A Cross-Sectional Analysis of the Utilisation of GP Services in Ireland: 1987- 2001" -

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Abstract

This paper examines the determinants of general practitioner (GP) utilisation patterns in Ireland over the period 1987-2001. Using three different micro-data sets, the influence of socio-economic factors as well as health status variables on the demand for GP visits is analysed. A particular focus of this paper is an examination of the impact of economic incentives as represented by medical card eligibility. While medical cardholders are entitled to free GP consultations, non-medical cardholders must pay for each visit. In addition, it is important to analyse the impact of the 1989 change in the reimbursement system for GPs with medical cardholder patients from fee for service to capitation. A variety of cross-sectional econometric methodologies are considered with the two-step hurdle negative binomial model found to be the most appropriate. The empirical results confirm the results of earlier studies about the effects of socio-economic characteristics such as age, sex and income on GP utilisation patterns and also confirm the highly significant effects of health status. While medical card eligibility is consistently positive and significant across the years of our analysis (1987, 1995, 2000, 2001), there is no evidence to show that this effect diminished in importance between 1987 and 1995.

1 Introduction

With the publication of the national *Health Strategy* in 2001, there has been a growing recognition of the importance of primary care services in the Irish health care system. While the majority of public health care expenditure is concentrated on acute hospital services[1], an increasing emphasis on prevention as well as diagnosis and treatment means that primary care has the potential to play a much-increased role in the future. Both the Department of Health and Children (2001) and Tussing (2001) explicitly state that a strengthened primary care service has the potential to reduce reliance on the acute hospital sector, the main resource user in the Irish health service. In addition, GPs in Ireland act as "gatekeepers" for the use of hospital services and therefore, the behaviour of GPs and their patients also has important implications for resource use in the hospital sector. In this context, it is important to understand the factors that influence GP visits and to examine the extent to which resources in this sector are allocated in an efficient and equitable manner.

The primary objective of this paper is therefore to examine the determinants of the utilisation of GP services in Ireland over the period 1987-2001. A particular concern is to quantify the impact of economic incentives associated with medical card eligibility as it is felt that the current incentive structure inherent in this system does not permit an inefficient use of resources. The extent to which economic incentives and access to services distort the relative prices facing different consumers in the health care market has been extensively studied (see Buchmueller *et al*. (2002), Jones *et al*. (2002), Harmon and Nolan (2001), Schellhorn (2001), Vera-Hernandez (1999), Waters (1999), Chiappori *et al*. (1998), Holly *et al*. (1998), Hurd and McGarry (1997) and Cameron *et al*. (1988) for studies examining the role of private insurance in influencing the

[1] In 2002, public expenditure on "general hospital services" amounted to 46.6 per cent of total public non-capital expenditure on the health services, while public expenditure on GP services and primary care services amounted to 12.0 per cent and 18.7 per cent respectively (Department of Health and Children (2002)).

demand for health services[2] and Jimenez-Martin *et al*. (2001) and Pohlmeier and Ulrich (1995) for an examination of the role of incentives facing suppliers of GP services such as the remuneration system in operation for GPs and the density of GP services). In Ireland, the focus is not so much on insurance coverage as eligibility category as nearly 30 per cent of the population, termed "medical cardholders", are entitled to free GP consultations and effectively face a zero monetary cost in visiting their GP. The remainder of the population must pay out-of-pocket for GP consultations. The consequent distortion in the price of medical care facing medical cardholders may lead this group to "over-consume" GP services, after controlling for their health status and other socio-economic characteristics. Similarly, GPs may be more likely to prescribe and/or to arrange return visits (i.e., to engage in "demand inducement") if they know that their medical cardholder patients do not incur any monetary cost in doing so. In response to evidence in favour of demand inducement presented by Tussing (1985), the reimbursement system for GPs with medical cardholder patients in Ireland was changed from fee-for-service to capitation in 1989. It is important to examine whether this change impacted on the incentives facing GPs with regard to their medical card patients. This paper will therefore address these two concerns: whether medical cardholders "over-consume" GP services, after controlling for health status and other socio-economic characteristics and whether the change in the reimbursement system in 1989 led to any reduction in this effect. The latter is similar in approach to earlier work by Winkelmann (2001) on the impact of an increase in co-payments for prescription drugs on GP services utilisation in Germany and Hakkinen *et al*. (1996) on the influence of economic depression in Finland on the use of GP services. In addition, an examination of the influence of various factors on the demand for GP services may serve to highlight inequities in the use of GP services; for example, Gerdtham (1997) finds that factors other than morbidity such as income

[2] While the majority of these studies examine the role of insurance on the demand for GP services, Jones *et al*. (2002) and Harmon and Nolan (2001) examine the role of private insurance on the demand for specialist visits. Waters (1999) does not distinguish between different health care providers and Holly *et al*. (1998) analyses in-patient stays in hospital.

and size of location of residence have an impact on the utilisation of GP services and cites these findings as evidence of horizontal inequity in the utilisation of GP services in Sweden. Van Doorslaer *et al*. (2002) find that GP services across 14 OECD countries are used more by the poor than the rich while the opposite is true for specialist services. If it assumed that there is a difference in the quality of care between GPs and specialists, they conclude that health services are therefore not distributed according to need, but rather by ability to pay.

The starting point for this research is a comprehensive study of various aspects of the Irish health care system, primarily GP services, by Tussing (1985). While this study was the first attempt to explain variations in GP utilisation patterns in Ireland, the nature of the data meant that important influences on demand such as income and health status could not be quantified. However, Tussing did present some evidence in favour of demand inducement by GPs in terms of arranging return visits[3] and this influenced the change in the policy for reimbursing GPs for their medical card patients from fee-for-service to capitation in 1989. The research by Nolan (1991, 1993) represented an important addition to this body of research in Ireland by examining the determinants of GP utilisation rates using a more detailed data set, which allowed the influences of variables not available to Tussing such as income, social class and various measures of health status to be quantified. The results confirmed the findings of Tussing that those with medical cards consume significantly more GP services than those without, although the magnitude of the effects was somewhat reduced due to the inclusion of detailed health status variables. A more recent study by Kelleher and McElroy (2002) specifically focuses on the determinants of the number of GP visits per household among those households with at least one member with a medical card. The objective of this research was to identify the influence of factors other than age

[3] Tussing (1985) presented evidence for demand inducement by GPs on the basis of the results of logistic regressions of the probability that the most recent GP visit resulted in a return visit being arranged. The coefficients on GP density of area of residence (positive), medical card ratio of area of residence (negative) and medical card eligibility of the individual (positive) were all statistically significant at the one per cent level, which are all consistent with evidence in favour of demand inducement by GPs.

and sex that are used to calculate the (weighted) capitation payment that GPs receive from the GMS (General Medical Services) Payments Board. They find that additional variables such as location, social class, education and health status are also highly significant and recommend that these be incorporated into the weighted capitation formula used to remunerate GPs for their medical card patients.

Using three micro-data sets, the 1987 Survey of Income Distribution, Poverty and Usage of State Services (which is the dataset originally utilised by Nolan (1991, 1993)), the 1995 and 2000 Living in Ireland Surveys and the 2001 Quarterly National Household Survey Module on Health, the factors influencing GP utilisation rates in Ireland are examined using a variety of econometric methodologies. While this research analyses the determinants of variations in GP utilisation rates using cross-sectional econometric methodologies, future work will extend the analysis to incorporate panel-data econometric techniques using the 1995-2001 Living in Ireland Surveys, which survey the same households annually. Section 2 provides a brief overview of the features of the Irish health care system as well as recent trends in GP utilisation patterns. Section 3 introduces the datasets and the various dependent and independent variables employed in the subsequent analyses. Section 4 describes the econometric methodologies employed and the procedures for deciding on the most appropriate specification. Section 5 presents empirical results while Section 6 summarises and concludes.

2 GP Utilisation in Ireland

Overview of the Irish Health Care System

The Irish health care system is characterised by a number of features that make it unusual in an international context. Firstly, nearly 70 per cent of the population must pay out-of-pocket for GP

services while the remainder, medical cardholders, are entitled to free GP services.[4] Secondly, over 50 per cent of the Irish population has private medical insurance. Private medical insurance covers the cost of in-patient and out-patient services in public and private hospitals but does not cover the cost of GP services, prescribed medicines or dental, ophthalmic and aural services except where large deductibles are exceeded. While all individuals in Ireland are entitled to free care and maintenance in public hospitals, subject to a certain minimum charge, the complex mix between private and public practice in the hospital sector has meant that insurance is taken out primarily to ensure speed of access to hospital services and to guard against large medical bills (see Harmon and Nolan (2001)).

This combination of public and private financing and provision results in a set of incentives for service use that differ considerably across different sectors of the population. In addition, the incentives facing health service providers may differ depending on the eligibility category/insurance status of their patients. On the consumer side, while medical cardholders face a zero monetary cost in visiting their GP, non-medical cardholders incur the full economic cost. This distortion in relative prices may lead to an inefficient use of GP resources on the part of medical card patients. The introduction of charges for in-patient and out-patient hospital treatments in 1987 removed the perverse incentive that existed prior to 1987 for non-medical cardholders who had to pay for GP services but received out- and in-patient stays in hospital free of charge to favour hospital services over visiting their GP (see also Section 3.3). However, this incentive still exists to some extent today in that insured patients can be reimbursed for these

[4] All individuals who are ordinarily resident in Ireland are granted either full or limited eligibility for health care services. Individuals with full eligibility, termed "medical cardholders", are entitled to receive all health services free of charge, including GP services, prescribed medicines, all dental, ophthalmic and aural services, maternity services, in-patient services in public hospitals and specialist treatment in out-patient clinics. The remainder of the population are entitled to free maternity services, in-patient services in public hospitals (subject to a charge per day), specialist services in out-patient clinics (again, subject to a charge per day) and assistance towards the cost of prescribed medicines over a monthly limit. They must, however, pay for all GP consultations and all dental, ophthalmic and aural treatments. Eligibility for a medical card is dependent upon income and is decided on the basis of a means test with the income thresholds set by the local Health Boards and updated annually.

charges. Similarly, GPs face differing incentives, depending on the eligibility status of their patients. GPs are remunerated for their medical card patients on a capitation basis, a payment which varies depending on the age, sex and geographical location of their patients. Private patients pay on a fee-for-service basis. Prior to 1989, GPs were also remunerated on a fee-for-service basis for their medical card patients. In response to the findings by Tussing (1985) in favour of demand inducement by GPs under such a system, the basis for remuneration was changed to capitation to reduce the incentives for GPs to arrange return visits. However, the current difference in the remuneration system between private and public patients may mean that GPs are more willing to arrange follow-up visits for their non-medical cardholder patients. Finally, as access to hospital is usually on the basis of a referral from a GP, GPs act as "gatekeepers" for hospital care. Again, it likely that the incentives of GPs may be affected by this system with GPs more likely to refer patients to a specialist if they have a medical card or are covered by private medical insurance.

