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HORIZONTAL INEQUITY IN ACCESS TO HEALTHCARE SERVICES AND EDUCATIONAL LEVEL IN SPAIN

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SUMMARY:

The aim of this study is to measure horizontal equity in the use of healthcare services in Spain, proposing two methodological innovations. First by defending it as equality of access for equal need, irrespective of educational level, unlike the prevailing methodological approach to horizontal equity which relates it to income. Second, by estimating it by means of the slope index of the inequality of characteristics, analagous to the inequity index proposed by Kakwani, Wagstaff and van Doorslaer (1997; HI_{WV}) but presenting some methodological advantages, the greater robustness of the data available on educational level than of those on income, and the possibility of isolating the net effect of the educational level on the use of healthcare by controlling for other variables.

The methodology is designed in three parts: (1) estimation of the relationship between the educational level and the use of healthcare services by means of a model of the likelihood of demand for healthcare services, commonly used in the literature; (2) estimation of the relationship between educational level and health by approximating a production function of individuals' health according to their personal characteristics and other factors conditioning health; and (3) estimation of the slope index of inequality as a measure of horizontal inequity, using educational level instead of income as the criterion for ranking individuals.

The data base used was a sample of 55,598 observations from the Survey of disabilities, handicaps and state of health of 1999, carried out in Spain. No significant statistical association was found between educational level and use of healthcare services. On the other hand, the relationship between educational level and health, with the three proxy variables used (perception of health, days of limitation and number of chronic illnesses) shows a positive correlation, i.e. an increase in educational level is associated with a greater probability of enjoying better health.

Horizontal inequity, measured by the proposed slope index of inequality, gives a range of statistically significant values between 13.91% and 9.40%, depending on cases, i.e. the significant inverse relationship between state of health and educational level is not reflected proportionally in healthcare use, implying that, with greater need, the access of individuals with a lower educational level to public healthcare services is the same as for the rest.

These results suggest that the educational level may be a variable to consider when characterizing the healthcare needs of a population in a defined geographical area, at least from the normative characterization of horizontal equity proposed.

Key words: Education and health; Healthcare needs; Horizontal Inequity; Logistic regression ; Ordinal regression; Regional funding.

Códigos JEL: C21; H42; H77; I12; I20

HORIZONTAL INEQUITY IN ACCESS TO HEALTHCARE SERVICES AND EDUCATIONAL LEVEL IN SPAIN.

INTRODUCTION

One of the fundamental objectives of the healthcare policies of developed countries is the equity of their healthcare systems. However, there is no definition or single measurement of this. One of the most frequent normative approaches is horizontal equity, understood as equal treatment for equal need. Healthcare need can be defined in several ways: level of health, resources used, capacity to benefit from treatments, etc though empirical studies frequently use measures of perception of health, or of morbidity, as a proxy of clinical need.

A substantial part of the literature interprets the principle of horizontal equity in relation to wealth as equal treatment for equal need, independently of the level of income(Van Doorslaer et al, 2000). This study investigates horizontal equity with reference to the educational level, defining it as equal treatment for equal need independently of the educational level. This approximation is particularly attractive for countries whose institucional framework guarantees to their citizens a broad collective insurance, independently of their income level, as is the case of the Spanish National Health System (SNS) , where wealth should not be the greatest barrier to access. Methodologically it presents the significant advantage of greater quality and quantity in the data available in health surveys. For example in the Spanish National Health Survey of 1999 (EDDES99), out of a total of 60,666 individuals interviewed, only 37 (0.061%) did not respond about their educational level whereas 10,299 (16.98%) did not respond regarding their level of income. The poor quality of the data on income, derived from resistance or lack of knowledge, makes it necessary on occasions to make estimations of income (Urbanos, 2000; Alvarez, 2001) which are not needed if horizontal equity is defined in relation to the educational level.

The objective of this study is to investigate horizontal equity in access to public healthcare services in Spain in relation to educational level, as well as the relationship between educational level and health. More specifically we analyze to what extent, for equal need, differences may be occurring in access to public healthcare services according to individuals' educational levels.

From this perspective horizontal equity was measured by means of the slope of inequality, with characteristics similar to the inequity index (HI_{WV}) of Kakwani, Wagstaff and van Doorslaer (1997). To construct it, an index of access to healthcare services is calculated, and an index of health in relation to educational level. The slope index of inequality has been defined as the comparison between the coefficients of straights of use and health according to educational level. Significant differences between the two indicate horizontal inequity .

The relationship between the educational level and the health of a population has traditionally been studied in the context of developing countries, where the links between education and health are usually presented in the form of high correlation between low schooling rates, high mortality rates and uncertain economic and social growth and stability [1](Wang, 2002; Canagarajah and Ye, 2001). In the context of developed countries the accent is usually placed on finding the causal mechanisms that link educational level with health, establishing the efficient level of investment, and analyzing the relationship between educational levels and equality of access and results in health.

The predominant conceptual framework of the majority of studies is that provided by Grossman (1972), who deals with the relationships between Education and health within the neoclassical theory of human capital. Health is the result of a production function in which education constitutes an important input. Fuchs (1982) suggests the possibility that both are conditioned by a third, the personal time discount rate, so that the individuals with a lower discount rate would be interested in promoting jointly their health and education so the simple direct relationship between the two could be considered spurious[2]. The direction of the causality can also be the subject of discussion; it is thus possible that good health is what permits higher levels of education to be attained (Perri, 1984). Other studies (Lleras-Muney and Lichtenberg, 2002; Glied and Lleras-Muney, 2003) suggest that it is the special predisposition of more educated people to accept new medical treatments and new medicines that leads to better health results.

The analysis of the relationships between inequalities of health and of access and certain variables such as income or education presents some methodological limitations (López-Casasnovas and Rivera, 2002). Fuch (1982) or Lleras-Muney and Lichtenberg (2002) detect a potential endogeneity between the level of health and that of education because the cause-effect process can go in different directions. However, a large part of the literature finds that the direct effects of education on health are greater than the indirect ones, i.e. the health-education-health reciprocal ones. (Kemma, 1987;Berger and Leigh, 1989; Haveman et al. 1994)[3]. Arendt (2001) detects the presence of endogeneity between education and health at two distinct levels: on a first individual plane, people who appreciate education also appreciate health, but on a second plane, both variables are conditioned by aggregated third-party variables (society in which it occurs, parents' cultural level, rurality, etc.) in the sense that the educational level of the milieu also influences both education and individual health .

