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ETHNICITY AND EQUITY IN THE USE OF HEALTH CARE SERVICES IN THE SPANISH NATIONAL HEALTH CARE SYSTEM

Dolores Jiménez-Rubio

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DOLORES JIMÉNEZ-RUBIO

dolores@ugr.es

Universidad de Granada. Dpto. Economía Aplicada.

Campus de Cartuja. 18011 Granada (Spain).

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Universidad de Granada. Dpto. Economía Aplicada.

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Abstract. *An important recent change in the Spanish society is the increasing proportion of the population who are immigrants. Immigrants often face situations of social exclusion and disadvantage, circumstances that may affect their health status. Empirical evidence about differences in health status or the utilisation of health services between native and immigrant population is however insufficient. This paper uses the 2003 National Health Survey to explore whether non-Spaniards, for the same level of need, use health care services at the same rate as national citizens. The findings show different patterns of health care use to the disadvantage of immigrants.*

Key words**:** Equity in health care, immigrant population, Spanish National Health System.

JEL classification**:** I11, J15

1. *INTRODUCTION*

The Spanish health care system establishes that all people, regardless of their nationality, should be entitled to use health care services with the same conditions as Spanish citizens. The only requisite for immigrants, whether legally accredited or not, to be able to access health care services in the same way as Spaniards is to be registered in the local population census (Law 4/2000 of 11th of January about rights and liberties of foreigners in Spain). Even immigrants who are not registered in the population census are covered by emergency services. Children and pregnant women have full coverage irrespective of their legal and administrative situation (WHO, 2006).

So far, however, the evidence on whether the Spanish National Health System provides equal treatment for equal need to different nationality groups is clearly insufficient. On the one hand, immigration in Spain is a recent phenomenon (Arango, 2004), and despite the recent rapid growth (see Figure 1), immigrants still represent a low proportion of the population. This contrasts with the situation in other European countries, particularly the United Kingdom, where immigrants have been arriving to the country in search for work for much longer. Consequently, some research has already been conducted on this issue in the British National Health System (e.g. Smaje and Le Grand, 1997, Gravelle *et al*., 2006). On the other hand, in the Spanish context an additional obstacle is the lack of micro data related to this population group (Rivera, 2007). For this reason, the limited research on the use of health care services by immigrants is referred to specific health care areas or centres, or has been focused on specific immigrant groups (e.g. Salazar *et al*., 2003, Cots *et al*., 2002 and 2007, Torres and Sanz, 2000).

(Figure 1 about here)

The 2003 Spanish National Health Survey (SNHS) has incorporated a variable describing the country of origin of respondents that was not available in previous waves of the SNHS. Compared to Spaniards, however, the number of non-Spaniards included in the survey is very low (97% versus 3% respectively). In spite of this, I have taken advantage of this newly collected information and have explored whether there are any systematic differences in the patterns of health care utilisation between Spanish nationals and non-national individuals.

Figure 1 helps us to understand the increasing importance of the immigration phenomenon in Spain. Considering the 1998-2006 time span, the proportion of foreigners registered in the census as a proportion of the total population has increased from 1.6% to 9.3%. As shown in Figure 2, immigrants tend to concentrate in Balears and Comunidad de Valencia. Galicia and Asturias are the *Autonomous Communities* (ACs) where immigrants represent the lowest proportion of the population. By nationality, Latin Americans are the most numerous, followed by citizens from the European Union and Africa (see Figure 3).

2. *METHODOLOGY*

The analysis of inequalities in the use of health care is based on an analysis of horizontal inequities (Wagstaff and Van Doorslaer, 2000). Assuming a linear model, horizontal equity can be tested by regressing medical care use (y_i) on income, a vector of k medical need indicator variables (x_k), and a set of p non-need variables (z_p) using the equation:

$$y_i = \alpha + \beta * renta_i + \sum_k \gamma_k x_{k,i} + \sum_p \delta_p z_{p,i} + \varepsilon_i \quad (1)$$

Need variables are those that ought to affect the use of health care, whereas non-need variables are those that ought not to affect current health care use. In spite of the considerable debate on the meaning of need and the value judgements involved in distinguishing between need and non-need variables, I follow the standard approach in the empirical literature and use morbidity variables (proxied by health status and health limitations) as need indicators, and variables such as income, education, AC of residence (as a proxy for availability of care), and ethnicity, as non-need indicators (Gravelle *et al*, 2006). There is horizontal inequity if, holding need variables constant, use varies with non-need variables, that is, if coefficients associated to non-need variables are statistically significant (β or $\delta_p \neq 0$). In this paper I focus in particular on the coefficient associated to the variable country of origin of the respondents.

Because health care use variables are discrete and non-normally distributed, linear (OLS) estimation methods are in general not appropriate for the regression specified in equation (1), and non-linear methods are called for (Jones, 2000). The general functional form G of a non-linear model can be written as:

$$y_i = G\left(\alpha + \beta * renta_i + \sum_k \gamma_k x_{k,i} + \sum_p \delta_p z_{p,i} \right) + \varepsilon_i \quad (2)$$

The test for horizontal inequity uses the estimated coefficients on the non-need variables in exactly the same way as in a linear model.

