have poor access to hospital services. The Scottish Indices of Deprivation (SIOD) attempt to measure access to a 'core' set of services including a GP surgery or health centre, primary school, general store or supermarket, petrol station, community internet facilities, and a bank or building society.¹

Geographical space is said to be the principal constraint impeding access. The direct relation between proximity to surgery and utilisation has been studied,³³⁻³⁶ geographical information systems being used to calculate distance and travel times to nearest surgeries.^{32, 37-39} Nevertheless, using distance as a sole factor for access ignores the nature of roads.²⁹

A good example of a study that classified areas according to both rurality and remoteness was undertaken in Northumberland and Cumbria.¹² The proportion of the registered population living over three miles from the main practice surgery was used to define three categories of *rurality* – sparsely (>50% over three miles); intermediate (20% - 50%); and densely populated (<20%). A drawback of this approach is that it measures service configuration and access costs rather than rurality *per se*. The group also categorised the population according to travel times from the main practice to the nearest hospital with full A&E services (as a measure of *remoteness*). The Bartholomew's road network was used to calculate travel time. Practices with travel times of less than 20 minutes, between 20-30 minutes, and over 30 minutes were defined as least remote, intermediate and most remote, respectively. The nature of the roads was not taken into consideration. The results indicated that there is a moderate correlation between rurality and remoteness. The study, however, may have included some suburban practices in the densely populated rural areas, making its accuracy in reflecting the rurality of practices questionable. In addition, the definition of remoteness used distance from practices, not from patients' home. It is impossible to tell, therefore, how strong any correlation between rural and remoteness is.

In summary, the heterogeneous nature of what constitutes rural makes defining the concept in a single, universally applicable, standard definition very difficult, if not impossible.⁴⁰ Areas have to be classified as rural or remote in context with other proximate areas, and within the national context. It is a relative term; what is considered to be rural in one nation, say the UK, may be very different to that in other countries.

Although there has been no consensus about actual definitions, there is a consensus that rural and remote areas are different to urban ones, that these differences arise from a number of important elements, and that each element should be measured as specifically as possible depending on the task at hand. Rurality is inherently an area characteristic, reflecting the location and characteristics of groups of proximate individuals. Remoteness may be more individual or household specific and, depending on the purpose of the study, even service-specific. If one is interested in the effect of access on uptake then service-specific access costs may be most important. If one is interested in the effects of remoteness (generically defined) on comparative access to particular services, then measures of generic remoteness (such as access to large settlements) are probably more appropriate.

In this study we adopt the latest definition derived for Scotland, which incorporates both settlement size and remoteness. Boundaries of settlements are derived from the GROS postcode settlement index. A postcode with greater than 2.1 residential addresses per hectare or greater than 0.1 non-residential addresses per hectare is classified as urban. The GROS combines neighbouring urban postcodes that together contain more than 210 residential addresses to create a settlement. This is

equivalent to a population of 500. GIS information and drive time data are used to define ‘access zones’ around the large settlements. Eight categories are created (see table below).⁴¹

Travel time to nearest urban settlement	Settlement size (population)			
	>125,000	10,000-124,999	3,000-9,999	< 3,000
<30 minutes	Primary cities	Urban settlements	Accessible small towns	Accessible rural areas
30-60 minutes	-	-	Remote small towns	Remote rural areas
60+ minutes	-	-	Remote small towns	Very remote rural areas

This classification has a number of advantages and disadvantages. Since the geographical units are determined by settlement boundaries, there is no problem of averaging ‘rurality’ across administrative areas. However, the subsequent grouping of settlements limits its discriminatory power. Remoteness is defined by drive time rather than straight-line distance but areas are then grouped into relatively broad bands. The measure reflects ‘generic’ remoteness rather than service-specific remoteness so is more appropriate for comparative analyses of access to different services rather than the analyses of the relationship between access and use of a particular service.

2.2 The relationship between remoteness/rurality and health and healthcare services

A number of studies have examined the effect of rurality or remoteness on health care utilisation and health outcomes. The focus of these studies has ranged from availability and accessibility of primary care services to specialist care provision. Several studies from the UK have indicated that, while health is generally better outside urban areas, individuals living in more remote rural areas may experience worse health than those residing in more accessible rural areas.⁴²⁻⁴³ Remote rural residents in Scotland have been found to have more advanced disease at diagnosis and poorer survival from various cancers.⁴⁴ Similar results have been found in France⁴⁵ and the US.⁴⁶ Remoteness and geographical isolation has been linked with increased mortality from asthma⁴⁷. In the case of cerebrovascular disease, more rural residents die while getting to emergency services than urban counterparts (although the overall effect on mortality is low as urban residents are more likely to die subsequently while in hospital).⁴⁸

Other UK studies have indicated that more remote rural residents have a relatively high need for health care, which may be aggravated by the closure of hospitals and general practices, and with practitioners aggregating into large group practices⁴⁹. Rurality is associated with differences in the characteristics of GPs serving these areas, with fewer female GPs in rural areas leading to reduced choice for patients and poorer access to some treatments.⁵⁰

Population sparsity inevitably leads to higher unit costs through diseconomies of scale. The trade-off between diseconomies of scale and equity of access is a major challenge for healthcare planning in rural and remote areas. Several studies have highlighted that additional travel costs; limited access to training, consultancy and other support services; high unproductive time; and adverse effects on spouse’s occupation, availability of schooling and recreational facilities; are major challenges to health care delivery in rural areas⁵¹⁻⁵².