Recent Trends in GP Utilisation in Ireland

Based on the data from two of the data sets described in Section 3, Column (4) of Table 1 illustrates the trends in the number of GP visits for the previous twelve months for all adults aged 16 years and over. The average number of GP visits per annum fell from 4.0 in 1987 to 3.4 in 2000. A closer examination of these statistics reveals that while there has been a large increase in the proportion of the population visiting their GP at least once in the previous twelve months (from 58.5 per cent in 1987 to 71.7 per cent in 2000), these individuals are visiting their GP much less frequently (for those with at least one visit, the average number of GP visits fell from 6.9 per person in 1987 to 4.8 per person in 2000). The data indicate that the shift in the pattern of GP visiting occurred between 1987 and 1995 as patterns of visiting in 1995 and 2000 are very

similar.[5] Table 1 also confirms that individuals entitled to free GP care (medical cardholders) have a higher average number of GP visits per annum, accounted for by both a higher proportion visiting their GP at least once and a higher average number of visits for those that visit at least once. While it is difficult to state whether this distinction would persist after other socio-economic and health status variables are accounted for (an objective of the multivariate analyses undertaken in Sections 4 and 5), it is interesting to note that the distinction between medical cardholders and non-medical cardholders seems to persist when age, a factor expected to be highly correlated with medical card eligibility, is controlled for.

3 Data

3.1 Data Sources

Three data sources are employed in this paper. The first is the 1987 Survey of Income Distribution, Poverty and Usage of State Services, which was carried out by the Economic and Social Research Institute (ESRI) between February 1987 and September 1987. A more detailed description of the design and conduct of the survey as well as response rates and the representativeness of the survey are provided in Nolan (1991) and Callan *et al*. (1989). Health information on medical card eligibility, insurance coverage, number of visits to GPs, number of nights in hospital *etc*. were obtained for all individuals in the household from the head of household (HOH) or the spouse of the HOH. In addition, each adult aged 15 years and over completed a personal questionnaire. This covered a wide range of information on labour force

[5] Possible explanations for the finding that more individuals are visiting their GP at least once but visiting much less frequently when they do include:

- A change in the composition of the population (see Table 7). Apart from social class and insurance, the composition of the samples changed little over the period.
- The change in survey methodology between 1987 and 1995/2000 (see Section 3.1). However, these patterns persist when the samples are restricted to head of households (HOHs) and/or spouses of the HOHs.
- The change in the reimbursement system for GPs with medical cardholder patients in 1989. However, this would only explain the reduced frequency of visits among medical cardholders. It would not explain why more people are visiting their GP at least once or that this pattern exists also for non-medical cardholders (see Table 1).
- An increase in health awareness/education levels among the population. This may explain why more individuals visit their GP at least once but decide to self-medicate, maybe with the aid of a pharmacist for follow-up diagnoses.

status, occupation, income, style of living, debts and assets, and attitudes. It also included some questions on health status, both physical and psychological. The latter represented a major advantage of these data over the earlier 1980 data set employed by Tussing (1985).

The second source of data is the Living in Ireland (LII) Survey.[6] The data were collected by the ESRI and where possible, the same households were followed through time. Similar questions to those asked in the 1987 Survey of Income Distribution, Poverty and Usage of State Services were included in the LII Surveys. However, while the HOH or spouse of the HOH provided information on each individual's use of GP services, medical card eligibility *etc*. in the 1987 Survey, each adult aged 16 years and over provided this information personally in the LII Surveys. As with the 1987 Survey of Income Distribution, Poverty and Usage of State Services, this personal questionnaire also contains information on physical and psychological health status. In this paper, data from the second (1995) and seventh (2000) waves of the LII Survey are analysed.[7]

The third data source is the 2001 Quarterly National Household Survey (QNHS) Module on Health, which was conducted by the Central Statistics Office (CSO) in the third quarter of 2001, between June and August. While the primary purpose of the QNHS is to collect information on employment and unemployment every quarter, it also includes occasional modules on social topics of interest. The health module was asked of all persons aged 18 years and over who were participating directly in the survey. The survey included questions on consultations with GPs, other health appointments, waiting lists, private medical insurance, medical cards, self-assessed

[6] The Living in Ireland (LII) Surveys constitute the Irish component of the European Community Household Panel (ECHP). The ECHP began in 1994 and ended in 2001. It involves an annual survey of a representative sample of private households and individuals aged 16 years and over in each EU member state, based on a standardised questionnaire.

[7] We do not utilise data from the first (1994) wave, as the number of GP visits is not separately identified from the number of visits to medical specialists, dentists and opticians in this year. Future work will involve an examination of data from 1996-1999 inclusive and 2001 using panel data econometric techniques (see Section 6).

health status and health conditions. CSO (2002) contains further details on the conduct of the survey.

3.2 Sample Sizes

Table 2 presents sample sizes for each data set. For the 1987, 1995 and 2000 data, the samples include all adults aged 16 years and over[8], amounting to 9,421, 8,531 and 8,056 observations in 1987, 1995 and 2000 respectively. After deleting observations for which information on one or more variables of interest was missing, completed observations are available for 6,347 individuals in 1987, 7,084 individuals in 1995 and 6,286 individuals in 2000.[9] The QNHS includes 44,844 individuals aged 18 years and over.

3.3 1987 Survey of Income Distribution, Poverty and Usage of State Services and 1995 and 2000 Living In Ireland Survey Data

Table 3 presents variable definitions while Table 4 presents summary statistics for these variables. As discussed in Section 4, a number of different econometric methodologies are proposed to model utilisation of GP services. For the two-stage models, two dependent variables are necessary: a binary variable indicating whether the individual visited a GP in the previous twelve months (GPPOS1) and a count variable recording the number of visits to a GP in the previous twelve months (GPVISITS). For the one-stage models, only GPVISITS is employed. Examining the summary statistics in Table 3 reveals that the average number of GP visits fell from 4.0 in 1987 to 3.5 in 2000. As is evident from the table, the standard deviation of GPVISITS

[8] While all household members aged 15 years completed a personal questionnaire in the 1987 Survey of Income Distribution, Poverty and Usage of State Services, the 1995 and 2000 LII Surveys required all household members aged 16 years and over to complete an individual questionnaire. For this reason, we concentrate on those aged 16 years and over in our econometric work.

[9] The majority of the missing observations occur for the social class and psychological health status questions. In the first instance, the individual's social class is taken as the dominant social class in the household. In cases such as all-student households and households where the only adult is engaged in home duties, social class is therefore missing. The majority of missing observations for the psychological stress questions are due to the fact that the survey was completed by proxy rather than in person for these individuals.

is consistently larger than the mean, a feature of the data which has consequences for the choice of the most appropriate econometric methodology (see Section 4.1). Schellhorn (2001) discusses the problem of reporting error that may arise when individuals are asked to recall behaviour over a long period of time. An examination of the frequency of GP visits in Table 5 reveals that there are peaks at 10, 12, 24 and 52 visits, which are consistent with individuals approximating "once a month" for example. However, the percentage of individuals with such frequencies is only a small fraction of the total and is consequently not considered a problem.

Variable definitions for the independent variables are presented in Table 6 and summary statistics for these variables are presented in Table 7. The socio-economic characteristics of the individual, which are usually assumed to underpin an individual's tastes and preferences, are represented by variables describing the age, sex, location, social class and income of the individual. The age variable contains six categories with those aged 16-24[10] years taken as the base category. The sex of the individual is represented by a binary variable with the value one indicating a female. The household location of the individual is also represented by dummy variables with the value one indicating that the individual lives in a rural area.[11] In the two-step models considered in Section 4.2, variables that reflect the motivations, preferences *etc.* of the physician are important. However, with cross-sectional survey data, these supply-side variables such as physician density are often not available (Pohlmeier and Ulrich (1995)). The location variable is therefore primarily included to proxy such factors as physician density at the second stage of the decision-making process but also to proxy the individual's opportunity costs associated with visiting a GP at the first stage. The social class of the individual is represented by a categorical variable with six

[10] While those aged 15 years and over complete an individual questionnaire in 1987, these individuals (3) are excluded and the samples for 1987, 1995 and 2000 comprise those aged 16 years and over. See also Section 3.2.

[11] The rural/urban variable is constructed from the variable indicating the size of the location where the household is located. Households located in open country or in villages with less than 1,500 inhabitants are classified as rural whereas households in towns with 1,500 to 10,000 or more inhabitants, Waterford, Galway, Limerick and Cork cities and Dublin city and county are classified as urban households (see also Table 6).

categories with those in the intermediate non-manual categories regarded as the base category. It is included in an attempt to reflect differences in tastes or attitudes towards medical care or the ability to process information, if social class is regarded as a proxy for the highest level of education completed. The income of the individual is represented by total household disposable income, adjusted for household size.[12] While Pohlmeier and Ulrich (1995) state that in the presence of a high degree of free public health provision and coverage by private medical insurance, income may more accurately reflect a difference in opportunity costs rather than an income effect in the traditional sense (i.e., not picking up ability to pay in the monetary sense as few people incur the monetary costs of health services use), this is not so in Ireland where approximately 70 per cent of the population must pay out-of-pocket for GP visits.

Economic incentives and access to services are represented by medical card eligibility[13] and insurance coverage, both of which are dummy variables. While previous international literature concentrates on the role of private medical insurance in distorting the effective price of health care to the insured users and leading to an over-utilisation of health care services (see Section 1), a similar argument may also be applied to medical cardholders in an Irish context. Medical card eligibility is included as a proxy for the price of services and also for the attitudes of the doctor. For example, a GP may be more likely to encourage follow-up visits if an individual faces a zero monetary cost in doing so. Conversely, the remuneration system in operation for medical cardholder patients may mean that a GP is more likely to encourage follow-up visits for non-medical cardholder patients. While GP visits are not covered by private medical insurance in

[12] Household disposable income is adjusted for household size using the following scale: 1 for the head of household, 0.66 for each additional adult aged 14 years and over and 0.33 for children aged less than 14 years.