Following the literature on the determinants of health care utilisation, I have used a two-part model (e.g. Van Doorslaer et al. 2004, Gerdtham, 1997), where the first part refers to the patient who decides whether to contact a doctor or not (*contact decision*), and the second part is determined to a large extent by the preferences of a physician (*frequency decision*). Two part models consider the participation decision and the frequency decision to be generated by separate probability processes:

$$E(y_i) = \underbrace{P(y_i > 0 | renta_i, x_{ki}, z_{pi})}_{\text{Probability of a contact}} * \underbrace{E(y_i | y_i > 0, renta_i, x_{ki}, z_{pi})}_{\text{Frequency of contacts}} \quad (3)$$

I have specified a logit model for analysing the probability of a visit, and a truncated at zero Negative binomial (Negbin) to model the conditional number of visits to health care services. By analysing each part of the decision-making process separately, it is possible to assess whether income, for instance, has a greater effect on the contact decision or on the frequency decision.

Individual weights (provided by the SNHS) were applied in all computations in order to make the results representative of the Spanish population. Throughout, given their special status, Ceuta and Melilla have been excluded from the analysis, and instead restricted attention to the seventeen Spanish ACs.

3. *DATA AND VARIABLES*

The data is taken from the adult survey of the 2003 SNHS that contains information from about 21.150 individuals aged 16 years or older living in Spain. The health status and health care use data contained in the adult survey is supplemented with socio-economic information from the household survey. Previous waves of the SNHS include 1987, 1993, 1995, 1997 and 2001. I restrict the analysis to the 2003 SNHS because it is the only one that incorporates a variable describing the country of origin of the respondents.

Measurement of the utilisation of the general practitioner (GP) and medical specialist services is based on the question: "During the last two weeks, about how many times have you visited: (a) a family doctor or general practitioner and (b) a medical specialist?". Hospital utilisation is measured on the basis of the questions: "How many times in the past 12 months have you been a patient overnight in a hospital?".

Income is measured as a categorical variable with 8 possible response categories that provides an estimate of the aggregate monthly income, after taxes and deductions, of all household members from all sources. On the basis of these categories I have created 4 dummy variables (<600 euros, <1200 euros, <3600 euros, >3600 euros) and have used less than 600 euros as the reference category.

The variables used to proxy need in our analysis are: age, sex, self-assessed health, health limitations and health difficulties. Age is captured by the following five

dummy variables: 16-34, 35-44, 45-64, 65-74, and over 75 years. I allow for interaction between age and sex. 16-34 year old male individuals are the reference category. The measurement of health as a proxy for health care need is based on three questions in the SNHS. The first refers to the self-perceived health status of an individual: "In general, would you say your health is: very good, good, fair, poor, very poor?". Based on these five categories, I have constructed four dummy variables, keeping very good health as the reference category. The second health related question is: "Are you limited in your daily activities by chronic or long term health problems?" (yes, no). I have created a dummy variable for the variable health limitation. No health problem in daily activities is used as the baseline category. The third health-related question is: "Are you experiencing any difficulties to do your day life activities?" (no, yes: moderate, yes: severe, yes: absolute). I create three dummy variables for the different levels of difficulty and use no difficulty as the reference category.

The other (non-need) variables used in the analysis are: AC of residence, economic status, education and nationality of respondents. I have included a dummy variable for each AC, except for the base category: Comunidad de Madrid. For education, I use four levels: less than primary school, primary and secondary (first cycle) studies, secondary (second cycle) and postsecondary studies, and university studies (reference category). Economic status is measured by six dummy variables derived from different variables that describe the activity status of the respondents: employed (base category), unemployed, retired, student, housework and other. Nationality is captured by the following variables: European Union, other European

country, Canada or USA, other American country, Asia, Africa, and Oceania. Spanish nationality is the baseline category.

4. *RESULTS*

Descriptive statistics

Table 1 shows the mean of the nationality categories used in our empirical estimations. Due to the low representation of most of the non-Spanish nationalities, I have collapsed them into two main categories: NAT1 and NAT2, representing respectively the 0.6% and 2.6% of the survey sample size. The first group includes individuals from the relatively wealthier European Union, North America (Canada or USA), and Oceania. The remaining nationality categories are included in the second group of relatively less wealthy areas.

(Table 1 about here)

After Spaniards, nationals from Central and South America are the most numerous, followed by European Union citizens, Africans and Europeans (from non European Union countries). Asian, Australasian, and North American are the less representative nationalities in the survey.

Figures 4 to 6 illustrate the means of the health care utilisation variables by nationality groups. Details on the descriptive statistics of the health care use variables are provided in Table 2. Summary statistics of all variables included in the regression models are presented in the Appendix.

(Figures 4 to 6 about here)

(Table 2 about here)

According to Figures 4 to 6 and Table 2, there are differences in the use of health care services among different national groups in Spain. Non-Spaniards report fewer visits to a GP and a specialist doctor, and more visits to a hospital than Spaniards do. The differences are more extreme for NAT2, the group of nationals from relatively less wealthy countries. I will now explore whether these differences still persist after controlling for all those factors that are known to affect health care use.

