

“Supplementary health insurance in the Colombian managed care system: Adverse or advantageous selection?”

David Bardey and Giancarlo Buitrago

Supplementary health insurance in the Colombian managed care system: ¿Adverse or advantageous selection?

David Bardey¹, Giancarlo Buitrago²

September 2016

Abstract

The aim of this article is to estimate the type of selection that exists in the voluntary health insurance market in Colombia where the compulsory coverage is implemented through a managed care competition. We build a panel database that combines individuals' information from the Ministry of Health and a database provided by two private health insurers. We perform the correlation test for health expenditure and coverage. Following Fang *et al.* (2008), we condition the estimation on health controls that are available to the econometrician but not to insurers. In both cases we obtain a positive correlation, suggesting that adverse selection predominates. In order to rule out some moral hazard effects, we estimate the correlation between previous health service consumption and insurance purchase. The positive correlation obtained is robust to the inclusion of controls for diagnosis, suggesting that despite some risk selection strategies, health insurers are not protected from adverse selection.

JEL code: D82, I13, G22.

Keywords: Information asymmetry, Health insurance, Adverse Selection, Correlation test.

¹ Universidad de Los Andes (Bogotá). Department of Economics. Toulouse School of Economics. Address: Calle 19A No 1-37 Este. Bloque W Of. 810 (Bogotá). Tel: (57-1) 3394949 Ext: 2415 E-mail: d.bardey@uniandes.edu.co

² Pontificia Universidad Javeriana (Bogotá). Department of Clinical Epidemiology and Biostatistics. Address: Cra. 7 No. 40-62 - Hospital Universitario San Ignacio. Segundo Piso (Bogotá). Tel: (57-1) 3208320 Ext. 2799. E-mail: g_buitrago@javeriana.edu.co

1. Introduction

Health insurance markets are usually characterized by market failures caused by the presence of information asymmetries (Cutler, 2000). More precisely, the main information asymmetries described are related to the nature of selection on the one hand, and the presence of moral hazard on the other. The first of these occurs when individuals have private information prior to the purchase of insurance, and this information is correlated both with the purchase of insurance and the probability of the occurrence of an event (Rothschild and Stiglitz [1976]; De Meza and Webb [2001]). In contrast, moral hazard is defined as an increase in the magnitude of pooled risk due to insurance (Pauly [1968]; Blomqvist [1997]).

Basically, the types of selection described are divided in two groups: adverse and advantageous.³ In practice, insurers define risk categories using observable variables and they offer contracts calculated for the average risk within each category. Under an adverse selection scenario, (within each category) individuals with unobservable increased health risk are those who are more willing to buy insurance coverage. As such, adverse selection leads to equilibria characterized with under-insurance (Einav *et al.*, 2010). Conversely, advantageous selection corresponds to scenarios in which individuals that prefer insurance with greater coverage exhibit a lower health risk (De Meza and Webb, [2001]; Hemenway [1990]).⁴ Unlike adverse selection, advantageous selection leads to equilibria characterized with over-insurance (Einav and Finkelstein, 2011). As a result, and indeed crucially, optimal regulation in health insurance markets depends on the nature of the selection at work.

Beyond the inefficiencies just mentioned, the results of these asymmetries also have consequences for the design and outcomes of public policies in mixed health systems where public and private insurance markets coexist. In particular, Buitrago and Bardey (2015) show that the effect of subsidies for private insurance on public health depends on the nature of the selection that prevails in the market. More precisely, they point out that subsidies increase public spending in an advantageous selection scenario, while they tend to decrease it under adverse selection.

It is due to these reasons that we aim to estimate the type of selection at play in the Colombian health system that allows for the coexistence in the market of private/voluntary insurance and compulsory insurance provided in a managed care system. This health system has created a series of incentives (subsidies) through tax cuts for individuals who want to have access to better quality health services through supplementary coverage.⁵ Using the integrated information system of the Ministry of Health and Social Protection (SISPRO), and information from two health insurers that offer compulsory and supplementary (private) coverage, a panel is constructed for 2010 and 2011 of over 400,000 individuals who are dues-paying members of the system (adult workers). This contains information regarding health

³ Another form of heterogeneity among individuals has been defined through which they can anticipate moral hazard behaviors before purchasing insurance, and this increases the likelihood of purchase. Einav *et al.* (2013) refer to this phenomenon as selection on moral hazard.