[13] In 1987, there were three categories of entitlement to free public care: Category I, which correspond to current medical cardholders (who receive all health services free of charge, including GP consultations) and Categories II and III (which correspond to individuals who currently do not have a medical card and must pay for GP care). In 1987, Category II individuals did not have to pay for public hospital treatments or care while Category III received free public hospital care but not treatments. In 1991, Categories II and III were merged with the result that all non-medical cardholders must now pay for GP care but receive free public hospital in- and out-patient care subject to a certain minimum charge. The base category for 1987 therefore refers to Categories II and III (see also Table 6).

Ireland, insurance possibly acts as a proxy for the tastes of the individual, i.e., individuals who take out private medical insurance may be more risk averse than those who do not.

Finally, following Nolan (1991, 1993), three measures of current[14] health status are employed. Whether an individual gave birth during the previous twelve months is represented by a dummy variable as are individuals who report that they suffer from "*any chronic, physical or mental health problem, illness or disability*"[15]. Individuals who score above the conventional threshold of two on the General Health Questionnaire (GHQ) are represented by a dummy variable. The GHQ contains twelve questions relating to psychological health status. For the six positive statements, a person scores one if they answer "less than usual" or "much less than usual" while for the six negative statements, a person scores one if they answer "more than usual" or "much more than usual".[16] These scores are added up and anyone scoring above the conventional threshold of two is considered to be in psychological distress (see also Nolan (1991)). It is important to control for health status in analysing the demand for GP services. If those that are ill are more likely to hold medical cards/be insured, the positive effect of medical card eligibility/insurance on GP utilisation may not be the result of the incentive structures inherent in these systems but rather the result of adverse selection of the ill into these categories of eligibility/insurance coverage. A number of studies therefore treat insurance as an endogenously determined variable (see Jones *et al*. (2002), Harmon and Nolan (2001), Schellhorn (2001), Vera-Hernandez (1999), Waters (1999), Hurd and McGarry (1997) and Cameron *et al*. (1988)). While Harmon and Nolan (2001) and Hurd and McGarry (1997) either find that those in better health are more likely to be insured (and therefore that the positive effect of insurance coverage on

[14] Jimenez-Martin *et al*. (2002), Schellhorn *et al*. (2000), Hakkinen *et al*. (1996) and Cameron *et al*. (1988) all discuss the problem of using current measures of health status to predict past health services utilisation. They suggest that lagged values of health status be used instead. We will consider this issue in a future paper employing panel data from the Living in Ireland Survey.

[15] See Table 6 for the slightly different wording of this question in 1987.

[16] An example of a positive statement is "have you recently been able to concentrate on whatever you're doing?" while an example of a negative statement is "have you recently lost much sleep over worry?".

health services utilisation is under-stated if insurance is not treated as an endogenous variable) or no evidence for adverse selection, we do not consider this possibility in this paper and instead rely on extensive health status variables to control for differences in health status.

3.4 2001 Quarterly National Household Survey Data

The data collected in the 2001 QNHS Module on Health are quite different to those collected in the 1987 Survey of Income Distribution, Poverty and Usage of State Services and the 1995 and 2000 LII Surveys. Individuals are asked to state whether they visited their GP during the previous two weeks but are not asked for the frequency of their visits. In addition, there are no household variables available such as household size, income *etc*. However, the data include detailed information on location within Ireland (not available in either of the two earlier data sets) and information on self-assessed health status and incidence of certain chronic conditions.

For the analysis based on the QNHS data, Table 8 indicates that the dependent variable is a binary variable indicating whether the individual visited a GP in the previous two weeks (GPPOS2). These data indicate that 19 per cent of the population had visited a GP in the previous two weeks (see Table 9). However, as the recall period is different, it is impossible to ascertain if this figure is comparable with the figures on the percentage visiting their GP at least once from the LIII surveys.

The age of the individual is represented by a variable with six categories with those aged 18-24 years regarded as the base category (see Table 10). The sex of the individual is represented by a dummy variable with the value one indicating a female. In the 2001 QNHS, more detailed information on the location of the individual's household is available. However, it is impossible to separately identify rural and urban households; instead, the relative urbanisation of an area may be apparent from its location, e.g. it is assumed that residents of Dublin city and county are

predominately located in urban areas whereas those living in the Border counties (Cavan, Donegal, Leitrim, Louth, Monaghan and Sligo) are predominately located in rural areas. As discussed in Section 3.3, location may act as a proxy for time costs and the supply of GP services. Additional socio-economic variables available in the QNHS include the marital status and employment status of the individual. The marital status of the individual is represented by a four-category variable with those that are single regarded as the base category. In the absence of family identifiers in the QNHS data, marital status may proxy important household composition effects such as the presence of children in the household. Employment status is included to proxy time commitments and is represented by a variable with three categories with those that are not economically active regarded as the base category.

As with the 1987, 1995 and 2000 data, dummy variables with the value one representing individuals entitled to a medical card and those holding private medical insurance are included to capture the influence of economic incentives and access to services on GP utilisation patterns. While the indication of recent maternity experience and the measure of psychological health status in the 1987, 1995 and 2000 data are not available in the QNHS, respondents are asked to state whether they suffer, or have recently suffered from, a number of health conditions[17] (see Table 10 for more details).

4. Econometric Methodologies

4.1 One-Step Models

In modelling the demand for GP visits, the nature of the data on utilisation determines the type of econometric methodology employed. The highly skewed nature of the distribution of GP visits (a large proportion of observations are clustered at zero while only a small proportion of individuals

[17] As discussed in Section 3.3, the accuracy of using current health status to predict past health services use has been questioned. However, we will leave this as an avenue for future research.

record frequent visits (see Table 5)) means that conventional OLS estimation techniques are inappropriate. In addition, the number of GP visits is a variable that can take on only non-negative, integer values. An OLS regression would assume a normally distributed error term as well as predicting negative values for the dependent variable. Using a count model overcomes these problems by assuming a skewed, discrete distribution and restricting predicted values to non-negative values. The most basic count data model is the Poisson model, where the probability of an event, Y , is determined by a Poisson distribution as follows:

$$Pr(Y = y_i) = \frac{exp(-\lambda_i)\lambda_i^{y_i}}{y_i!}, \quad y_i = 0,1,2,... \tag{1}$$

where y_i are the observed frequencies of the event Y , λ_i is a function of the set of independent variables, i.e.,

$$\lambda = exp(x_i'\beta)^{18} \tag{2}$$

and $E(y_i) = V(y_i) = \lambda_i$ (3)

Two restrictive features of the Poisson model mean that it is rarely employed in applied work. Firstly, the assumption that the mean and variance of the variable in question are equal is an assumption that is too restrictive for many scenarios. If this restriction is violated, the coefficients are consistent but their standard errors are not. In our case, Table 4 illustrates that the variance of the number of GP visits is consistently larger than the mean. Secondly, the Poisson model assumes that events occur independently through time, i.e., that when an event occurs, this does not affect the probability of the event occurring in the future. This may not be an appropriate assumption to make in modelling GP visits where one illness spell may necessitate a number of consultations with a GP. This feature may explain why the variance typically exceeds the mean with data of this type (Gerdtham *et al*. (1997)). The alternative negative binomial model overcomes these two problems. A common derivation of the negative binomial model is to re-

[18] Taking the exponential forces the expected count to be positive.

specify λ_i to account for unobserved heterogeneity, a possible source of over-dispersion in the dependent variable as follows:

$$\lambda_i = exp(x_i' \beta) exp(\varepsilon) \quad (4)$$

where ε has a gamma distribution with mean one and variance α. ε can be thought of as either the combined effect of unobserved variables that have been omitted from the model or as another source of pure randomness. The negative binomial probability distribution takes the form:

$$Pr(Y = y_i | \varepsilon_i) = \frac{exp(-\lambda_i(\varepsilon_i))(\lambda_i(\varepsilon_i))^{y_i}}{y_i!}, \quad y_i = 0,1,2,... \quad (5)$$

Unlike the Poisson model, the mean and variance of the dependent variable are now allowed to differ as follows:

$$V(y_i) = E(y_i)(1 + \alpha E(y_i)) \quad (6)$$

As the Poisson model reduces to the negative binomial when $\alpha = 0$, a t-test of the significance of the estimated value of α enables us to test the negative binomial against the Poisson specification (see also Section 4.3). Finally, the negative binomial model helps to overcome the problem of events that are not independent through time by correcting for over-dispersion in the dependent variable, a feature which may arise from multiple illness spells (Durkan *et al*. (1996)). Table 12 presents the results of likelihood ratio tests of the Poisson against the negative binomial specification of the model. Both the Poisson and negative binomial models may be estimated using the maximum likelihood estimation technique.

The Poisson and negative binomial models assume that all individuals have a positive probability of experiencing the event in question. A number of authors (Kelleher and McElroy (2002), Giuffrida (2000) and Durkan *et al*. (1996)), question the validity of assuming that all zero observations are generated from the same underlying decision-making structure. In other words, it is important to ascertain whether zero observations relate to true non-participants (i.e., individuals that would never visit a GP) or to individuals who are potential participants (i.e.,

individuals who do visit their GP but who are not observed doing so during the survey period in question). The zero-inflated Poisson and negative binomial models allow us to distinguish between different sources of zero observations and in the process, overcome the problem whereby conventional count data methodologies may under-estimate the true extent of the zero observations. In other words, the zero-inflated Poisson and negative binomial models alter the standard count data models to account for the fact that not all individuals are potential participants. The zero-inflated negative binomial model[19] therefore consists of two parts:

- A binary model (e.g. logit), which estimates the probability that an individual is one of two different types: a non-user and a potential/actual user (also known as the splitting function).

  $$P(y_i = 0) = \psi_i = F(z_i'\gamma) \qquad (7)$$

  where ψ_i is the probability that an individual is a non-user and and $F(.)$ is the logistic/standard normal cumulative distribution function and z_i are the set of explanatory variables, which may be the same as x_i.

- A negative binomial model of the usage of the potential/actual users.

$$P(y_i) = (1-\psi_i)\frac{exp(-\lambda_i(\varepsilon_i))(\lambda_i(\varepsilon_i))^{y_i}}{y_i!}, \text{ for } y_i > 0 \text{ and } (y_i = 0 \text{ and } \psi_i = 0) \qquad (8)$$

Zero-inflated count data models are also estimated using the maximum likelihood estimation technique. Section 4.3 contains further details on the choice of the most appropriate one-step methodology to use in modelling the utilisation of GP services in Ireland.

