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Ignacio Abásolo
Rob Manning
Andrew M. Jones

CHE Technical Paper Series 12

Equity in utilisation and access to public-sector GPs in Spain

Ignacio Abásolo[1], *Rob Manning*[2] *and Andrew M. Jones*[2]
[1] Departamento de Economía de las Instituciones, Estadística Económica y Econometría, Universidad de La Laguna, Tenerife
[2] Department of Economics and Related Studies, University of York

Abstract

We outline a framework for testing empirically whether *utilisation* of and *access* to public-sector *GPs* in Spain in 1993 was consistent with the twin criteria of *horizontal* and *vertical equity*, where these are defined with respect to *need*. Vertical (horizontal) *inequities in access* are assessed by including *interactions* between *determinants of access* and *need* (*non-need*) variables in our utilisation equation. Our findings are consistent with the principle of vertical equity in the *utilisation* of *GP* services, but are not consistent with horizontal equity. We impute travel time for individuals who did not visit their *GP* but find that it is not a significant determinant of utilisation or access. However, we express caution when interpreting our findings, as they may be contaminated by biases arising from unit non-response, measurement error and simultaneity. We conclude with a set of recommendations for future studies.

Key words: equity, utilisation, access, *GPs*, National Health Survey, Spain

JEL Code: I1

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1 Corresponding author: Ignacio Abásolo (e-mail: iabasolo@ull.es; phone: 34-922-317088). We thank John Cairns for his discussion of a previous version of this paper at the January 1998 *HESG* and participants of the XVIII Jornadas de Economia de la Salud in May 1998 for their comments. We are also grateful to Juan Acosta, José Barea, Victor Cano, Paul Contoyannis, Martin Forster, Antonio Giuffrida, Peter Martinsson, Nigel Rice, Matt Sutton, John Wildman and Alan Williams for helpful comments on previous drafts. Ignacio Abásolo thanks the staff of the York Health Economics Consortium (*YHEC*) for their hospitality, particularly its Director John Posnett. Finally, we are grateful to the "Fundación Dr. Morales" (Ayuntamiento de Tazacorte in La Palma) for financial support to visit *YHEC* to undertake this research. Any errors are our responsibility.

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Introduction

Many governments specify equity objectives for their healthcare systems. We consider how the attainment of these objectives may be translated into testable hypotheses and outline the practical and methodological problems of testing these empirically. To illustrate the complexities involved, we assess whether access to and utilisation of publicly-funded Spanish GPs in 1993 was consistent with the twin criteria of *horizontal equity* and *vertical equity*, where these are defined with respect to 'need'. Although this example is very specific, our framework is sufficiently flexible to accommodate alternative notions of equity and examine different areas of healthcare activity. Furthermore, we are able to draw general conclusions that allow us to specify a sequence of tasks that researchers may pursue if they wish to assess equity within a particular healthcare system.

Our initial task, which we undertake in section 1, is to define equity in a way that is valid theoretically and enables us to specify empirically-testable hypotheses. In section 2, we review briefly how other analysts have done this and, in section 3, highlight the practical and methodological difficulties that remain. We address some of these within the context of an econometric model of public-sector *GP* services, the results from which we discuss in section 4. We conclude with a discussion of results and a set of recommendations, which aim to help researchers conduct future studies on equity in the delivery of health care.

1. Defining equity and specifying empirically-testable hypotheses

To assess whether equity-related policy objectives have been secured, we first have to translate these into hypotheses that are testable empirically. This task is not straightforward or value-free but we take the following quotation from the prevailing *Spanish General Health Act* of 1986 (*SGHA*) as our starting point.

> " ... public health care will cover the overall Spanish population. Access and provision of health care will be established in conditions of effective equality. Health policy will be oriented towards the overcoming of social and territorial imbalances ... public authorities will orient their health care expenditure policies in order to correct health care inequalities and to guarantee equality of access to health care services throughout the Spanish territory ... "

Equality of provision and access seem to be the two key issues in the allocation of health resources (although there are others, see, eg Culyer and Wagstaff, 1993). The relationship with 'need', as the rationing criterion, is not mentioned explicitly in the statement above but may be implicit in the stated intention to overcome '*social and territorial imbalances*' and '*correct health care inequalities*'.

Therefore, we test whether access to, and utilisation of, publicly-funded Spanish *GP*s in 1993 was consistent with *horizontal equity* and *vertical equity*, where these are defined with respect to need. We defer our discussion of need until section 3 but specify informally our hypotheses below, with reference to ***Box 1***.

It follows from ***Box 1*** that *differential* utilisation of, and access to, healthcare amongst individuals should: (a) relate *only* to differences in their needs; and (b) *not* relate to differences in their non-need characteristics, such as age (*A*); gender (*G*); socioeconomic background (*SEB*); or the geographical region (*R*) in which they reside. While distinct conceptually, age and gender have in practice been treated synonymously with need because of the difficulties of measuring the latter. We consider this issue - which is one of identification - later, together with our use of socioeconomic indicators, rather than income.

Box 1.	Utilisation of GP services	Access to GP services
Horizontal Equity	[H_0^{hu}]: *utilisation* of health care is equal amongst those with equal needs.	[H_0^{ha}]: *access* to health care is equal amongst those with equal needs.
Vertical Equity	[H_0^{vu}]: *utilisation* of health care is greater amongst those with greater needs.	[H_0^{va}]: *access* to health care is greater amongst those with greater needs.

We specify our hypotheses more formally in section 3, within the context of a model that describes whether individuals did or did not visit a publicly-funded *GP* during a particular period. Although we focus on this relatively-narrow area of healthcare activity, the role of *GP*s as 'gatekeepers' to (elective) secondary care suggests that any inequity in the access to and utilisation of primary care is likely to be replicated throughout the system. Moreover, our *methods* are applicable to other areas of healthcare, within Spain and other countries.

2. Previous Studies

Studies that assess healthcare-related equity using micro data can be classified in two broad groups. The first compares the distribution of healthcare services (or expenditure) across income or socioeconomic groups, after adjusting for 'need'. The second approach models utilisation as a function of a broader range of determinants and examines the role played by socioeconomic characteristics and other *equity*-relevant factors.

Since the pioneering study by Le Grand (1978), who compared the distribution of need and public healthcare expenditure by different socioeconomic groups, several authors have refined such standardisation procedures. Collins and Klein (1980) split their sample by need categories and studied the distribution of healthcare services across these. Wagstaff et al. (1991b) and O'Donnell and Propper (1991a) examined the distribution of health care expenditure using the direct standardisation approach used in epidemiology. Wagstaff et al. (1991b) and Van Doorslaer et al. (1993) used the regression approach to standardise for different need indicators. What is common in this first group of studies is that any variability in utilisation across socioeconomic -or income- groups which can not be explained fully by differences in need, age or gender, is interpreted as evidence of socioeconomic inequity in health care utilisation.

In Spain, a few studies of equity in the delivery of health care have followed this approach. For example, the distribution of health care expenditure was firstly analysed by Rodríguez et al. (1993) based on the 1987 Spanish Health Survey of 1987, who found evidence suggesting that the distribution of overall health care expenditure -public and privately financed- moderately favoured the higher income groups. Abásolo (1997, 1998) used the 1993 Health Survey to analyse horizontal equity in the distribution of public health care expenditure across socioeconomic groups. His results suggest that, once adjusted by 'need', public health care expenditure is distributed in favour of the lower socioeconomic groups; in addition, horizontal inequity indices are relatively higher in the Canaries, with respect to the whole Spain. Urbanos (1997) used the Health Surveys of 1987, 1993, 1995 and the Budget Household Survey of 1990, to analyse horizontal equity in the public provision of different health services, by comparing utilisation across income groups. Following Wagstaff (1996) she studies the statistical significance of different horizontal inequity indices. She did not find statistically significant inequities, whether considering overall services, or by examining them separately. However, her results suggest that for each of those years, inequity favours the higher income groups. Although significant for 1987, the inequity indices for 1993 and 1995 are not statistically significant. Finally, Ortiz et al. (1998), using the methodology proposed by Collins et al. (1980), calculated the average public health expenditure received by different income groups within each of three morbidity categories, standardising by age and sex. They got information on self-assessed health, demographic characteristics and income from the 1993 Household Panel Survey and from the 1993 National Health Survey. Amongst those in good health, the distribution of public expenditure seems to favour middle income groups (for men) and the richest groups (for women). For those in fair health there seems to be a slightly pro-poor distribution. There is no clear pattern in the worst health category.

The second approach consists of studies in which health care utilisation is modelled and emphasis is given to the role of equity-relevant determinants (particularly, socioeconomic factors). They aim to model health care utilisation in terms of medical need, socioeconomic, demographic and other supply factors (e.g. Broyles et al. 1983, Puffer 1986, Manga et al. 1987, Evandrou et al 1990, and Birch et al. 1993). This requires a separate analysis for each item of service. The regression approach is used to *explain* utilisation, rather than as a device for *standardising* the distribution of health care. In Spain, a similar approach was undertaken by Regidor et al. (1996), who used a logistic multiple regression model to explain overall (public and privately financed) doctor consultations and hospital admissions, taking account of the following factors: self-reported morbidity, age, sex, size of area of residence and having private-public insurance. They found no evidence of statistically significant differences in the use of these services by socioeconomic groups.

The first approach is of interest to analyse and measure horizontal equity in health care, and is particularly attractive from a public expenditure incidence perspective. However, it does not help to explain the origin of any deviation from an horizontally equitable distribution of health care services. In addition, it does not allow an appropriate test for vertical equity issues. If analysis aims to help policy makers to understand the sources of any potential inequity, the econometric approach seems to be more informative. Moreover, this framework allows appropriate econometric tools to be used when tackling problems like missing data, self-selection of individuals, errors in measurement of 'need' variables, and so on.

3. Methodology

3.1. The model

We develop a reduced-form model that explains utilisation of public-sector *GPs* in terms of those demand and supply factors that we expect to be influential under the Spanish National Health System (*SNHS*).

We begin by postulating that individuals will visit their GP if their valuation of the health improvements they anticipate from visiting their *GP* exceeds the costs. The capacity of an individual to experience such health improvements represents their *need* for a *GP* visit. Therefore, we specify need as an important demand-side factor. The valuation the individual places on any health improvement will depend on their assessment of its intrinsic worth and of the benefits of the consequent increase in consumption and production opportunities. Hence, we anticipate that *permanent income*, *employment status*, *household characteristics*, *age* and *gender* will be important.

Although there are no user charges under the *SNHS*, Sugden and Williams (*1978*) remind us that this

> " ... does not mean that consultations are costless to the patient. Visiting a surgery requires the patient to sacrifice time - travelling to and from the surgery, waiting to see the GP, and the time spent in the consultation itself. ... If [the patient] travels to the surgery by car or by public transport, or if [they have] to take time off work, the consultation may also involve outlays of money." (p149)

Therefore, we also aim to include indicators for these 'access costs' in the model, i.e. travel and waiting times, as they might influence GP utilisation. In addition, *supply-side* characteristics are also included because of the influence these may have on *access* to, and hence demand for, *GP* services.