⁴ The argument behind advantageous selection is that more risk averse individuals are usually more willing to undertake prevention activities that lower their health risk on the one hand, and more willing to buy generous insurance contracts on the other.

⁵ Official figures for the health system in Colombia for 2012 show that 9.65% of individuals enrolled in the public insurance system are affiliated with a policy offered in the private system.

services consumption, type of health service, spending and related diagnostics, socioeconomic variables, and affiliation or not to voluntary insurance.

To begin with, we perform the test suggested in Chiappori and Salanié (2000) to determine the correlation between spending on health and insurance coverage.⁶ We find that the correlation test is positive, that is, the consumption of health services correlates positively with affiliation to voluntary insurance, suggesting the presence of information asymmetries. As explained by Chiappori and Salanié (2000), from this test we are unable to disentangle adverse selection from moral hazard. Also, using the approximation of Fang *et al.* (2008) we condition the estimation on health controls such that trace pathologies, which provide a good proxy for the health of individuals. Such controls are available to the econometrician but not to insurers. In both cases, that is, with and without such controls, we obtain a positive correlation, suggesting that adverse selection predominates.

However, this estimate may still include effects related to moral hazard behaviors. Thus, controlling by a set of individual characteristics, we take advantage of the consumption of health services in the year immediately preceding (supplementary) health insurance purchase. This strategy allows for the elimination of a moral hazard effect since the correlation is estimated when individuals have not yet purchased the insurance. Our results show that the use of hospital services in the year preceding insurance purchase is positively correlated with the purchase of insurance, corroborating that adverse selection is the predominant scenario in the private health insurance market in Colombia. This estimate is robust to the inclusion of controls for diagnosis (which correlate negatively with the purchase of insurance), suggesting that despite the strategies of risk selection used by health insurers these do not protect them from adverse selection.

Finally, the activities of primary and secondary prevention realized by policyholders before the purchase of insurance are also taken into account. More precisely, consumption associated with the cervical Pap smear, mammogram, PSA measurement and vaccination are identified. The first three of these are related to activities of secondary prevention, while vaccination corresponds to primary prevention activities. It is assumed that primary prevention activities are positively correlated with advantageous selection, and negatively correlated with adverse selection, while secondary prevention activities are negatively correlated with advantageous selection (and positively with adverse selection).⁷ We find that there exists a positive correlation between the use of PSA and cervical-vaginal cytology with health insurance purchase in the following year and that this correlation is robust to socio-demographic, health status and service consumption controls. Moreover, the correlation between vaccination and the purchase of voluntary insurance remains negative for all estimates. Again, all of these results are suggestive of adverse selection.

⁶ We use the frequency of healthcare services such as the health consumption variable instead of health spending, which is related to price and affected by unknown factors.

⁷ The intuition behind this statement is as follows: in scenarios of advantageous selection individuals undertake more activities that reduce the risk of disease (or the probability of its occurrence). In this case, the goal of vaccination is to prevent the occurrence of disease. On the contrary, in adverse selection the individual knows their risk of disease and so the use of secondary prevention activities plays two roles: first, the individual (or medical) receives a signal about his or her risk of getting sick, which leads to a greater probability of him or her using these services; second, according to the results, individuals propensity to buy insurance may increase because of knowledge of a more likely adverse outcome.