4.2 Two-Step Models

A number of authors (Buchmueller *et al*. (2002), Van Doorslaer *et al*. (2002), Hurd and McGarry (1997), Gerdtham *et al*. (1997), Hakkinen *et al*. (1996), Pohlmeier and Ulrich (1995), Nolan (1991, 1993) and Tussing (1985)) have argued that two-step approaches are more appropriate in

[19] As the zero-inflated negative binomial model is preferred to the zero-inflated Poisson model in our application to GP visits (see Section 4.3 and Table 12), this derivation of the zero-inflated model focuses on the negative binomial.

accounting for the nature of the decision-making process underlying the decision to visit a GP. They argue that different variables may affect the decision to visit a GP (contact decision) and secondly, the decision about frequency of visits (frequency decision). In addition, the same variables may affect the two stages of the decision-making process in different ways. The most common interpretation of the two-step model is in terms of a principal-agent framework whereby the patient initiates the visit to their GP but the GP decides on the frequency of treatment. This is in contrast to the one-step models discussed above in which the patient is assumed to be the sole actor determining the demand for GP services. At the second stage of the two-step model, the GP is assumed to determine the intensity of treatment not only in response to medical need but also in response to their own interests and consumer incentives. The use of this methodology necessitates the existence of variables that describe the motivations *etc.* of the GP (for example, Jimenez-Martin *et al*. (2001) and Pohlmeier and Ulrich (1995) use physician density). However such variables are often not available in household or individual surveys. This means that the estimates from the first step may be more precisely determined than those from the second step. Nonetheless, some variables such as household location, which describe the opportunity cost to the patient at the first stage, may act as proxies for supply-side variables such as GP density at the second stage (see also Section 3.3). The first stage is modelled using a binary choice model (logit or probit) while a variety of techniques are used for the second stage, including truncated OLS, Poisson and negative binomial models. As the second stage variable is an integer count variable, we only consider Poisson or negative binomial specifications for the second stage (see also Van Doorslaer *et al*. (2002), Gerdtham *et al*. (1997), Hakkinen *et al*. (1996), Grootendorst (1995) and Pohlmeier and Ulrich (1995)). As Table 12 indicates that the truncated negative binomial is preferred to the truncated Poisson model, the following exposition of the two-step model assumes that the second step is modelled using a truncated negative binomial model. The two-step or hurdle negative binomial model therefore consists of two stages:

- A binary model (e.g. logit), which estimates the probability that an individual visited a GP within the observation period, i.e.,

$$P(y_i = 1) = F(x_i' \boldsymbol{b}) \quad (9)$$

where $F(.)$ is the logistic cumulative distribution function and x_i are the set of explanatory variables.

- A truncated negative binomial model for positive observations, i.e.,

$$P(y_i \mid y_i > 0) = \frac{exp(-\boldsymbol{l}_i(\boldsymbol{e}_i))(\boldsymbol{l}_i(\boldsymbol{e}_i))^{yi}}{y_i!}, \text{ for } y_i > 0 \quad (10)$$

The set of explanatory variables may be the same for both stages and both stages of the model may be estimated separately using the maximum likelihood estimation technique.

Kelleher and McElroy (2002), Jimenez-Martin (2001) and Santos-Silva and Windmeijer (1999) argue that the two-step methodology is only appropriate when the data refer to a single illness spell, an assumption that is often violated in surveys that record health services utilisation over relatively long periods of time such as a year. Indeed, Jimenez-Martin *et al*. (2001) find that the two-step model is rejected in favour of the one-step negative binomial model in their study of the determinants of GP visits in twelve European countries and explain this finding as due to the restrictive assumptions about illness spells underlying the two-step model. However, both Santos-Silva and Windmeijer (1999) and Pohlmeier and Ulrich (1995) argue that the violation of the single illness spells hypothesis is a more serious problem in modelling visits to a specialist than visits to a GP. In addition, while individuals are asked to record their GP utilisation patterns over the previous year in two of the data sets used in this study, over 60 per cent of individuals have at most two visits to their GP in each of the three years (see Table 5), i.e., the majority of observations are assumed to relate to single illness spells (see also Schellhorn *et al*. (2000) and Pohlmeier and Ulrich (1995)).

4.3 Model Specification

Table 12 presents the results of model specification tests. The Poisson model is overwhelmingly rejected in favour of the negative binomial on the basis of likelihood ratio tests, indicating the presence of unobserved heterogeneity in the data. In addition, while the results of the standard negative binomial model are not presented here, the significance of the α parameter provides an additional test in favour of the negative binomial model (see also Section 4.1). Table 12 indicates that, on the basis of the Vuong test for non-nested hypotheses, the standard negative binomial model is rejected in favour of the zero-inflated negative binomial. This result provides evidence in favour of different types of zero observations: those who never visit their GP and those who visit their GP but who did not visit during the survey period in question. Table 12 further indicates that the zero-inflated Poisson model is rejected in favour of the zero-inflated negative binomial model, again on the basis of likelihood ratio tests. For the two-step models, the truncated negative binomial is favoured over the truncated Poisson model. As the zero-inflated negative binomial and hurdle negative binomial models are non-nested, the Hausman test statistic must be employed to determine which process best describes our data. The results in Table 12 indicate that the hurdle negative binomial is preferred to the zero-inflated negative binomial. In other words, the distinction between the contact and frequency decisions is more important than the distinction between different sources for the zero observations, for Irish data on GP visits. This may be due to the length of the survey period (one year), where it is likely that all zero observations are true non-users as opposed to the case where some may use GP services but do not do so during the survey period in question. This result is in contrast to those of Kelleher and McElroy (2002), Jimenez-Martin *et al*. (2001) and Gerdtham *et al*. (1997) who favour the zero-inflated model over the hurdle model but in agreement with the results of Grootendorst (1995) who favour the hurdle negative binomial model, albeit in a model of the consumption of prescription drugs. For comparison purposes, both sets of results (from the zero-inflated negative binomial model and the hurdle negative binomial model) are presented in Tables 13, 14 and 15

although the results from the hurdle model (Tables 14 and 15) form the basis for the discussion in Section 5.

As the 1987, 1995 and 2000 data record the frequency of GP visits over the previous twelve months, we investigate the full range of models for these data-sets, namely, the Poisson, negative binomial, zero-inflated Poisson and zero-inflated negative binomial models for one-step models and the hurdle Poisson and negative binomial for the two-step models. However, as the 2001 data only record whether an individual visited their GP during the previous two weeks, we must model this decision using binary choice econometric methodologies. For comparison purposes, we employ the logit model as specified in equation (9) above. For the 1987, 1995 and 2000 models, the set of independent variables is comparable across all three years (with the exception of the physical illness variable where the underlying question changed slightly between 1987 and 1995/2000; see Table 6 for further details). As far as possible, the variables employed using the 2001 data are constructed so as to be comparable with those from the earlier data sets. Nonetheless, the recall period for the dependent variable along with additional/unavailable variables means that the results from the logit models for 1987, 1995 and 2000 are not directly comparable with those for 2001. For the 1987, 1995 and 2000 samples, a small number of completed observations (13 in 1987, 10 in 1995 and 4 in 2000) report more than 52 visits to a GP in the previous year (see Table 5). While an examination of these data suggest that these values are correct (all report either physical or psychological ill-health or spend some time in hospital), the models are also run excluding these observations in an attempt to determine if the inclusion of these observations significantly changes the results. The results confirm that there is little difference in the results when these outliers are excluded and therefore the final results presented in Section 5 include these observations. Finally, for the 1987, 1995 and 2000 samples, all standard errors are adjusted to take into account the fact that observations are clustered by household.

5. Empirical Results

5.1 1987 Survey of Income Distribution, Poverty and Usage of State Services and 1995 and 2000 Living in Ireland Surveys

As illustrated in Tables 14 and 15, the estimates from the first step are more precisely determined than those from the second step. This is due not only to the smaller sample sizes at the second stage but also to the fact that the majority of individuals have only a small number of visits (see Table 5). In addition, the set of explanatory variables relate to individual characteristics, which are deemed more important in determining contact with a GP than the frequen

cy of visits in the principal-agent framework and potentially important explanatory variables for the second stage, such as GP density, are unavailable in our data (see also Jimenez-Martin *et al*. (2001) and Pohlmeier and Ulrich (1995)). As expected, those aged 65+ years are most likely to visit their GP, in comparison with the base category of those aged 16-24 years. There is some evidence to show that the effect of increasing age on the probability of visiting a GP is not strictly linear in 1987 and 1995 however. Those aged 65+years also visit their GP most frequently in comparison with those aged 16-24 years although the effect is not strictly linear in 1995 and 2000. Even when health status and medical card eligibility have been controlled for, older individual are still more likely to visit their GP and also visit their GP more frequently when they do, reflecting perhaps a greater awareness of good health as age increases. Females are consistently more likely to visit their GP than males in all years and visit more frequently than males, although the latter effect is insignificant in 1987. The fact that gender differences in GP services utilisation persist even when recent maternity experience and health status are controlled for may indicate the presence of unobservable factors such as tastes and attitudes towards medical card that are proxied by gender. Individuals resident in rural areas are less likely than their urban counterparts to visit their GP, a finding consistent with the expectation that distance and/or the availability of GPs have an impact on GP services utilisation. The location of the individual is, however, only significant for the second stage in 1987 and indicates that those living in rural

areas in 1987 visited their GP less frequently than those living in urban areas. This provides some evidence in favour of demand inducement by GPs if it is assumed that rural areas have lower GP densities. In areas with lower GP densities, GPs do not have to compete for business and therefore are less likely to arrange return visits. The insignificance of this variable in 1995 and 2000 may indicate that the change in the reimbursement system in 1989 affected the referral decisions of GPs with regard to their medical card patients; previously all visits were on a fee-for-service basis meaning that the incentive to induce demand existed regardless of patient eligibility. The social class of the individual is consistently insignificant in explaining the decision to visit a GP but exerts some influence on the frequency decision. In 1987, those in the professional social classes visited their GP less frequently while those in the skilled, semi-skilled and unskilled manual social classes visited more frequently than those in the non-manual social class. For 1995, only the latter statement holds while for 2000, only the former statement holds. While it is difficult to explain these patterns, they may indicate the influence that education has on GP utilisation decisions. For example, if social class is a proxy for level of education, it is reasonable to assume that those with higher levels of education may be more likely to self-diagnose and therefore visit their GP less frequently than those with lower levels of education. Interestingly, per capita household disposable income affects the decision to visit a GP in a positive manner in 1995 and 2000 (it is insignificant in 1987), but is consistently insignificant in determining the frequency of visits, a result also found by Gerdtham *et al*. (1997) and Hurd and McGarry (1997). This may indicate that, for the initial contact decision, income does play a role in determining access to GP services suggesting that some individuals are precluded from GP services on the basis of income. However, once the decision to visit a GP has been taken, the level of income does not influence the frequency of visits. Hurd and McGarry (1997) interpret this effect as consistent with a principal-agent view of the decision-making structure with the GP determining the frequency of treatment at the second stage.