The services provided by *GPs* in the *private sector* may be viewed as *substitutes* for those supplied by their public-sector counterparts, although these may be accorded a different value by some individuals. Because the relative price of private-sector *GP* consultations will depend on whether the individual has private healthcare insurance, we take account of this in our model.

We combine the variables suggested by this brief consideration of demand and supply influences with 'equity-relevant' factors used by other researchers and divide the composite list into three broad categories: 'need variables'; 'non-need variables'; and 'access variables'. This allows us to distinguish between different sources of inequity and assess their relative importance. We defer a detailed description of our variables until section *3.2*. Here, we consider them briefly and specify how they feature in the hypotheses we outlined in *Box 1*.

Needs Variables

Self-reported indicators of short-term and long-term *morbidity* are used as measures of need in many empirical studies. We have tried to make use of the wide range of morbidity indicators included in the survey. In addition, we aim to interact short term and long term morbidity as we anticipate that people with a similar short term condition might have different patterns of utilisation or access according to their general health state. However, these measures of *ill health* or *initial health* (Culyer and Wagstaff, op cit) reflect a different notion of need to that discussed by Williams (op cit). Therefore, the health indicators we include in our model (*N*) will measure 'true need' for *GP* services with error. This has important implications for our ability to assess the extent of any vertical inequity, as this is defined in terms of 'true need'. We discuss the consequences of, and solutions to, this 'errors-in-variables' problem in section *3.3*.

Non-need Variables

These comprise influences other than need and access costs, and include *age* (*A*); *gender* (*G*); *socioeconomic background* (*SEB*), as measured by *education, employment* and *occupation*; the *region* (*R*) in which the individual resides; the characteristics of their household (*H*); and whether they have private health insurance (*PHI*). By examining the role of these variables in explaining patterns of *GP* utilisation, we may assess the extent to which an important objective of Spanish health policy, 'the overcoming of social and territorial imbalances', has been secured.

In particular, if we were able to distinguish need from *age* and *gender*, we could assess the extent of any inter-generational inequity or 'gender bias' in access to and the use of *GP* services. However, we will not be able to identify the separate effects of *age* and *gender* if *unmeasured need* is correlated with these variables.

As we have seen, the comparison of utilisation across *income groups* is a common method for assessing horizontal equity. However, because we do not have a reliable measure of income, we examine the role played by indicators of *SEB,* although these variables may have their own, independent effects and may also be correlated with *unmeasured need.*

Geographical dimensions of equity have received less attention in the literature. However, since the

1986 *SHCA*, the seventeen *Autonomies* comprising Spain (we refer to these as regions *R* throughout the paper) have been given greater responsibility for healthcare resources and the tailoring of these to the needs of their resident population.This is particularly important for those Regional Health Authorities (Andalucía, Cataluña, País Vasco, Navarra, Galicia and Valencia) with full competencies in health care in 1993 (in addition to the "Insalud" health authority which accounts for the delivery of health care of the remaining eleven autonomies. As a consequence of such decentralisation, we anticipate geographical variation, or 'territorial imbalances', in access to and utilisation of *GP* services.

Access Variables

The importance of 'access costs' within a publicly-funded healthcare system was emphasised above. Unfortunately, we could not obtain satisfactory data for each of their components, only self-reported data on *travel time* (*TT*). However, we would not expect time spent waiting in the surgery to be as influential as travel time, as the former is characterised by a greater degree of uncertainty. We also include supply-side variables (*S*) to measure physical access to *GPs*.

Having considered briefly the factors that may influence each individual's assessment of the *net benefit* of visiting their *GP*, which we represent by the *latent variable* GP_i^*, we can write:

[1] $$GP_i^* = GP(N_i, A_i, G_i, SEB_i, R_i, H_i, PHI_i, S_i, TT_i) + \varepsilon_i,$$

where *i* indexes individuals and ε_i captures influences that are unobserved by the analyst. We assume that observed GP utilisation is generated according to the following indicator function,

[2] $$GP_i = 1[GP_i^* > 0].$$

Hence, if individual *i* anticipates a positive net benefit from visiting their *GP* $(GP_i^* > 0)$, they will do so $(GP_i = 1)$, otherwise $(GP_i^* \leq 0)$ they will not $(GP_i = 0)$.

Although **[1]** and **[2]** provide a *descriptive* model of *GP* utilisation, we may assess our findings against those equity criteria outlined in ***Box 1***, which are themselves *normative*. In particular, we specify hypotheses concerning the magnitude and direction of selected coefficients, that allow us to test empirically whether the equity-related objectives of the *SNHS* have been secured. These are shown in ***Box 2***.

Box 2.	*Utilisation of GP services*	*Access to GP services*
Horizontal Equity	$[H_0^{hu}]$: $\frac{\partial GP}{\partial[non\text{-}need]} = 0$	$[H_0^{ha}]$: $\frac{\partial^2 GP}{\partial[non\text{-}need].\partial[access]} = 0$
Vertical Equity	$[H_0^{vu}]$: $\frac{\partial GP}{\partial[need]} > 0$	$[H_0^{va}]$: $\frac{\partial^2 GP}{\partial[need].\partial[access]} \neq 0$

Assessing equity of *utilisation* with respect to need is relatively straightforward. This is not so in the case of equity of *access*, for reasons discussed by Culyer and Wagstaff (op cit). However, we are able to make some progress in this direction, by considering whether the impact of our *access variables* on

GP utilisation $\left(\partial GP / \partial[access]\right)$ varies significantly by 'equity relevant' characteristics.

Horizontal equity requires that differential *utilisation* of *GP* services between individuals should relate *only* to differences in their 'needs'. Therefore, the corresponding hypothesis (H_0^{hu}) is that the coefficients on our non-need variables, such as age (*A*), gender (*G*), socioeconomic background (*SEB*) and region (*R*), are zero.

Vertical equity dictates that individuals with greater need make greater *use* of *GP* services. A prerequisite for the fulfilment of this criterion is that the coefficients of our need variables are positive. However, a further requirement is that the size of these coefficients are significant in policy terms. That is, they should exceed the threshold P_u that corresponds to policy makers' notion of *how much greater use* 'needy' individuals should make of *GP* services. Therefore, without P_u, we can only test the hypothesis that the *necessary condition* for vertical equity (H_0^{vu}) is satisfied but not whether the *sufficient condition* $\left(\partial GP / \partial[need] > P_u\right)$ is met.

Horizontal equity implies that differential *access* to *GP* services between individuals should relate *only* to differences in their needs. Therefore, the corresponding hypothesis (H_0^{ha}) is that $\partial GP / \partial[access]$ should not differ according to the non-need characteristics of individuals, such as their age, gender or *SEB*. Otherwise, the costs of access to *GP* services will vary between age groups, females and males, regions and individuals with different levels of educational, for example.

Vertical equity dictates that individuals with *greater* need should have *greater access* to *GP*s. A prerequisite for the fulfilment of this criterion is that access costs decline as need increases. However, a further requirement is that the rate with which access costs fall with greater need exceeds a threshold P_a. Where P_a corresponds to policy makers' notion of *how much greater access* to *GP* services should be among more needy individuals. Therefore, without P_a, we can only test the hypothesis that the *necessary condition* for vertical equity (H_0^{vu}) is satisfied but not whether the *sufficient condition* is met.

3.2. Data and variable definitions

The data we use were collected during the 1993 *Spanish National Health Survey*, which employed a multistage, stratified-random design to identify samples of adults (aged 16 or over) that were representative at the level of the 17 *Autonomies*, with the target number of survey interviews (21,120) being assigned proportionally to the 52 *Provinces* and age-gender cohorts. This design specifies the sub-populations from which individuals ('study units') were sampled, by random routes and by age and gender quotas (see MSC 1995 for more details).

Data on self-reported morbidity, demographic and socioeconomic characteristics, lifestyles and healthcare utilisation were collected for the 21,061 survey participants. The *appendix* contains definitions for all of the variables used in our models, including those collected from additional sources, which record the level of healthcare resources and other characteristics at the *Province* level.

GP_i, our binary dependent variable, takes the value 1 if individual i visited a public-sector general practitioner during the two-week period prior to the time of the survey.

The *self-reported measures of health* we use as proxies for need (*N*) include a categorical indicator that records whether individual i considered their *general health* during the twelve months prior to the survey to be 'very good', 'good', 'fair', 'poor' or 'very poor'. A set of dummy variables indicate whether the respondent reports the presence of any of the seven listed *chronic conditions*. Any *acute illness* is categorised according to whether it restricts the normal activity of the respondent or confines them to bed. The number of days affected by each of these is noted. Self-reported height and weight are used to compute the individual's body mass index (*BMI*), from which are derived the health-related categorisations of *underweight, normalweight, overweight* and *obese*.

Socioeconomic group (*SEG*) is based on a standard classification of the individual's occupation. For retired individuals or those who are unemployed, their last occupation is used. The *SEG* of the individual with the highest level of income within the household is used for those respondents without a previous or paid occupation. The binary variable *working* records whether the individual is in paid employment at the time of the survey. *Education* is indicated by the level of schooling. Other 'equity-relevant characteristics', such as *age* (*A*), *gender* (*G*) and *region* (*R*) of residence are also recorded, as are household characteristics (*H*). The latter include indicators of whether the respondent is married, lives alone, has children (aged less than ten years), or resides in an area characterised by predefined population sizes. *PHI* records whether the survey respondent has private health insurance.

Our indicators of *access* include survey information on *travel time* and measures of the availability of healthcare resources. For the former, individuals that *did* visit, report the number of minutes they spent travelling to the surgery. The latter set of variables record the number of beds and the number of doctors per capita for each province (INE 1993).

The following characteristics, measured at the province level, serve as 'identifying variables': availability of public and private transport, climate and population density (INE 1993). Measures of the latter are interacted with indicators of population size. Finally, a binary variable indicates whether individuals aged more than 65 experience difficulties walking, taking a bus or climbing stairs.

3.3. Econometric issues

To proceed, we have to select a *functional form* for our empirical model; we need to specify, *inter alia*: which of the possible explanatory variables we should include; whether these affect our dependent variable in a linear or nonlinear fashion; and whether our continuous variables enter the model in their natural units or as logarithms, as higher-order powers or as cross products with other variables. An incorrect functional form leads to 'mis-specification' bias. Fortunately, we are able to use economic and statistical criteria to discriminate between the alternatives.

The *latent variable framework* - described by **[1]** and **[2]** - is derived from economic theory and leads naturally to the nonlinear *probit* or *logit* specification. The alternative *linear probability model* (*LPM*) does not have the same appeal, as it models $E[GP_i|(.)]$ rather than $E[GP_i^*|(.)]$ and its predictions of the former may lie outside of the logically-feasible (0,1) range (Maddala, 1983). Furthermore, standard specification tests help us to discriminate between these alternative *functional forms*.