This paper contributes to the empirical literature on asymmetries of information to identify the predominant selection scenario, taking into account the effects of moral hazard in the health insurance market (Finkelstein and McGarry [2006]; Cohen [2005]; Einav *et al.* [2010]; Einav *et al.* [2013]). Empirical tests for determining the existence and nature of the selection or moral hazard in the insurance market are difficult to develop. The difficulty is that adverse selection has similar consequences to moral hazard in the correlation test; in either of the two scenarios there is an increased use of services offered by insurance, therefore to isolate the two effects is not easy and it depends on the data available. Some empirical studies (Fang *et al.*, 2008; Resende and Zeidan, 2010) have been based on the correlation test for asymmetric information developed by Chiappori and Salanié (2000). This test estimates the correlation between the level of insurance coverage and the costs of making a claim.

In performing this correlation test, Fang *et al.* (2008) identify that there exists asymmetric information in the private insurance market that is linked to Medicare in the United States. They propose an empirical strategy that involves comparing the sign associated with the correlation between coverage and health expenditures, including models without controls for the health status of individuals and models with controls (again only available to the econometrician). They argue that if the positive correlation test changes to a negative correlation in the health controls scenario then this is evidence of the existence of private information that suggests the presence of advantageous selection.

The approach presented herein differs from that proposed by Einav *et al.* (2010), and although it is close to the proposals made by Chiappori and Salanié (2000) and Fang *et al.* (2008), it makes a contribution by supplementing these proposals in several aspects. First, we take advantage of the consumption of services prior to health insurance affiliation to rule out moral hazard behaviors. Thus the positive correlation between the consumption of health services and insurance purchase at a later time corroborates our result that adverse selection predominates in the supplementary health insurance market in Colombia. Second, this paper identifies the channels or type of private information that can be related to one or another form of selection. In particular, it considers the correlation between buying insurance and the use of activities of primary and secondary prevention.

This article comprises five sections. The second section describes the sources of information and data. The third presents the identification strategy. The fourth shows the results of the empirical estimates and the fifth concludes.

2. Data

2.1. Information sources

The main source of information is the Integrated Information System of Social Protection (SISPRO), which integrates more than 10 primary sources of health-related information in a single query system.⁸ SISPRO makes a match through the citizen identification of each of the

⁸ SISPRO handles quality standards and information validation, allowing for reliability with respect to those reported in each of the databases that SISPRO uses. More information: <http://www.sispro.gov.co/>

subjects included and this relates to the different sources of information. Using SISPRO we can build a database for 2010 and 2011 with information coming from three primary sources: BDUA, PILA and UPC.

The first source is the BDUA: it corresponds to the database that contains information regarding those members fully identified with the different social security regimes. From this database we retrieve all of the individuals' standard socioeconomic variables as well as information related to membership status. From PILA we extract individuals' monthly incomes. Finally, from the UPC database we have information related to the consumption of healthcare services during a calendar year. In particular, this database contains information such as member ID and the characterization of the health service provided: place of delivery, delivery date, type of service provided, related diagnostic, health institution that provided the service, and value paid by the health insurer.

Finally, the information panel was paired with information from two health insurers that offer the compulsory insurance as well as the supplementary coverage. Information for the two insurers is used to identify whether individuals benefited from supplementary coverage or not.⁹ This information was available for the years 2010 and 2011. In short, we build a panel database that contains information on an individual level for each of the health expenses paid by the compulsory coverage along with related diagnoses, demographic information of the individual and whether they benefited from supplementary coverage.¹⁰

The total for matched individuals between the base obtained from SISPRO and the contents of the membership status for supplementary health insurance was 484,005 individuals (6.4% of contributors in Colombia), which corresponds to the total of dues-paying members of the two health insurers included. From the UPC database we identify the cost of services used, the frequency of use between inpatient and outpatient services, the diagnosis associated with the services used and whether the individual is affiliated with supplementary coverage or not. In addition, the frequency of use of primary and secondary prevention services (cervical Pap smear, mammogram, PSA measurement and vaccination) are characterized by the codes of the Unified Classification of Health Procedures (CUPS). The diagnostics used for health are blood pressure (hypertension), chronic kidney disease (CKD), diabetes mellitus (DM), cancer, pneumonia, urinary tract infection (UTI), preeclampsia, gastrointestinal disease, upper respiratory tract infection (URTI), chronic obstructive pulmonary disease (COPD), asthma and mental illness.

