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Measuring Access to Health Services: General Dental Services in Scotland

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Measuring access to health services: General Dental Services in Scotland

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Abstract

Objective Recently the issue of access to health services has been brought into sharp focus by clear evidence of rationing – patients queuing for NHS registration – in the NHS General Dental Services. Conventional estimates suggest that about 50% of adults are registered per annum. This paper demonstrates that these conventional measures of access and utilisation can generate potentially misleading inferences.

Design By analysing individual-level claims data from over 35,000 patients over 6 years we are able to: identify the underlying patterns of utilisation that generate the aggregate 50% registration rate; provide more detailed estimates of utilisation and access; and suggest possible determinants of the patterns of utilisation we observe.

Setting Primary Care

Results In contrast to conventional estimates of access we find that access to GDS in Scotland is over 80% over 6 years. Moreover, we find that the population is comprised of a relatively large group of patients (30% of the population) who access GDP services at least once a year and a substantial group (19% of the adult population) who access services only once in 6 years. The groups who access services at intermediate frequencies are less numerous.

Conclusions Assessing the effectiveness of the public provision of health care services requires accurate information regarding access to those services. This paper sets out a framework for analysing and interpreting longitudinal data to provide information on the extent of access to health care services.

1 Introduction

Ensuring access to health services is a key objective of health care policy. Access was a central component of both the recent Office of Fair Trading investigation into pharmacy services in the UK and the new GMS contract [1], [2]. Recently the issue of access has been brought into sharp focus by clear evidence of rationing in the form of patients queuing for NHS registration in the NHS General Dental Services [3]. The purpose of this paper is to assess the extent of access to the publicly funded General Dental Service (GDS) by adults in Scotland. A number of sources indicate that approximately 50% of the population of Scotland is registered with an NHS dentist at any point in time. This observation does not, however, provide evidence regarding the extent to which the stock of registered individuals changes over time and thus the observation of 50% of the population being registered is consistent with a broad range of patterns of access including either the same group of individuals accessing NHS dental services at least once every year, or a greater proportion of the population accessing services but doing so infrequently. In planning dental services and assessing the effectiveness of public provision, it is important to know which of the competing possibilities corresponds to the true position.

This paper demonstrates that conventional measures of access and utilisation can generate potentially misleading inferences. Using data on individual patients, observed over a six year period we are able to identify the underlying patterns of utilisation that generates the aggregate 50% registration rate and thus provide more detailed estimates of utilisation and access and suggest possible determinants of the patterns of utilisation we observe.

2 Method

In the context of NHS General Dental Services, contact with a GDP results in a *claim*. The source for our data is MIDAS@DHSRU, which is an anonymised dataset containing all NHS GDS claims in Scotland. Our analysis is based on a 1% random sample of patients for whom a claim is recorded at any time during the period January 1997 to December 2002. The sample consists of 35,863 patients for whom there are a total of 172,552 claims for treatment. Table 1 provides some descriptive statistics for this sample.

Table 1 shows, for example, that: the average age of a patient claiming for NHS dental treatment is 45; 57% of claims were made on behalf of female patients; and 79% of all courses of treatment had at least one 'diagnosis' claim.

Table 1: MIDAS@DHSRU descriptive statistics

Variable	Mean
Age	45
Male (%)	43
Received at least one diagnosis treatment (%)	79
Received at least one preventive treatment (%)	0.1
Received at least one periodontal treatment (%)	53
Received at least one conservative treatment (%)	44
Received at least one surgical treatment (%)	9
Received at least one prosthetic treatment (%)	9
Received at least one orthodontic treatment (%)	1
Fee nominal (£)	38
Exempt (%)	27

2.1 Conventional estimates of utilisation

In the analysis that follows we adopt a specific measure of utilisation. To conform with some of the previous empirical literature in this area and in order to ensure comparability across other data sets the empirical measure of utilisation we adopt is *participation*: whether an individual uses any General Dental Services at least once in a year.

Of the 35,863 patients in the sample Table 2 shows that about 52% participated in 1997 and about 47% participated in 2002. These figures correspond closely to the suggestion [4] that approximately 50% of the adult population is registered or receive treatment at any point in time.

Table 2: Aggregate participation rates per annum

Year	% receiving treatment
1997	51.51
1998	51.34
1999	50.03
2000	48.57
2001	48.14
2002	46.83

While useful in providing cross sectional information on the aggregate use of NHS dental services, Table 2 fails to exploit the underlying individual-level dynamic data that generates the aggregate data. In particular this table does not reveal whether the participants are the same individuals in each time period or an ever changing stock of patients. For example, an observed 50% participation rate is consistent with half the population receiving treatment every year and the other half never receiving

any NHS treatment but is also consistent with every individual in the population receiving treatment once every two years. In the first case there may be a substantial access problem in that half the population never sees an NHS dentist, whereas in the second case there is 100% access to NHS services, albeit at reduced frequency. From the perspective of planning and formulating policy towards the GDS these two cases are clearly substantially different.