Having specified our model, considered the different forms it may take, stated our hypotheses and described our data, we are now in a position to assess empirically the extent to which the equity-related objectives of the *SNHS* have been secured. The task appears to be straightforward. However, there are a number of problems that complicate matters. We consider each of these in turn, describe their solutions and, where these cannot be implemented, the implications they may have for the conclusions we can draw from our results.

3.3.1. Incomplete survey data

Our empirical model may be subject to *selection bias* whenever the data on which it relies are incomplete. Survey data may be incomplete either because some study units chosen for inclusion in the survey did not respond to the questionnaire ('unit non-response') or because some survey respondents did not provide information for each of the survey items ('item non-response'). If the pattern of non-response of either type is *systematic* (or non-random), conventional estimators may be biased and inconsistent. Systematic non-response occurs when factors that are known to the individual but *unobserved by the analyst*: (a) influence the propensity of individuals to self select into the sub sample of units that provide complete survey data; and (b) affect independently the outcome of interest. Conventional solutions to *unit non-response* require the analyst to model the reporting behaviour of *all* study units.

The target number of survey interviews was 21,120. Although valid data were provided by 21,061, it is not clear whether this represents a response rate of 99.7% or whether the population were resampled until the final figure was attained. In the latter case, 21,061 may comprise a nonrandom sample of the study population, in which case we face the problem of *unit non-response*. Implementation of standard solutions for any consequent selection bias requires data on nonrespondents or knowledge of the variables that influence the decision of study units to provide survey data (Maddala, 1983).

Ninety-six percent of respondents supplied a valid reply to the question on *GP* utilisation, so we do not anticipate that *item non-response* concerning our dependent variable will be problematic. However, the percentage of 'intact observations' falls well below this figure because of item non-response affecting the independent variables, which we consider below.

Values for *travel time* are recorded only for those individuals who visited their *GP*, although for such individuals did not provide a valid response. Therefore, to estimate the impact of this variable, we have to impute values for those individuals who did not visit their *GP*. If individuals reporting their travel time are a *self-selected* sample of the population (rather than a random sample), we cannot simply impute the missing values from the complete observations. To do so may lead to erroneous inferences concerning the effects of travel times on *GP* utilisation. Therefore, to impute missing values that do not lead to this form of *self-selection bias*, we implement Heckman's (1979) two-stage estimation approach. Because these predictions (or 'instrumental variables') are, by design, uncorrelated with the disturbance term for the *GP* equation, $\partial GP / \partial TT$ can be identified. However, because this method relies on the differences in the functional form of our *GP* and *TT* equations, identification may be fragile. Therefore, we add 'identifying variables' to our travel time equation. These variables should affect significantly *TT* but not *GP* utilisation directly. We employ overidentification tests, to assess the *validity* of these variables, that is, to ensure that they can be excluded legitimately from the *GP* equation. Their *relevance* is tested by assessing whether they are jointly-significant in the *TT* equation.

Because data were not supplied by all survey respondents for those *items* corresponding to the other regressors in our model, our final sample of complete observations was reduced by 31%; from 21,061 to 14,543, of which 7,190 are women and 7,353 are men. However, our tests suggest that this *item non-response* was random, rather than systematic, and does not influence our final results.

3.3.2. Measurement Error

Because we do not have direct measures of each individual's 'capacity to benefit' from a *GP* visit, we are forced to rely upon proxies for this theoretically-correct measure of need. Like previous researchers, we use measures of morbidity and self-reported health. Although such proxies are subject to 'measurement error' that renders conventional estimators biased and inconsistent, it is preferable that they are included in rather than omitted from our specification. If individuals that visit their *GP* are either more able or more willing to report their 'true health' than those who do not, we face an additional type of bias.

The solution to each of these problems is to model, from (more) objective measures of health, the correlation between our need indicators (*N*) and the *unobserved* dimensions of need contained in ε_i. As we did not implement this strategy, we should be cautious in interpreting the results relating to our need variables, the coefficients of which may be subject to bias.

3.3.3. Simultaneity

Simultaneity arises when some of our right-hand-side variables are not determined exogenously but are influenced (at least in part) by our left-hand-side variable. Under these circumstances, conventional estimators will be biased and inconsistent. Variables that may be *endogenous* in our model include measures of need and private insurance. As our measures of supply are taken at the *aggregate* level, they are unlikely to be *endogenous* to decisions taken at the *individual* level.

If individuals that do visit their *GP* have better health as a consequence, the values of GP_i and our need (*N*) variables will be determined simultaneously. Similarly, individuals with a higher propensity to visit a public-sector *GP* are less likely to purchase private health insurance. By constructing *instrumental variables* for these endogenous regressors, we may tackle the problem of simultaneity bias.

Clearly, the problems of *unit non-response*, *measurement error* and *simultaneity* may bias the methods we employ. This should be borne in mind when considering our results, to which we now turn.

4. Discussion of Results

We found that *RESET* specification tests favoured the *probit* over the *logit* and the *LPM*. The logit was rejected for females and the *LPM* for both men and women. Therefore, we confine our attention to the *probit*. First, we discuss the results from the *probit* equation for *GP* visits that includes independent and identifying variables (*Table 1*). Second, we consider briefly the *Heckman* (2nd-stage) regression for travel time (*Table 2*). Finally, we compare results in *Table 1* to those obtained from the *probit* equation for *GP* visits that includes predicted travel time (*Table 3*). The *Tables* are included at the back of the text and show separate results for females and males.

The *RESET* test indicates that there are no problems with the functional form of the models presented in *Table 1*. However, as is often the case when the *probit* is applied to cross-sectional data, the goodness of fit is low. The McFadden (or pseudo) R-squared statistic for females (males) is 0.14 (0.17). The proportion of correct predictions for females (males) is high, 0.86 (0.90), although the models under predict the number of *GP* visits.

Individuals reporting an *acute illness* that either restricted their normal activity (*ACUTNORM*) or confined them to bed (*ACUTEBED*) are significantly more likely to visit their *GP*, as expected, although the effect of the former (latter) is greater for females (males). However, the number of days restricted in each case (*DAYSNORM* and *DAYSBED*, respectively) is not significant, for men or women.

Indicators of *longer-term health status* suggest that, relative to people who described their health as 'very good', individuals reporting poorer health (*HEALGOOD*, *HEALFAIR*, *HEALPOOR*, *HEALVPOOR*) are significantly more likely to visit their *GP*, although a clear gradient is more apparent for females than males.

We include interactions between these measures of acute and longer-term health, to test whether the impact of the former varied with the latter. Only three of these interaction terms is significant for females, and only one for males. Compared with women who reported 'very good' health, the impact of the number of days of normal activity restricted by an acute episode (*DAYSNORM*) becomes progressively more *negative* as longer-term health declines. For men, on the other hand, the effect of *DAYSNORM* is *positive* for those whose long-term health is 'poor'. Again, this is relative to those reporting 'very good' health.

Each of the proxies for need are 'subjective'. More-objective measures are provided by indicators of selected chronic conditions and classifications of body mass index (*BMI*), although the latter were not significant for men or women. We expect the existence of chronic conditions to have a significant and positive impact on *GP* utilisation. However, this is so only for females and males with *hypertension* and for males with problems associated with *cholesterol*, *diabetes* and *heart disease*.

Overall, we find that patterns of *GP* utilisation are consistent with the principle of *vertical equity*. Indeed, we are unable to reject the corresponding hypothesis (H_0^{vu}) for indicators of acute illness and longer-term health among both genders and for the majority of chronic conditions reported by men. The clear exception to this - which holds for females alone - becomes apparent only because we explore the interactions between measures of acute and longer-term health. Results concerning the remaining interaction terms and the classifications of *BMI* are inconclusive.

The impact of need variables on *GP* visits is broadly similar between men and women, except for three of the seven chronic conditions and for the small number of interactions between measures of acute and longer-term health that were statistically significant. Vertical equity (H_0^{vu}) holds for men but not for women.

Although the coefficients on *SEG2*, *SEG3* and *SEG4* for each gender suggest a socioeconomic gradient that favours these individuals relative to those in *SEG1*, these are statistically significant only in the case of *SEG4*. A similar result pertains to *educational achievement* amongst males; the coefficients indicate a gradient favouring those with fewer qualifications but these are not significant. Amongst females, those at the lower end of the education scale are significantly more likely to visit their *GP* compared to university graduates. *Working individuals* are less likely to visit their *GP*, although this is significant for males only.

Thus, horizontal *inequity* (implying rejection of (H_0^{hu})) appears to favour men and women in lower socioeconomic groups, women with fewer educational qualifications and men who are not working. These results rest on the assumption that we have controlled fully for need, as proxied by a wide range of health indicators. However, *unobserved* need may be correlated with *SEB*. In addition, a higher degree of substitution between public-sector and private-sector services - that we do not capture fully with our indicator of private healthcare insurance - may occur among higher socioeconomic groups.

Horizontal *inequity* in *GP* utilisation, relative to our baseline region, Andalucia, is apparent for females in *Cantabria* and for both genders in *Asturias*, *Castilla-Leon* and *Galicia*. This may have implications for the geographical distribution of public-sector resources, at least those pertaining to primary care. However, before making any recommendations based on these results, we would have to be satisfied that the relatively higher use of *GP* services in Andalucia does not reflect a higher level of unmeasured need in this region.

Contrary to our expectations, age did not have a significant impact on *GP* utilisation, amongst men or women. If our health indicators do capture fully the need for *GP* services, this finding suggests that there is no inter-generational inequity.

Both genders are significantly less likely to use a public-sector *GP* if they have private healthcare insurance, although the effect is more pronounced amongst females. However, as we noted above, the observed effect may be contaminated by unobservable heterogeneity bias. Supply-side factors are not significantly associated with *GP* utilisation amongst women but the number of doctors practising within a province has a significant positive effect amongst men. If this can be interpreted as a differential 'access effect', it implies rejection of H_0^{ha} and is, therefore, indicative of *horizontal inequity of access* to *GPs*.

None of the instruments for travel time are significant, for men or women. This suggests that either travel time is not a significant factor for *GP* utilisation or, if it is, the instruments have low relevance. We assess the likelihood of these alternative explanations with reference to *Table 2* and *Table 3*, to which we now turn.

Although the *RESET* test indicates there are no problems with the specification of our model of *travel time* (*Table 2*), it has limited explanatory power. This may contribute to the poor performance of the predicted variable (*TTALL*) in the final *GP* equation, as may the limited relevance of the identifying variables, although the *F*-statistic does suggest that these are jointly significant. The major difference between the contents of *Table 3* and *Table 1* is that while the latter includes 'identifying variables' for travel time (*TT*), these are replaced with imputed travel time (*TTALL*) in *Table 3*.

The *RESET* and *overidentification* tests indicate that there are no problems with the functional form of the models for each gender and that our identifying variables are valid. The explanatory and predictive power of the models are close to those presented in *Table 1*.