Subjective measurement of health, as is the case of self-assessment of the state of health or that of feeling limited for certain everyday tasks, faces at least two difficulties: the absence of a universally accepted standard of what should be considered good or bad health, and the incentives that some individuals have not to declare their true state of health (Anderson and Burkhauser, 1984; Bound, 1991; or Waidman, Bound, and Schoenbaum, 1995).

Notwithstanding these problems it is a solid and dynamic program of research; we could mention the studies by Grossman (1973) Lairson et al. (1984); Sickles and Taubman

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[1] The importance of these matters has aroused the interest of numerous international organizations (World Bank, 2002a and b; OECD, 2002; UNESCO, 2001) through various programs (e.g.. *Education For All* (EFA), as well as a profusion of recommendations for political intervention (Roberts, 2003).

[2] In this same sense the relationship could also be much influenced by the quality or healthiness of the different jobs that are usually accessed depending on the educational level attained (Kemna, 1987).

[3] Kemna (1987), for example, goes so far as to affirm that from 70 to 95% of the total effect is direct from education to health.

(1986), Lleras-Muney (2002) Lleras-Muney and Lichtemberg (2002) or Ghosh (2001) for the case of the U.S.A.; Kennedy (2003) comparing the cases of Canada and Australia; Wagstaff (1986) for the case of Europe; or Arendt (2001); Hartog and Oosterbeek (1998) Townsend, Davison and Whitehead (1988) for Denmark, Holland or England respectively, etc.

In Spain there are several studies relating to equity of access, among which can be quoted those directed by van Doorslaer and Wagstaff, in 1986, 1997, 2000 and 2002 at international level, or Urbanos, 2000 specifically referring to Spain. The literature that has studied specifically the relationships between health inequalities and educational level is small, e.g. Borrell and Pasarín (1999) Borrell et al (1999), Benach and Yasui (1999) Benach (2001) or Escardibul (2002 and 2003).

There are, however, no studies to estimate horizontal equity defined in relation to the educational level, by means of the slope index of inequality as in this study. This approximation is particularly attractive for a healthcare policy that aims to reduce social inequities in health. In Spain it constitutes a modest contribution to the debate on the healthcare need variables that must be included in the model of funding at regional level.

The current debate as to the variables of need that should form part of the new funding model for the autonomous regions is focussed on demographic variables, ignoring the possibility that people's social characteristics may condition their capacity to access and make use of the offer of public services. Given that the different Autonomous Communities (regions) present different aggregate profiles in respect of educational level, income, and socio-economic conditions in general, the fact that the current political debate on the new regional funding model ignores this dimension is an interesting test of the values that in reality guide the actions of the political elites.

The text is organized in three sections. First we describe the methodology adopted for the estimation of the relationships between educational level, healthcare utilization, and health. We also develop the measure of horizontal equity based on the slope index of inequality. The second section sets out the results obtained. A brief section of conclusions closes the paper.

1. METHODOLOGY

The data base used was the health module of the Survey of Disabilities, Defects and State of Health (*Encuesta sobre Discapacidades, Deficiencias y Estado de Salud, 1999)* (EDDES99), carried out by the *Instituto Nacional de Estadística*, in collaboration with the *Instituto de Migraciones y Servicios Sociales* and the *Fundación ONCE*. The territorial scope is all Spain, the method is stratified random sampling and the procedure is by personal interview at the respondent's home. The microdata file contains information on more than 70,000 individuals and more than 230 variables of healthcare interest [4].

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[4] This survey is the ordinary Health Survey corresponding to the year 1999. With the difference, and the advantage, that other health surveys, which are carried out every two years, usually have from 6,000 to 20,000 entries while in this one a more than 70,000 individuals were interviewed. This survey, furthermore, incorporates the so-called elevation factor which has been considered in the various estimations.

The methodological strategy employed is divided into three phases:

a) Estimation of the relationship between educational level and the use of healthcare services.
b) Estimation of the relationship between educational level and health.
c) Estimation of the slope index of inequality as a measure of horizontal inequity.

For the relationship between educational level and utilization we estimated a probability model of the demand for healthcare services, habitually used in the literature (Phelps and Newhouse, 1973; Hartog, 1998; Contoyannis, Jones and Rice 2001; Jiménez-Martin Labeaga and Martinez, 2001 and 2002; Escardibul, 2003, etc.):

$$Pr\ (y_{ij} = 1 | X_i) = \Lambda_j\ (\beta\ X_i) + \varepsilon_{ij} \qquad [1]$$

Where y_{ij} is the probability that the individual i will demand healthcare service j and X_i is the matrix reflecting his or her state of health and the characteristics (personal, social, economic, etc.) that condition his or her health, β is the vector of estimators. Given that, in the data base used, the variables reflecting the use of each healthcare service are dichotomous (1: does use; 0: does not use) it is appropriate to use a logistic model, so Λ will represent the linking logit function[5] and finally ε_{ij} captures the random disturbances which we assume to be uncorrelated with the regressors. The model developed is also usually presented with the following notation:

$$P(Y_{ij} | X_i) = \frac{1}{1 + exp\left[-(\beta_{ij} X_i)\right]} \qquad [2]$$

The independent variables were selected by means of a double filter, study of multicollinearity by means of the index of condition[6] and the inclusion of significant variables by the "Wald forward" method[7]. Also, individuals aged under 23 were excluded from the sample because it is estimated that, up to that age, the educational level may still be being completed; also the residents of Ceuta and Melilla and some

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5 In the case of *medicos_ss or analisis_ss or enf_cron* the EDDES99 measures the frequentation, so count estimation models could also have been used; however both have been transformed into dichotomous variables for several reasons: a) the estimated parameters of the logistic model (OR's) have an immediate probabilistic interpretation b) for the final elaboration of the index of inequality, it is considered of interest for the parameters to be homogeneous and, given that they include dummy variables (*farma_ss; limit; estasalud*) that can only be estimated by means of logit (or probit) models, it is recommendable to reduce them all to this expression. c) the number of visits to the doctor, the number of diagnostic tests or the chronic illnesses diagnosed are not independent of each other; d) most of these variables have the value either zero or one, so the loss of information is minimal. Of 55598 cases, 61.17% of *enf_cron*, 95.88% of *medicos_ss* and 98.39% of *analisis_ss* are zeros or ones .

6 The index of condition applies principal component factor analysis to all the variables. The self-value of each component is calculated. The self-value is the proportion of variance that each component explains exclusively, so that a self-value close to zero implies that that dimension is highly correlated with others. The index of condition is the square root of the ratio between the highest and the lowest self-values. Foe Belsey (1991) collinearity is serious when the index of condition exceeds 30 points.