There is very little information about economies of scale in primary care. A few studies on hospital services have examined variations in costs in relation to the degree of rurality.⁵³⁻⁵⁶ A systematic review of the evidence on economies of scale in the provision of hospital services indicated that unit costs fall little beyond 600 beds. Quality (in terms of mortality) can sometimes, but may not always, be improved by increased volume, although concentrating services increases travel costs for patients and carers, affecting access and use differentially in different social class groups.⁵⁷

2.3 Policy responses to remoteness and rurality in Scotland

The issues raised by rurality and remoteness are recognised in NHS policy in Scotland as highlighted by the Acute Services Review:⁵⁸

“Equity of access for patients to services of a uniformly high quality is a continuing challenge for the NHS in Scotland given the nature of Scotland’s geography and the dispersal of its population....Not all can have high quality specialised services available on their doorstep” (Chapter 2, Paragraph 30).

Scotland’s formula for allocating health care resources to NHS Boards includes an adjustment for remoteness/rurality, in addition to the adjustments for demography and morbidity/life circumstances.⁵⁹ The adjustment for hospital services is based on analysis of variations in costs between the twelve mainland Boards and the three island Boards combined. Cost was found to be strongly related to one indicator (road kilometres per capita), which was used to make the remoteness/rurality adjustment. The adjustments for the island Boards were almost 30% above the national average. Several of the mainland Boards with a substantial proportion of their population living in remote and rural areas (Borders, Dumfries and Galloway and Highland) required additional resources per capita of between 7.5% and 10%. Relative to a per capita allocation, the Scottish formula for hospital, community health services and GP prescribing redistributes 1.5% of the total budget between NHS Boards on the basis of rurality/remoteness, while 1.3% and 3.5% are redistributed on the grounds of demography and morbidity/life circumstances, respectively.

In a commentary on primary care policy in Scotland, Ritchie⁶⁰ highlighted the issue of remote and rural areas. He noted a number of policy reviews and initiatives (including nurse practitioners, enhanced telemedicine, training, Managed Clinical Networks, and publication of quality standards) and concluded that urgent reform was required.

Until April 2004, General Medical Services were funded through a national payment system – the Statement of Fees and Allowances (‘Red Book’). This system included a bewildering array of payments including allowances, capitation payments, fee-for-service elements, and (partial) cost reimbursements. Most of the payment streams have indirect implications for the distribution of resources between urban and rural areas. Three of the payments, however, have more direct consequences. First, capitation payments were enhanced by Rural Practice Payments. Practices were eligible to receive additional payments for patients that lived more than 3 miles from the surgery if this involved travel outwith conurbations. Payments were made in proportion to the distances travelled, with additional weightings for travel by footpath or over water. Second, some practices were identified as ‘inducement practices’, for whom the national payment system would not deliver sufficient income. These practices were paid 82% of average income, regardless of their entitlement to payments under the SFA. Third, the Chapter 10.5 transitional payments scheme, which was originally introduced for just three years in 1990 to protect the income of practices that lost out when the Scottish Rural Practices Fund was abolished.

In addition, practices were able to apply for Personal Medical Services contracts from 1998. GPs became salaried employees of the local NHS Trust and, when the scheme was rolled-out, priority was to be given to deprived and remote/rural areas. A further system for incentivising location in rural areas was introduced in 2001 in the form of ‘golden hellos’, whereby new GPs joining remote and rural practices received a one-off payment of £5,000.

From April 2004, the SFA has been replaced with a new GMS contract, which includes funding for workload, achievement of quality standards and provision of national and local enhanced services. The formula for General Medical Services estimated as part of the Arbutnott Review forms the basis of the workload formula for the new GMS contract. This Scottish Allocation Formula (SAF)⁶¹ includes a weighting for remoteness and rurality based on analysis of variations in GMS payments between practices. Population density (hectares per resident) and sparsity (the percentage of the population living in settlements of less than 500 residents) in the local area and the percentage of the practice population attracting road mileage payments were found to be significantly associated with payments per capita. These three variables are used to weight the notional practice lists. The remoteness and rurality adjustment is the largest weighting. The adjustments for demography and

deprivation redistribute 1.1% and 3.8% of the total budget between practices, while the remoteness/rurality adjustment redistributes 5.0%. There is no specific adjustment for scale so smaller practices will only receive additional resources if they have remoteness/rurality characteristics that attract additional weighting. In the short-term, resources for individual practices will be protected by the *Minimum Practice Income Guarantee*.

3 FRAMEWORK FOR THIS STUDY

In this section we provide an overview of the framework that will be adopted to analyse the influence of rurality and remoteness on primary medical services.

We begin with a health equation:

$$h_{ij} \mid h(x_{ij}, q_{ij}, z_j) \quad [1]$$

in which h_{ij} is the health of individual i in area j , which is a function of individual characteristics (x_{ij}) and area characteristics (z_j). We highlight one particular individual-level variable which is the consumption of health care (q_{ij}). For simplicity we do not add subscripts for time though these are clearly important since health care consumption may influence health with a lag and it is more conventional to specify the health production function as a stock that depreciates through time.⁶² However, for the purposes of this framework this is an unnecessary complication.

The literature review indicated that rurality and remoteness should be specified in different ways. Rurality is an area characteristic since it generally relates to aspects of geographical space occupied by (usually) more than individual. Remoteness on the other hand may be viewed as being a more individual characteristic (which may be service-specific).