The coefficient on *TT* suggests that, after controlling for other influences, travel time does not have a significant effect on *GP* utilisation, for either gender. We also observe that, in general, the coefficients on the remaining variables are similar to those reported in *Table 1*. The only changes are that the variables relating to geographical location (*R*) and characteristics (population size) become statistically significant, thereby violating the principle of horizontal equity. In the case of the former, men and women residing in *Canarias*, *Navarra* and *Pais Vasco* are now less likely to visit a *GP*, relative to their counterparts in *Andalucia*. Compared to their counterparts living in more-highly-populated areas, women are significantly less likely to visit their *GP*, as indicated by the coefficient on *AREA2,* and men are significantly more likely to visit, as indicated by the coefficients on *AREA3*, *AREA4* and *AREA5*. Finally, interactions of *TTALL* with other non-need variables, such as *AGE, SEG or Education,* suggest that *TT* does not have a significantly different impact on *GP* utilisation across such different groups of individuals.

5. Conclusions and recommendations

We have outlined a framework for testing empirically whether the *utilisation* of and *access* to public-sector *GPs* in Spain during 1993 was consistent with the twin criteria of *horizontal* and *vertical equity*, where these are defined with respect to *need*. Although we focus on this relatively-narrow area of healthcare activity, the role of *GP*s as *gatekeepers* to (elective) secondary care suggests that any inequity in the access to and utilisation of primary care is likely to be replicated throughout the system.

We propose that horizontal (vertical) *inequities in access* maybe assessed by including *interactions* between *determinants of access* and *non-need* (*need*) variables in our utilisation equation. To implement this approach, we impute travel time (*TT*) for individuals that did not visit their *GP*.

Our results suggest that patterns of *GP* utilisation are consistent with the principle of *vertical equity*. However, when we explore *interactions* between measures of acute and longer-term health, a clear exception to this finding becomes apparent for females. Gender differences also relate to the impact of selected chronic conditions, which are significantly positive only for men.

Horizontal *inequity* appears to favour men and women in lower socioeconomic groups, women with fewer educational qualifications, men who are not working and individuals residing in selected regions. This may have implications for the geographical distribution of primary care resources, although these differences may reflect variation in unmeasured need.

Because travel time is not significant alone, we do not combine it with measures of need in order to assess the extent of any *vertical inequity in access*. Comparisons of the partial effect of *TT* by non-need characteristics, such as gender, provide a test of *horizontal equity in access*, although the difference is not significant. Non-significant differences are also obtained when assessing the partial effect of *TT* by socioeconomic position, education level or age groups.

However, these findings should be treated with caution, given the econometric problems that we face. In view of these, we conclude with a summary of the methodology we have tried to follow in this empirical assessment of equity within a particular healthcare system:-

- Identify policy statements concerning equity-related objectives
- Note the population specified and the definitions of equity employed
- Translate equity-related objectives into hypotheses
- Model outcome of interest (expenditure, health, service use), attempting to ensure that all influences are identified
- Specify the variables suggested by the model
- Collect data on these variables for the population of interest, which should be sampled randomly
- Note unit non-response, where possible collecting any available data on characteristics of non-respondents
- If necessary, combine survey data with other sources to ensure all variables are covered
- Assess the degree of and implement solutions for non-response, mis-specification, measurement error, and simultaneity
- Test the adequacy of the model and these solutions
- Test hypotheses and assess the implications of the results

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DATA APPENDIX: VARIABLES, DEFINITIONS AND MEANS

	MEANS MALES (N= 7353)	MEANS FEMALES (N = 7190)
DEPENDENT VARIABLES		
GP if the individual has visited a public GP in the last 2 weeks (Yes=1, No=0)	0.1064	0.1439
INDEPENDENT VARIABLES		
(*) denotes baseline variable		
Need (health indicators)		
ACUTNORM has had an acute illness which restricted normal activity (Yes=1, No=0)	0.0582	0.1025
DAYSNORM No. of days of normal activity restricted by the acute illness (continuous)	0.2686	0.4857
ACUTBED has had an acute illness which has obliged to be in bed (Yes=1, No=0)	0.0582	0.0793
DAYSBED number of days in bed due to such acute illness (continuous)	0.1837	0.2503
HEAVGOOD very good health state through the last year (Yes=1, No=0) (*)	0.1278	0.1025
HEALGOOD good health state through the last year (Yes=1, No=0)	0.6285	0.5833
HEALFAIR fair health state through the last year (Yes=1, No=0)	0.1982	0.2548
HEALPOOR poor health state through the last year (Yes=1, No=0)	0.0405	0.0508
HEAVPOOR very poor health state through the last year (Yes=1, No=0)	0.0050	0.0086
GOODNOR interaction between DAYSNORM and HEALGOOD (Yes=1, No=0)	0.0237	0.0288
FAIRNOR interaction between DAYSNORM and HEALFAIR (Yes=1, No=0)	0.0214	0.0471
POORNOR interaction between DAYSNORM and HEALPOOR (Yes=1, No=0)	0.0083	0.0204
VPOORNOR interaction between DAYSNORM and HEAVPOOR (Yes=1, No=0)	0.0019	0.0032
GOODDAYN interaction between DAYSNORM and HEALGOOD (continuous)	0.0922	0.1029
FAIRDAYN interaction between DAYSNORM and HEALFAIR (continuous)	0.1004	0.2242
POORDAYN interaction between DAYSNORM and HEALPOOR (continuous)	0.0460	0.1292
VPOODAYN interaction between DAYSNORM and HEAVPOOR (continuous)	0.0215	0.0211
GOODDAYB interaction between DAYSBED and HEALGOOD (continuous)	0.0653	0.0654
FAIRDAYB interaction between DAYSBED and HEALFAIR (continuous)	0.0578	0.1029
POORDAYB interaction between DAYSBED and HEALPOOR (continuous)	0.0390	0.0634
VPOODAYB interaction between DAYSBED and HEAVPOOR (continuous)	0.0116	0.0115
HYPERT having hypertension as a chronic condition (Yes=1, No=0)	0.0804	0.1138
CHOLEST having cholesterol as a chronic condition (Yes=1, No=0)	0.0767	0.0720
DIABET having diabetes as a chronic condition (Yes=1, No=0)	0.0291	0.0392
ASTHMA having asthma as a chronic condition (Yes=1, No=0)	0.0503	0.0328
HEART having heart diseases as a chronic condition (Yes=1, No=0)	0.0351	0.0293
STOMULC having stomach ulcer as a chronic condition (Yes=1, No=0)	0.0469	0.0263
ALLERGY having allergy as a chronic condition (Yes=1, No=0)	0.0506	0.0751
UNDERWEI having a body mass index (BMI) between 13 and 19 (Yes=1, No=0)	0.0377	0.0348
NORMALWEI having a BMI between 20 and 24 (Yes=1, No=0) (*)	0.5341	0.5232
OVERWEI having BMI between 25 and 30 (Yes=1, No=0)	0.3027	0.3095
OBESE having a BMI higher than 30 (Yes=1, No=0)	0.1255	0.1325
Socioeconomic background		
SEG1 individual belonging to socio-economic group 1 (Yes=1, No=0) (*)	0.1375	0.1242
SEG2 individual belonging to socio-economic group 2 (Yes=1, No=0)	0.3359	0.3552
SEG3 individual belonging to socio-economic group 3 (Yes=1, No=0)	0.3205	0.2790
SEG4 individual belonging to socio-economic group 4 (Yes=1, No=0)	0.2060	0.2416
EDUCA1 individual having university studies (Yes=1, No=0) (*)	0.1000	0.0766
EDUCA2 individual having secondary studies but no university (Yes=1, No=0)	0.3030	0.2484

EDUCA3 individual having primary studies (Yes=1, No=0)	0.4846	0.5288
EDUCA4 individual not having studies at all. (Yes=1, No=0)	0.1125	0.1462
WORKING individual currently working (Yes=1, No=0)	0.5898	0.2666
Geographical characteristics		
ANDALUCI individual resident in Andalucía (Yes=1, No=0) (*)	0.1036	0.1004
CATALUNA individual resident in Cataluna (Yes=1, No=0)	0.1000	0.1015
ARAGON individual resident in Aragón (Yes=1, No=0)	0.0491	0.0520
ASTURIAS individual resident in Asturias (Yes=1, No=0)	0.0305	0.0321
CANARIAS individual resident in Canarias (Yes=1, No=0)	0.0441	0.0403
BALEARES individual resident in Baleares (Yes=1, No=0)	0.0400	0.0399
VALENCIA individual resident in Valencia (Yes=1, No=0)	0.0744	0.0713
GALICIA individual resident in Galicia (Yes=1, No=0)	0.0719	0.0764
NAVARRA individual resident in Navarra (Yes=1, No=0)	0.0430	0.0428
PVASCO individual resident in País Vasco (Yes=1, No=0)	0.0743	0.0701
CANTABRI individual resident in Cantabria (Yes=1, No=0)	0.0384	0.0413
CMANCHA individual resident in Castilla La Mancha (Yes=1, No=0)	0.0438	0.0412
CLEON individual resident in Castilla León (Yes=1, No=0)	0.0733	0.0712
LARIOJA individual resident in La Rioja (Yes=1, No=0)	0.0403	0.0394
EXTREMAD individual resident in Extremadura (Yes=1, No=0)	0.0514	0.0523
MADRID individual resident in Madrid (Yes=1, No=0)	0.0894	0.0986
MURCIA individual resident in Murcia (Yes=1, No=0)	0.0328	0.0291
Age groups		
AGE1 age between 16-24 (Yes=1, No=0) (*)	0.3335	0.3271
AGE2 age between 25-34 (Yes=1, No=0)	0.2088	0.2007
AGE3 age between 35-44 (Yes=1, No=0)	0.1656	0.1704
AGE4 age between 45-54 (Yes=1, No=0)	0.1544	0.1498
AGE5 age between 55-64 (Yes=1, No=0)	0.1410	0.1377
AGE6 age more than 65 (Yes=1, No=0)	0.1259	0.1364
Access factors		
LTT logarithm of the number of minutes spent travelling to doctor's consultation (just for those who visit the doctor)	2.1604	2.2068
Supply factors (for each of the 52 provinces)		
BEDS number of beds per 1,000 population by province of residence (continuous)	4.2023	4.2163
DOCTORS number of doctors per 1,000 population by province of residence (continuous)	4.0656	4.0784
Demand factors		
PRIHINS individual having private insurance in addition to public (Yes=1, No=0)	0.0786	0.0650
Other household characteristics		
MARRIED individual married (Yes=1, No=0)	0.6079	0.6533
CHILDREN individual having at least one child -aged up to 9 years- (Yes=1, No=0)	0.2017	0.2376
LIVEALONE individual living completely alone (Yes=1, No=0)	0.0598	0.0451
TELEPH No. of phone lines installed per capita by province of residence (continuous)	36.3561	36.4639
TELEPH is TELPH squared		
AREA1 individual resident in an area with population > 1,000,000 (Yes=1, No=0) (*)	0.0847	0.0921
AREA2 individual resident in an area with population 400,000-1,000,000 (Yes=1, No=0)	0.0488	0.0477
AREA3 individual resident in an area with population 50,000-400,000 (Yes=1, No=0)	0.3495	0.3431
AREA4 individual resident in an area with population 10,000-50,000 (Yes=1, No=0)	0.2224	0.2179