⁹ The match between the two databases was performed for affiliated contributors, that is to say, beneficiaries were not included in the final database. The members of the contributory system are divided into contributors (the workers who are deducted a percentage of their salary for health) and beneficiaries (those who are economically dependent on the contributor, usually a spouse and/or children).

¹⁰ It is important to note that the information obtained regarding the status of affiliation to supplementary coverage relates uniquely and exclusively to that realized with the same insurer. That is, if the individual is enrolled in supplementary health coverage offered by a different health insurer from that which administers the obligatory plan then they cannot be found in the database. This implies that we may exhibit underreporting relative to the classification of being in a supplementary plan or not. However, different estimates for Colombia show that 97% of people who have supplementary coverage have a contract with the same company to which they are affiliated for the obligatory plan.

2.2. Descriptive statistics

As shown in Table 1, 3.17% of contributing members bought a supplementary coverage. In general, the average age of the population was 37 years, being higher in affiliates of supplementary coverage (43 years on average). Likewise, there are more women than men in the study population. 40% of individuals of the database are female but this proportion is higher for individuals with supplementary coverage (54%). The average income is close to the legal minimum wage but is higher (17%) for individuals who benefit from supplementary coverage.

It is also noted that there are not many differences between the diseases, although there are proportionally fewer people with chronic diseases that are affiliated with supplementary coverage. This may be due to entry restrictions to existing supplementary coverage. Finally, both the average consumption of health services (both ambulatory and hospital) and the average cost of services are higher in individuals affiliated with supplementary coverage (frequency of ambulatory services is 3.82 higher; frequency of hospital services is 1.2 higher; and average cost is 1.23 higher).

3. Empirical Strategy

This paper aims to identify the nature of the selection that dominates in the voluntary health insurance market in Colombia. To this end, we first develop the same empirical strategy as Fang *et al.* (2008). Due to the fact that health spending is linked to the price that the insurer pays each provider, and that this price is affected by many factors that cannot be observed, the consumption of health services frequency is considered. We assume that the consumption of health services in 2011 is a function of having bought supplementary coverage, socio-demographic characteristics, health status and previous health consumption of the individual. Using ordinary least squares, we estimate the following equation:

$$Y_{i,t} = \beta_0 + \beta_1 MP_{i,t} + \beta_2 X_i + \beta_3 Dx_i + \beta_4 Y_{i,t-1} + \mu_i, \quad (1)$$

where $Y_{i,t}$ is the consumption of health services for individual i for 2011, which is measured in frequency use, $MP_{i,t}$ is a dichotomous variable that indicates whether the individual is affiliated or not in 2011; X_i is a vector of the individual's characteristics; Dx_i is the state of health of the individual through the diagnosis of certain trace pathologies and $Y_{i,t-1}$ is the consumption of health services in the previous year. It is worth to note that both Dx_i and $Y_{i,t-1}$ are not observed by health insurers. In this estimation, our parameter of interest is β_1 . Its sign determines the correlation between having bought a supplementary coverage and the consumption of health services.

Next, we estimate the following equation:

$$MP_{i,t} = f(Dx_{i,t-1}, P_{i,t-1}, Y_{i,t-1}, X_i), \quad (2)$$

where MP and X are the same variables as in (1). Dx and Y also denote the same variables as in (1) but taken in $t-1$. $P_{i,t-1}$, which is not observed by health insurers, measures the activities of primary and secondary prevention that the individual performs during the previous year.¹¹ Equation (2) is twofold: i) it allows us to identify the nature of the existing selection ruling out the presence of moral hazard¹²; ii) it describes the characteristics of individuals who purchase voluntary insurance (which may suggest the possible sources of asymmetric information).¹³ The estimation for (2) is performed using a logit model.