As expected, individuals with medical cards are both more likely to visit their GP and to visit more frequently when they do visit. However, there is little evidence to suggest that the effect of medical card eligibility has lessened over time with the results in Tables 14 and 15 indicating that the coefficient on medical card eligibility actually increased over time. If the change in the reimbursement system in 1989 from fee-for-service to capitation for medical card patients was to have any effect of the behaviour of GPs with respect to their medical cardholder patients, we would have expected the differential in utilisation patterns between medical cardholders and non-medical cardholders to lessen over time. The coefficient values suggest that the change in the reimbursement system, while it changed the incentives of GPs, did nothing to change the relative incentives between medical cardholders and non-medical cardholders with regard to the utilisation of GP services. Interestingly, the effect of having private medical insurance significantly increases the probability of visiting a GP in all three years but is insignificant in determining the frequency of visits. The latter result is not surprising given that private medical insurance in Ireland does not cover the cost of GP visits, except in cases where a large deductible is exceeded. The significance of insurance in determining the contact decision may reflect differences in attitudes towards health care between the two groups with those covered by private medical insurance possibly more risk averse than those without. It is also possible that the GP realises that the patient is not covered by insurance for GP visits and therefore does not recommend follow-up visits. While we have employed a number of health status variables as explanatory factors, an area in need of future research is an investigation into the significance and direction of the medical card/insurance effect when medical card/insurance are treated as endogenously determined variables. The three health status variables are all positive and significant in explaining both the contact and frequency decisions. In common with results elsewhere (see for example Jimenez-Martin *et al*. (2001), Gerdtham *et al*. (1997), Hakkinen *et al*. (1996), Pohlmeier and Ulrich (1995) and Nolan (1993)), the measure of physical ill-health is particularly significant.

5.2 2001 Quarterly National Household Survey Module on Health

In contrast with the results from 1987, 1995 and 2000, those aged 25-34 years and 35-44 years are significantly more likely to have visited a GP in the last two weeks than those aged 18-24 years, with those aged 25-34 years being most likely to visit a GP (see Table 14). Interestingly, being aged 45-54 years and 55-64 years significantly reduces the probability of having a GP visit while there is no significant difference between those aged 18-24 years and those aged 65+ years in their probability of visiting a GP. When an alternative measure of health status (e.g. self-assessed health status) is employed, all age effects are the same except that those aged 65+ years are now significantly less likely to visit their GP while the effect of being 35-44 years is now insignificant. It is difficult to explain why these results are so different to those obtained from the earlier data sets as it would be expected that the three health status variables employed in the earlier data sets are more comprehensive indicators of morbidity than the two measures employed in 2001, rather than less accurate. Consistent with the earlier results, females are more likely than males to have visited their GP in the last two weeks. While the variable relating to recent maternity is not available in this data set, it is expected that the significantly positive effect of being a female reflects other differences in morbidity and/or attitudes towards medical care and would persist if we had information on recent maternity experience. Location variables suggest that, in comparison with those living in the Dublin area, mid-east and mid-west residents are significantly more likely to have visited their GP while residents of the west are significantly less likely to have visited their GP. There is no significant difference between residents of the border, midlands, south-east, south-west and Dublin in the probability of visiting a GP within the previous two weeks. It is possible that the regional variables reflect the availability of services and/or the distance that individuals must travel to visit their GP. These results may indicate that certain areas (e.g. mid-east and mid-west) have a higher supply of GPs per head of population, ensuring faster access to GP services in comparison with other areas of the country. Being married or separated increases the probability of visiting a GP with separated individuals being

most likely to visit in comparison with those in the base category, i.e., single individuals. Marital status may be a proxy for household composition. The significance of the married and separated/divorced variables as well as the insignificance of the widowed variable suggests that the presence of children in the household has a significantly positive effect on the probability of visiting a GP. In comparison with being economically inactive (retired, in home duties, permanently incapacitated for work *etc.*), those that are employed are significantly less likely to have visited their GP within the previous two weeks. This is consistent with the theory that time as well as financial costs are important in influencing the decision to visit a GP with those in employment finding it harder to arrange appointments. The unemployed are also less likely to have visited their GP within the last two weeks but this effect is smaller in magnitude than that for employed persons. In addition, it is difficult to explain why unemployed individuals are significantly less likely to visit their GP than those on home duties, retired or permanently incapacitated for work.

As expected, having a medical card and private medical insurance significantly increases the probability of having visited a GP within the previous two weeks. Consistent with the results for 1987, 1995 and 2000, the coefficient on the medical card variable is larger than that on the insurance variable, reflecting the greater importance of medical card eligibility in influencing the decision to visit the GP (as private medical insurance does not cover the cost of GP consultations in Ireland except in cases where a large deductible is exceeded). In common with the results from the previous models, those with at least one health condition are significantly more likely to visit a GP and the addition of this variable adds considerably to the explanatory power of the model.

6. Summary and Conclusions

As a first step in the estimation of the demand for GP services in Ireland, this paper has identified the major determinants of the decision to visit a GP and subsequent to this decision, the

frequency of visits to a GP for three years, 1987, 1995 and 2000. On the basis of a number of statistical tests, it was found that this two-step hurdle negative binomial was more appropriate than one-step models such as the standard Poisson and negative binomial and zero-inflated negative binomial in determining the utilisation of GP services in Ireland. Socio-economic characteristics such as age and sex are consistently significant in explaining both steps of the decision-making process. The finding that income, while positive and significant for the decision to visit a GP in 1995 and 2000, is insignificant in determining the frequency of visits once the decision to visit a GP has been taken, illustrates the presence of horizontal inequity in access to GP services in Ireland at the contact decision but that GP services are utilised regardless of income for those visiting at least once. This result highlights the importance of analysing the two decisions, the contact and frequency decisions, separately. As expected, the measures of health status are all significant in explaining GP consultation decisions with the measure of physical health status being particularly significant.

Most importantly, the results highlight the importance of economic incentives and access to services as represented by medical card eligibility and insurance on the utilisation of GP services. In particular, the finding the medical cardholders are significantly more likely to visit their GP and also visit their GPs more frequently than those without medical cards even after controlling for a variety of socio-economic and health status characteristics highlights the incentives towards excessive utilisation of GP services among the medical card population. In addition, there is evidence to show that the change in the reimbursement system for GPs with medical card patients from fee-for-service to capitation in 1989 had no effect in terms of reducing the differential between those with medical cards and those without in terms of GP services utilisation. This would suggest that incentives towards over-utilisation of GP services exist on the part of the patient, rather than the provider. The significance of insurance in determining the probability of visiting a GP but insignificance in determining the frequency of visits once this decision has been

taken may be indicative of the fact that insurance does not cover the cost of GP care in Ireland, i.e., such individuals may visit a GP once for a diagnosis but rather than visit a GP subsequently either use pharmacy services or out-patient clinics.

Less comprehensive data from the 2001 QNHS, although using a much larger sample, were employed to model the determinants of the probability of visiting a GP during the two weeks prior to the survey. While many of the variables such as sex, health status, medical card eligibility and insurance coverage exhibited similar effects to those found in 1987, 1995 and 2000, age and household location were found to have substantially different effects. While potentially important explanatory variables such as income were unavailable in the QNHS data-set, the availability of additional variables such as marital status and employment status allowed us to quantify the influence of factors such as household composition and time constraints on GP services utilisation.

In terms of future work, an obvious starting point is to extend the two-step analysis to incorporate additional data. The Living in Ireland Survey follows the same households through time and would therefore allow us to investigate more accurately the impact of such events as the change in the system of reimbursement on the utilisation of GP services over the period 1995-2001. In addition, the use of the panel data-set will allow us to use measures of past health status to predict current GP service use, which means that the potential endogeneity of current GP services use with respect to current health status is prevented. Finally, it may be necessary to investigate the potential endogeneity of a number of variables, particularly, medical card eligibility and insurance coverage in an attempt to decide whether the positive effect of being a medical cardholder/insured is as a result of the incentives embodied in the system rather than adverse selection.

Bibliography

Buchmueller, T., Couffinhal, A., Grignon, M. and Perronnin, M. (2002). *Access to Physician Services: Does Supplemental Insurance Matter? Evidence from France.* Working Paper No. 9238. Washington: National Bureau of Economic Research.

Callan, T., Nolan, B., Whelan, B., Hannan, D., Creighton, S. (1989). *Poverty, Income and Welfare in Ireland*. General Research Series Paper No. 146. Dublin: Economic and Social Research Institute.

Cameron, A., Milne, F., Trivedi, P. and Piggott, J. (1988). A Microeconometric Model of the Demand for Health Care and Health Insurance in Australia. *The Review of Economic Studies*, 55, 85-106.

Central Statistics Office (2002). Quarterly National Household Survey: Health. Dublin: Central Statistics Office.

Chiappori, P., Durand, F. and Geoffard, P. (1998). Moral Hazard and the Demand for Physician Services: First Lessons from a French Natural Experiment. *European Economic Review*, 42 (3-5), 499-511.

Department of Health and Children (2001). *Health Strategy: Quality and Fairness, A Health System for You*. Dublin: Stationery Office, 2001.

Department of Health and Children (2002). Health Statistics 2002. Available from www.doh.ie/statistics/health_statistics/2002/stats02.html

Durkan, J., Harmon, C. and Hughes, J. (1996). *Health Services Utilisation in the UK: An Empirical Analysis using Microdata.* Working Paper N65/07/96. Maynooth: National University of Ireland, Department of Economics.