AREA5 individual resident in an area with population < 10,000 (Yes=1, No=0)	0.2946	0.2992
Extra-instruments		
ZWL individuals in waiting list per 1000 population by province (continuous)	6.3687	6.4261
ZPUT public transport vehicles per 1000 population by province of residence	1.7111	1.7259
ZPRT private transport vehicles per 1000 pop. by prov.residence (continuous)	20.9119	21.0269
ZRAI total rain in mm. fall in February93, by province(continuous)	38.9987	38.9224
ZTEM average of the minimum temperature in °C in Feb93 by province	5.8200	5.7753
ZDEN population per km^2 in the province of residence	286.9683	284.2106
ZDENA2 interaction between ZDEN and AREA2 (continuous)	5.7038	5.5392
ZDENA3 interaction between ZDEN and AREA3 (continuous)	145.9642	138.6288
ZDENA4 interaction between ZDEN and AREA4 (continuous)	50.0495	48.7747
ZDENA5 interaction between ZDEN and AREA5 (continuous)	33.6070	34.9462
MOBILI65 individual with = or > than 65 with problems to walk, take bus (taxi) or get up stairs (Yes=1, No=0)	0.0143	0.0250
ZPUPRIT interaction between ZPUT and ZPRT (continuous)	39.3640	40.0302

Table 1
PROBIT EQUATIONS FOR GP VISITS

PROBIT FEMALES (n = 7190)
Marginal/average effects and std.errors

Log-Likelihood	-2567.117
Restricted Log-Likelihood	-2962.779
Chi-squared (83)	791.326
Significance level	0.000
McFadden R^2	0.136
Proportion of correct predictions	0.862
RESET test 6.23; sq(3)= 7.81	

Variable	*Coefficient*	*Standard Error*	*t-ratio*	*p-value*
NEED *(HEALTH INDICATORS)*				
ACUTNORM	0.22722	0.78765E-01	2.885	0.00392
DAYSNORM	-0.96228E-02	0.26928E-01	-0.357	0.72082
ACUTBED	0.11698	0.19514E-01	5.994	0.00000
DAYSBED	0.22966E-01	0.25034E-01	0.917	0.35895
HEALGOOD	0.83219E-01	0.18405E-01	4.521	0.00001
HEALFAIR	0.14727	0.19249E-01	7.651	0.00000
HEALPOOR	0.18345	0.25882E-01	7.088	0.00000
HEAVPOOR	0.28217	0.42712E-01	6.606	0.00000
GOODNOR	-0.47776E-01	0.82838E-01	-0.577	0.56412
FAIRNOR	-0.18928	0.81631E-01	-2.319	0.02041
POORNOR	-0.23082	0.88480E-01	-2.609	0.00909
VPOORNOR	-0.36717	0.13812	-2.658	0.00785
GOODDAYN	0.29680E-02	0.27389E-01	0.108	0.91370
FAIRDAYN	0.13848E-01	0.27094E-01	0.511	0.60928
POORDAYN	0.11321E-01	0.27271E-01	0.415	0.67805
VPOODAYN	0.98576E-02	0.29601E-01	0.333	0.73912
GOODDAYB	-0.19032E-01	0.25430E-01	-0.748	0.45421
FAIRDAYB	-0.20907E-01	0.25049E-01	-0.835	0.40393
POORDAYB	-0.28331E-01	0.25234E-01	-1.123	0.26154
VPOODAYB	-0.22939E-01	0.28529E-01	-0.804	0.42137
HYPERT	0.40433E-01	0.11662E-01	3.467	0.00053
CHOLEST	0.12222E-01	0.13942E-01	0.877	0.38068
DIABET	0.32568E-01	0.16881E-01	1.929	0.05369
ASTHMA	0.34900E-01	0.18782E-01	1.858	0.06315
HEART	0.30796E-02	0.19954E-01	0.154	0.87735
STOMULC	-0.10547E-01	0.21357E-01	-0.494	0.62142
ALLERGY	0.58811E-02	0.13851E-01	0.425	0.67113
UNDERWEI	0.26668E-01	0.19940E-01	1.337	0.18108
OVERWEI	-0.11784E-02	0.87026E-02	-0.135	0.89229
OBESE	-0.30769E-02	0.11732E-01	-0.262	0.79312
SOCIOECONOMIC BACKGROUND				
SEG2	0.10602E-01	0.14753E-01	0.719	0.47238
SEG3	0.23324E-01	0.15119E-01	1.543	0.12292
SEG4	0.30662E-01	0.15529E-01	1.974	0.04833
EDUCA2	0.32377E-01	0.20128E-01	1.609	0.10771
EDUCA3	0.58349E-01	0.19907E-01	2.931	0.00338
EDUCA4	0.45332E-01	0.22627E-01	2.003	0.04513
WORKING	-0.19317E-01	0.98795E-02	-1.955	0.05056
GEOGRAPHICAL CHARACTERISTICS				
ARAGON	-0.93377E-01	0.50958E-01	-1.832	0.06689
BALEARES	-0.36351E-01	0.13150	-0.276	0.78222
ASTURIAS	-0.12084	0.49982E-01	-2.418	0.01562
CANARIAS	-0.12422	0.77429E-01	-1.604	0.10865
CANTABRI	-0.10167	0.44827E-01	-2.268	0.02333
CLEON	-0.12886	0.38289E-01	-3.365	0.00076
CMANCHA	-0.75809E-01	0.45694E-01	-1.659	0.09710
EXTREMAD	-0.12220E-01	0.34211E-01	-0.357	0.72095
LARIOJA	-0.65436E-01	0.66835E-01	-0.979	0.32755
MADRID	-0.80125E-02	0.94512E-01	-0.085	0.93244
MURCIA	-0.40953E-01	0.34503E-01	-1.187	0.23526
CATALUNA	-0.86046E-01	0.51774E-01	-1.662	0.09652
VALENCIA	-0.54488E-01	0.36164E-01	-1.507	0.13189
GALICIA	-0.10733	0.28179E-01	-3.809	0.00014
NAVARRA	-0.66559E-01	0.53030E-01	-1.255	0.20943
PVASCO	-0.89555E-01	0.48751E-01	-1.837	0.06621
AGE GROUPS				
AGE2	0.12000E-01	0.14750E-01	0.814	0.41591
AGE3	-0.15891E-01	0.15898E-01	-1.000	0.31752
AGE4	0.94983E-02	0.16361E-01	0.581	0.56156
AGE5	0.19075E-01	0.16848E-01	1.132	0.25755
AGE6	0.34759E-03	0.18392E-01	0.019	0.98492

PROBIT MALES (n = 7353)
Marginal/average effects and std.errors

Log-Likelihood	-2078.130
Restricted Log-Likelihood	-2491.328
Chi-squared (83)	826.396
Significance level	0.000
McFadden R^2	0.166
Proportion of correct predict.	0.897
RESET test 3.69; sq(3)= 7.81	

Variable	*Coefficient*	*Standard Error*	*tratio*	*p-value*
NEED *(HEALTH INDICATORS)*				
ACUTNORM	0.14300	0.57244E-01	2.498	0.01249
DAYSNORM	0.27694E-01	0.15802E-01	1.753	0.07967
ACUTBED	0.82541E-01	0.16608E-01	4.970	0.00000
DAYSBED	0.10936E-01	0.11548E-01	0.947	0.34360
HEALGOOD	0.39208E-01	0.12792E-01	3.065	0.00218
HEALFAIR	0.99167E-01	0.13691E-01	7.243	0.00000
HEALPOOR	0.91604E-01	0.19026E-01	4.815	0.00000
HEAVPOOR	0.94769E-01	0.41572E-01	2.280	0.02263
GOODNOR	-0.14175E-01	0.61007E-01	-0.232	0.81626
FAIRNOR	-0.11495	0.61921E-01	-1.856	0.06340
POORNOR	-0.28885E-01	0.72299E-01	-0.400	0.68951
VPOORNOR	-0.60669	0.31834	-1.906	0.05667
GOODDAYN	-0.30832E-01	0.16607E-01	-1.857	0.06338
FAIRDAYN	-0.22615E-01	0.16153E-01	-1.400	0.16151
POORDAYN	-0.35687E-01	0.16946E-01	-2.106	0.03521
VPOODAYN	0.24805E-01	0.29403E-01	0.844	0.39887
GOODDAYB	-0.97720E-03	0.12110E-01	-0.081	0.93569
FAIRDAYB	-0.19533E-01	0.12246E-01	-1.595	0.11070
POORDAYB	-0.20380E-01	0.12429E-01	-1.640	0.10107
VPOODAYB	-0.25531E-01	0.14948E-01	-1.708	0.08764
HYPERT	0.40407E-01	0.10100E-01	4.000	0.00006
CHOLEST	0.32352E-01	0.10488E-01	3.085	0.00204
DIABET	0.35002E-01	0.14676E-01	2.385	0.01708
ASTHMA	-0.23521E-02	0.12429E-01	-0.189	0.84990
HEART	0.28427E-01	0.13771E-01	2.064	0.03900
STOMULC	0.10002E-01	0.13291E-01	0.752	0.45175
ALLERGY	0.22494E-01	0.12765E-01	1.762	0.07804
UNDERWEI	-0.32010E-01	0.18393E-01	-1.740	0.08180
OVERWEI	-0.40793E-02	0.70293E-02	-0.580	0.56170
OBESE	0.97796E-02	0.92354E-02	1.059	0.28963
SOCIOECONOMIC BACKGROUND				
SEG2	0.17288E-01	0.11896E-01	1.453	0.14615
SEG3	0.20492E-01	0.12041E-01	1.702	0.08879
SEG4	0.42827E-01	0.12745E-01	3.360	0.00078
EDUCA2	0.14386E-01	0.14284E-01	1.007	0.31387
EDUCA3	0.25020E-01	0.14460E-01	1.730	0.08359
EDUCA4	0.27599E-01	0.16704E-01	1.652	0.09848
WORKING	-0.29751E-01	0.77942E-02	-3.817	0.00014
GEOGRAPHICAL CHARACTERISTICS				
ARAGON	-0.23735E-01	0.39584E-01	-0.600	0.54876
BALEARES	-0.23889E-02	0.11174	-0.021	0.98294
ASTURIAS	-0.11001	0.42163E-01	-2.609	0.00908
CANARIAS	-0.10078	0.58615E-01	-1.719	0.08556
CANTABRI	-0.59078E-01	0.36274E-01	-1.629	0.10339
CLEON	-0.98634E-01	0.30381E-01	-3.247	0.00117
CMANCHA	0.46780E-02	0.35585E-01	0.131	0.89541
EXTREMAD	0.11560E-01	0.28202E-01	0.410	0.68188
LARIOJA	-0.25778E-01	0.53205E-01	-0.485	0.62803
MADRID	-0.58081E-01	0.82686E-01	-0.702	0.48242
MURCIA	-0.52506E-01	0.28789E-01	-1.824	0.06818
CATALUNA	-0.19152E-01	0.42191E-01	-0.454	0.64988
VALENCIA	-0.21482E-01	0.30233E-01	-0.711	0.47738
GALICIA	-0.56827E-01	0.22768E-01	-2.496	0.01256
NAVARRA	-0.65683E-01	0.43170E-01	-1.521	0.12814
PVASCO	-0.63724E-01	0.39210E-01	-1.625	0.10412
AGE GROUPS				
AGE2	0.11527E-02	0.11803E-01	0.098	0.92220
AGE3	0.12567E-02	0.14154E-01	0.089	0.92925
AGE4	0.13634E-01	0.14226E-01	0.958	0.33785
AGE5	0.20661E-01	0.14557E-01	1.419	0.15581
AGE6	0.28274E-01	0.15109E-01	1.871	0.06129

Table 1 (cont.)