Regression results

Tables 3 and 4 present the regression results for the three health care utilisation variables employed in this study. The estimated overdispersion parameters of the Negbin are positive in the three cases (see Table 4), suggesting overdispersion of the data. The LR test statistics of the truncated Negative binomial against the truncated Poisson are highly significant at the 1% significance level, indicating that the truncated Poisson model is rejected. The Hausman tests of the restricted Negbin model against the truncated Negbin model suggest that there are important differences between the two decision making processes in the three types of services so that using a restricted Negbin model would result in inconsistent estimates. Therefore only the results of the combined logit-zero truncated Negbin model are discussed separately for each type of health care utilisation.

(Tables 3 and 4 about here)

GP visits

Income. The variable income is significant at the 5% significance level only in one case (income > 3600 euros) in both stages of the decision making process. Very rich people have a lower probability to contact a GP. However, conditional on a visit, the frequency of visits is higher for this group as compared to less wealthy people.

Need factors. As it is expected, both the contact and the frequency decisions are highly influenced by need as proxied by morbidity. Self reported health and health limitations both turn out to be highly significant in the regression results. In addition, as the level of self assessed health worsens, the estimated frequency of visits increases. Having moderate difficulties is associated with more frequent visits to a GP. The estimated effects of the interaction dummies for age and sex are not significant on any decision stage. Only 45 to 64 year old female individuals appear to visit the GP less frequently relative to 16-34 year old male individuals.

Socio-economic factors. Education only exerts an influence on the decision whether to contact or not a GP. According to the results, highly educated people have a lower probability of contacting a GP doctor than lower educated people. Activity status has a different impact on each part of the decision making process. Retired, unemployed and housewives have a greater probability to contact a GP as compared to employed people. Conditional on a GP visit, however, retired and housewives appear to be low frequent users relative to those in paid. As compared to employed people, individuals belonging to the activity status category other (voluntary work, no current economic activity) appear to be more frequent users, whereas students are less frequent users.

As for the variable AC, the regions with a higher probability of contacting a GP relative to Madrid are: Aragón, Asturias, Canarias, Castilla La Mancha and Galicia. Only in Cantabria and Cataluña the probability of visiting a GP is lower than in Madrid. As for the frequency of visits, the regions with the highest propensity are: Balears, Castilla La Mancha, Cataluña, Comunidad Valenciana, Extremadura, Navarra and Pais Vasco. The lowest frequency of visits to a GP relative to Madrid is found in Canarias.

Nationality. The variable country of origin does not appear to be an important determinant of the utilisation of GP services. Only the variable NAT2 turns out as significant at the 10% significance level in the frequency decision. The findings suggest that foreigners have the same probability of contacting a GP than Spaniards, though, conditional on a visit, the group of less wealthy foreigners are less frequent users of GP services than the Spaniards are.

Inpatient stays

Income. The variable income is significant at the 5% significance level only in one case (income > 3600 euros) in the frequency decision. Conditional on a visit, the frequency of visits is higher for the very rich group as compared to less wealthy people.

Need factors. As with GP visits, both the contact and the frequency decisions are highly influenced by morbidity variables. Self reported health and health limitations both turn out to be highly significant in the regression results. Also, both the probability of a visit and the estimated frequency of visits increase as the level of self

reported health worsens. Not surprisingly, having absolute difficulties is associated with a lower probability of inpatient treatment, while having severe difficulties is associated with more frequent inpatient stays. The estimated effects of the interaction dummies for age and sex suggest that 16 to 34 year old indicate that women are more likely to visit a hospital, probably due to the use of maternity services by healthy women.

Socio-economic factors. The educational level does not seem to have an influence on any of the parts of the decision making process of using hospital services. Activity status plays a different role on each stage: students are less likely to visit a hospital than employed, while housewives are more likely to go to hospital; unemployed are less likely to be frequent hospital users. Relative to Madrid, people living in Andalucia, Castilla y León, Galicia and Murcia are less likely to spend a night in hospital. The frequency of visits to a hospital conditional on a visit is higher in Asturias and Cataluña.

Nationality. For both foreign groups NAT1 and NAT2 the results reveal a higher probability to stay in a hospital as compared to a Spanish citizen. Given that the variation for the NAT1 group was not sufficiently high for the truncated Negbin estimations, I have excluded this category only for the second stage of the analysis, the frequency decision. The results indicate that, given a stay in a hospital, the NAT2 group individuals report fewer stays in hospital than Spaniards per year.

Specialist visits

Income. The income dummies are significant only in the contact decision and the gradient increases with income. Therefore, the probability of contacting a specialist doctor for an individual is higher the higher his income is. Conditional on a visit to a specialist doctor, the frequency of visits does not appear to be related to individual income.

Need factors. According to the results, the probability of contacting a specialist doctor increases as health gets worse. Having an absolute difficulty is associated with a lower probability of visits relative to those with no difficulties. Individuals in bad or very bad health are more frequent users of specialist visits given a visit than healthy ones. Having a health limitation or moderate health difficulty is also associated with a higher frequency of use. Females in the age groups 16 to 34 and 35 to 44 are more likely to pay a visit to a specialist physician, probably due to the use of gynaecologist services by healthy women in this age interval.