Gerdtham, U. (1997). Equity in Health Care Utilisation: Further Tests Based on Hurdle Models and Swedish Micro Data. *Health Economics,* 6 (3), 303-319.

Giuffrida, A. (2000). *Night Visits in General Practice: Practice Organisation and Patient Demand*. Technical Paper Series 16. University of York, Centre for Health Economics.

Grootendorst, P. (1995). A Comparison of Alternative Models of Prescription Drug Utilisation. *Health Economics*, 4 (3), 183-198.

Hakkinen, U., Rosenqvist, G. and Aro, S. (1996). Economic Depression and the Use of Physician Services in Finland. *Health Economics*, 5 (5), 421-434.

Harmon, C. and Nolan, B. (2001). Health Insurance and Health Services Utilisation in Ireland. *Health Economics*, 10 (2), 135-145.

Holly, A., Gardiol, L., Domenghetti, G. and Bisig, B. (1998). An Econometric Model of Health Care Utilisation and Health Insurance in Switzerland. *European Economic Review*, 42 (3-5), 513-522.

Hurd, M. and McGarry, K. (1997). Medical Insurance and the Use of Health Care Services by the Elderly. *Journal of Health Economics*, 16 (2), 129-154.

Jimenez-Martin, S., Labeaga, J. and Martinez-Granado, M. (2002). Latent Class Versus Two-Part Models in the Demand for Physician Services Across the European Union. *Health Economics*, 11 (4), 301-322.

Jones, A., Koolman, X. and van Doorslaer, E. (2002). *The Impact of Private Health Insurance on Specialist Visits: Analysis of the European Community Household Panel (ECHP)*. Working Paper No. 9. Rotterdam: Erasmus University, ECuity II Project.

Kelleher, R. and McElroy, B. (2002). *A Comparison of Alternative Models to Assess the General Practitioner Weighted Capitation System in Ireland*. Paper presented to the 17th Annual Irish Economics Association Conference 2002.

Nolan, B. (1991). *The Utilisation and Financing of Health Services in Ireland*. General Research Series Paper No. 155. Dublin: Economic and Social Research Institute.

Nolan, B. (1993). Economic Incentives, Health Status and Health Services Utilisation. *Journal of Health Economics*, 12, 151-169.

Pohlmeier, W. and Ulrich, V. (1995). An Econometric Model of the Two-Part Decision Process in the Demand for Health. *The Journal of Human Resources*, 30 (2), 339-361.

Santos Silva, J. and Windmeijer, F. (1999). *Two-Part Multiple Spell Models for Health Care Demand*. Working Paper 99/2. London: Institute for Fiscal Studies.

Schellhorn, M. (2001). The Effect of Variable Health Insurance Deductibles on the Demand for Physician Visits. *Health Economics*, 10 (5), 441-456.

Tussing, A. (2001). The Great Health Debate. *Confronting the Hard Issues: The Way Forward to Reform*. Speech to the Adelaide Hospital Society Conference, 2001. Available from: www. Adelaide.ie/reports/2001conference/tussing.html

Tussing, A. (1985). *Irish Medical Care Resources: An Economic Analysis*. General Research Series Paper No. 126. Dublin: Economic and Social Research Institute.

Van Doorslaer, E., Koolman, X. and Puffer, F. (2001). *Equity in the Use of GP and Specialist Care in OECD Countries: Has Equal Treatment for Equal Need been Achieved*. Working Paper No. 3. Rotterdam: Erasmus University, ECuity II Project.

Vera-Hernandez, A. (1999). Duplicate Coverage and the Demand for Health Care. The Case of Catalonia. *Health Economics*, 8 (7), 579-598.

Waters, H. (1999). Measuring the Impact of Health Insurance with a Correction for Selection Bias: A Case Study of Ecuador. *Health Economics*, 8 (5), 473-483.

Winkelmann, R. (2001). *Health Care Reform and the Number of Doctor Visits – An Econometric Analysis*. Discussion Paper No. 317. Bonn: Institute for the Study of Labour (IZA).

Table 1 Average Number of GP Visits and Frequency of GP Visits by Age and Medical Card Eligibility[20]

	(1) 16-24 years			(2) 25-64 years			(3) 65+ years			(4) ALL		
	1987	**1995**	**2000**	**1987**	**1995**	**2000**	**1987**	**1995**	**2000**	**1987**	**1995**	**2000**
Average number of visits												
No Medical Card	1.2	1.6	1.6	3.0	2.5	2.3	4.0	3.2	3.8	2.6	2.3	2.3
Medical Card	3.4	3.2	3.8	6.6	5.4	6.1	8.4	7.7	7.2	6.7	5.7	6.2
All	**1.7**	**2.1**	**2.1**	**4.0**	**3.3**	**3.2**	**7.1**	**6.4**	**6.1**	**4.0**	**3.6**	**3.4**
Percentage having at least one visit												
No Medical Card	35.6	57.2	57.9	56.2	66.0	67.1	66.1	80.6	87.1	51.8	65.1	66.5
Medical Card	53.7	62.3	69.5	69.5	78.3	82.3	82.8	93.1	93.9	71.4	80.1	84.5
All	**39.7**	**58.8**	**60.5**	**60.0**	**69.5**	**70.5**	**78.1**	**89.5**	**91.7**	**58.5**	**70.5**	**71.7**
Average number of visits for those with at least one visit												
No Medical Card	3.4	2.9	2.8	5.3	3.7	3.5	6.1	4.0	4.3	5.1	3.6	3.4
Medical Card	6.3	5.1	5.4	9.5	6.9	7.4	10.1	8.3	7.7	9.4	7.1	7.3
All	**4.3**	**3.6**	**3.4**	**6.7**	**4.8**	**4.5**	**9.1**	**7.2**	**6.7**	**6.9**	**5.0**	**4.8**

Note: (i) All Statistics are based on the weighted samples.

[20] Data from the 2001 QNHS are not presented here as they do not include information on the frequency of visits (see Section 3.4).

Table 2 Sample Sizes

	IDPUSS	LII		QNHS
	1987	1995	2000	2001
Full Sample	6,344	7,084	6,286	44,844
No GP Visits	2,574	2,146	1,744	35,410
At least one GP Visit	3,770	4,938	4,542	9,434

Note: (i) While the 1987, 1995 and 2000 data refer to the number of GP visits in the previous twelve months, 2001 data refers to GP visits in the previous two weeks. This accounts for the much higher numbers having at least one GP visit in 1987, 1995 and 2000 as a proportion of the total.

Tables 3 to 7 inclusive refer to the data from the 1987 Survey of Income Distribution, Poverty and Usage of State Services and the 1995 and 2000 Living in Ireland Surveys.

Table 3 Variable Definitions for Dependent Variables

VARIABLE	DEFINITION
GPPOS1	=1 if visited a GP in the previous twelve months =0 otherwise
GPVISITS	Number of GP visits in the previous twelve months

Table 4 Summary Statistics for Dependent Variables

	IDPUSS	LII	
	1987	1995	2000
GPPOS1			
Mean	0.59	0.70	0.72
Standard Deviation	0.49	0.46	0.45
Minimum	0.0	0.0	0.0
Maximum	1.0	1.0	1.0
GPVISITS			
Mean	4.0	3.4	3.5
Standard Deviation	7.6	6.1	5.8
Minimum	0.0	0.0	0.0
Maximum	150.0	156.0	104.0

Table 5 Frequency of GP Visits

	1987		1995		2000	
Number of GP Visits	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
0	2574	40.57	2146	30.29	1744	27.74
1	782	12.33	1217	17.18	1053	16.75
2	609	9.60	1090	15.39	1039	16.52
3	355	5.60	567	8.00	525	8.35
4	340	5.36	556	7.85	537	8.54
5	177	2.79	220	3.11	190	3.02
6	315	4.97	357	5.04	348	5.53
7	60	0.95	64	0.90	57	0.91
8	95	1.50	88	1.24	92	1.46
9	19	0.30	18	0.25	14	0.22
10	119	1.88	128	1.81	106	1.69
11	4	0.06	6	0.08	4	0.06
12	572	9.02	390	5.51	380	6.04
13	10	0.16	10	0.14	5	0.08
14	20	0.32	11	0.16	12	0.19
15	44	0.69	28	0.4	24	0.38
16	11	0.17	12	0.17	7	0.11
17	3	0.05	4	0.06	4	0.06
18	12	0.19	3	0.04	1	0.02
19	1	0.02	0	0.00	0	0.00
20	60	0.95	51	0.72	43	0.68
21	2	0.03	0	0.00	1	0.02
22	1	0.02	1	0.01	1	0.02
23	1	0.02	0	0.00	2	0.03
24	39	0.61	29	0.41	21	0.33
25	14	0.22	10	0.14	8	0.13
26	22	0.35	17	0.24	14	0.22
28	1	0.02	1	0.01	0	0.00
29	0	0.00	1	0.01	0	0.00
30	16	0.25	19	0.27	13	0.21
33	0	0.00	1	0.01	0	0.00
34	0	0.00	1	0.01	0	0.00
35	0	0.00	1	0.01	0	0.00
36	3	0.05	1	0.01	2	0.03
39	1	0.02	0	0.00	0	0.00
40	4	0.06	4	0.06	14	0.22
41	1	0.02	0	0.00	0	0.00
42	0	0.00	0	0.00	1	0.02
44	0	0.00	0	0.00	1	0.02
48	2	0.03	3	0.04	1	0.02
50	9	0.14	7	0.10	7	0.11
52	33	0.52	12	0.17	13	0.21
53	0	0.00	1	0.01	0	0.00
54	1	0.02	0	0.00	0	0.00
55	0	0.00	1	0.01	0	0.00
58	1	0.02	1	0.01	0	0.00
60	5	0.08	2	0.03	1	0.02
69	1	0.02	0	0.00	0	0.00
70	0	0.00	1	0.01	2	0.03
72	0	0.00	1	0.01	0	0.00
80	1	0.02	0	0.00	0	0.00
90	0	0.00	1	0.01	0	0.00
100	1	0.02	1	0.01	0	0.00
104	1	0.02	0	0.00	1	0.02
120	1	0.02	0	0.00	0	0.00
150	1	0.02	0	0.00	0	0.00
156	0	0.00	1	0.01	0	0.00
Total	**6,344**	**100.00**	**7,084**	**100.00**	**6,288**	**100.00**