7 This consists in the configuration of econometric models consecutively introducing variables accotrding to the amount of variability that they explain and excluding those that explain little. The Wald index is, in logistic regression, what the t statistic is in linear regression. This process maximizes explanatory capacity with the greatest possible succinctness. When the inclusion of a variable has improved the general significance of a regression model, it has been included in the rest of the models in order to make the estimations comparable; this is why in the annex some models contain some variables that are of little significance.

observations considered strange or lacking responses[8]. These selections reduce the sample to 18 healthcare variables in respect of 55,598 individuals representating 28,754,100 residents in Spain (table 12 of the annex).

The dependent variables of use (Table 1) refer to the fourteen days preceding that of the survey[9].

Table 1. Selected (dependent) variables of use

Name	Description	Characteristicas
farma_ss	Consumption of medicines with SNS	dichotomous
farma	Consumption of unprescibed medicines	dichotomous
médicos_ss	SNS medical and nursing services	dichotomous
análisis_ss	Attendance at SNS diagnostic tests	dichotomous

The variable relating to the *completed level of education* (estudios) was structured in five basic categories (Table 2).

Table 2 Categories of level of education

	Frecuency	Percentage	s.d.
estudiosno (Illiterate or no education)	10551	0.1898	0.392
estprim (Primary education)	19020	0.3421	0.474
estsec1 (Secondary education-first cycle)	7716	0.1388	0.345
estsec2 (Secondary education-second cycle)	8579	0.1543	0.361
estsup (Higher educ.-University and Professional)	9732	0.1750	0.380
Total	55598		

To study the relationships between health and education, a production function of individuals' health is proxied by means of their personal characteristicas and other factors conditioning health. In the model in equation [1] , y_{ij} has been interpreted as the state of health of each individual i measured in the dimension of health j which may be objective or subjective. In the EDDES99 various questions were introduced in respect of individual health, three of which were selected: self-assessment of the state of health; days limited in daily activities and diagnosis of a chronic illness. The first two are subjective dimensions and the last objective. X_i is the matrix of independent variables (table 13 of the annex).

The dependent variable self-assessment of the state of health can adopt five discrete values, from 1, very good perceived health, to 5, very bad. In this case we have used the ordinal logistic regression (Propper, 2000) based on the methodology introduced by McCullagh (1980), whose multivariate version has the form:

$$log\,it\left[P(Y \leq s)\right] = ln\frac{P(Y \leq s)}{P(Y \succ s)} = \alpha_s + \beta_0 + \beta_1 X_1 + \ldots + \beta_m X_m \qquad s = 1,2,..c-1 \qquad [3]$$

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8 Such exclusions are normal in the majority of studies of this subject since such groups present a particular heterogeneity that conditions the estimations of the rest of the population. To these effects we considered to be strange observations those that declared more than 14 visits in the previous 14 days (18 observations). Also, in the sample there were 24 individuals who did not respond as to their educational level.

9 The survey contained other dimensions of use of healthcare services and assets such as : hospitalization, surgery, physiotherapy, odontology, ambulance, etc. but they are excluded from this analysis because, due to the lack of response, there is a reduction of the sample mass below the minimum necessary for obtaining significant results in respect of the educational level.

This specification permits us to obtain a single estimation of β:

$$exp(\beta_i \alpha_s) = \frac{Odds(x_i | \leq s)}{Odds(x_o | \leq s)}; \qquad [4]$$

in the case where two individuals only differ in one variable by one unit. This measure the likelihood that an individual will present the characteristic of interest, in our case enjoys a certain level of health, cumulatively up to level *s*.

Third and finally, as a measure of horizontal inequity we estimate the slope index of inequality, which compares the slopes of the curves of use and health according to educational level. This index is used in epidemiology and presents properties analogous to the inequity index (HI_{WV}) of Kakwani, Wagstaff and van Doorslaer (1997)[10].

If y_{1i} is defined as the OR's of use of a healthcare service, *educ* as the relative order of educational levels, and u_{1i} the disturbances that are assumed to be normal, the regression can be written:

$$y_{1i} = \alpha_1 + \beta_1 \, educ + u_{1i} \qquad [5]$$

To capture the information on the distribution of the population, we resolve with a linear estimator by weighted least squares (WLS) or where $\hat{\beta}_1$ is the slope of use of healthcare services according to educational level.

If y_{2i} is defined as the OR's of enjoying, or suffering from, a certain state of health, then in the regression:

$$y_{2i} = \alpha_2 + \beta_2 \, educ + u_{2i} \qquad [6]$$

$\hat{\beta}_2$ will be the slope of health against educational level. The difference between the two slopes (IDP) will be a measure of inequity of the system, $IDP = \hat{\beta}_2 - \hat{\beta}_1$. An elementary test for measuring whether or not the difference of estimations is significant is that based on Student's *t* .

[10] The concentration and inequality index of Kakwani (1997) (KWV) is based on the approximation of the Gini index by Yitzhaki (1984), which can be written as:

$$C = -\frac{2}{\mu} Cov \left[y_i, (1 - R_i) \right]$$

where y_i is the use of the healthcare service, R_i the relative position of each individual *i* according to income and μ is the mean healthcare use of the sample ($\mu = \bar{y}_i$). This can be calculated alternatively by means of the appropriate regression (van Doorslaer et al., 2000):

$$2\sigma_R^2 = \frac{y_i}{\mu} = \alpha + \beta R_i + u_i$$

where $\hat{\beta}$ is the index of concentration. Defining y_i as healthcare use we estimate (estimator MCP) $\hat{\beta}_1 = C_M$ as the index of concentration of use and defining y_i as the expected (estimated) healthcare use we obtain $\hat{\beta}_2 = C_N$ as the index of concentration of need, the index of horizontal inequity (HI_{WV}) is the difference between the two $HI_{WV} = C_N - C_M$. The expected healthcare use is obtained by means of an auxiliary regression : $y^*_i = F(edad, género, enf\_cron, estasalu)$.

Its interpretation is immediate and analogous to that proposed by van Doorslaer et al. (2000): if the difference between the two slopes is significant, horizontal inequity exists, since the use according to educational level is different (greater or less) than the need.

While the index of horizontal inequity (HI_{WV}) compares the slope of use with that of estimated use according to income, where use is estimated on the basis of the state of health, the index of inequality that is proposed here compares the slope of use directly with that of the state of health according to educational level. The principal methodological difference arises from the consideration of control variables. The index of inequality proposed captures the net effect of educational level on healthcare use by controlling for the other variables (locality of residence, marital status, healthcare habits, type of job, etc.) which does not occur with the index of horizontal inequity (HI_{WV}) where these variables are not introduced, so the use and the estimated use are gross.