OTHER FACTORS				
DEMAND SIDE FACTORS				
PRIHINS	-0.10935	0.19540E-01	-5.596	0.00000
SUPPLY SIDE FACTORS				
BEDS	0.50755E-03	0.73041E-02	0.069	0.94460
DOCTORS	-0.11814E-01	0.14456E-01	-0.817	0.41378
OTHER HOUSEHOLD CHARACTERISTICS				
CHILDREN	-0.44265E-02	0.10858E-01	-0.408	0.68350
LIVEALON	0.14653E-01	0.20112E-01	0.729	0.46626
MARRIED	0.10145E-01	0.11379E-01	0.892	0.37263
TELEPH	0.49612E-01	0.18497E-01	2.682	0.00731
TELEPH2	-0.66392E-01	0.26877E-01	-2.470	0.01350
AREA2	0.83676E-02	0.13477	0.062	0.95049
AREA3	-0.21119E-01	0.12128	-0.174	0.86175
AREA4	-0.20698E-01	0.12126	-0.171	0.86447
AREA5	-0.10521E-01	0.12131	-0.087	0.93089
ADDITIONAL INSTRUMENTS				
ZWL	0.25871E-02	0.19001E-02	1.362	0.17334
ZPUT	0.45159E-01	0.85539E-01	0.528	0.59754
ZPRT	0.40547E-03	0.75579E-02	0.054	0.95721
ZRAI	0.10117E-03	0.43873E-03	0.231	0.81763
ZDEN	-0.13766E-04	0.20240E-03	-0.068	0.94577
ZTEM	-0.48158E-02	0.78677E-02	-0.612	0.54047
ZMOB65	0.14643E-01	0.23411E-01	0.625	0.53166
ZDENA2	-0.84845E-03	0.44430E-03	-1.910	0.05618
ZDENA3	-0.30716E-05	0.20026E-03	-0.015	0.98776
ZDENA4	0.79037E-04	0.20168E-03	0.392	0.69513
ZDENA5	0.72835E-04	0.20296E-03	0.359	0.71969
ZPUPRIT	-0.13357E-02	0.37037E-02	-0.361	0.71838
ZTEM2	-0.10961E-02	0.64979E-02	-0.169	0.86605
Constant	-1.2077	0.29530	-4.090	0.00004

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	6071	84	6155
1	912	123	1035
TOTAL	6983	207	7190

OTHER FACTORS				
DEMAND SIDE FACTORS				
PRIHINS	-0.43420E-01	0.13841E-01	-3.137	0.00171
SUPPLY SIDE FACTORS				
BEDS	0.71454E-02	0.59445E-02	1.202	0.22935
DOCTORS	0.24416E-01	0.11591E-01	2.107	0.03516
OTHER HOUSEHOLD CHARACTERISTICS				
CHILDREN	-0.17288E-01	0.98187E-02	-1.761	0.07829
LIVEALON	0.20027E-01	0.14317E-01	1.399	0.16186
MARRIED	0.81072E-02	0.10313E-01	0.786	0.43179
TELEPH	0.54811E-01	0.15590E-01	3.516	0.00044
TELEPH2	-0.79477E-01	0.22628E-01	-3.512	0.00044
AREA2	-0.26585E-01	0.10949	-0.243	0.80816
AREA3	0.70254E-01	0.10018	0.701	0.48314
AREA4	0.56157E-01	0.10013	0.561	0.57491
AREA5	0.70780E-01	0.10023	0.706	0.48010
ADDITIONAL INSTRUMENTS				
ZWL	-0.16057E-02	0.15847E-02	-1.013	0.31093
ZPUT	-0.57042E-01	0.70920E-01	-0.804	0.42121
ZPRT	-0.67461E-02	0.60539E-02	-1.114	0.26513
ZRAI	0.25070E-03	0.35616E-03	0.704	0.48149
ZDEN	0.60530E-04	0.16770E-03	0.361	0.71814
ZTEM	0.61233E-03	0.59360E-02	0.103	0.91784
ZMOB65	-0.10599E-01	0.22456E-01	-0.472	0.63694
ZDENA2	0.10496E-03	0.33106E-03	0.317	0.75121
ZDENA3	-0.72420E-04	0.16573E-03	-0.437	0.66213
ZDENA4	-0.29028E-04	0.16690E-03	-0.174	0.86192
ZDENA5	-0.47699E-04	0.16824E-03	-0.284	0.77679
ZPUPRIT	0.34952E-02	0.31213E-02	1.120	0.26281
ZTEM2	-0.38512E-03	0.48076E-02	-0.080	0.93615
Constant	-1.2623	0.24967	-5.056	0.00000

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	6506	65	6571
1	696	86	782
TOTAL	7202	151	7353

Table 2
TRAVEL TIME EQUATIONS

HECKMAN EQUATION FEMALES (n = 7190)
Dependent variable Log(travelling time) LTT

Observations 1035
R^2 0.233
Adjusted R^2 0.154
Sum of squares 446.832
Model test F[84,950] 3.44
Prob. value 0.000
RESET test 1.41; F[3, 947]= 2.6
F-test for instruments 4.00; F[13, 950]= 1.73

Variable	*Coefficient*	*Standard Error*	*t-ratio*	*p-value*
NEED (HEALTH INDICATORS)				
ACUTNORM	0.93565	0.97838	0.956	0.33891
DAYSNORM	-0.28341	0.14063	-2.015	0.04388
ACUTBED	-0.10582E-01	0.44919	-0.024	0.98121
DAYSBED	0.21482	0.15876	1.353	0.17604
HEALGOOD	0.12545	0.38681	0.324	0.74570
HEALFAIR	0.12341	0.64493	0.191	0.84825
HEALPOOR	0.61569E-01	0.78564	0.078	0.93754
HEAVPOOR	-0.22699	1.1416	-0.199	0.84240
GOODNOR	-0.62620	0.43077	-1.454	0.14604
FAIRNOR	-0.91870	0.85111	-1.079	0.28041
POORNOR	-0.84846	1.0204	-0.832	0.40568
VPOORNOR	0.32342	1.5585	0.208	0.83561
GOODDAYN	0.21085	0.13835	1.524	0.12750
FAIRDAYN	0.27827	0.14621	1.903	0.05702
POORDAYN	0.29801	0.14494	2.056	0.03977
VPOODAYN	0.12037	0.15653	0.769	0.44188
GOODDAYB	-0.24531	0.15432	-1.590	0.11193
FAIRDAYB	-0.16154	0.15827	-1.021	0.30742
POORDAYB	-0.21336	0.17236	-1.238	0.21575
VPOODAYB	-0.15227	0.17176	-0.886	0.37535
HYPERT	0.14365E-02	0.16560	0.009	0.99308
CHOLEST	0.37759E-01	0.86706E-01	0.435	0.66322
DIABET	0.97524E-02	0.14542	0.067	0.94653
ASTHMA	0.86520E-01	0.15714	0.551	0.58192
HEART	0.19685	0.10184	1.933	0.05325
STOMULC	-0.18082	0.12431	-1.455	0.14576
ALLERGY	0.47609E-01	0.78995E-01	0.603	0.54672
UNDERWEI	0.66074E-01	0.14639	0.451	0.65172
OVERWEI	0.98823E-01	0.51797E-01	1.908	0.05641
OBESE	-0.15481	0.70927E-01	-2.183	0.02906
SOCIOECONOMIC BACKGROUND				
SEG2	0.48422E-01	0.10067	0.481	0.63050
SEG3	0.19900E-01	0.13239	0.150	0.88051
SEG4	0.80753E-02	0.15436	0.052	0.95828
EDUCA2	0.72622E-01	0.18280	0.397	0.69117
EDUCA3	0.85100E-01	0.26650	0.319	0.74948
EDUCA4	0.25562	0.22914	1.116	0.26461
WORKING	0.60140E-01	0.96476E-01	0.623	0.53305
GEOGRAPHICAL CHARACTERISTICS				
ARAGON	-0.95480	0.48117	-1.984	0.04722
BALEARES	-0.78050	0.98454	-0.793	0.42792
ASTURIAS	-0.39198	0.56890	-0.689	0.49082
CANARIAS	1.2255	0.68885	1.779	0.07524
CANTABRI	-0.43479	0.46534	-0.934	0.35013
CLEON	-0.40355	0.55644	-0.725	0.46831
CMANCHA	-0.68208	0.40797	-1.672	0.09454
EXTREMAD	-0.11532	0.20506	-0.562	0.57386
LARIOJA	-1.0246	0.47800	-2.143	0.03207
MADRID	-0.59268	0.71401	-0.830	0.40650
MURCIA	-0.12453	0.25773	-0.483	0.62897
CATALUNA	-0.27527	0.47420	-0.580	0.56159
VALENCIA	-0.58654	0.31783	-1.845	0.06497
GALICIA	0.66071	0.45414	1.455	0.14570
NAVARRA	-0.64606	0.41030	-1.575	0.11535
PVASCO	-0.80958	0.46138	-1.755	0.07931
AGE GROUPS				
AGE2	0.17824	0.10402	1.713	0.08662
AGE3	0.12143	0.11894	1.021	0.30729
AGE4	0.12054	0.10516	1.146	0.25170
AGE5	0.74155E-01	0.12618	0.588	0.55674
AGE6	0.17655	0.10904	1.619	0.10542

HECKMAN EQUATION MALES (n = 7353)
Dependent variable Log(travelling time) LTT

Observations 782
R^2 0.245
Adjusted R^2 0.154
Sum of squares 305.018
Model test F[84,950] 2.70
Prob. value 0.000
RESET test 1.51; F[3, 694]= 2.6
F-test for instruments 3.38; F[13, 697]= 1.73