4. Results

This section presents the results of the empirical estimation and is divided into three sub-sections. The first shows the results related to the estimation of equation (1), which represents the correlation test (Chiappori and Salanié, 2000). The second sub-section describes the effects of the relationship between health and consumption in the previous year on membership to supplementary coverage (Equation 2). The third sub-section presents the characteristics of individuals who buy supplementary coverage, especially those related to the activities of primary and secondary prevention.

4.1. Correlation test

Following Fang *et al.* (2008), Table 2 presents the estimation of equation (1) using ordinary least squares where the dependent variable is the frequency of healthcare services consumption. The coefficient associated with having bought supplementary coverage in 2011 remains positive for all estimates. It indicates that despite the inclusion of controls that are available to the econometrician but not to health insurers, there remains a positive correlation between private insurance and frequency of use of health services. These results suggest the presence of adverse selection, but may also include some moral hazard effects. Regarding the other coefficients these are generally consistent between different estimates; the presence of diseases is associated with increased consumption frequency of health services, and the same occurs for age and being female.

4.2. Nature of the selection

Table 3 presents the estimation of equation 2, showing the association between the frequency of use of healthcare services and expenses in the period preceding membership year with the probability of enrollment to supplementary coverage. This estimate allows us to eliminate the effect of moral hazard (increased consumption of services after insuring), so that the whole sample is used (in the left panel) and the sample excludes individuals who had supplementary

¹¹ Through information regarding services consumed, four types of service related to activities of primary and secondary prevention were identified: vaccination services, PSA, mammography and cervical-vaginal cytology.

¹² Because we observe individuals before the purchase private insurance, we can isolate moral hazard effects. Thus the sign associated with $Y_{i,t-1}$ in equation (2) determines which type of selection is predominant in the voluntary insurance market.

¹³ In particular, the characteristics of the individual related to activities of primary and secondary prevention and their relation to the purchase of supplementary insurance.

health insurance in 2010 (right panel).¹⁴ We observe that health spending in 2010 is not associated with the purchase of private insurance in 2011. In contrast, females, older persons and those with a higher income are positively related to the purchase of supplementary insurance. Pathologies are negatively related to the purchase of supplementary insurance, which is consistent with the restrictive policy of insurance companies for the affiliation of people who already have some underlying condition (pre-existence). On the contrary, the use of hospital services in 2010 is positively associated with the purchase of private insurance in 2011.

This finding suggests the presence of adverse selection, where individuals have private information that insurers cannot observe and which increases the likelihood of insurance purchase. Moreover, this result is consistent despite the presence of diagnostic controls, that is, the risk selection strategies of insurers do not prevent adverse selection, as would appear to be the case in this context.

4.3. Activities of primary and secondary prevention

Finally, Table 4 shows the association of the activities of primary and secondary prevention of individuals in the previous year with the chance to buy supplementary health insurance in 2011. This analysis is performed for the sample of men and women separately due to promotion and prevention activities being related exclusively to gender. It is noted that, controlling for socio-demographic and health characteristics, practicing one cervical Pap smear or having the prostate-specific antigen (PSA) are associated with an increased likelihood of buying supplementary health insurance. This finding contrasts with vaccination, where vaccination is associated with a decrease in the probability of buying supplementary health insurance in the previous year.

Again, these findings corroborate the result of adverse selection because health insurers do not observe the frequency of consumption before the supplementary health insurance purchase, that is to say, this information is only known by the individual before affiliation to private insurance. In particular, when the primary prevention activities are positively correlated with the purchase of insurance, this indicates the existence of advantageous selection (lower-risk individuals are those who prefer higher coverage), on the other hand the negative correlation indicates adverse selection. We find that the correlation between vaccination in the previous year and supplementary health insurance remains negative across all estimates.¹⁵

On the other hand, since people with some predispositions for some diseases are more willing to undertake secondary prevention actions,¹⁶ the positive correlation between the use of secondary prevention services and the purchase of supplementary insurance indicates the

¹⁴ With this the argument that the consumption of health services in 2010 is associated with having supplementary health insurance coverage in the same year is eliminated.