3. RESULTS[11]

We describe below the results of the three types of analysis considered relating to educational level, use of healthcare services, level of health and index of horizontal inequity [12]

3.1. USE OF HEALTHCARE SERVICES

As we can observe in table 3, the probability of consumption of medicines prescribed by the SNS, i.e. paid for wholly or partly by the public sector, increases inversely to the educational level.

Table 3. Odds Ratios of consuming medicines prescribed by the SNS. *farma_ss*

	B	Standard error	Wald	Significance	Exp(B)
EST_NO (Ref)	-	-	-	-	-
ESTPRIM	-0.029	0.034	0.718	0.397	0.972
ESTSEC1	0.003	0.044	0.006	0.936	1.004
ESTSEC2	-0.085	0.045	3.469	0.063	0.919
ESTSUP	-0.078	0.045	2.972	0.085	0.925
Constant	-3.011	0.180	279.605	0.000	0.049

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11 The data presented in the tables are: the estimated parameter ($\hat{\beta}$) and its standard error; the Wald coefficient, the interpretation of which for the logistic regression is similar to that of the t in the linear regression; the p-value that indicates the statistical significance; finally the odds ratios (*OR=exp(B)*). The Odds are a magnitude representing the probability of an event occurring as against it not occuring (*Odds:* $\{\Re \in [0;\infty]\}$). An OR_i higher than 1 indicates that the event is more likely to occur and by what amount the $Odds_i$ exceeds the variable of reference and viceversa. If we define: $OR = exp(\beta_i)$ and $Odds_i = exp(\beta_i)\ exp(cte)$, the conversion between probability and OR can be calculated as :

$$Pr_i\ (y \mid X_i) = Odds_i \ / \ 1+ Odds_i$$

The Odds of the categories of reference are reflected in the constant of the model. In the case of education, the individual of reference (IR) belongs to the category of “Illiterate or no education”.

12 The estimations of the rest of the variables figure in the annex.

The Odds Ratio (OR) between the lower educational level of reference, and the higher, university education, is 0.905. If this is expressed in terms of probability, the individual of reference (IR)[13] with a university education, which is the only category with significant differences [14], has a probability of consuming medicines of 4.34%[15] as against 4.67% for the population without education.

The results change when private consumption of medicines is considered, as reflected in Table 4 where the total consumption, public and private, is considered.

Table 4. Odds Ratios of consuming medicines. *farma*

	B	Standard error	Wald	Significance	Exp(B)
EST_NO	-	-	-	-	-
ESTPRIM	0.048	0.036	1.836	0.175	1.049
ESTSEC1	0.141	0.044	10.280	0.001	1.151
ESTSEC2	0.138	0.045	9.472	0.002	1.148
ESTSUP	0.205	0.045	21.011	0.000	1.227
Constant	-3.128	0.179	307.015	0.000	0.044

The probability of consumption of medicines is now higher depending on educational level. Furthermore the statistical significance is general except in the case of *estprim*. The results suggest both a lower opportunity cost and a greater propensity to consume medicines according to educational level.

With regard to the probability of being attended to by non-hospital healthcare staff [16], the increase in educational level reduces the probability of use. Nevertheless, just as in the case of *farma_ss*, the differences are significant only for the extreme groups. For example, the probability of use of this service by the IR without education is 5.93% and that of the educated group with higher education is 5.13%. (Table 5)

Table 5. Odds Ratios of being attended by (non-hospital) healthcare staff. *medicos_ss*

	B	Standard error	Wald	Significance	Exp(B)
EST_NO	-	-	-	-	-
ESTPRIM	-0.033	0.034	0.949	0.330	0.968
ESTSEC1	-0.038	0.048	0.636	0.425	0.962
ESTSEC2	-0.078	0.051	2.365	0.124	0.925
ESTSUP	-0.153	0.052	8.553	0.003	0.859
Constant	-2.771	0.189	215.920	0.000	0.063

In respect of the number of diagnostic tests undergone during the previous fourteen days (Table 6) the odds of utilization are slightly higher in the intermediate levels of education.

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13 The individual of reference (IR) is a woman, resident in a town of less than 10,000 inhabitants, single, 53 years of age, with no known diseases, limitations or handicaps, who feels in very good health, has never smoked but does not exercise, lives alone, is employed , has no education and contributes to the national insurance régime.

14 It must be taken into account that the IR has no education, so the significance should be understood as referring to each educational level in comparison with the "no education" category.

15 $0.0434 = (0.925 \cdot 0.049) / (1 + (0.925 \cdot 0.049))$

16 This section includes attendance by both general practitioners and specialist doctors and nursing services during the last fourteen days.

Table 6. Days spent undergoing diagnostic tests. ***analisis_ss***

	B	Standard error	Wald	Significance	Exp(B)
EST_NO	-	-	-	-	-
ESTPRIM	0.136	0.044	9.638	0.002	1.146
ESTSEC1	0.108	0.063	2.953	0.086	1.114
ESTSEC2	0.180	0.065	7.540	0.006	1.197
ESTSUP	0.012	0.068	0.033	0.856	1.012
Constant	-3.112	0.248	158.058	0.000	0.045

3.2. EDUCATION AND STATE OF HEALTH

The subjective valuation of health is ranked in five categories from 1 (very good health) to 5 (very bad), it being possible to summarise this information in a single statistic by means of ordinal regression, which also provided a good fit (Nagelkerke's R^2 of 29.9%). Taking as reference category 5 (state of health very bad), the probability of finding individuals of higher educational level becomes progressively lower as we approach the category of reference (Table 7):

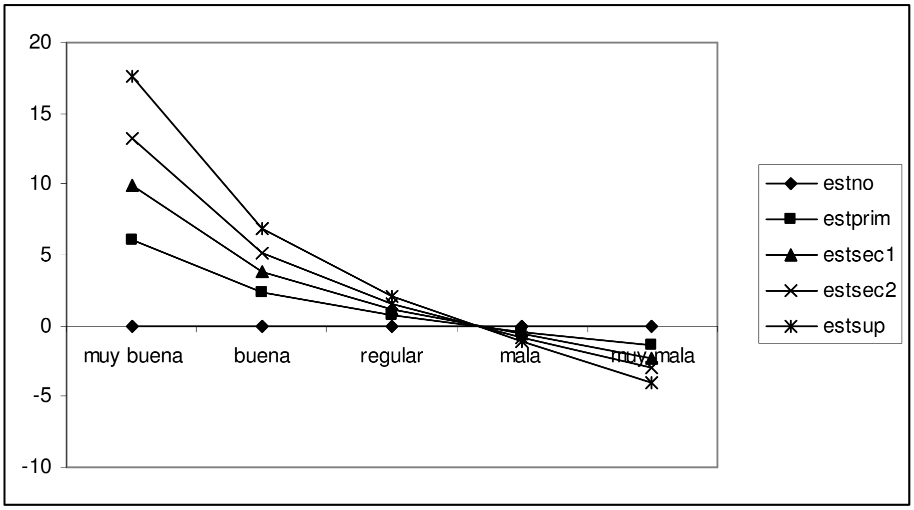
Table 7. Perceived state of health and educational level. Ordinal regression .