Rurality/remoteness may enter the health function directly or influence it indirectly through its structural components. We prefer to assume it does not enter directly, since this implies some influence that we cannot explain structurally. In empirical work we can test the specification of the model by including rurality directly and test for unspecified structural effects.

Health care is the specific focus of this study so we treat the other components in [1] as potentially confounding covariates. We can specify that the consumption of health care depends on supply and demand factors.

$$q_{ij} \mid q(d_{ij}, s_{ij}) \quad [2]$$

in which d_{ij} is demand and s_{ij} is supply.

A notable behavioural model of the utilisation of health care was developed by Andersen and Newman.⁶³ Demand was specified as a function of *predisposing* (age, health beliefs), *enabling resource* (socio-economic status, employment, education) and *need* (chronic illness, general health) characteristics. Using this categorisation of influences, we can specify the demand function as:

$$d_{ij} \mid d(p_{ij}, e_{ij}, n_{ij}) \quad [3]$$

in which p_{ij} are the predisposing, e_{ij} the enabling resource and n_{ij} the need factors. The model was extended to include aspects of urbanisation by Verheij.⁶⁴

Rurality and remoteness are also likely to influence supply conditions. There is an obvious influence through distance and travel times, which thus affect both, monetary and time costs of accessing care (and associated net benefits). But there may be other influences. The characteristics of rural/remote areas vis-à-vis urban areas will appeal to different types of individuals. With respect to population, this is most appropriately seen as a x_{ij} variable – sometimes referred to as the *compositional* characteristics of areas. But these selection effects will also influence the workforce.

If age influences preferences for working in urban/rural areas, and the quality of care or willingness to work long hours, then (quality-adjusted) health care consumption will vary between rural and urban areas. We therefore need to compare the characteristics of service providers that are associated with volume and quality across urban-rural areas. In addition, our literature review has shown that remoteness and rurality has a multitude of direct and indirect influences on the level of resources available.

We can specify the supply equation as:

$$s_{ij} \mid s(a_{ij}, v_j, \phi_{ij}) \quad [4]$$

in which a_{ij} are access costs, v_j is the volume of input to local area and ϕ_j the characteristics of the inputs to the local area. Since there is fixed capacity in the local area, the access costs to an individual will depend on the demand of all other individuals in the local area. We should therefore take account of competing demands on local supply in calculating supply measures for the individual.

This brief discussion of a framework for the study demonstrates the need for clarity in the analysis. We have proposed that the care provided to individuals influences their health, and that rurality and remoteness may influence various aspects of the care provided through both demand and supply-side considerations. We intend to adopt a Structure-Process-Outcome approach in which good structure increases the likelihood of good process, and good process increases the likelihood of good outcome.⁶⁵ Structure captures the attributes of the settings in which care is delivered, including material (e.g. equipment), human (e.g. number of GPs) and organisational (e.g. reimbursement method) resources. Process includes activities of people in seeking care and practitioners' activities in making a diagnosis and recommending or implementing treatment. Outcome represents the effects of care on the health status of the population.

Thus far, we have not linked the elements of this framework in one analysis. In the next section we compare structural aspects of Primary Medical Services between urban-rural categories – an analysis of how rurality affects [5]. In the proceeding section we analyse the utilisation of, and patient satisfaction with, GPs. We can consider demand-side factors but are not able to link with supply-side factors. We therefore include the urban-rural classification (r_j) as potential determinants of utilisation and satisfaction:

$$q_{ij} \mid q(d(p_{ij}, e_{ij}, n_{ij}), r_j) \quad [2a]$$

At this stage therefore we can only speculate as to whether any estimated effects of r_j may be caused by the observed differences in structure.

4 SALIENT FEATURES OF PRIMARY MEDICAL SERVICES STRUCTURE IN URBAN-RURAL AREAS

Key structural characteristics of primary medical services in urban-rural areas are compared in this section. These include characteristics of general practitioners, practices and the populations served. The focus is restricted to variables from national datasets to ensure 100% coverage of Scottish practices.

4.1 Data sources

General Practitioners

Data were obtained from the October 2002 GP Census maintained by ISD Scotland. We analysed the gender, age and contracted time commitment of all principals. GPs can hold full-time, three-quarter time, half-time or job-share status. We calculated whole time equivalents (WTE) using a standard set of assumptions: “full-time” = 1; “three-quarter time” = 0.69; “half-time” = 0.60; and

“job-share” = 0.65 each.⁶⁶ We included posts that were vacant in the GP numbers but excluded them in the analysis of GP characteristics.

Practices

We aggregated the GP file to practice-level to examine a number of practice-level variables, including the partnership size and the availability of a female practitioner. We also analysed the payments made to practices in the 2002/3 financial year. Data were not held centrally on payments for Personal Medical Services practices and, having calculated PMS participation rates, these practices are excluded from the payments analysis. We also excluded practices that were not open for the entire financial year and calculated payments per capita on the basis of the registered list.

Populations

Age and gender compositions of the populations served were obtained from practice registrations. Health status information was not available directly for practice populations but could be attributed from geographical information. We obtained three health measures for each of the 42,604 Scottish Output Areas (OA): Standardised Mortality Ratios under 75 years (SMR<75), Standardised Illness Ratio (SIR), and Standardised Not-Good General-Health Ratio (SNGR). The SMR<75 was based on 2001 Census populations and deaths in a five-year period (October 1997 – September 2002). The SIR was based on responses to the limiting long-term illness question in the 2001 Census. The SNGR was based on the three-category (‘good’, ‘fairly good’ and ‘not good’) census question about self-assessed general health. We indirectly-standardised for age and gender and centred each of the measures on 100.