¹⁵ The negative correlation between vaccination and the purchase of insurance can also be explained because this sample is composed of adults, and the use of vaccines in adults is related to the presence of comorbidities and specific health conditions (for example, patients with cancer, IRC, some transplants, *etc.*, are vaccinated for different viral pathogens), which in turn correlate negatively with the purchase of insurance.

¹⁶ For example, consider a case where the individual has a family history of prostate cancer or cervical cancer. This signal makes the individual more prone to the use of secondary activities for prevention to aid in early detection, thus allowing for more effective treatment.

presence of adverse selection. Furthermore, in case of positive results, knowledge of the results of these tests can also make the individuals more prone to affiliation with broader coverage.

5. Conclusions

Our results suggest that adverse selection is predominant in the Colombian supplementary health insurance market. Our empirical strategy allows us to rule out moral hazard effects. On the other hand, our results are corroborated by findings related to the behavior of individuals through the consumption of primary and secondary prevention. Another result of great value is that the risk selection strategies used by insurers do not prevent adverse selection.

The nature of selection in the health insurance market (that is, what kind of individuals are more likely to purchase insurance) is of great importance for both the design of public policies related to insurance and the optimal design of policies in the private sector. Our results presented here provide a basis for decision-making related to the voluntary insurance market in Colombia. As pointed out in Buitrago and Bardey (2015), some of these policies may be related to the advisability or not of providing subsidies to private insurance or regulation strategies related to risk selection by health insurers. Our results suggest that subsidies for supplementary health insurance may decrease public expenses.

Bibliography

- Blomqvist, A, (1997), "Optimal non-linear Health Insurance", *Journal of Health Economics*, 16, 303-321.
- Buitrago, G., Bardey, D., (2005) "Voluntary Health Plan Subsidies and Public Expenditure" Working Paper No. 605 (October) TSE working paper.
- Chiappori, P.A., Salanié. B., (2000), "Testing for Asymmetric Information in Insurance Markets," *Journal of Political Economy*, 108, 56-78.
- Cohen, Alma. (2005). "Asymmetric Information and Learning: Evidence from the Automobile Insurance Market." *Rev. Econ. Statis.* 87 (June): 197-207.
- Cohen, A., Siegelman. P., (2009). "Introduction to the Special Issue on Long-Term Care Insurance and Health Insurance." *Journal of Risk & Insurance*, 76(1):1-4.
- De Meza, D., Webb, D., (2001) "Advantageous Selection in Insurance Markets." *Rand Journal of Economics*, 32:249-262.
- Einav L, Finkelstein A, Ryan S, Schrimpf P, Cullen MR. (2013) "Selection on Moral Hazard in Health Insurance". *American Economic Review*. Feb;103(1):178-219.
- Einav, L., Finkelstein A., (2011) "Selection in Insurance Markets: Theory and Empirics in Pictures". *Journal of Economic Perspectives*. 25(1):115-138.
- Einav, L., Finkelstein A., Cullen. M., (2010). "Estimating Welfare in Insurance Markets using Variation in Prices." *Quarterly Journal of Economics* 125 (3): 877-921.
- Fang, H., Keane. M., Silverman. D., (2008). "Sources of Advantageous Selection: Evidence from the Medigap Insurance Market." *Journal of Political Economy*, 116(2): 303-350.
- Finkelstein, A., and McGarry. K., (2006). "Multiple Dimensions of Private Information: Evidence from the Long-Term Care Insurance Market." *American Economic Review* 96 (4): 938-958.
- Hemenway David. (1990). "Propitious Selection." *Quarterly Journal of Economics*, 105(4): 1063-69.
- Pauly, M.V., (1968), "The Economics of Moral Hazard: Comment," *American Economic Review* 58(13):531-37.
- Resende M, Zeidan R. (2010) "Adverse selection in the health insurance market: some empirical evidence" *European Journal of Health Economics*, 11(4):413-8
- Rothschild, M., Stiglitz. J., (1976). "Equilibrium in Competitive Insurance Markets." *Quarterly Journal of Economics*, 90(4):629-49.