In addition to these extreme examples there are a number of other configurations of individual participation behaviour that may generate an aggregate participation rate of 50%. To discriminate between these configurations, and thus be in a position to assess the effectiveness of services delivery, *longitudinal* or *panel data* are required which record individuals' participation histories over a (usually) relatively short time period.

2.2   The composition of utilisation using panel data

Our data source – MIDAS@DHSRU – permits the decomposition of the aggregate participation rates from Table 2 into each individual patient's pattern of participation over time. Table 3 illustrates the 7 most frequent patterns of participation in the GDS in Scotland over 6 years. A '1' in the 'Pattern' column indicates that a patient participated in that year whilst a '0' indicates they did not. Therefore, of the 35,863 patients identified over the 6 years of the sample, 5,847 (16.3% of the sample) patients attended in each of the 6 years. In contrast, 3,125 (8.7%) patients participated in 1997 but were not observed in the sample thereafter.

Table 3: Patterns of participation in the GDS 1997-2002

Frequency	%	Pattern
5847	16.3	111111
3125	8.7	100000
2301	6.4	010000
2239	6.2	000001
1745	4.9	001000
1655	4.6	000010
1554	4.3	000100
17397	48.5	Other patterns
35863	100	

Table 3 illustrates that the most frequent pattern of claims – accounting for about 14% patients in our sample – is for patients to claim at least once every year. In contrast, the next 6 most frequent patterns of claims – accounting for almost 35%

of patients in our sample – comprise those patients that receive treatment in only one year over the six-year period.[1] Thus participation is split between 'highly regular users' and 'highly irregular' users.

2.3   The frequency of participation

The patterns of participation in Table 3 may be influenced by a number of determinants and will almost certainly vary for a given individual over time. However, in order to provide some insight into the nature of participation, we consider the following simplified model. We assume that there are $I + 1$ groups of individuals within the population. We use $i = 0, 1, 2, .., I$ to indicate a specific group and assume that group i has n_i constituent members. For groups $i > 0$ we assume that each of these individuals accesses the services of a GDP every i years whilst for group $i = 0$, we assume that the individuals never visit a dentist.[2] To account for population dynamics, we augment the framework to allow for a fixed proportion δ of the population to exit (death and out-migration) each year, offset by fixed proportion ρ entrants (births and in-migrants).We are interested in knowing how important each of these groups is as a percentage of the population and in order to obtain a closed-form solution for the population groups n_i, we assume that $\delta = \rho$, which is approximately true for the Scottish population. Hence the number of distinct patients observed in year 1 is,

$$N_1 = n_1 + \frac{1}{2}n_2 + \frac{1}{3}n_3 + \frac{1}{4}n_4 + \frac{1}{5}n_5 + \frac{1}{6}n_6,$$

whilst in the following year the new patients will be comprised of,

$$
\begin{aligned}
N_2 &= \delta n_1 + (1 - \delta)\frac{1}{2}n_2 + \frac{1}{2}\delta n_2 + (1 - \delta)\frac{1}{3}n_3 + \frac{1}{3}\delta n_3 + \\
&\quad + (1 - \delta)\frac{1}{4}n_4 + \frac{1}{4}\delta n_4 + (1 - \delta)\frac{1}{5}n_5 + \frac{1}{5}\delta n_5 + (1 - \delta)\frac{1}{6}n_6 + \frac{1}{6}\delta n_6.
\end{aligned}
$$

In subsequent years, account must be taken of both the survival of the births from previous years appearing for the first time (in proportion to their treatment group) to be treated and the exit of those as yet untreated members of infrequent treatment groups.

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[1]Table 3 reports only the most frequent 7 patterns of participation. All other patterns are suppressed.

[2]For reasons of exposition, we present our framework as deterministic. It is straightforward to consider a probabilistic analogue in which individuals in group i attend a dentist with probability p_i in any given year.