We also obtained four deprivation measures for each OA from the Census: persons in households with no access to a car (percentage), persons in high-occupancy households (percentage), standardised unemployment rate (ratio), and the standardised rate of no formal educational qualifications (ratio). Both ratios have a mean of one. These smallest geographical units are believed to be more sensitive to rural areas than the standard area-level indicators that are based on postcode sectors.⁶⁷

Urban-rural classification

The eight-fold urban-rural classification is available as a postcode lookup file. Each OA was assigned to one of the eight urban-rural categories. Only 660 (1.5%) OAs contained postcodes in more than one category and these were assigned to the modal category based on 2001 populations.

The classification of practices was less straightforward. Practices can be categorised on the basis of the postcode of the main (or branch) surgery, or on the postcodes of residence of the registered populations. While the latter seems more appropriate, each practice is likely to contain a mix of patients in different categories. Using an extract of the registrations file as at September 2002, we calculated the proportion of each practice’s population in each category and assigned the practice to the modal category.

The different classifications of areas and practices mean that the populations and their characteristics are not strictly attributable to the practices. In particular, population counts will differ for three reasons: (i) the Census populations relate to private residents only; (ii) entire practice populations were assigned to the modal group; and (iii) practice registers generally contain more persons than are enumerated at the Census.⁶⁸

4.2 Analysis

We calculated mean values of the variables for each of the eight urban-rural categories and tested for statistical significance in observed variations using regression models with the Primary Cities as

the reference group. We ran ordinary least square models for continuous variables, probit models for binary variables, a multinomial logit model for the age distribution of GPs and a negative binomial model for the count of the GPs in each practice. We present the overall significance of the model and the significance of each category compared to the reference group. Practice-level data were weighted by practice populations and robust standard errors were used throughout.

4.3 Results

Practitioners

There were 3,845 GPs providing primary medical services in Scotland in October 2002. Eleven practitioners (0.3%) could not be linked to the urban-rural classification and were omitted from the analysis. Fourteen percent of GPs were located in rural areas, serving 10% of all registered people in Scotland (Table 1). Seventy percent (2,681) of the GPs were practicing in primary cities and urban settlements serving 74% (4.0 million) of the registered population. There are 73 GP vacancies and significant variations in their distribution across urban-rural categories. Ten (6.5%) of the principal positions in remote rural areas were vacant, compared with about 2% in urban areas. The proportion of GPs with full-time contracts tended to be similar across the eight categories (roughly 80%) except in remote small towns, where there was a slightly lower percentage (70%). A smaller percentage of GPs practicing in rural areas were female (the percentage fell from 44% in the Primary Cities to 31% in the rural areas). Seventy-two percent of GPs were within the age range 35-54 years. In the very remote rural areas, the percentage of GPs older than 54 years (19.4%) was higher and the percentage aged less than 35 years (9.7%) lower than in other areas, although none of the differences were statistically significant.

Practices

There were 1046 practices, of which 103 (9.8%) were Personal Medical Services (PMS) practices. Practices in the very remote categories were more likely to be PMS. The mean partnership size ranged from 3.5 in primary cities to 1.7 in very remote rural areas. There was a decreasing trend in the number of partners as remoteness in rural areas increases. This agrees with the observation that 61% (57) of practitioners in very remote and 30% (13) of practitioners in remote rural areas are single-handed. Of the 184 single-handed practitioners in Scotland, 46% are practicing in rural areas.

Rural practices had higher WTE of GPs per 1000 population than urban areas, which rose with the remoteness of rural areas (to 1.221 per 1000 in very remote rural areas). Overall, payments per registered person tended to rise with increases in rurality and remoteness; and these differences were statistically significant. Practices in remote rural areas received £162 per capita compared to £71 in primary cities. These practices received more on a per capita basis for all types of payment except deprivation payments. Deprivation payments in primary cities were £2.51 per capita. Practices in very remote rural areas received £61.85 per capita in specific rural payments.

Populations

The figures on resident populations indicated that approximately 68% (3.4m) of the total population live in primary cities and urban settlements (table 2). Rural populations amount to 18% (0.92m) of the Scottish population, dispersed across the three rural categories. The registered population was 7.3% (360,884) higher than the 2001 Census population in private residences. This varied considerably across urban-rural categories. In accessible rural areas there was an almost 50% difference between the private resident populations and the registered populations. This may reflect the tendency for populations in accessible rural areas to be registered with practices in larger settlements where they represent a minority of the registered population.

Rural areas had higher numbers of older people (65+) and this tended to increase with remoteness in rural areas. Compared to primary cities, rural populations consisted of more older (>65 years) and more younger (<15 years) persons, and a lower percentage of females.

The three ill-health measures were highest in cities and urban settlements. Differences between geographical groups were largest for SMR<75 and smallest for SIR. Deprivation measures were also highest in the cities except for the absence of formal qualifications, which was slightly higher in remote and very remote small towns. Rural residents tended to have the lowest mean levels of deprivation on all four indicators except unemployment, which was higher in very remote rural areas than in accessible small towns.