		Estimation	Standard error	Wald	Significance
Threshhold	[ESTASALU = 1]	-12.793	0.538	565.396	0.000
	[ESTASALU = 2]	-4.933	0.127	1508.276	0.000
	[ESTASALU = 3]	-1.463	0.124	139.417	0.000
	[ESTASALU = 4]	0.807	0.125	41.483	0.000
	[ESTASALU = 5]	2.938	0.133	491.345	0.000
Location	ESTPRIM	-0.474	0.025	352.791	0.000
	ESTSEC1	-0.775	0.034	515.357	0.000
	ESTSEC2	-1.029	0.035	859.636	0.000
	ESTSUP	-1.381	0.035	1543.438	0.000

The threshold represents the category of reference of each of the categories of the dependent variable, so a negative value implies a lower probability of finding uneducated or illiterate individuals in each category and viceversa. The rest of the categories are now compared with the reference category so that their negative value implies a situation in which all the levels of health, except the first, are below the "uneducated" group.

The graph shows that the probability of finding individuals with a good state of health is higher at higher levels of education and viceversa. For example, of the 9,732 individuals with higher education, 24.76% declare very good health and 65.98% good, while of the 10,551 illiterate or uneducated individuals only 3.73% declare themselves to be in very good health and 36.80% in good health. The indices are also significant for $\alpha < 0.001$ in all categories.

Illustration 1. Odds Ratios of having a certain perceived state of health.



With regard to suffering some type of limitation on carrying out everyday activities because of health, the results of the logistic regression, with the "limit" variable as dependent, show that a lower educational level is correlated with a higher probability of finding oneself limited in daily tasks. This variable was codified as 1 in the case of having been limited during the last fourteen days and 0 otherwise.

Table 8. Odds Ratios of being limited in everyday tasks

	B	Standard error	Wald	Significance	Exp(B)
EST_NO	-	-	-	-	-
ESTPRIM	-0.358	0.032	128.630	0.000	0.699
ESTSEC1	-0.512	0.047	116.845	0.000	0.599
ESTSEC2	-0.783	0.051	236.756	0.000	0.457
ESTSUP	-1.022	0.052	383.423	0.000	0.360
Constant	-1.976	0.170	135.383	0.000	0.139

Individuals with higher education (Table 8) have an OR of being limited 0.36 times lower than the uneducated or illiterate. This implies, for example, that the probability of finding an uneducated IR who suffers limitation is 12.20%, while the probability of finding such an IR who has finished primary education is 8.86%, and up to 4.77% if they have completed university education.

As a measure of objective health we used *enf_cron*, representing the sum of chronic illnesses diagnosed, as dependent variable, codifying it as 1 if the individual had been diagnosed with any chronic illness and 0 if he/she had not. The results are shown in Table 9.

Table 9. Diagnosis of one or more chronic illnesses.

	B	Standard error	Wald	Significance	Exp(B)
EST_NO	-	-	-	-	-
ESTPRIM	-0.219	0.031	48.916	0.000	0.803
ESTSEC1	-0.322	0.038	70.940	0.000	0.725
ESTSEC2	-0.486	0.039	156.409	0.000	0.615
ESTSUP	-0.627	0.039	261.525	0.000	0.534
Constant	1.017	0.149	46.335	0.000	2.766

Individuals with higher educational level are also diagnosed with fewer illnesses, so if it is assumed that there is no discrimination against these individuals in the diagnosis, we can infer that their probability of having caught an illness is also lower. The differences between educational levels, as well as being significant in statistical terms, are qualitatively important. 73.45% of the uneducated IRs had been diagnosed with a chronic illness, while the percentage falls to 59.79% in the case of IRs with higher education.

3.3. EQUITY IN ACCESS

Table 10 shows the parameters estimated in the logistic regression models in the form of ORs both of use of healthcare services and of suffering some kind of health problem according to educational level[17]. In the case of the *estasalud* variable, and to standardize the parameters with the rest of the variables, an auxiliary logistic regression was designed with a dummy (*estasalu1*) codified as 0 – enjoying very good health - and 1- not enjoying very good health[18] - the results of which are shown in the annex.

Table 10. Odds Ratios of use of the SNS and of state of health

	Use of healthcare services			State of health		
	farma_ss	**medico_ss**	**analisis_ss**	**estasalu1**	**limit**	**enf_crónicas**
EST_NO	1	1	1	1	1	1
ESTPRIM	0.972	0.968	1.146	0.686	0.699	0.803
ESTSEC1	1.004	0.962	1.114	0.526	0.599	0.725
ESTSEC2	0.919	0.925	1.197	0.462	0.457	0.615
ESTSUP	0.925	0.859	1.012	0.321	0.360	0.534

In the dimensions of use analyzed we observe that the increase in educational level slightly reduces the probability of using public healthcare services, though non-significantly in most cases. In the three state of health variables studied we observe that an increase in educational level is associated with better health, significantly for all educational levels. Altogether, individuals with a lower educational level make somewhat more use of healthcare services but have a worse state of health.

For the calculation of the index of inequity we estimated six auxiliary regressions by weighted minimum squares (MCP) [19] (Table 11):

Table 11. Horizontal equity in access to public healthcare services: results and tests.

	Use (robust s.e.)	**Average use**		**Health (robust s.e.)**	**Inequality**	**t (p-value)**
FARMA_SS	-0.0192 (0.003)	-0.0154	ESTASALU1	-0.1545 (0.027)	-0.1391	-11.34 (0.000)
MEDICOS_SS	-0.0322 (0.005)		LIMIT	-0.1477 (0.026)	-0.1323	-11.33 (0.000)
ANALISIS_SS	0.0031 (0.036)		ENF_CRON	-0.1094 (0.015)	-0.0940	-14.21 (0.000)

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17 Represented in the exp($\hat{\beta}$) column of the preceding tables.