Variable	*Coefficient*	*Standard Error*	*t-ratio*	*p-value*
NEED (HEALTH INDICATORS)				
ACUTNORM	-0.15706	0.86846	-0.181	0.85649
DAYSNORM	0.59647E-01	0.11296	0.528	0.59748
ACUTBED	0.45632	0.42518	1.073	0.28316
DAYSBED	-0.16699	0.11443	-1.459	0.14446
HEALGOOD	0.12753E-01	0.26603	0.048	0.96176
HEALFAIR	-0.59650E-01	0.56537	-0.106	0.91597
HEALPOOR	-0.32280	0.53669	-0.601	0.54753
HEAVPOOR	0.76300E-01	0.60407	0.126	0.89949
GOODNOR	0.13418	0.38246	0.351	0.72571
FAIRNOR	0.12485	0.76726	0.163	0.87074
POORNOR	-0.15056	0.52393	-0.287	0.77383
VPOORNOR	3.8041	3.7142	1.024	0.30574
GOODDAYN	-0.55722E-01	0.13521	-0.412	0.68027
FAIRDAYN	-0.72840E-01	0.93105E-01	-0.782	0.43402
POORDAYN	-0.14786E-02	0.14963	-0.010	0.99212
VPOODAYN	-0.34193	0.21930	-1.559	0.11895
GOODDAYB	0.13215	0.95235E-01	1.388	0.16526
FAIRDAYB	0.47803E-01	0.14565	0.328	0.74275
POORDAYB	0.10843	0.15035	0.721	0.47081
VPOODAYB	0.84204E-01	0.16979	0.496	0.61994
HYPERT	-0.63869E-01	0.21663	-0.295	0.76812
CHOLEST	-0.96640E-01	0.17731	-0.545	0.58572
DIABET	-0.80837E-01	0.19569	-0.413	0.67955
ASTHMA	0.17255	0.93076E-01	1.854	0.06376
HEART	-0.23225E-01	0.16883	-0.138	0.89059
STOMULC	0.60417E-01	0.11480	0.526	0.59869
ALLERGY	-0.10167	0.15100	-0.673	0.50076
UNDERWEI	-0.14117	0.23244	-0.607	0.54364
OVERWEI	-0.32498E-01	0.61254E-01	-0.531	0.59573
OBESE	-0.62019E-01	0.89534E-01	-0.693	0.48850
SOCIOECONOMIC BACKGROUND				
SEG2	0.53386E-01	0.13358	0.400	0.68942
SEG3	0.82390E-01	0.14336	0.575	0.56548
SEG4	0.99731E-01	0.23667	0.421	0.67347
EDUCA2	-0.68389E-01	0.16660	-0.411	0.68143
EDUCA3	-0.82232E-01	0.20893	-0.394	0.69388
EDUCA4	0.32176E-01	0.22423	0.143	0.88590
WORKING	-0.37606E-01	0.17108	-0.220	0.82602
GEOGRAPHICAL CHARACTERISTICS				
ARAGON	-0.80068	0.38585	-2.075	0.03798
BALEARES	-2.0605	1.0283	-2.004	0.04510
ASTURIAS	-0.38507	0.71885	-0.536	0.59218
CANARIAS	0.56811	0.78935	0.720	0.47170
CANTABRI	0.11029E-02	0.43477	0.003	0.99798
CLEON	-0.57046	0.58593	-0.974	0.33025
CMANCHA	-0.61392	0.32235	-1.905	0.05684
EXTREMAD	-0.28609	0.24585	-1.164	0.24454
LARIOJA	-0.89153	0.49463	-1.802	0.07148
MADRID	-2.0496	0.84983	-2.412	0.01587
MURCIA	-0.31621	0.37696	-0.839	0.40156
CATALUNA	-0.18724	0.39270	-0.477	0.63350
VALENCIA	-0.32937	0.29844	-1.104	0.26974
GALICIA	0.28718	0.35385	0.812	0.41703
NAVARRA	-0.43644	0.50458	-0.865	0.38706
PVASCO	-0.35732	0.50085	-0.713	0.47558
AGE GROUPS				
AGE2	-0.22705E-01	0.10556	-0.215	0.82969
AGE3	0.16808	0.12381	1.358	0.17460
AGE4	0.26488	0.14491	1.828	0.06757
AGE5	0.22390	0.16280	1.375	0.16902
AGE6	0.40913	0.19423	2.106	0.03516

Table 2 cont. (instruments)

OTHER FACTORS				
DEMAND SIDE FACTORS				
PRIHINS	0.28419	0.44901	0.633	0.52678
SUPPLY SIDE FACTORS				
BEDS	0.26203E-01	0.46467E-01	0.564	0.57283
DOCTORS	0.27599E-01	0.10394	0.266	0.79060
OTHER HOUSEHOLD CHARACTERISTICS				
CHILDREN	-0.19238	0.66441E-01	-2.896	0.00379
LIVEALON	0.79968E-01	0.12960	0.617	0.53722
MARRIED	-0.73051E-01	0.79220E-01	-0.922	0.35646
TELEPH	0.16636	0.22642	0.735	0.46250
TELEPH2	-0.18873	0.30900	-0.611	0.54135
AREA2	2.5364	0.67915	3.735	0.00019
AREA3	2.3077	0.59377	3.887	0.00010
AREA4	2.2659	0.59388	3.815	0.00014
AREA5	1.8746	0.58817	3.187	0.00144
ADDITIONAL INSTRUMENTS				
ZWL	-0.27662E-01	0.15873E-01	-1.743	0.08139
ZPUT	-1.0347	0.60300	-1.716	0.08618
ZPRT	-0.72640E-01	0.46680E-01	-1.556	0.11968
ZRAI	0.16280E-02	0.26939E-02	0.604	0.54562
ZDEN	0.38995E-02	0.99475E-03	3.920	0.00009
ZTEM	0.44314E-01	0.52676E-01	0.841	0.40020
ZMOB65	0.23682	0.12657	1.871	0.06134
ZDENA2	-0.54039E-02	0.41871E-02	-1.291	0.19684
ZDENA3	-0.37136E-02	0.97313E-03	-3.816	0.00014
ZDENA4	-0.39834E-02	0.10363E-02	-3.844	0.00012
ZDENA5	-0.33673E-02	0.10319E-02	-3.263	0.00110
ZPUPRIT	0.34457E-01	0.25988E-01	1.326	0.18488
ZTEM2	-0.52952E-01	0.38864E-01	-1.363	0.17304
LAMBDA	-0.14722E-01	0.98687	-0.015	0.98810
Constant	-1.6894	5.8537	-0.289	0.77289

OTHER FACTORS				
DEMAND SIDE FACTORS				
PRIHINS	-0.28899E-01	0.26639	-0.108	0.91361
SUPPLY SIDE FACTORS				
BEDS	-0.59326E-01	0.63857E-01	-0.929	0.35287
DOCTORS	0.10097	0.16227	0.622	0.53376
OTHER HOUSHOLD CHARACTERISTICS				
CHILDREN	-0.35423E-01	0.12583	-0.282	0.77831
LIVEALON	0.22260	0.15019	1.482	0.13831
MARRIED	-0.37380E-01	0.96142E-01	-0.389	0.69742
TELEPH	0.11225	0.31699	0.354	0.72327
TELEPH2	-0.13503	0.45958	-0.294	0.76890
AREA2	1.4272	0.92259	1.547	0.12188
AREA3	0.99912	0.91291	1.094	0.27376
AREA4	0.88128	0.88188	0.999	0.31764
AREA5	0.61827	0.91385	0.677	0.49868
ADDITIONAL INSTRUMENTS				
ZWL	0.12065E-01	0.15771E-01	0.765	0.44427
ZPUT	-2.4145	0.77346	-3.122	0.00180
ZPRT	-0.16193	0.67094E-01	-2.413	0.01580
ZRAI	-0.23056E-02	0.35104E-02	-0.657	0.51132
ZDEN	0.17749E-02	0.14444E-02	1.229	0.21913
ZTEM	-0.89814E-01	0.55551E-01	-1.617	0.10592
ZMOB65	0.15643	0.16494	0.948	0.34294
ZDENA2	-0.43404E-03	0.27268E-02	-0.159	0.87353
ZDENA3	-0.14519E-02	0.14358E-02	-1.011	0.31193
ZDENA4	-0.12611E-02	0.13982E-02	-0.902	0.36708
ZDENA5	-0.19107E-02	0.14309E-02	-1.335	0.18175
ZPUPRIT	0.10209	0.35969E-01	2.838	0.00454
ZTEM2	0.56408E-01	0.43118E-01	1.308	0.19080
LAMBDA	0.52791E-01	0.94321	0.056	0.95537
Constant	2.8665	7.6210	0.376	0.70682

Table 3
PROBIT FOR GP VISITS, WITH PREDICTED TRAVEL TIME

PROBIT FEMALES (*n* = 7190)
Marginal/average effects and std.errors

Log-Likelihood	-2575.702
Restricted Log-Likelihood	-2962.779
Chi-squared (71)	774.160
Significance level	0.000
McFadden R^2	0.131
Proportion of correct predictions	0.863