5 GP CONTACT RATES AND PATIENT SATISFACTION

In this section we examine equity of primary medical services use across urban-rural areas. Previous studies on equity of access and use of services have tended to focus on socio-economic status and ethnic differences of the population studied.⁶⁹ There have been relatively few studies of rural-urban differences in the use of primary medical services.

In the primary care setting, where more than 90% of the first contact takes place, the frequency of GP use and the level of individual's satisfaction with such services may be indicative measures of equity in access and process. Measuring equity, however, is far from straightforward. Self reported morbidity and use of services are used as proxy measures of equity due to the difficulties in determining precisely the health status of the population.⁷⁰ Variations in the use of primary medical services by individuals with the same level of need for care are interpreted here as an indication of inequities in access.

5.1 Data source

Data from 42,543 respondents in the Scottish Household Survey (1999-2001) were used to examine variations in service utilisation and satisfaction. The survey involved face-to-face interviews with a householder or the spouse/partner of a householder (part 1) and one of the adults in the household (the random adult) was randomly selected to complete the second part of the questionnaire.⁷¹ The first part deals with topics such as household composition, housing and tenure, the vehicles available to the household, the occupation and industry of the highest income householder, household income and housing costs. The random adult section deals with individuals' housing change, tenure change, neighbourhood problems, transport and use of public transport, public services, income and employment, health and GP visits.

Respondents were asked if they were registered with a GP or health centre and approximately how many times have they seen a GP or family doctor about their own health in the last year. This includes visits at home, at a surgery, or in a clinic. Respondents were asked for total numbers: none (21.1%); 1-2 (34.4%); 3-5 (20.8%); 6-10 (11.6%); 10 or more (12.1%). Respondents were also asked whether they were satisfied with their last GP visit. They are offered five possible categories: very satisfied (65%), fairly satisfied (27%), neither satisfied nor dissatisfied (2%), fairly dissatisfied (3%), and very dissatisfied (2%).

Regarding their self-reported health status respondents were asked a binary question:

"Can I just check, do you personally have any long-standing limiting illness, health problem or disability? By longstanding, I mean anything that has troubled you over a period of time or that is likely to trouble you over a period of time?"

Respondents were also asked for a self-assessment of their general health:

"Over the last 12 months would you say your health has on the whole been... good, fairly good, or not good?"

The economic status of the respondent was recorded in thirteen categories and we treated the full-time employed as the reference group. Respondents were also classified using the urban-rural classification, which was specifically designed for the Scottish Household Survey.

5.2 Method

The measurement of GP visits as a grouped count poses econometric challenges. We initially dichotomised the variable as zero for less than three visits and one for three or more visits and performed multivariate analysis using logistic regression. We compared this with count data models (assigning median values to the groups) and grouped data or interval regression models. The results are similar across specifications and we present the grouped data models here. In future work we plan to use appropriate grouped count models.⁷² Our basic model contains age, gender, and binary variables for the urban-rural classification only. We compared these results to a model also containing variables measuring health status and economic status. We then ran a parallel model for satisfaction with the last GP visit using ordered logistic regression. Analysis was undertaken in Stata v8.2 using robust standard errors and sampling weights from the survey.

5.3 Results

When we adjust for age and gender only, all of the remote and rural categories have fewer GP visits in the last year (Table 3 – Model 1). The rates are lowest and significant for the rural areas. As expected, age and being female exerted a positive influence on GP visits. Several of the *need* and *enabling* factors had a significant impact on GP visits (Table 3 - Model 2). Limiting long-term illness and poor self-assessment of health increased the likelihood of GP visits, although the interaction terms are less than zero. Most economic status groups had higher GP visits than the full-time employed, except the self-employed ($p=0.033$), those at school ($p<0.001$) and those in higher/further education ($p=0.006$). Those unable to work through permanent or short-term ill-health had particularly high numbers of GP visits. Respondents reporting that they were not registered with a GP had significantly lower GP visits, as expected. The inclusion of these additional factors has an important effect on the urban-rural categories. The very remote and the rural groups have higher GP visits than the Primary Cities, the categories are jointly significant ($p=0.031$), and the very remote groups have significantly higher visits.

The same set of variables also had significant effects on reported satisfaction with GP visits. Poor self-assessments of health were associated with less satisfaction although chronic health had no significant effect. Most economic status groups reported more satisfaction than the full-time employed, except the unemployed ($p=0.138$) and people on training schemes ($p=0.072$). Respondents that were permanently sick or looking after home/family, in particular, reported higher levels of satisfaction. All urban-rural categories reported higher satisfaction levels than the Primary Cities. This was particularly true of the rural areas, except the very remote rural areas where the coefficient is smaller and not significant. The coefficient is also smaller and insignificant for the very remote small towns.

6 DISCUSSION

Choosing a suitable urban-rural definition is complicated by the availability of various definitions. It is not feasible to have one standard definition that will meet the purposes of all studies and users. We reviewed the literature and selected the eight-fold typology derived for the Scottish Household Survey, which is believed to be more sensitive to rural areas. Based on this definition, we compared structure characteristics, access to GP use and satisfaction.

Significant variations are found in the structure of care, including the age and gender distribution of GPs. Practices in the very remote categories were smaller, received higher payments per capita and were more likely to be PMS.