18 This codification guarantees that the OR's will be comparable with the rest of the variables that capture the state of health in which 0 = good health and 1= bad health

19 y_j being the *ORs* of use of each healthcare service or, alternatively, of suffering a state of health *j* and *educ* the variable of the educational level (range 1 -no education- to 5 -higher education), the general results of the auxiliary MCP regressions were:

estimaciónR^{2}Use of healthcare services y_{farma_ss} = 1.0188 – 0.0192 educ0.6617y_{medico_ss} = 1.0370 – 0.0321 educ0.9205$y_{analisis_ss}$ = 1.0895 – 0.00314 educ0.0035 State of health $y_{estasalu1}$ = 1.0547 – 0.1545 educ0.9181y_{limit} = 1.0566 – 0.1477 educ0.9277y_{enf_cron} = 1.0578 – 0.1094 educ0.9560

The indices of use show, in general, a very gentle slope, negative in the case of consumption of medicines and doctors' visits, and positive, though not significantly different from zero, in the case of diagnostic tests. The indices of health are always negative and significant. The greatest inequality occurs in the case of self-assessment of the state of health and feeling limited for everyday activities, with a slope of approximately 15%. However, it is also steep in the case of diagnosis of chronic illnesses, with 10.94 %.

The final index of horizontal inequity is the difference between the two indices. For purposes of simplification we constructed a single index of use as a weighted average of the three, using as weighting variable the proportion of each component of expenditure in the expenditure of the INSALUD [National Health Institute] for 1999. The weighted average of the slope of use is 0.0154 (farma_ss weights 23.2%, medicos_ss 15.9% and analisis_ss 19.1%), so the index of inequity varies between 13.91% and 9.40%, all of them significant (Table 11).

For purposes of comparison, Table 12 reproduces the index of concentration for use (C_M) and health (C_N) following the methodology of Kakwani, Wagstaff and van Doorslaer (1997) but according to educational level and controlling for all the variables of our model. The results are very similar to those obtained previously.

Table 12. Indices of concentration and of inequality according to educational level

	C_M (s.e.)	C_M average		C_N (s.e.)	HI
FARMA_SS	-0.0148 (0.006)	-0.01101	ESTASALU1	-0.1962 (0.052)	0.185
MEDICOS_SS	-0.0255 (0.009)		LIMIT	-0.1805 (0.048)	0.170
ANALISIS_SS	0.0056 (0.023)		ENF_CRON	-0.1137 (0.030)	0.103

C_M: Index of concentration of Use
C_N: Index of concentration of Health (need)
HI: Index of horizontal inequity

The analysis carried out therefore points to the existence of horizontal inequity, so that even though healthcare utilization is independent of individuals' educational levels, those with a worse educational level use healthcare services less than they should according to their state of health, which is also worse.

4. CONCLUSIONS

No significant statistical association was found between educational level and utilization of healthcare services. On the other hand, the relationship between educational level and health, with the three proxy variables used (perception of health, days of limitation and number of chronic illnesses) shows a positive correlation, so that an increase in educational level is associated with a higher probability of enjoying better health.

The horizontal inequity measured by the slope index of inequality proposed gives a range of statistically significant values between 13.91% and 9.40%, depending on cases, i.e. the significant inverse relationship between state of health and educational level is not reflected proportionately in the use of healthcare, implying that, with greater need, the access by individuals with lower educational level to public healthcare services is equal to that of the rest.

These results are in harmony with, though slightly higher than, those obtained for the case of Spain in 1987 by van Doorslaer et al. (1997), whose index of inequality stands at 7.32%, and by Urbanos (2000) for the period 1987-1995 which vary between 8.23% and 4.37%; both studies use estimated income to rank individuals. Given the standard errors of these studies, such differences are not significant in the case of inequality measured by means of objective indicators (*enf_cron*) though they are significant when subjective measures are used (*limit* and *estasalud*). The existence of greater inequality when horizontal equity is measured in terms of education suggests that educational level is more relevant than income as a variable explaining inequality of access to healthcare services, in countries whose institutional frameworks guarantee a broad coverage of services irrespective of an individual's level of income.

If the educational level acts as a barrier to access and a source of inequity, it should be a variable to be considered in the design of healthcare policy, and particularly in the regional funding system. A lower aggregate educational level of a region may be a variable that reflects greater healthcare need due to inequity in the access of the population group with lowest educational level. In this hypothesis, a definition of healthcare need that only included demographic variables would be insufficient to aim for a reduction of inequalities of access.

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ANNEX

Table 13. Definitions of dependent variables and dummies.

variable	definition	range	dummies (0,1)
estasalu	self-assessment of state of health	1-very good 5- very bad	estasalu1,estasalu2, estasalu3, estasalu4, estasalu5
tot_dias	days off work due to illness	1-14	no
limit	limitation for performing everyday tasks	0-1	no
sum_enf2	square of sum of chronic illnesses	0-289	no
enf_cron	Diagnosis of a chronic illness. "other illnesses" *[otrasenf]* includes information from questionnaire on AIDS and other chronic illnesses or problems	0-1	bronquit, alergias, epilespia, diabetes, tension, corazon, colesterol, cirrosis, artrosis, ulcera, hernias, circulac, anemias, nervios, jaquecas, menopausia, otrasenf
genero	gender	0-woman; 1-man	no
edad2	Square of age	529-9801	no
edad	Age (in years) relative to mean	(-30)-46	no
certimin	possession of disability certificate	0-no; 1-si	no
ecivil	Marital status	1-5	ecivil1: single ecivil2: married ecivil3: widow ecivil4 separated ecivil5 divorced
tmuni	Size of municipality of resdidence	1-4	tmuni1: up to 10000 tmuni2:up to 50000 tmuni3: up to 500000 tmuni4: over 500000
fuma	Smoking habit	0: does not smoke and has never smoked 1 smokes or has smoked.	no
num_ciga	number of cigarettes smoked per day	0 – 70	no
ejercicio	Takes physical exercise at home and at work	0- none 4 – daily	no
fuen	Main source of economic resources	1 - 9	fuen1: employed fuen2: self-employed fuen34: pensioner fuen57: on benefits fuen8: owner fuen9: other
est	maximum level of completed education	1 – 5	estudiosno: illit. or uneducated. estprim: primary educ. estsec1: sec.educ. 1st cycle estsec2: sec.educ. 2nd cycle estsup: univ. and higher education.
afil	Availability of medical insurance	1-3	afil_pub: public insurance afil_priv: private insurance afil_no: no insurance
accidente	Has suffered accident during last year	0 – 1	no