Socio-economic factors. Compared to highly educated people, those with little or no education are less likely to contact a specialist. Having secondary and post secondary studies is associated with a higher frequency of visits relative to people with University studies. Activity status plays a role only on the contact decision: retired and housewives are more likely to pay a visit to a specialist doctor than employed individuals. Individuals in Andalucia, Castilla La Mancha, Castilla y León and Murcia are less likely to visit a specialist physician than people from Madrid. In Cantabria, Cataluña, Castilla La Mancha and Balears, conditional on a visit, people contact a specialist doctor more frequently than in Madrid.

Nationality. The group of relatively wealthy foreigners, NAT1, has a lower probability of visiting a specialist physician than Spanish nationals. As for the frequency of visits, the results suggest that the group NAT2 visit a specialist doctor less frequently than Spaniards after the first visit.

5. *DISCUSSION*

In this paper I have sought to address whether there are different patterns of health care utilisation by different nationality groups in the Spanish National Health System. For this purpose, I have used the 2003 Spanish National Health Survey, as it classifies for the first time respondents according to their country of origin. Given the relatively low representation of foreigners in the survey, I have created two sub-groups on the basis of their nationality: foreigners from relatively wealthier countries (North America, Canada, Oceania, European Union), and foreigners from relatively poorer countries (Africa, Asia, Central and South America, Europe).

The analysis of health care utilisation by nationality groups is based on the concept of horizontal equity. There is horizontal inequity when use varies with non-need characteristics, so that individuals with the same levels of the need variables consume different amounts of health care according to factors that ought not to affect use. Attention is drawn to whether, after having controlled for need variables (proxied by morbidity variables), utilisation of a GP, a specialist doctor, and hospitalisations vary according to the country of origin of the respondents. Other non-need variables included in the study are: income, education, Autonomous Community of residence, and economic status. Utilisation of health care services is modelled as a two-stage

decision process: the contact decision and the frequency decision, using appropriate non-linear estimation techniques.

According to the results there is no horizontal equity in the delivery of health care for any of the three types of services analysed. Although need is the most important predictor of use, other non-need factors were found to be clearly significant in predicting individual utilisation of health services, including the nationality of the respondent. The findings show evidence that the probability to contact a specialist physician is positively associated with both income and education, but that the frequency of visits is not so highly dependent on them. Activity status plays an important role as a determinant of use both in the contact decision and the frequency decision. The significant positive effect of retirement on the probability of contacting a GP and a specialist doctor is interesting, given that age has already been controlled for. One possible explanation for this might be that the retired category is picking up early retirement on health grounds. This result may reflect the fact that morbidity variables are not fully capturing the effect of need on consumption or the fact that the retired attend health services for non health related factors such as sickness certifications (Gravelle, 2006). Young and middle-aged women are more likely to seek specialised care than young men, but given a visit middle-aged females are relatively less frequent users. The impact of the AC of residence is especially important for GP visits in the two stages of the decision making process. Interestingly, in many of the ACs both the probability and the frequency of visiting a GP are higher than in Comunidad de Madrid.

Finally, regarding the variable country of origin, the results reveal that all foreigners are more likely to be treated in a hospital than Spaniards are. Also, there is some evidence that shows that foreigners from relatively wealthier countries are less likely to contact a specialist physician. As for the second stage of the decision making process, foreigners from relatively poorer countries are less frequent users of the three types of care employed in this study as compared to Spanish nationals. Given that the frequency of care is likely to be controlled by a doctor, the results imply that there is inequity to the disadvantage of the less wealthy immigrants: ceteris paribus, relatively poorer foreigners receive on average less follow-up care than Spanish citizens. Regarding the contact decision, it could be argued that foreigners from both rich and poor countries are more likely to go to hospital (probably through the emergency unit) once they get ill because of a limited understanding of the rules that govern their access to the Spanish health system. In line with these results, the study by Cots *et al.* (2007) using data from Barcelona suggests that immigrants tend to use more emergency services irrespective of their economic position due to easy access to the health system.

Some limitations of this study are worth considering to conclude the paper. An important data constraint is the low proportion of non-Spanish nationals in the 2003 health survey. Future research will benefit if the Spanish National Health Surveys continue the collection of health and health care data for a population group with an increasing importance in the Spanish society. A further limitation regarding the methodology is that the two-part model employed assumes a single episode of illness. For the variable inpatient stays the long recall period of one year leads to a higher probability of observing multiple spells illnesses and first contacts. Compared to visits

to the GP or the specialist, however, for inpatient stays there is less likelihood of observing multiple spells over a year. Finally, a more important limitation is that the two-part model assumes that the first visit in a year is the contact decision, while subsequent visits are the frequency decision. It is possible, however, to misclassify the first count in the observation period if the first contact in a year belongs to an episode of illness of the preceding year.