Measuring equity of access across different areas using health services utilisation and self-reported morbidity data is limited but practical. This study used quantitative data to measure equity of access between urban-rural areas. Most previous studies have tended to focus on socio-economic differences in service use to assess equity. In addition to economic status, we included self-reported health and measures of rurality to examine equity of access to primary medical services. Age, gender, morbidity and economic status adjusted regression shows very remote populations visit their GPs more frequently than primary cities. We also examined the process of health care, using the satisfaction of service users with their GP interaction. People in less remote rural areas tend to be more satisfied with their last GP consultation.

A strength of this study was the universality of the coverage. It was based on national datasets with details about the characteristics of practitioners, practices, and populations. In examining the use of health care services and the satisfaction level of consumers, it used data from the Scottish Household Survey, which over-samples rural areas. This study also has several limitations that deserve mention. First, the measure of access to health care (GP visit in the last year) was based on respondents' reports and those self-reports were not validated against medical records or other sources. Second, we were limited by the nature of data available in the survey, including a lack of information on other known barriers to access, which would be desirable.

The next steps in the project are:

- ## to explore the relationship between distance and the use of health care;
- ## to compare accessibility of primary care with other core services, such as banks, general stores/supermarkets, work, and various community services;
- ## to assess the extent to which differences between urban and rural areas in health service use are explained by differences in population need, enabling and predisposing characteristics, with particular attention to the availability of services;
- ## to identify suitable process indicators and health outcomes to compare between rural-urban areas; and
- ## to measure rural-urban variations in the process of care and health outcomes and seek to explain them.

Feedback on the work so far and the planned future steps would be most welcome.

Appendix A: Remoteness and rurality definitions used in Scotland

Rural definitions used at different times in Scotland include the following:

A. Industry based definition

Rurality is defined based on the proportion of population employed in agriculture, the availability of urban settlements over 100,000 persons, and less than 50% of the population are in settlements of 10,000-99,999 population. This district level classification classifies a place as rural if at least 10% of the economically- active population employed in agriculture.⁷³

B. Population density

Local authority districts with a population density of less than one person per square hectare are classified as rural according to the Randall definition.⁷⁴ This definition lacks identifying rural areas that are located in predominantly urban districts (Arran and East Lothian) and considers as rural districts with significant urban populations (Stirling, Perth, and Inverness). Based on this definition 29% (about 1.5M) of the total population is defined as rural.⁷⁴

C. Postcode sector

Postcode sectors with a population density of less than 100 persons per square kilometre are defined as rural. The flaw with this definition is that small sectors with a concentrated population within a rural area are identified as urban

D. Accessibility

The degree of isolation and accessibility are used to define areas rurality. Towns in rural areas are identified first to become a base for a variety of services to neighbourhood areas. Areas with a population between 5,000 and 10,000 were identified as market towns. The next stage was to see their access to different public services, such as GP surgeries, post office, primary schools, banks and petrol stations. To determine degree of accessibility a maximum of 10 minutes drive time was considered as a threshold. Market towns have 5-10,000 populations and are within 10 minutes drive from such amenities. Settlements with less than 5,000 population and within 10 minutes access to such amenities are classified as accessible rural areas and those with more than 10 minutes drive are considered as inaccessible rural areas.⁷⁵

E. Accessibility, population dispersion, and settlement size

McCleery identified three indicators for rural and remote areas in the study of social and economic change in the Highlands and Islands. He defined population dispersion as a unit of area of land per person and settlement size as the percentage of population living in settlements of less than 1,000. Accessibility is defined as the minimum notional distance a person would require travelling to reach a calculated population centre of gravity. The major limitation of this method of defining rurality is that it is limited to specific type of rural area.⁷⁶

F. Population density, employment, and demographic structure

The Scottish Office identified five types of rural areas in mid nineties with distinct nature.⁷⁴ Areas are classified based on the proportion of the population engaged in agriculture, density and demographic structure of the population. *Remote rural* have scattered low population density with a high proportion of the population engaged in agriculture with a high level of dependence on benefits and deprivation. *Less remote rural* are areas with fewer people employed in agriculture, forestry and fishing and more in tourism. *Mixed urban/rural* areas have high population densities and high proportion in settlements (over 10,000). Small proportion is employed in agriculture and relatively has higher young population. *Remote settlement dominated* areas characterised with more young population and greater proportion of population live in settlements. Smaller proportions of in migrants are retired than the average in rural Scotland. *Prosperous high growth* are marked with high population growth (due to natural increase and in-migration), low levels of deprivation and dependence on benefit, low rates of long term illness and high male and female employment rate.

G. Drive time to amenities

In a study aimed to explore the social, economic and environmental impact of petrol stations in Scotland a simple definition of rurality is used. Areas are classified as peri-urban, rural, remote rural, and very remote rural. *Peri-urban* takes up to 30 minutes drive, rural (30-60 minutes drive), *remote rural* (1-2 hours drive), and *very remote* (more than 2 hours drive).⁷⁷

H. Rural practices payments

Rural practice payments are intended to compensate practices for the increased time spent in visiting patients living at a distance. It is based on the number of rural patients on the practitioner's list who live over three miles away from the practice. Differences in physical conditions, road quality and population distribution are some of the factors considered. Based on this criteria a place is said to be rural if more than one third of all patients on the GP practice list are classified as rural patients upon whom calculations for Scottish Rural Practice payments are based.⁷⁸

I. EU rural areas

Rural areas in the EU are defined as those with a population density of less than 100 people per square kilometre. These areas are inhabited by 17.5% of the total EU population, but account for over 80% of the total territory. Population density varies across the union from 5% of the national population in Belgium and the Netherlands to 50% in Finland and 67% in Sweden.⁷⁹

J. Settlement size and drive time

This urban-rural classification was devised by the Scottish Executive for the Scottish Household Survey. It is the definition adopted in this study and explained in the main text.