Table 6 Variable Definitions for Independent Variables

VARIABLE	DEFINITION
Age 25-34	=1 if aged 25-34 years, =0 otherwise
Age 35-44	=1 if aged 35-44 years, =0 otherwise
Age 45-54	=1 if aged 45-54 years, =0 otherwise
Age 55-64	=1 if aged 55-64 years, =0 otherwise
Age 65+	=1 if aged 65+ years, =0 otherwise (Base Category = aged 16-24 years)
Female	=1 if female, =0 otherwise (Base Category = male)
Rural	=1 if lives in household located in open country or in a village with 200 - 1,499 inhabitants, =0 otherwise (Base Category = lives in a household located in a town with 1,500 – 10,000 or more inhabitants or in Waterford, Galway, Limerick and Cork cities or Dublin city and county)
Soc1	=1 if higher professional/managerial or a farmer with 200+ acres, =0 otherwise
Soc2	=1 if lower professional/managerial or a farmer with 100-199 acres, =0 otherwise
Soc4	=1 if skilled manual or a farmer with 30-49 acres, =0 otherwise
Soc5	=1 if semi-skilled manual or a farmer with less than 30 acres, =0 otherwise
Soc6	=1 if unskilled manual, =0 otherwise (Base Category = other non-manual or a farmer with 50-99 acres, =0 otherwise)
Income	Net Household Weekly Income in IR£ (adjusted for household size and divided by 100)
Medical Card[21]	=1 if have a medical card or covered on someone else's card, =0 otherwise (Base Category = does not have a medical card and is not covered on someone else's card)
Insurance[1]	=1 if insured either in own name or through another family member, =0 otherwise (Base Category = not insured in own name or through another family member)
Birth	=1 if gave birth in previous twelve months, =0 otherwise (Base Category = did not give birth in previous twelve months)
Ill-Health	=1 if 1987: have any major illness, physical disability or infirmity that has troubled you for at least the past year or that is likely to go on troubling you in the future 1995/2000: have any chronic, physical or mental health problem, illness or disability, =0 otherwise (Base Category = 1987: does not have any major illness, physical disability or infirmity that has troubled you for at least the past year or that is likely to go on troubling you in the future 1995/2000: does not have a chronic, physical or mental health problem, illness or disability)
Stress	=1 if scored 3 or above on GHQ[22], =0 otherwise

[21] While the majority of individuals with medical cards do not have private medical insurance, there are a number who have both and a number who have neither (1995: 28.6 per cent had neither, 39.7 per cent had insurance only, 30.1 per cent had a medical card only and 1.6 per cent had both; 2000: 26.6 per cent had neither, 44.3 per cent had insurance only, 26.7 per cent had a medical card only and 2.30 per cent had both).

[22] The General Health Questionnaire (GHQ) contains twelve questions relating to psychological health status. For the six positive statements, a person scores one if they answer "less than usual" or "much less than usual" while for the six negative statements, a person scores one if they answer "more than usual" or "much more than usual". These

Table 7 Summary Statistics for Independent Variables (Percentage of Sample in each Category[23])

	IDPUSS	LII	
Variable	**1987**	**1995**	**2000**
Age 16-24	13.8	19.0	17.8
Age 25-34	19.8	17.3	12.3
Age 35-44	18.6	18.4	18.7
Age 45-54	17.8	17.1	18.8
Age 55-64	15.1	13.6	15.2
Age 65+	14.9	14.7	17.2
Female	51.7	52.2	53.1
Male	48.3	47.8	46.9
Rural	46.9	51.1	52.3
Urban	53.1	48.9	47.7
Soc1	10.2	18.4	21.6
Soc2	12.6	19.6	21.0
Soc3	20.0	23.5	23.3
Soc4	24.4	18.5	16.5
Soc5	19.3	13.0	11.5
Soc6	13.4	6.9	6.1
Income	0.88	1.48	2.15
	(0.62)	(0.97)	(1.31)
Medical Card	33.1	31.7	29.1
No Medical Card	66.9	68.3	70.9
Insurance	28.4	41.3	46.6
No Insurance	71.6	58.7	53.4
Birth	2.2	1.7	1.2
No Birth	97.8	98.3	98.8
Ill-Health	16.8	17.2	19.3
No Ill-Health	83.2	82.8	80.7
Stress	15.9	16.4	15.1
No Stress	84.1	83.6	84.9

Tables 8 to 11 inclusive refer to the data from the 2001 Quarterly National Household Survey Module on Health.

Table 8 Variable Definitions for Dependent Variables

VARIABLE	DEFINITION
GPPOS2	=1 if visited a GP in the previous two weeks =0 otherwise

scores are added up and anyone scoring above the conventional threshold of two is considered to be in psychological distress (see also Nolan (1991)).

[23] For Equivalised Household Income, the summary statistics are the mean and standard deviation (in parentheses).

Table 9 Summary Statistics for Dependent Variables

GPPOS2	2001
Mean	0.19
Standard Deviation	0.39
Minimum	0.0
Maximum	1.0

Table 10 Variable Definitions for Independent Variables

VARIABLE	DEFINITION
Age 25-34	=1 if aged 25-34 years, =0 otherwise
Age 35-44	=1 if aged 35-44 years, =0 otherwise
Age 45-54	=1 if aged 45-54 years, =0 otherwise
Age 55-64	=1 if aged 55-64 years, =0 otherwise
Age 65+	=1 if aged 65+ years, =0 otherwise (Base Category = aged 18-24 years)
Female	=1 if female, =0 otherwise (Base Category = male)
Border	=1 if living in Cavan, Donegal, Leitrim, Louth, Monaghan or Sligo, =0 otherwise
Midlands	=1 if living in Laois, Longford, Offaly or Westmeath, =0 otherwise
West	=1 if living in Galway County Borough, Galway County, Mayo or Roscommon, =0 otherwise
Mid-East	=1 if living in Kildare, Meath or Wicklow, =0 otherwise
Mid-West	=1 if living in Clare, Limerick County Borough, Limerick County or Tipperary North Riding, =0 otherwise
South-East	=1 if living in Carlow, Kilkenny, Tipperary South Riding, Waterford County Borough, Waterford County or Wexford, =0 otherwise
South-West	=1 if living in Cork County Borough, Cork County or Kerry, =0 otherwise (Base Category = living in Dublin County Borough, Dun Laoghaire-Rathdown, Fingal or South Dublin)
Married	=1 if married, =0 otherwise
Separated	=1 if separated or divorced, =0 otherwise
Widowed	=1 if widowed, =0 otherwise (Base Category = single)
Employed	=1 if in employment, =0 otherwise
Unemployed	=1 if unemployed, =0 otherwise (Base Category = not economically active)
Medical Card[24]	=1 if have a medical card, =0 otherwise (Base Category = does not have a medical card)
Insurance[24]	=1 if have private medical insurance, =0 otherwise (Base Category = does not have private medical insurance)
Ill-Health	=1 if suffers from, or has ever suffered from, one or more of the following – angina, heart attack, stroke, hypertension, rheumatoid arthritis, osteo-arthritis, asthma, chronic bronchitis, diabetes, gastric ulcer, gallstones, kidney stones, osteoporosis, underactive thyroid, leg ulcer, skin cancer, other cancer, other, =0 otherwise (Base Category = does not suffer from, or has never suffered from, any of the above conditions)

[24] While the majority of individuals with medical cards do not have private medical insurance, there are a number who have both and a number who have neither (23.0 per cent had neither, 46.0 per cent had insurance only, 28.7 per cent had a medical card only and 2.4 per cent had both).

Table 11 Summary Statistics for Independent Variables (Percentage of the Sample in each Category)

VARIABLE	2001
Age 18-24	8.6
Age 25-34	17.4
Age 35-44	21.8
Age 45-54	19.0
Age 55-64	13.8
Age 65+	19.4
Female	59.0
Male	41.0
Border	12.6
Midlands	6.0
West	10.7
Dublin	29.9
Mid-East	10.1
Mid-West	7.0
South-East	10.0
South-West	13.8
Single	28.4
Married	57.3
Separated	5.1
Widowed	9.1
Employed	54.9
Unemployed	2.3
Inactive	42.8
Medical Card	31.1
No Medical Card	68.9
Insurance	48.4
No Insurance	51.6
Ill-Health	34.4
No Ill-Health	65.6

Table 12 Model Specification Tests

	1987	1995	2000
Likelihood Ratio Test			
H_o: Poisson; H_1: Negative Binomial			
Test Statistic	21,237.52	12,394.61	10,028.28
Critical Value	$c^2_{1,0.01}$ = 6.635	$c^2_{1,0.01}$ = 6.635	$c^2_{1,0.01}$ = 6.635
	Reject H_0	Reject H_0	Reject H_0
Vuong Non-Nested Test			
H_o: Negative Binomial; H_1: Zero-Inflated Negative Binomial			
Test Statistic	10.13	5.69	5.17
Critical Value	Z = 1.96	Z = 1.96	Z = 1.96
	Reject H_0	Reject H_0	Reject H_0
Likelihood Ratio Test			
H_o: Zero-Inflated Poisson; H_1: Zero-Inflated Negative Binomial			
Test Statistic	11,458.00	8,609.62	7,217.30
Critical Value	$c^2_{1,0.01}$ = 6.635	$c^2_{1,0.01}$ = 6.635	$c^2_{1,0.01}$ = 6.635
	Reject H_0	Reject H_0	Reject H_0
Likelihood Ratio Test			
H_o: Truncated Poisson; H_1: Truncated Negative Binomial			
Test Statistic	10,509.30	7,306.20	6,141.40
Critical Value	$c^2_{1,0.01}$ = 6.635	$c^2_{1,0.01}$ = 6.635	$c^2_{1,0.01}$ = 6.635
	Reject H_0	Reject H_0	Reject H_0
Hausman Test			
H_o: Zero-Inflated Negative Binomial; H_1: Hurdle Negative Binomial			
Test Statistic	82.03	187.60	171.57
Critical Value	$\chi^2_{18,0.01}$ = 34.81	$\chi^2_{18,0.01}$ = 34.81	$\chi^2_{18,0.01}$ = 34.81
	Reject H_o	Reject H_o	Reject H_o

Note: (i) Hausman Test undertaken on the basis of parameters from the second stage of the model (see Pohlmeier and Ulrich, 1995, pp.354 for a similar application)

But how to decide between efficiency/consistency of the models?