APPENDIX

Summary statistics of independent variables included in the regression models

Variable	Mean	Std. Dev.
Income		
income2	0.39	0.49
income3	0.44	0.50
income4	0.04	0.20
Self-reported health		
Very good	0.11	0.31
Good	0.56	0.50
Fair	0.24	0.43
Bad	0.07	0.26
Very bad	0.02	0.15
Health limitations	0.18	0.38
Health difficulties		
Moderate	0.05	0.22
Severe	0.02	0.15
Absolute	0.01	0.10
Age and sex		
Male*age1	0.17	0.38
Male*age2	0.10	0.30
Male*age3	0.13	0.34
Male*age4	0.05	0.22
Male*age5	0.04	0.19
Female*age1	0.17	0.37
Female*age2	0.10	0.30
Female*age3	0.13	0.34
Female*age4	0.07	0.25
Female*age5	0.05	0.22
Education		
None	0.14	0.35
Primary and secondary (cycle 1)	0.49	0.50
Secondary (cycle 2) and postsecondary	0.23	0.42
University	0.14	0.35
Activity status		
Employed	0.45	0.50
Retired	0.20	0.40
Unemployed	0.08	0.28
Student	0.09	0.28
Housework	0.17	0.38
Other	0.01	0.08

Variable	Mean	Std. Dev.
Comunidad Autónoma		
Andalucia	0.21	0.41
Aragón	0.02	0.13
Asturias	0.03	0.18
Balears	0.03	0.16
Canarias	0.06	0.23
Cantabria	0.02	0.13
Castilla La Mancha	0.06	0.24
Castilla y León	0.05	0.22
Cataluña	0.11	0.31
Comunidad Valenciana	0.10	0.30
Extremadura	0.03	0.16
Galicia	0.08	0.28
La Rioja	0.00	0.05
Madrid	0.09	0.29
Murcia	0.03	0.16
Navarra	0.02	0.13
País Vasco	0.06	0.24
Nationality		
NAT1	0.01	0.08
NAT2	0.03	0.16

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Tables

Table 1. Nationalities included in the 2003 SNHS

Nationality	Mean
European Union	0.006
Oceania	0.0001
North America	0.00003
NAT1	**0.006**
America	0.016
Europe	0.004
Africa	0.004
Asia	0.002
NAT2	**0.026**
SPAIN	**0.967**

Table 2. Summary statistics of health care use variables

		Visits GP		Hospital visits		Specialist visits	
Nationality	**Obs.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Spanish	15437	0.29	0.64	0.13	0.56	0.11	0.56
NAT1	96	0.21	0.45	0.14	0.35	0.07	0.54
NAT2	333	0.17	0.41	0.15	0.37	0.04	0.22
All	15866	0.28	0.63	0.13	0.55	0.11	0.56

Table 3. Regression results: probability of a visit

	GP visits		Hospital visits		Specialist visits	
	Coef[a].	z	Coef.	z	Coef.	z
income 2	-0.05	-0.8	-0.10	-1.0	0.23*	1.7
income3	-0.005	-0.1	0.05	0.4	0.39***	2.7
income4	-0.57**	-2.5	0.20	0.8	0.50*	1.7
Self-reported health						
Good	0.57***	4.5	0.05	0.3	0.13	0.7
Fair	1.13***	8.5	0.73***	4.3	0.73***	3.7
Bad	1.15***	7.4	1.30***	6.6	1.04***	4.5
Very bad	0.73***	3.7	1.43***	5.6	1.33***	4.3
Health limitations	0.19***	2.6	0.32***	3.2	0.19	1.5
Health difficulties						
Moderate	0.03	0.3	0.21	1.5	-0.11	-0.6
Severe	0.05	0.3	0.07	0.4	-0.31	-1.2
Absolute	-0.27	-1.2	-0.84**	-2.5	-1.12**	-2.2
Age and sex						
Male*age2	0.03	0.3	-0.18	-0.9	0.002	0.01
Male*age3	0.05	0.3	0.20	1.2	0.31	1.5
Male*age4	-0.27	-1.2	0.10	0.5	0.12	0.4
Male*age5	0.03	0.3	0.31	1.4	0.47	1.5
Female*age1	0.05	0.3	0.54***	3.2	0.42**	2.1
Female*age2	-0.27	-1.2	0.21	1.2	0.58***	2.8
Female*age3	0.03	0.3	-0.30	-1.6	0.39*	1.8
Female*age4	0.05	0.3	-0.15	-0.8	0.06	0.2
Female*age5	-0.27	-1.2	0.25	1.2	-0.17	-0.6
Education						
None	0.30**	2.5	-0.03	-0.2	-0.62***	-3.2
Primary and secondary (cycle 1)	0.18*	1.7	0.06	0.4	-0.41***	-2.7
Secondary (cycle 2) and Postsecondary	0.18*	1.7	-0.05	-0.33	-0.24	-1.56
Activity status						
Retired	0.54***	5.1	0.22	1.6	0.55***	3.1
Unemployed	0.24**	2.1	0.10	0.7	0.23	1.2
Student	0.04	0.3	-1.09***	-4.0	-0.19	-0.8
Housework	0.35***	3.8	0.34***	2.6	0.30*	1.9
Other	-0.14	-0.5	0.23	0.7	0.26	0.6
Comunidad Autónoma						
Andalucia	0.19	1.5	-0.35**	-2.2	-0.47**	-2.4
Aragón	0.39***	2.6	-0.25	-1.2	-0.07	-0.3
Asturias	0.33**	2.2	-0.25	-1.2	0.003	0.01
Balears	-0.13	-0.8	0.09	0.5	-0.18	-0.7
Canarias	0.40***	2.7	-0.22	-1.2	0.10	0.5
Cantabria	-0.52***	-2.9	-0.03	-0.2	-0.28	-1.1
Castilla La Mancha	0.50***	3.3	-0.26	-1.3	-0.96***	-3.4
Castilla y León	0.05	0.4	-0.31**	-2.1	-0.52***	-2.9
Cataluña	-0.40**	-2.5	-0.07	-0.4	0.17	0.9