Table 1 Characteristics of GPs and practices by urban-rural categories

GP Characteristics ¹	Primary cities	Urban settlements	Accessible small towns	Remote small towns	Very remote small towns	Accessible rural areas	Remote rural areas	Very remote rural areas	All groups	p-value
Total number of GPs (%)	1,489 (38.8)	1,192 (31.1)	447 (11.7)	99 (2.6)	63 (1.6)	281 (7.3)	109 (2.8)	154 (4.0)	3,834	
GP vacancies	25 (1.7)	22 (1.8)	8 (1.8)	1 (1.0)	2 (3.2)	4 (1.4)	1 (0.9)	10 (6.5)	73	0.0364
Number of GPs >54 yrs old (%) ²	194 (13.1)	157 (13.4)	57 (12.9)	7 (7.1)	4 (6.6)	37 (13.4)	11 (10.2)	28 (19.4)	495 (13.2)	0.0462
Number of GPs <35 yrs old (%) ²	223 (15.2)	200 (17.1)	67 (15.3)	19 (19.4)	12 (19.7)	27 (9.8)	16 (14.8)	14 (9.7)	578 (15.4)	
Total WTE	1374.5	1099.4	413.0	87.5	56.7	256.7	98.7	136.4	3522.9	
Full-time GPs (%)	1200 (82.0)	963 (82.3)	364 (82.9)	69 (70.4)	48 (78.7)	220 (79.4)	81 (75.0)	123 (85.4)	3,068 (81.6)	0.0501
Female GPs (%)	641 (43.8)	426 (36.4)	159 (36.2)	35 (35.7)	21 (34.4)	85 (30.7)	35 (32.4)	44 (30.6)	1,446 (38.5)	<0.001
Practice characteristics ¹										
Number of practices	419 (40.1)	258 (24.7)	101 (9.7)	21 (2.0)	14 (1.3)	96 (9.2)	44 (4.2)	93 (8.9)	1046	
PMS practices (%)	41 (9.8)	20 (7.7)	6 (5.9)	3 (14.3)	4 (28.6)	7 (7.3)	5 (11.4)	17 (18.3)	103 (9.8)	0.0345
Number of registered patients	2,218,154	1,732,112	636,489	113,261	79,132	345,033	100,988	111,720	5,336,889	
Mean number of partners	3.55	4.62	4.43	4.71	4.50	2.93	2.48	1.66	3.65	<0.001
WTE per 1000 pop	0.620	0.635	0.649	0.772	0.717	0.744	0.977	1.221	0.660	<0.001
At least one Female GP (%)	333 (79.7)	230 (89.1)	83 (82.2)	18 (85.7)	10 (71.4)	61 (64.2)	26 (59.1)	38 (43.2)	799 (76.9)	<0.001
Single handed GPs (%)	71 (16.9)	15 (5.8)	12 (11.9)	0 (0.0)	2 (14.3)	14 (14.6)	13 (29.5)	57 (61.3)	184 (17.6)	<0.001
GMS payments ¹										
Capitation fees	£ 22.09	£ 22.04	£ 22.13	£ 21.75	£ 22.26	£ 22.15	£ 22.81	£ 22.61	£ 22.10	<0.001
Deprivation payments	£ 2.51	£ 0.84	£ 0.38	£ 0.70	£ 0.83	£ 0.16	£ 0.25	£ 0.32	£ 1.40	<0.001
Rural payments ³	£ 0.02	£ 0.52	£ 2.33	£ 5.24	£ 3.81	£ 6.13	£ 21.28	£ 61.85	£ 2.55	<0.001
Premises	£ 5.64	£ 4.09	£ 4.19	£ 3.64	£ 5.36	£ 5.23	£ 7.88	£ 6.95	£ 4.95	0.0043
Staff salaries	£ 15.57	£ 15.12	£ 14.77	£ 16.22	£ 18.79	£ 16.74	£ 18.79	£ 25.98	£ 15.70	<0.001
Allowances ⁴	£ 11.24	£ 11.36	£ 11.57	£ 13.38	£ 12.25	£ 13.37	£ 18.86	£ 27.84	£ 11.96	<0.001
Other payments	£ 14.21	£ 14.63	£ 14.86	£ 15.17	£ 14.62	£ 15.16	£ 17.24	£ 16.80	£ 14.62	<0.001
Total GMS Payments	£ 71.28	£ 68.59	£ 70.22	£ 76.11	£ 77.93	£ 78.93	£ 107.11	£ 162.35	£ 73.28	<0.001

¹ Bold figures, p<0.01 and italics p<0.05 Reference group: Primary cities

² Data for October 2002 GP census and GMS payments 2002-03 financial year obtained from ISD

³ Reference group: aged 35-54 years

⁴ Rural Practice Payments include - Inducement allowance and Chapter 10.5 Payments

Allowances include basic practice, designated are, seniority, assistant, night-visits associate, and locum allowances and Doctor's retainer scheme, leave payments, sickness, post grad. travel and subsistence.