Table 13 Zero-Inflated Negative Binomial Models of GP Visits (Estimated Coefficients)

	1987 SIDPUSS		1995 LIIS		2000 LIIS	
	Logit	**NB**	**Logit**	**NB**	**Logit**	**NB**
Constant	0.16	0.89	0.70	0.26	-0.44	0.40
	(0.23)	(0.12)***	(0.55)	(0.08)***	(0.45)	(0.09)***
Age 25-34	-0.62	0.07	-0.58	0.12	0.12	0.19
	(0.18)***	(0.10)	(0.39)	(0.07)*	(0.32)	(0.08)**
Age 35-44	-0.54	0.20	-0.05	0.23	0.06	0.18
	(0.18)***	(0.10)**	(0.30)	(0.08)***	(0.32)	(0.08)**
Age 45-54	-0.22	0.22	-0.20	0.13	-0.40	0.19
	(0.17)	(0.10)**	(0.30)	(0.06)**	(0.36)	(0.08)**
Age 55-64	-0.43	0.39	-1.25	0.27	-0.83	0.30
	(0.18)**	(0.10)***	(0.64)**	(0.07)***	(0.45)*	(0.07)***
Age 65+	-1.06	0.45	-7.71	0.42	-21.15	0.45
	(0.24)***	(0.10)***	(16.08)	(0.06)***	(0.60)***	(0.07)***
Female	-0.51	0.09	-1.05	0.23	-0.99	0.21
	(0.10)***	(0.04)**	(0.25)***	(0.04)***	(0.22)***	(0.04)***
Rural	0.23	-0.11	0.42	-0.0004	0.48	0.05
	(0.11)**	(0.05)**	(0.25)*	(0.04)	(0.30)	(0.04)
Soc1	-0.24	-0.31	-1.00	-0.09	-0.44	-0.19
	(0.27)	(0.09)***	(0.73)	(0.06)	(0.50)	(0.07)**
Soc2	-0.23	-0.22	0.54	-0.01	0.27	-0.11
	(0.23)	(0.09)**	(0.34)	(0.06)	(0.38)	(0.07)*
Soc4	-0.02	0.21	-0.002	0.09	0.06	-0.02
	(0.16)	(0.07)***	(0.32)	(0.06)	(0.29)	(0.07)
Soc5	0.18	0.18	-0.17	0.11	-0.23	0.00
	(0.16)	(0.08)**	(0.36)	(0.06)*	(0.41)	(0.07)
Soc6	0.45	0.26	0.17	0.21	0.19	-0.01
	(0.18)**	(0.07)***	(0.42)	(0.08)**	(0.44)	(0.08)
Income	-0.14	-0.07	-1.40	0.04	-0.35	0.01
	(0.14)	(0.05)	(0.41)***	(0.02)	(0.14)**	(0.01)
Medical Card	-0.72	0.25	-0.87	0.43	-0.73	0.52
	(0.15)***	(0.06)***	(0.31)***	(0.05)***	(0.30)**	(0.05)***
Insurance	-0.49	-0.03	-0.67	-0.02	-0.61	-0.01
	(0.18)***	(0.07)	(0.31)**	(0.05)	(0.39)	(0.06)
Birth	-25.69	0.83	-27.95	1.09	-20.99	1.13
	(0.49)***	(0.09)***	(1.64)***	(0.08)***	(0.62)***	(0.09)***
Ill-Health	-7.86	0.85	-17.50	1.05	-19.24	0.85
	(29.00)	(0.05)***	(1.02)***	(0.04)***	(2.75)***	(0.04)***

Notes: (i) Standard errors, which are adjusted for the clustering of observations by household, are reported in parentheses.
(ii) *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table 13 continued

	1987 SIDPUSS		1995 LIIS		2000 LIIS	
	Logit	**NB**	**Logit**	**NB**	**Logit**	**NB**
Stress	-0.11	0.33	-1.45	0.36	-0.46	0.40
	(0.15)	(0.06)***	(0.79)*	(0.04)***	(0.42)	(0.06)***
α	1.09		0.85		0.72	
	(0.05)***		(0.05)***		(0.05)***	
Number of Observations	6,344		7,084		6,286	
Log-Likelihood	-13,887.96		-15,138.72		-13,623.32	
Wald Chi-Squared	902.16		1406.49		1439.32	
Prob > Chi-Squared	0.00		0.00		0.00	

Notes: (i) Standard errors, which are adjusted for the clustering of observations by household, are reported in parentheses.
(ii) *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table 14 Logit Models of the Probability of Visiting a GP (Estimated Coefficients)

	1987 SIDPUSS	1995 LIIS	2000 LIIS	2001 QNHS
Constant	-0.71 (0.12)***	-0.49 (0.12)***	-0.29 (0.13)**	-2.43 (0.07)***
Age 25-34	0.43 (0.10)***	0.24 (0.09)***	0.10 (0.11)	0.30 (0.06)***
Age 35-44	0.45 (0.10)***	0.17 (0.09)*	0.10 (0.10)	0.13 (0.06)**
Age 45-54	0.30 (0.10)**	0.20 (0.09)**	0.29 (0.09)***	-0.12 (0.07)*
Age 55-64	0.49 (0.11)***	0.40 (0.10)***	0.49 (0.11)***	-0.15 (0.07)**
Age 65+	0.88 (0.12)***	1.03 (0.12)***	1.25 (0.14)***	-0.07 (0.07)
Female	0.35 (0.05)***	0.53 (0.06)***	0.52 (0.06)***	0.35 (0.03)***
Rural	-0.19 (0.06)***	-0.14 (0.06)**	-0.14 (0.07)**	
Border				-0.01 (0.04)
Midlands				0.03 (0.06)
West				-0.11 (0.05)**
Mid-East				0.09 (0.05)*
Mid-West				0.22 (0.05)***
South-East				-0.02 (0.05)
South-West				0.02 (0.04)
Married				0.19 (0.04)***
Separated				0.28 (0.06)***
Widowed				0.07 (0.05)

Notes: (i) Standard errors, which are adjusted for the clustering of observations by household, are reported in parentheses.
(ii) *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table 14 continued

	1987 SIDPUSS	1995 LIIS	2000 LIIS	QNHS 2001
Employed				-0.33
				(0.03)***
Unemployed				-0.26
				(0.09)***
Soc1	-0.03	0.02	-0.06	
	(0.12)	(0.10)	(0.11)	
Soc2	0.01	-0.09	-0.12	
	(0.11)	(0.09)	(0.10)	
Soc4	0.12	0.07	-0.06	
	(0.09)	(0.09)	(0.11)	
Soc5	0.01	0.13	0.08	
	(0.09)	(0.11)	(0.13)	
Soc6	-0.08	0.01	-0.15	
	(0.11)	(0.14)	(0.17)	
Income	0.03	0.19	0.11	
	(0.05)	(0.04)***	(0.03)***	
Medical Card	0.58	0.69	0.73	0.75
	(0.08)***	(0.08)***	(0.10)***	(0.04)***
Insurance	0.23	0.25	0.22	0.07
	(0.08)***	(0.07)***	(0.08)**	(0.03)**
Birth	1.74	1.97	2.41	
	(0.28)***	(0.39)***	(0.59)***	
Ill-Health	1.88	1.55	1.66	1.30
	(0.11)***	(0.11)***	(0.13)***	(0.03)***
Stress	0.26	0.48	0.57	
	(0.08)***	(0.09)***	(0.11)***	
Number of Observations	6,344	7,084	6,286	44,844
Log-Likelihood	-3,821.64	-3,893.40	-3,263.44	-20,324.05
Wald Chi-Squared (18)	649.76	598.48	594.31	5,492.01
Prob > Chi-Squared	0.00	0.00	0.00	0.00

Notes: (i) Standard errors, which are adjusted for the clustering of observations by household in 1987, 1995 and 2000, are reported in parentheses.
(ii) *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table 15 Truncated Negative Binomial Models of the Number of GP Visits (Estimated Coefficients)

	1987 SIDPUSS	1995 LIIS	2000 LIIS
Constant	1.27 (0.09)***	0.77 (0.06)***	0.83 (0.07)***
Age 25-34	0.05 (0.08)	0.11 (0.05)**	0.15 (0.06)**
Age 35-44	0.16 (0.08)*	0.19 (0.06)***	0.15 (0.06)**
Age 45-54	0.17 (0.08)**	0.10 (0.05)**	0.13 (0.07)**
Age 55-64	0.29 (0.08)***	0.22 (0.06)***	0.22 (0.06)***
Age 65+	0.33 (0.08)***	0.28 (0.05)***	0.29 (0.05)***
Female	0.06 (0.04)*	0.14 (0.03)***	0.14 (0.03)***
Rural	-0.08 (0.04)**	-0.001 (0.03)	0.05 (0.03)
Soc1	-0.26 (0.07)***	-0.06 (0.05)	-0.15 (0.05)***
Soc2	-0.18 (0.07)**	0.00 (0.05)	-0.11 (0.05)**
Soc4	0.16 (0.06)***	0.07 (0.05)	-0.01 (0.06)
Soc5	0.14 (0.07)**	0.10 (0.05)**	0.00 (0.05)
Soc6	0.20 (0.06)***	0.18 (0.06)***	0.01 (0.07)
Income	-0.06 (0.04)	0.02 (0.02)	-0.001 (0.01)
Medical Card	0.20 (0.05)***	0.30 (0.04)***	0.43 (0.04)***
Insurance	-0.01 (0.06)	-0.05 (0.04)	-0.01 (0.05)
Birth	0.64 (0.08)***	0.82 (0.07)***	0.88 (0.09)***

Notes: (i) Standard errors, which are adjusted for the clustering of observations by household, are reported in parentheses.
(ii) *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table 15 continued

	1987 SIDPUSS	1995 LIIS	2000 LIIS
Ill-Health	0.72	0.85	0.69
	(0.04)***	(0.04)***	(0.04)***
Stress	0.27	0.33	0.33
	(0.05)***	(0.04)***	(0.05)***
α	0.56	0.42	0.40
	(0.02)***	(0.02)***	(0.02)***
Number of Observations	3,770	4,938	4,542
Log-Likelihood	-10,589.87	-12,098.99	-11,087.43
Wald Chi-Squared (18)	914.51	1331.56	1356.59
Prob > Chi-Squared	0.00	0.00	0.00

Notes: (i) Standard errors, which are adjusted for the clustering of observations by household, are reported in parentheses.
(ii) *** significant at 1% level; ** significant at 5% level; * significant at 10% level.