The resulting equations can be summarised as;

$$
\begin{pmatrix} N_1 \\ N_2 \\ N_3 \\ N_4 \\ N_5 \\ N_6 \end{pmatrix} = \begin{pmatrix} 1 & 1/2 & 1/3 & 1/4 & 1/5 & 1/6 \\ \rho & 1/2 & 1/3 & 1/4 & 1/5 & 1/6 \\ \rho & \frac{2\rho-\rho^2}{2} & 1/3 & 1/4 & 1/5 & 1/6 \\ \rho & \frac{2\rho-\rho^2}{2} & \frac{3\rho-3\rho^2+\rho^3}{3} & 1/4 & 1/5 & 1/6 \\ \rho & \frac{2\rho-\rho^2}{2} & \frac{3\rho-3\rho^2+\rho^3}{3} & \frac{4\rho^4-6\rho^3+4\rho^2-\rho}{4} & 1/5 & 1/6 \\ \rho & \frac{2\rho-\rho^2}{2} & \frac{3\rho-3\rho^2+\rho^3}{3} & \frac{4\rho^4-6\rho^3+4\rho^2-\rho}{4} & \frac{5\rho^5-10\rho^4+10\rho^3-5\rho^2+\rho}{5} & 1/6 \end{pmatrix} \begin{pmatrix} n_1 \\ n_2 \\ n_3 \\ n_4 \\ n_5 \\ n_6 \end{pmatrix}.
$$

or in matrix notation

$$\mathbf{N} = \mathbf{Mn}.$$

The solution of these equations can then be obtained from

$$\mathbf{n} = \mathbf{M}^{-1}\mathbf{N}.$$

We apply this method to data on $\mathbf{N}$ derived from our sample and the results, which express the importance of the different groups of participants as a percentage of the total population, are reported in Table 4.

Table 4: The frequency of participation

Participation rate	Calculated % of Scottish Population
Once per year	30.2
Once every two years	13.0
Once every three years	9.4
Once every four years	5.3
Once every five years	7.2
Once every six years	16.2
Fewer than one visit in six years – non-users	18.7

Providing that our sample is representative, Table 4 suggests that an estimate of the percentage of non-users in Scotland is 18.7% – considerably smaller than the often assumed 50%. Moreover, this figure overstates the prevalence of NHS 'non-users' for two reasons. First, access to NHS dental services can occur through utilisation of both community dental (CDS) and hospital dental (HDS) services that are excluded from this analysis. Second, data limitations have restricted our period of investigation to a six year period. Hence, individuals who participate at frequencies lower than once every six years are under-represented in our data.[3]

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[3]The individuals who are being under-represented here are very infrequent users and thus might usefully be considered a part of the non-user group.

2.4 The determinants of participation

The analysis in Section 2.3 is limited by the assumptions we have imposed upon the determinants of participation. In particular we have assumed that participation patterns are constant over time and are determined exogenously. Clearly this assumption is unrealistic. Indeed, the existing literature literature suggests a number of possible determinants of participation including health state, demographics, preferences, prices and income [5], [6] .

The precise impact of these determinants on the patterns of participation remain to be identified by future research. However, collecting panel data allows the estimation of (at least) two other determinants of participation that conventional cross sectional or aggregate data are unable to identify: *state dependence* and *individual heterogeneity*. State dependence refers to the impact of participation today upon participation tomorrow and is easy to conceptualise within a health context: for example, preventive treatment today may make participation tomorrow less likely. Individual heterogeneity refers to the extent to which a patient's participation rate may depend upon their specific characteristics such as, for example, their preferences for oral health. Our own preliminary, and other [5] [7], research suggests both factors are large and significant determinants of patterns of participation.

3 Conclusion

The observation of a relatively fixed proportion of individuals registered with GDPs does not provide reliable information about the extent of access to General Dental Services because of turnover amongst those registered. In this paper we have set out a framework for analysing and interpreting longer run claims data with a view to eliciting information upon overall utilisation and the pattern of access to GDP services in Scotland. This information may be used to assist in planning dental services and assessing the effectiveness of public provision.

We find that, whereas only approximately 50% of the adult population is registered at any point in time, a much larger percentage of the population – close to 80% – has had access to GDP services over a six year period. Our framework permits a more detailed breakdown of the pattern of access than that previously available. We find that the population is comprised of a relatively large group of individuals (30% of the adult population) who access GDP services at least once per year and a substantial group (19% of the adult population) who access services only once in six years. The groups within the population who access services at intermediate frequencies are less

numerous. These observations would appear to have important implications for policy reform and beg questions regarding the likely impact of changes in patient charges, changes in the frequency of dental recall, changes in service availability and changes in GDP contracts for the overall impact of GDP services. Finally, whilst we have identified a number of the potential determinants of participation rates, the impact of these determinants and whether the pattern of participation we observe is optimal – in the sense that it is either cost-effective or equitable – remain questions for further research.

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