Table 14. Summary of results of regressions for use of healthcare services

depvar	**farma_ss**			**farma**			**medico_ss**			**analisis_ss**		
	B	**Sig.**	**Exp(B)**	**B**	**Sig.**	**Exp(B)**	**B**	**Sig.**	**Exp(B)**	**B**	**Sig.**	**Exp(B)**
ESTASALU2	0.381	0.000	1.464	0.312	0.000	1.366	0.428	0.000	1.535	0.094	0.140	1.098
ESTASALU3	0.988	0.000	2.685	0.993	0.000	2.699	0.851	0.000	2.342	0.527	0.000	1.695
ESTASALU4	1.476	0.000	4.375	1.496	0.000	4.464	0.879	0.000	2.409	0.479	0.000	1.615
ESTASALU5	2.162	0.000	8.686	2.194	0.000	8.969	0.764	0.000	2.147	0.384	0.011	1.469
TOT_DIAS	0.003	0.007	1.003	0.004	0.000	1.004	0.006	0.000	1.006	0.007	0.000	1.007
LIMIT	0.767	0.000	2.154	0.996	0.000	2.708	0.551	0.000	1.735	0.297	0.000	1.346
SUM_ENF2	-0.084	0.000	0.920	-0.087	0.000	0.917	-0.031	0.000	0.969	-0.034	0.000	0.967
BRONQUIT	0.886	0.000	2.426	0.895	0.000	2.448	0.432	0.000	1.541	0.376	0.000	1.457
ALERGIAS	0.782	0.000	2.187	0.866	0.000	2.377	0.290	0.000	1.336	0.364	0.000	1.439
EPILESPIA	1.729	0.000	5.633	1.633	0.000	5.118	-0.013	0.932	0.987	0.385	0.028	1.469
DIABETES	1.793	0.000	6.009	1.876	0.000	6.526	0.439	0.000	1.551	0.688	0.000	1.991
TENSION	1.795	0.000	6.021	2.048	0.000	7.754	0.534	0.000	1.705	0.470	0.000	1.600
CORAZON	1.494	0.000	4.456	1.724	0.000	5.606	0.416	0.000	1.516	0.551	0.000	1.735
COLESTEROL	0.870	0.000	2.387	0.903	0.000	2.467	0.295	0.000	1.343	0.523	0.000	1.688
CIRROSIS	0.418	0.008	1.519	0.316	0.061	1.371	0.306	0.036	1.358	0.428	0.016	1.535
ARTROSIS	0.467	0.000	1.596	0.531	0.000	1.700	0.235	0.000	1.264	0.166	0.000	1.181
ULCERA	0.858	0.000	2.358	1.020	0.000	2.773	0.443	0.000	1.557	0.375	0.000	1.454
HERNIAS	0.582	0.000	1.790	0.535	0.000	1.708	0.225	0.000	1.253	0.451	0.000	1.570
CIRCULAC	0.678	0.000	1.971	0.719	0.000	2.052	0.308	0.000	1.360	0.313	0.000	1.368
ANEMIAS	0.719	0.000	2.052	0.890	0.000	2.435	0.495	0.000	1.641	0.492	0.000	1.636
NERVIOS	1.008	0.000	2.739	1.107	0.000	3.026	0.241	0.000	1.272	0.181	0.000	1.198
JAQUECAS	0.556	0.000	1.744	0.893	0.000	2.443	0.201	0.000	1.223	0.341	0.000	1.407
MENOPAUSIA	0.838	0.000	2.312	0.823	0.000	2.276	0.489	0.000	1.630	0.578	0.000	1.782
OTRASENF	0.934	0.000	2.546	1.018	0.000	2.768	0.479	0.000	1.614	0.509	0.000	1.664
GENERO	-0.182	0.000	0.834	-0.305	0.000	0.737	-0.188	0.000	0.829	-0.225	0.000	0.798
EDAD2	0.000	0.000	1.000	0.001	0.000	1.001	0.000	0.785	1.000	0.000	0.002	1.000
EDAD	-0.020	0.000	0.980	-0.035	0.000	0.966	0.000	0.971	1.000	0.025	0.000	1.026
CERTIMIN	0.112	0.102	1.118	-0.093	0.205	0.912	-0.247	0.000	0.781	-0.149	0.059	0.862
ECIVIL2	0.082	0.019	1.085	0.126	0.000	1.134	0.132	0.001	1.141	0.219	0.000	1.244
ECIVIL3	0.114	0.050	1.120	0.172	0.004	1.188	0.107	0.060	1.113	0.037	0.621	1.038
ECIVIL4	-0.101	0.265	0.904	-0.102	0.243	0.903	0.090	0.379	1.094	0.312	0.013	1.366
ECIVIL5	-0.193	0.073	0.824	0.101	0.315	1.107	-0.064	0.614	0.938	-0.376	0.043	0.686
TMUNI2	0.041	0.197	1.042	0.084	0.007	1.087	-0.060	0.084	0.942	0.062	0.184	1.064
TMUNI3	-0.053	0.077	0.948	0.021	0.478	1.021	-0.140	0.000	0.870	0.163	0.000	1.177
TMUNI4	0.080	0.024	1.083	0.175	0.000	1.191	0.065	0.089	1.067	0.397	0.000	1.487
THOGAR	-0.010	0.229	0.990	-0.033	0.000	0.968	-0.030	0.001	0.970	-0.035	0.005	0.965
FUMA	0.011	0.754	1.011	0.043	0.184	1.044	0.048	0.238	1.049	0.042	0.438	1.043
NUM_CIGA	-0.013	0.000	0.987	-0.007	0.000	0.993	-0.007	0.001	0.993	-0.012	0.000	0.988
EJERCICIO	-0.040	0.035	0.961	-0.022	0.228	0.979	0.110	0.000	1.116	0.141	0.000	1.151
FUEN2	0.062	0.050	1.064	0.042	0.149	1.043	0.080	0.033	1.083	0.250	0.000	1.284
FUEN34	0.349	0.000	1.418	0.163	0.000	1.177	0.089	0.032	1.093	0.123	0.027	1.131
FUEN57	0.234	0.001	1.264	0.138	0.045	1.148	0.202	0.011	1.224	0.136	0.216	1.145
FUEN8	-0.003	0.983	0.997	0.153	0.326	1.165	0.202	0.241	1.224	0.692	0.000	1.997
FUEN9	0.080	0.529	1.083	0.272	0.026	1.312	0.357	0.005	1.430	-0.338	0.109	0.713
ESTPRIM	-0.029	0.397	0.972	0.048	0.175	1.049	-0.033	0.330	0.968	0.136	0.002	1.146
ESTSEC1	0.003	0.936	1.004	0.141	0.001	1.151	-0.038	0.425	0.962	0.108	0.086	1.114
ESTSEC2	-0.085	0.063	0.919	0.138	0.002	1.148	-0.078	0.124	0.925	0.180	0.006	1.197
ESTSUP	-0.078	0.085	0.925	0.205	0.000	1.227	-0.153	0.003	0.859	0.012	0.856	1.012
AFIL_PRIV	-0.399	0.000	0.671	0.126	0.000	1.134	-0.264	0.000	0.768	-0.135	0.006	0.874
AFIL_NO	-0.026	0.431	0.974	0.240	0.000	1.271	-0.134	0.000	0.874	0.057	0.209	1.058
ACCIDENTE	0.092	0.071	1.097	0.159	0.002	1.173	0.262	0.000	1.300	0.149	0.014	1.160
CONSTANT	-3.011	0.000	0.049	-3.128	0.000	0.044	-2.771	0.000	0.063	-3.112	0.000	0.045
$-2\log (v_i/v_s)$	50663.390			53265.476			43827.118			29579.746		
R^2 (Nagelk)	0.4838			0.4632			0.1162			0.0895		
Cut-off	0.45			0.45			0.2			0.2		
% correct	79.66			77.60			74.68			88.46		