Table 1 Descriptive statistics of individuals.

Variable	Total		Supplementary health insurance				p
	Average	SD	Yes		No		
	Average	SD	Average	SD	Average	SD	
Age	37,14	11,88	43,07	12,22	36,94	11,82	***
Female	0,40	0,49	0,54	0,50	0,40	0,49	***
Average monthly income 2010	589.296,90	692.114,90	684.314,70	989.596,60	585.999,70	679.221,00	***
HT	0,10	0,31	0,09	0,29	0,10	0,31	***
CKD	0,01	0,08	0,00	0,05	0,01	0,08	***
DM	0,02	0,15	0,03	0,16	0,02	0,14	***
Cancer	0,02	0,13	0,01	0,12	0,02	0,13	***
Pneumonia	0,01	0,08	0,01	0,07	0,01	0,08	
UTI	0,06	0,24	0,05	0,21	0,06	0,24	***
Preeclampsia	0,00	0,05	0,00	0,02	0,00	0,05	***
Gastrointestinal disease	0,12	0,32	0,14	0,35	0,12	0,32	***
HRTI	0,06	0,24	0,04	0,20	0,06	0,25	***
COPD	0,01	0,10	0,01	0,11	0,01	0,10	***
Asthma	0,01	0,12	0,01	0,10	0,01	0,12	***
Mental disorder	0,00	0,05	0,00	0,05	0,00	0,04	***
Use of hospital services 2011	0,48	8,96	1,70	16,49	0,44	8,60	***
Use of ambulatory services 2011	8,21	12,25	9,87	14,67	8,16	12,16	***
Use of hospital services 2010	0,42	9,37	1,78	33,79	0,38	7,29	***
Use of ambulatory services 2010	7,43	11,19	9,09	13,93	7,37	11,08	***
Spending 2010	486.469,30	4.399.673,00	597.543,00	3.730.686,00	482.646,30	4.420.851,00	***
Spending 2011	557.202,50	4.123.044,00	672.578,60	2.949.511,00	553.231,30	4.157.489,00	***
Observations	484.005		15.376		468.629		

*** p<0.01, ** p<0.05, * p<0.1.

SD: Standard Deviation; HT: Hypertension; CKD: Chronical Kidney Disease, DM; Diabetes Mellitus; UTI: Urinary Tract Infection; URTI: Upper Respiratory Tract Infection; COPD: Chronical Obstructive Pulmonary Disease.

Table 2. Effect of the Supplementary Health Insurance (SHI) over the frequency of use of healthcare services (Equation 1)

VARIABLES	Hospital services in 2011				Ambulatory services in 2011			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SHI 2011	1.259***	0.875***	0.719***	0.571***	1.718***	0.810***	-0.386***	0.216**
	(0.134)	(0.141)	(0.150)	(0.145)	(0.120)	(0.121)	(0.128)	(0.103)
SHI 2010		1.239***	1.037***	0.812***		2.929***	0.152	0.581***
		(0.147)	(0.147)	(0.139)		(0.127)	(0.121)	(0.0953)
Age			0.0228***	0.0104***			0.228***	0.0418***
			(0.00200)	(0.00207)			(0.00200)	(0.00143)
Female			0.324***	0.137***			5.258***	2.139***
			(0.0317)	(0.0317)			(0.0404)	(0.0346)
AMI 2010			-0.163***	-0.0792*			-1.481***	-0.453***
			(0.0475)	(0.0461)			(0.0649)	(0.0517)
Hospital services 2010				0.190***				0.0193***
				(0.0209)				(0.00480)
Ambulatory services 2010				0.0211***				0.531***
				(0.00319)				(0.00405)
HT				-0.265***				3.782***
				(0.0700)				(0.0932)
CKD				0.167				6.427***
				(0.489)				(0.321)
DM				1.215***				3.314***
				(0.210)				(0.147)
Cancer				0.870***				3.580***
				(0.216)				(0.153)
Pneumonia				2.457***				2.385***
				(0.595)				(0.265)
ITU				0.342***				2.454***
				(0.100)				(0.0807)
Preeclampsia				1.620***				0.298
				(0.575)				(0.652)
Gastrointestinal disease				0.139**				2.818***
				(0.0557)				(0.0754)
URTI				-0.396***				1.998***
				(0.0534)				(0.0662)
COPD				0.984***				3.895***
				(0.302)				(0.229)
Asthma				0.127				2.181***
				(0.206)				(0.158)
Mental disorder				1.811***				4.683***
				(0.701)				(0.471)
Constant	0.443***	0.414***	1.632***	0.741	8.155***	8.086***	17.60***	6.461***
	(0.0126)	(0.0123)	(0.620)	(0.600)	(0.0178)	(0.0178)	(0.856)	(0.684)
Municipality control	NO	NO	YES	YES	NO	NO	YES	YES
Observations	484,005	484,005	409,905	409,905	484,005	484,005	409,905	409,905
R-squared	0.001	0.001	0.002	0.049	0.001	0.002	0.088	0.404