Table 2 Characteristics of resident and registered populations by urban-rural categories

Population characteristics	Primary cities	Urban settlements	Accessible small towns	Remote small towns	Very remote small towns	Accessible rural areas	Remote rural areas	Very remote rural areas	All groups	p-value
Resident population ¹	1,936,312	1,467,319	521,546	77,938	53,061	642,797	141,341	135,691	4,976,005	
Female population (%) ²	50.4%	50.9%	50.8%	50.9%	50.3%	50.4%	50.4%	49.9%	50.62	<0.001
65+ years old (%) ²	15.0%	15.0%	15.8%	18.8%	17.3%	16.7%	19.8%	19.2%	15.48	<0.001
<15 years old (%) ²	15.9%	17.5%	18.2%	17.6%	17.6%	17.7%	16.9%	17.0%	16.94	<0.001
Mean distance from surgery ²	1.69	1.79	1.90	2.32	3.14	2.78	3.60	5.13	1.96	<0.001
Mean upper quartile distance ²	2.24	2.14	2.41	2.88	4.01	4.11	5.63	7.63	2.56	<0.001
Mean 90 th percentile distance ²	3.40	3.68	4.90	6.94	8.79	6.85	9.18	11.38	4.31	<0.001
Standardised Mortality Ratio <75 ^{1,3}	115	101	91	93	101	79	73	82	100	<0.001
Standardised Illness Ratio ¹	108	101	94	94	91	83	81	84	100	<0.001
Standardised Not Good Health Ratio ¹	117	100	90	87	82	75	70	69	100	<0.001
No access to car ¹	34.8	24.6	19.6	23.5	29.3	11.1	10.7	13.4	25.63	<0.001
Over-occupancy ¹	19.6	12.2	11	9.9	10.8	8	6.4	7.2	14.06	<0.001
Unemployment ratio ¹	1.237	1.142	0.959	1.085	1.128	0.784	0.905	1.059	1.000	<0.001
No qualifications ratio ¹	1.031	1.037	0.999	1.065	1.068	0.890	0.898	0.921	1.000	<0.001

¹ Source: Census data for Scotland 2001.

² ISD, Scotland, October 2002

³ GROS, Death Records, (October 1997 – September 2002)

Table 3 Relationship between geographical areas and GP contact rates, and patient satisfaction, based on data from the Scottish Household Survey (1999-2001)

Variable	Valid cases	Weighted mean	GP consultation Model 1		GP consultation Model 2		Satisfaction with GP use	
			Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Urban-rural classification ¹								
Urban settlements	43,929	0.39	-0.004	0.943	-0.023	0.581	0.027	0.384
Accessible small towns	43,929	0.30	-0.105	0.159	-0.015	0.794	0.100	0.028
Remote small towns	43,929	0.10	-0.223	0.150	-0.005	0.969	0.121	0.236
Very remote small towns	43,929	0.02	-0.021	0.902	0.274	0.032	0.043	0.639
Accessible rural areas	43,929	0.01	-0.267	< 0.001	0.074	0.173	0.204	< 0.001
Remote rural areas	43,929	0.13	-0.256	0.061	0.085	0.432	0.375	< 0.001
Very remote rural areas	43,929	0.02	-0.261	0.018	0.228	0.008	0.093	0.168
PREDISPOSING								
Female	42,983	0.549	1.046	< 0.001	**	**	**	**
Age	43,394	47.764	0.036	< 0.001	**	**	**	**
NEED ²								
Self-assessed health (SAH)								
Good	42,977	0.541						
Fairly good	42,977	0.314			1.997	< 0.001	-0.448	< 0.001
Not good	42,977	0.145			6.022	< 0.001	-0.522	< 0.001
With Limiting longstanding illness (LLSI) ³	42,976	0.226			1.680	< 0.001	0.002	0.984
LLSI and fairly good SAH	42,976	0.091			-0.076	0.602	0.072	0.465
LLSI and not good SAH	42,976	0.111			-0.513	0.009	-0.003	0.978
ENABLING ⁴								
Self-employed	42,983	0.048			-0.149	0.033	0.080	0.262
Part time employment	42,983	0.108			0.195	0.001	0.080	0.097
Looking after home/family	42,983	0.085			0.698	< 0.001	0.243	< 0.001
Permanently retired from work	42,983	0.248			0.625	< 0.001	0.171	0.004
Unemployed and seeking work	42,983	0.039			0.028	0.747	-0.101	0.138
At school	42,983	0.014			-0.758	< 0.001	-0.011	0.937
Higher/further education	42,983	0.035			-0.272	0.006	0.082	0.352
Government work/training scheme	42,983	0.002			0.122	0.712	-0.448	0.072
Permanently sick or disabled	42,983	0.051			1.206	< 0.001	0.353	< 0.001
Unable to work due to short term ill-health	42,983	0.007			2.521	< 0.001	0.175	0.155
Other	42,983	0.005			0.861	0.002	-0.044	0.795
Not registered with a GP					-1.093	< 0.001	-0.200	0.256
<i>Joint significance of rural</i>								
Sample size			42,753		42,752		34,116	
θ^2			$\theta^2(7)= 24.68$	$p<0.001$	$\theta^2(7)= 15.42$	$p= 0.031$	$\theta^2(7)= 38.07$	$p<0.001$

* Reference group: ¹ Primary cities; ² Self assessed health good; ³ No LLSI; ⁴ Full-time employed;

** Gender-age interaction included in the model but not shown in the table

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