Comunidad Valenciana	0.36***	2.6	0.03	0.2	0.03	0.2
Extremadura	-0.02	-0.1	-0.19	-0.9	-0.37	-1.4
Galicia	0.26*	1.9	-0.36**	-2.0	-0.12	-0.6
La Rioja	0.10	0.4	-0.41	-1.0	-0.19	-0.4
Murcia	0.25	1.6	-0.39*	-1.8	-0.47*	-1.7
Navarra	0.12	0.7	-0.15	-0.7	-0.30	-1.1
País Vasco	-0.14	-0.9	-0.27	-1.4	-0.07	-0.3
Nationality						
NAT1	0.11	0.4	0.87**	2.3	-1.53**	-2.1
NAT2	0.03	0.1	0.86***	3.9	-0.35	-1.1
Pseudo R^2	0.10		0.07		0.05	
Log-L	-7140.63		-4171.89		-3134.14	
N	15866		15866		15866	

[a] The asterisks indicate significance at the 1% level (***), 5% level (**) and 10% level (*)

Table 4. Regression results: frequency of visits

	GP visits		Hospital visits		Specialist visits	
	Coef[a].	Z	Coef.	Z	Coef.	z
income 2	-0.0003	0	0.10	0.5	-0.27	-1.0
income3	-0.08	-0.6	-0.08	-0.3	-0.07	-0.3
income4	0.69**	2.2	0.87**	2.3	0.02	0.0
Self-reported health						
Good	0.61*	1.8	-0.43	-1.2	-0.38	-1.1
Fair	1.38***	4.0	0.45	1.2	0.28	0.8
Bad	1.70***	4.8	1.01***	2.6	1.07***	2.7
Very bad	2.20***	5.5	1.77***	4.3	0.79*	1.7
Health limitations	0.49***	4.3	0.35**	2.0	0.37*	1.9
Health difficulties						
Moderate	0.46***	3.0	0.22	1.0	0.93***	3.3
Severe	0.10	0.5	0.95***	3.5	0.45	1.3
Absolute	0.39	1.3	0.92	2.2	-0.12	-0.2
Age and sex						
Male*age2	-0.05	-0.2	1.21	3.2	0.15	0.4
Male*age3	-0.18	-0.9	0.05	0.2	-0.09	-0.3
Male*age4	-0.48*	-1.7	-0.41	-0.9	-0.74	-1.6
Male*age5	-0.52*	-1.7	0.17	0.4	-0.04	-0.1
Female*age1	0.15	0.7	0.34	1.0	-0.45	-1.5
Female*age2	-0.30	-1.3	-0.54	-1.3	-1.32***	-3.4
Female*age3	-0.62***	-2.9	-0.45	-1.2	-0.68**	-2.0
Female*age4	-0.16	-0.6	-0.72*	-1.7	-0.72*	-1.7
Female*age5	-0.43	-1.6	-0.33	-0.8	-0.70	-1.4
Education						
None	-0.07	-0.3	-0.14	-0.4	-0.02	-0.1
Primary and secondary (cycle 1)	0.24	1.2	0.47	1.6	0.14	0.5
Secondary (cycle 2) and postsecondary	0.18	0.8	0.25	0.8	0.56**	2.0

Activity status						
Retired	-0.71***	-3.9	0.19	0.8	-0.19	-0.7
Unemployed	0.03	0.2	-0.89**	-2.3	-0.38	-1.1
Student	-0.57**	-2.1	0.28	0.6	0.07	0.2
Housework	-0.74***	-4.2	0.27	1.1	-0.21	-0.8
Other	0.80**	2.1	0.20	0.3	-2.84	-1.6
Comunidad Autónoma						
Andalucia	0.08	0.4	0.16	0.6	-0.06	-0.2
Aragón	-0.45	-1.0	-0.26	-0.4	0.59	1.0
Asturias	-0.31	-1.0	0.82**	2.2	-0.07	-0.2
Balears	1.63***	5.7	0.14	0.3	1.24**	2.4
Canarias	-0.73**	-2.4	-0.53	-1.3	-0.50	-1.3
Cantabria	-1.11	-1.3	-0.64	-0.9	-1.93*	-1.7
Castilla La Mancha	0.64***	2.7	-0.09	-0.2	0.97**	2.2
Castilla y León	0.35	1.3	0.27	0.7	0.55	1.3
Cataluña	0.88***	3.8	0.79***	2.7	0.59*	1.9
Comunidad Valenciana	0.47**	2.1	0.11	0.4	0.16	0.5
Extremadura	0.84***	2.8	0.29	0.6	-0.31	-0.5
Galicia	0.37	1.6	0.08	0.2	-0.08	-0.2
La Rioja	0.70	0.7	-1.09	-0.5	0.52	0.3
Murcia	-0.03	-0.1	0.26	0.5	0.35	0.6
Navarra	0.66*	1.7	-0.08	-0.1	0.53	0.8
País Vasco	0.46*	1.7	0.09	0.3	0.17	0.5
Nationality						
NAT1	-0.48	-0.6	--	--	1.98	1.1
NAT2	-0.78*	-1.7	-1.95**	-2.2	-2.72**	-2.4
Log-L	-2083.8		-949.1		-1034.8	
Pseudo R^2	0.09		0.09		0.13	
α	52310.1		2468176.0		245050.9	
LR[b]	16802.3***		9257.0***		10459.4***	
Hausman[c]	278.06***		284.78***		99.41***	
N	4122		1110		1674	