RESET test 7.02; sq(3)= 7.81
OVERIDENTIFYING test 17.17; sq(13-2)= 19.68

Variable	*Coefficient*	*Standard Error*	*t-ratio*	*p-value*
NEED *(HEALTH INDICATORS)*				
ACUTNORM	0.25515	0.82815E-01	3.081	0.00206
DAYSNORM	-0.17467E-01	0.28082E-01	-0.622	0.53393
ACUTBED	0.11721	0.19588E-01	5.984	0.00000
DAYSBED	0.28041E-01	0.25708E-01	1.091	0.27537
HEALGOOD	0.85017E-01	0.18783E-01	4.526	0.00001
HEALFAIR	0.14853	0.19581E-01	7.586	0.00000
HEALPOOR	0.18584	0.25978E-01	7.153	0.00000
HEAVPOOR	0.27820	0.43341E-01	6.419	0.00000
GOODNOR	-0.69338E-01	0.84516E-01	-0.820	0.41198
FAIRNOR	-0.21737	0.85413E-01	-2.545	0.01093
POORNOR	-0.26349	0.91395E-01	-2.883	0.00394
VPOORNOR	-0.37619	0.13867	-2.713	0.00667
GOODDAYN	0.93710E-02	0.28058E-01	0.334	0.73839
FAIRDAYN	0.21551E-01	0.28201E-01	0.764	0.44475
POORDAYN	0.20131E-01	0.28509E-01	0.706	0.48009
VPOODAYN	0.14616E-01	0.29919E-01	0.489	0.62518
GOODDAYB	-0.25082E-01	0.26270E-01	-0.955	0.33968
FAIRDAYB	-0.24099E-01	0.25396E-01	-0.949	0.34266
POORDAYB	-0.33411E-01	0.25932E-01	-1.288	0.19761
VPOODAYB	-0.26006E-01	0.28881E-01	-0.900	0.36787
HYPERT	0.41798E-01	0.11686E-01	3.577	0.00035
CHOLEST	0.13258E-01	0.14020E-01	0.946	0.34434
DIABET	0.33201E-01	0.16894E-01	1.965	0.04938
ASTHMA	0.36509E-01	0.18950E-01	1.927	0.05403
HEART	0.68256E-02	0.21001E-01	0.325	0.74517
STOMULC	-0.13864E-01	0.22071E-01	-0.628	0.52992
ALLERGY	0.74989E-02	0.13953E-01	0.537	0.59096
UNDERWEI	0.29860E-01	0.20022E-01	1.491	0.13586
OVERWEI	0.34020E-03	0.91811E-02	0.037	0.97044
OBESE	-0.71930E-02	0.12446E-01	-0.578	0.56330
SOCIOECONOMIC BACKGROUND				
SEG2	0.10990E-01	0.14841E-01	0.741	0.45898
SEG3	0.24350E-01	0.15134E-01	1.609	0.10762
SEG4	0.31051E-01	0.15547E-01	1.997	0.04580
EDUCA2	0.33357E-01	0.20205E-01	1.651	0.09876
EDUCA3	0.58779E-01	0.20053E-01	2.931	0.00338
EDUCA4	0.48263E-01	0.23643E-01	2.041	0.04122
WORKING	-0.17462E-01	0.10062E-01	-1.735	0.08267
GEOGRAPHICAL CHARACTERISTICS				
ARAGON	-0.73934E-01	0.38877E-01	-1.902	0.05721
BALEARES	-0.56550E-01	0.66289E-01	-0.853	0.39361
ASTURIAS	-0.80480E-01	0.32415E-01	-2.483	0.01304
CANARIAS	-0.11911	0.30531E-01	-3.901	0.00010
CANTABRI	-0.93170E-01	0.37304E-01	-2.498	0.01251
CLEON	-0.96225E-01	0.25972E-01	-3.705	0.00021
CMANCHA	-0.49883E-01	0.26987E-01	-1.848	0.06455
EXTREMAD	0.12331E-01	0.24291E-01	0.508	0.61170
LARIOJA	-0.66320E-01	0.49804E-01	-1.332	0.18299
MADRID	-0.29661E-01	0.46910E-01	-0.632	0.52719
MURCIA	-0.33993E-01	0.30809E-01	-1.103	0.26988
CATALUNA	-0.74779E-01	0.45302E-01	-1.651	0.09880
VALENCIA	-0.59437E-01	0.31094E-01	-1.912	0.05594
GALICIA	-0.65701E-01	0.22979E-01	-2.859	0.00425
NAVARRA	-0.93325E-01	0.41282E-01	-2.261	0.02378
PVASCO	-0.82179E-01	0.33863E-01	-2.427	0.01523
AGE GROUPS				
AGE2	0.14861E-01	0.15713E-01	0.946	0.34428
AGE3	-0.12742E-01	0.16386E-01	-0.778	0.43680
AGE4	0.12114E-01	0.16885E-01	0.717	0.47309
AGE5	0.21607E-01	0.17104E-01	1.263	0.20649
AGE6	0.98961E-02	0.18989E-01	0.521	0.60226
ACCESS FACTORS				
LTTALL	-0.20598E-01	0.27848E-01	-0.740	0.45951

PROBIT MALES (*n* = 7353)
Marginal/average effects and std.errors

Log-Likelihood	-2082.759
Restricted Log-Likelihood	-2491.328
Chi-squared (71)	817.138
Significance level	0.000
McFadden R^2	0.164
Proportion of correct predictions	0.896

RESET test 5.09; sq(3)= 7.81
OVERIDENTIFYING test 9.26; sq(13-2)= 19.68

Variable	*Coefficient*	*Standard Error*	*t-ratio*	*p-value*
NEED *(HEALTH INDICATORS)*				
ACUTNORM	0.14115	0.57738E-01	2.445	0.01450
DAYSNORM	0.28322E-01	0.16090E-01	1.760	0.07837
ACUTBED	0.83535E-01	0.18759E-01	4.453	0.00001
DAYSBED	0.11077E-01	0.11973E-01	0.925	0.35489
HEALGOOD	0.38644E-01	0.12826E-01	3.013	0.00259
HEALFAIR	0.98766E-01	0.13724E-01	7.197	0.00000
HEALPOOR	0.92876E-01	0.19916E-01	4.663	0.00000
HEAVPOOR	0.90686E-01	0.41681E-01	2.176	0.02958
GOODNOR	-0.13478E-01	0.61487E-01	-0.219	0.82649
FAIRNOR	-0.11409	0.62369E-01	-1.829	0.06736
POORNOR	-0.32060E-01	0.72922E-01	-0.440	0.66019
VPOORNOR	-0.60358	0.32301	-1.869	0.06168
GOODDAYN	-0.31149E-01	0.16887E-01	-1.845	0.06510
FAIRDAYN	-0.23122E-01	0.16452E-01	-1.405	0.15990
POORDAYN	-0.36156E-01	0.17196E-01	-2.103	0.03550
VPOODAYN	0.24612E-01	0.30021E-01	0.820	0.41233
GOODDAYB	-0.12410E-02	0.12364E-01	-0.100	0.92005
FAIRDAYB	-0.19638E-01	0.12349E-01	-1.590	0.11177
POORDAYB	-0.20784E-01	0.12653E-01	-1.643	0.10047
VPOODAYB	-0.26516E-01	0.15128E-01	-1.753	0.07964
HYPERT	0.40353E-01	0.10202E-01	3.955	0.00008
CHOLEST	0.32947E-01	0.10647E-01	3.095	0.00197
DIABET	0.34715E-01	0.14725E-01	2.358	0.01840
ASTHMA	-0.25156E-02	0.12823E-01	-0.196	0.84448
HEART	0.28491E-01	0.13791E-01	2.066	0.03884
STOMULC	0.89971E-02	0.13376E-01	0.673	0.50118
ALLERGY	0.23790E-01	0.12941E-01	1.838	0.06602
UNDERWEI	-0.31657E-01	0.18668E-01	-1.696	0.08992
OVERWEI	-0.35896E-02	0.70719E-02	-0.508	0.61174
OBESE	0.10176E-01	0.93266E-02	1.091	0.27522
SOCIOECONOMIC BACKGROUND				
SEG2	0.17080E-01	0.11980E-01	1.426	0.15397
SEG3	0.21305E-01	0.12168E-01	1.751	0.07995
SEG4	0.42592E-01	0.12873E-01	3.309	0.00094
EDUCA2	0.14306E-01	0.14422E-01	0.992	0.32124
EDUCA3	0.25116E-01	0.14624E-01	1.718	0.08589
EDUCA4	0.27301E-01	0.16782E-01	1.627	0.10378
WORKING	-0.30605E-01	0.78296E-02	-3.909	0.00009
GEOGRAPHICAL CHARACTERISTICS				
ARAGON	-0.44727E-01	0.28448E-01	-1.572	0.11590
BALEARES	0.60277E-01	0.52300E-01	1.153	0.24911
ASTURIAS	-0.10413	0.28065E-01	-3.710	0.00021
CANARIAS	-0.66817E-01	0.24031E-01	-2.780	0.00543
CANTABRI	-0.52024E-01	0.30241E-01	-1.720	0.08538
CLEON	-0.10648	0.21029E-01	-5.063	0.00000
CMANCHA	0.10648E-01	0.21239E-01	0.501	0.61614
EXTREMAD	0.87940E-02	0.20022E-01	0.439	0.66050
LARIOJA	-0.35351E-01	0.38595E-01	-0.916	0.35969
MADRID	-0.16048E-01	0.37718E-01	-0.425	0.67050
MURCIA	-0.48723E-01	0.25432E-01	-1.916	0.05538
CATALUNA	-0.55527E-02	0.36642E-01	-0.152	0.87955
VALENCIA	-0.32780E-01	0.24244E-01	-1.352	0.17634
GALICIA	-0.52893E-01	0.16904E-01	-3.129	0.00175
NAVARRA	-0.10626	0.32972E-01	-3.223	0.00127
PVASCO	-0.63270E-01	0.26795E-01	-2.361	0.01821
AGE GROUPS				
AGE2	0.17225E-02	0.11849E-01	0.145	0.88442
AGE3	0.17401E-02	0.14534E-01	0.120	0.90470
AGE4	0.14197E-01	0.15110E-01	0.940	0.34745
AGE5	0.21631E-01	0.15112E-01	1.431	0.15233
AGE6	0.26691E-01	0.16882E-01	1.581	0.11388
ACCESS FACTORS				
LTTALL	0.92607E-03	0.18268E-01	0.051	0.95957

Table 3 (cont.)

OTHER FACTORS				
DEMAND SIDE FACTORS				
PRIHINS	-0.10334	0.21132E-01	-4.890	0.00000
SUPPLY SIDE FACTORS				
BEDS	0.11607E-02	0.63229E-02	0.184	0.85435
DOCTORS	0.17864E-02	0.10584E-01	0.169	0.86597
OTHER HOUSEHOLD CHARACTERISTICS				
CHILDREN	-0.74822E-02	0.12038E-01	-0.622	0.53425
LIVEALON	0.15212E-01	0.20144E-01	0.755	0.45014
MARRIED	0.75399E-02	0.11653E-01	0.647	0.51761
TELEPH	0.43592E-01	0.14658E-01	2.974	0.00294
TELEPH2	-0.57137E-01	0.21501E-01	-2.657	0.00787
AREA2	-0.92221E-01	0.24908E-01	-3.702	0.00021
AREA3	-0.10841E-01	0.15902E-01	-0.682	0.49540
AREA4	0.11198E-01	0.16753E-01	0.668	0.50385
AREA5	0.10599E-01	0.18407E-01	0.576	0.56474
Constant	-1.1339	0.23928	-4.739	0.00000

Frequencies of actual & predicted outcomes
predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	6071	84	6155
1	903	132	1035
TOTAL	6974	216	7190

OTHER FACTORS				
DEMAND SIDE FACTORS				
PRIHINS	-0.43703E-01	0.13903E-01	-3.144	0.00167
SUPPLY SIDE FACTORS				
BEDS	0.42476E-02	0.50687E-02	0.838	0.40203
DOCTORS	0.30473E-01	0.84735E-02	3.596	0.00032
OTHER HOUSEHOLD CHARACTERISTICS				
CHILDREN	-0.16843E-01	0.98618E-02	-1.708	0.08766
LIVEALON	0.19452E-01	0.14874E-01	1.308	0.19095
MARRIED	0.79086E-02	0.10359E-01	0.763	0.44520
TELEPH	0.42403E-01	0.11892E-01	3.566	0.00036
TELEPH2	-0.61008E-01	0.17500E-01	-3.486	0.00049
AREA2	-0.36106E-01	0.21006E-01	-1.719	0.08564
AREA3	0.27178E-01	0.13084E-01	2.077	0.03778
AREA4	0.27464E-01	0.13769E-01	1.995	0.04608
AREA5	0.35025E-01	0.15732E-01	2.226	0.02599
Constant	-1.1444	0.20381	-5.615	0.00000

Frequencies of actual & predicted outcomes
predicted outcome has maximum probability.

	Predicted		
Actual	0	1	TOTAL
0	6505	66	6571
1	697	85	782
TOTAL	7202	151	7353