Table 15. Summary of results of ordinal regression for self-assessment of state of health.

		Estimation	Std. Error	Wald	Sig.
Threshold	[estasalu = 1]	-12.793	0.538	565.396	0.000
	[estasalu = 2]	-4.933	0.127	1508.276	0.000
	[estasalu = 3]	-1.463	0.124	139.417	0.000
	[estasalu = 4]	0.807	0.125	41.483	0.000
	[estasalu = 5]	2.938	0.133	491.345	0.000
Location	genero	-0.335	0.018	337.251	0.000
	edad_m	0.072	0.004	398.633	0.000
	edad2	0.000	0.000	108.058	0.000
	certimin	1.496	0.046	1070.740	0.000
	ecivil2	0.006	0.027	0.055	0.814
	ecivil3	-0.156	0.042	14.048	0.000
	ecivil4	0.333	0.072	21.730	0.000
	ecivil5	0.339	0.085	15.728	0.000
	tmuni2	-0.070	0.024	8.126	0.004
	tmuni3	-0.083	0.023	12.977	0.000
	tmuni4	-0.108	0.027	15.760	0.000
	thogar	0.048	0.007	54.021	0.000
	fuma	-0.134	0.027	24.234	0.000
	num_ciga	0.010	0.001	65.030	0.000
	ejercicio	-0.412	0.015	796.174	0.000
	fuen2	0.016	0.025	0.429	0.512
	fuen34	0.377	0.029	175.045	0.000
	fuen57	0.284	0.057	24.916	0.000
	fuen8	0.027	0.125	0.047	0.828
	fuen9	0.322	0.096	11.226	0.001
	estprim	-0.474	0.025	352.791	0.000
	estsec1	-0.775	0.034	515.357	0.000
	estsec2	-1.029	0.035	859.636	0.000
	estsup	-1.381	0.035	1543.438	0.000
	afil_priv	-0.306	0.025	143.923	0.000
	afil_no	0.232	0.026	82.322	0.000
	accidente	0.474	0.036	176.322	0.000
	$-2\log(v_i/v_s)$	736902.865			
	R^2 (Nagelk)	0.2985			

Table 16. Summary of results of logistic regressions for health.

depvar	limit			enf_cron			estasalu1		
	B	Sig.	Exp(B)	B	Sig.	Exp(B)	B	Sig.	Exp(B)
GENERO	-0.096	0.000	0.908	-0.349	0.000	0.705	-0.229	0.000	0.795
EDAD_M	-0.029	0.000	0.971	0.045	0.000	1.046	0.074	0.000	1.077
EDAD2	0.001	0.000	1.001	0.000	0.081	1.000	0.000	0.000	1.000
CERTIMIN	2.516	0.000	12.374	1.246	0.000	3.478	1.084	0.000	2.958
ECIVIL2	-0.142	0.000	0.868	0.136	0.000	1.145	0.023	0.557	1.023
ECIVIL3	0.000	0.995	1.000	0.144	0.007	1.155	-0.078	0.379	0.925
ECIVIL4	0.166	0.099	1.181	0.133	0.075	1.143	0.107	0.350	1.112
ECIVIL5	0.342	0.003	1.408	0.335	0.000	1.398	-0.126	0.324	0.882
TMUNI2	-0.068	0.047	0.934	0.079	0.004	1.082	-0.153	0.000	0.858
TMUNI3	-0.023	0.473	0.977	0.093	0.000	1.097	-0.152	0.000	0.859
TMUNI4	-0.067	0.082	0.935	0.014	0.650	1.014	-0.110	0.012	0.896
THOGAR	0.018	0.058	1.018	0.009	0.225	1.009	0.014	0.182	1.014
FUMA	-0.200	0.000	0.819	-0.117	0.000	0.890	0.009	0.810	1.009
NUM_CIGA	0.010	0.000	1.010	0.002	0.250	1.002	0.008	0.000	1.008
EJERCICIO	-0.565	0.000	0.568	-0.082	0.000	0.921	-0.321	0.000	0.726
FUEN2	0.119	0.002	1.127	0.024	0.357	1.024	0.002	0.955	1.002
FUEN34	0.250	0.000	1.284	0.274	0.000	1.315	0.238	0.000	1.269
FUEN57	0.319	0.000	1.376	0.128	0.034	1.136	0.185	0.046	1.203
FUEN8	0.192	0.246	1.212	0.129	0.368	1.138	-0.099	0.607	0.906
FUEN9	0.235	0.074	1.265	0.037	0.729	1.038	0.124	0.418	1.132
ESTPRIM	-0.358	0.000	0.699	-0.219	0.000	0.803	-0.377	0.000	0.686
ESTSEC1	-0.512	0.000	0.599	-0.322	0.000	0.725	-0.642	0.000	0.526
ESTSEC2	-0.783	0.000	0.457	-0.486	0.000	0.615	-0.771	0.000	0.462
ESTSUP	-1.022	0.000	0.360	-0.627	0.000	0.534	-1.138	0.000	0.321
AFIL_PRIV	0.000	0.996	1.000	0.040	0.139	1.041	-0.335	0.000	0.715
AFIL_NO	0.489	0.000	1.630	0.404	0.000	1.498	0.052	0.177	1.054
ACCIDENTE	1.016	0.000	2.763	0.475	0.000	1.607	0.154	0.013	1.166
CONSTANTE	-1.976	0.000	0.139	1.017	0.000	2.766	4.898	0.000	134.046
$-2\log(v_i/v_s)$	43832.504			65564.391			37992.765		
R^2 (Nagelk)	0.2619			0.2240			0.1487		
Cut-off point	0.3			0.5			0.8		
% correcto	81.94			68.46			77.43		