[a] The asterisks indicate significance at the 1% level (***), 5% level (**) and 10% level (*)

[b] Likelihood ratio test of the truncated Negative binomial model against the truncated Poisson model

[b] Hausman test of the Negbin truncated at zero model against the restricted Negbin model

Figures

Figure 1. Proportion of foreigners in the total population of Spain, 1998-2006

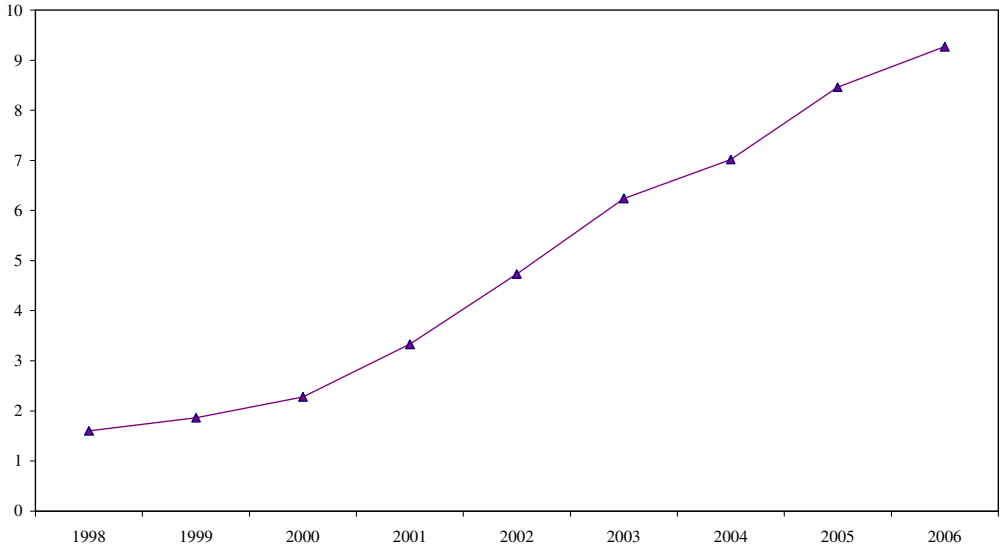

Figure 2. Proportion of foreigners in the total population of each *Comunidad Autónoma*, 2006

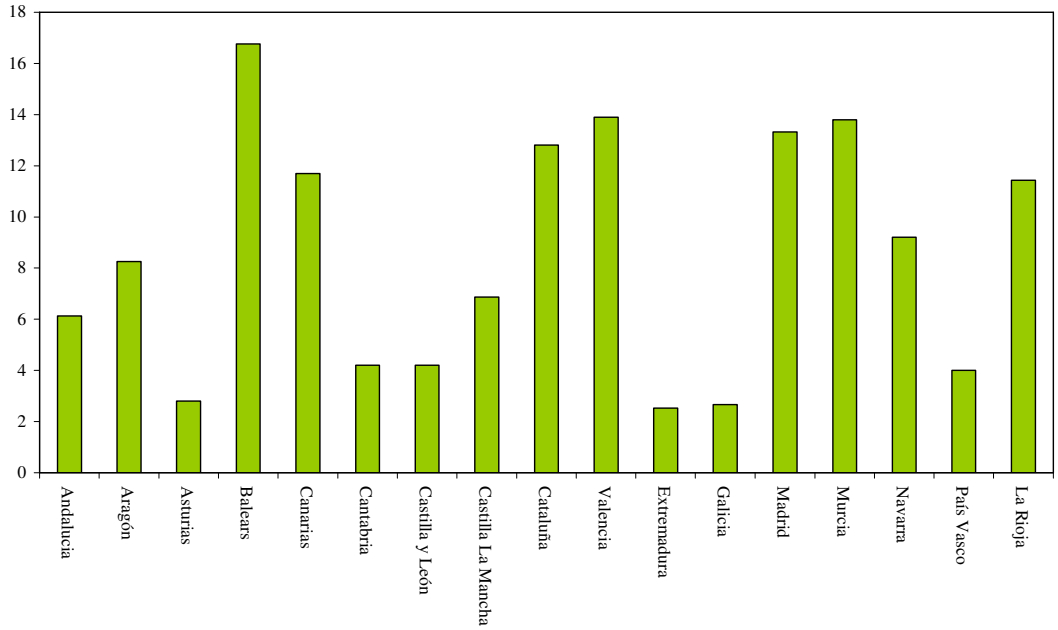

Figure 3. Foreigners classified by nationality group, 2006

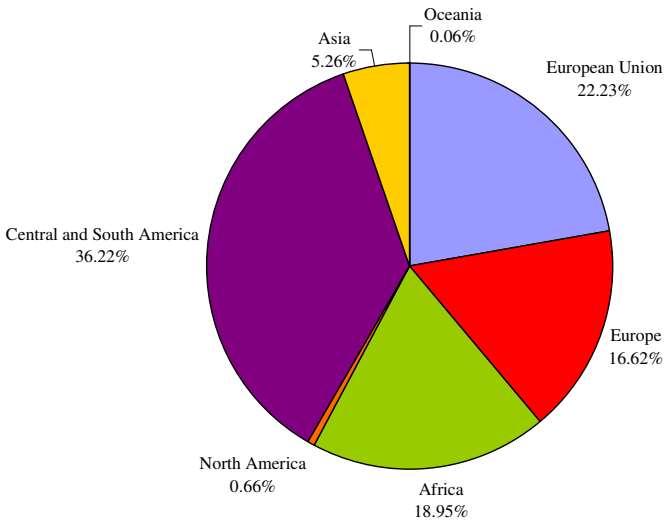

Figure 4. Visits to the GP by nationality groups

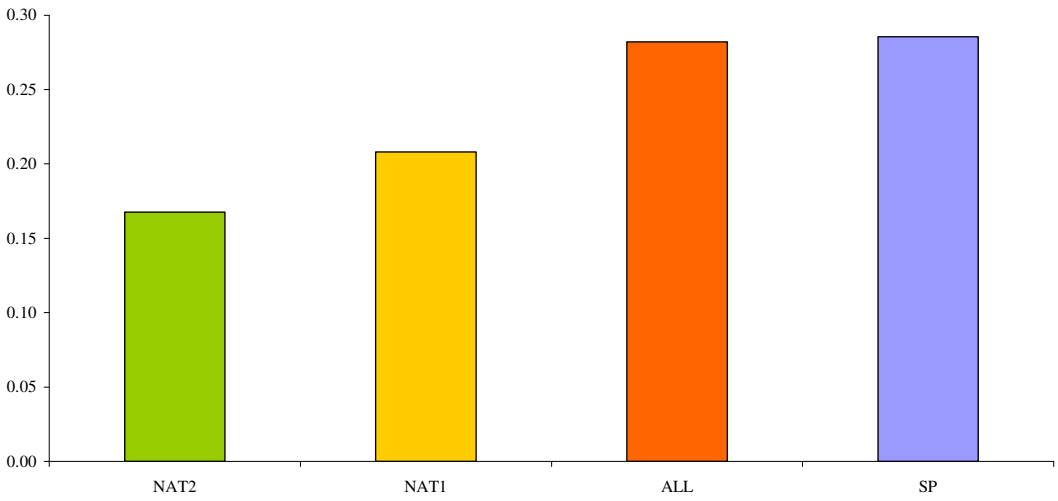

Figure 5. Visits to the hospital by nationality groups

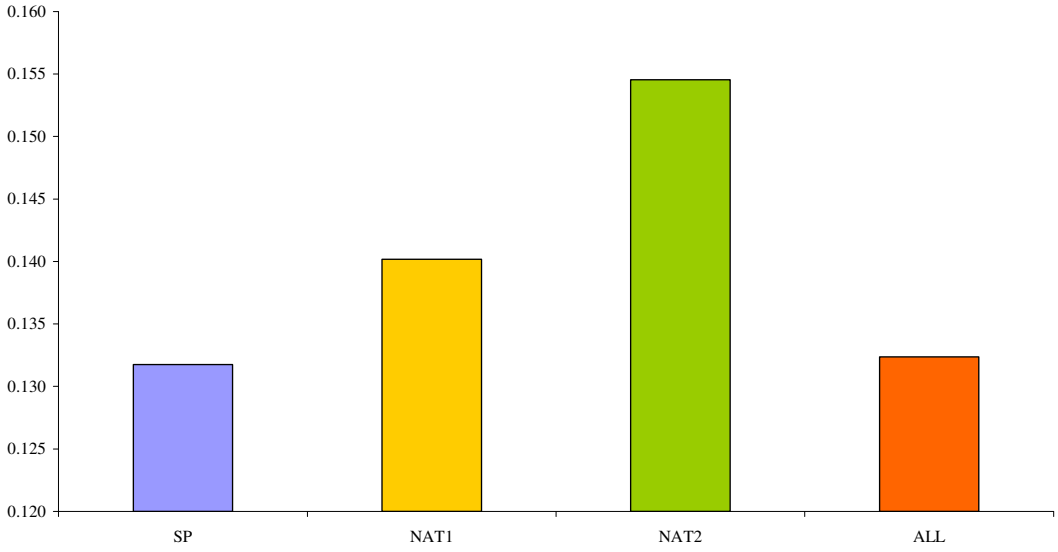

Figure 6. Visits to a specialist doctor by nationality groups