Robust standard errors *** p<0.01, ** p<0.05, * p<0.1

SHI: Supplementary Health Insurance; AMI: Average Monthly Income; HT: Hypertension; CKD: Chronical Kidney Disease, DM; Diabetes Mellitus; UTI: Urinary Tract Infection; URTI: Upper Respiratory Tract Infection; COPD: Chronical Obstructive Pulmonary Disease

Table 3. Characteristics of individuals who were in Supplementary Health Insurance (SHI).

VARIABLES	Full sample				Sample without individuals who had supplementary health insurance in 2010			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Hospital services 2010	0.00458***	0.00317***	0.00322***	0.00325***	0.00422***	0.00422***	0.00429***	0.00436***
	(0.000578)	(0.000589)	(0.000609)	(0.000633)	(0.000656)	(0.000656)	(0.000681)	(0.000618)
Ambulatory services 2010	0.0103***	0.00447***	-0.00416***	0.00194**	0.00336***	0.00336***	-0.00677***	0.00162
	(0.000597)	(0.000678)	(0.000836)	(0.000871)	(0.000873)	(0.000873)	(0.00112)	(0.00113)
SHI 2010		3.009***	2.809***	2.762***				
		(0.0197)	(0.0212)	(0.0214)				
Age			0.0241***	0.0279***			0.0226***	0.0271***
			(0.000723)	(0.000776)			(0.000847)	(0.000912)
Female			0.376***	0.386***			0.549***	0.559***
			(0.0192)	(0.0194)			(0.0228)	(0.0230)
AMI 2010			0.817***	0.791***			1.021***	0.993***
			(0.0271)	(0.0271)			(0.0282)	(0.0281)
HT				-0.509***				-0.630***
				(0.0345)				(0.0443)
CKD				-0.987***				-1.402***
				(0.181)				(0.288)
DM				0.00667				0.125*
				(0.0613)				(0.0756)
Cancer				-0.404***				-0.520***
				(0.0746)				(0.0975)
Pneumonia				-0.179				-0.100
				(0.131)				(0.151)
ITU				-0.334***				-0.414***
				(0.0424)				(0.0511)
Preeclampsia				-1.072***				-1.066***
				(0.369)				(0.381)
Gastrointestinal disease				0.0253				-0.0146
				(0.0273)				(0.0332)
URTI				-0.400***				-0.462***
				(0.0444)				(0.0533)
COPD				-0.0282				-0.0857
				(0.0897)				(0.118)
Asthma				-0.241**				-0.202*
				(0.0942)				(0.106)
Mental disorder				-0.0370				-0.0392
				(0.182)				(0.236)
Constant	-3.504***	-3.835***	-15.65***	-15.41***	-3.827***	-3.827***	-18.36***	-18.12***
	(0.00975)	(0.0114)	(0.363)	(0.362)	(0.0121)	(0.0121)	(0.379)	(0.377)
Municipality control	NO	NO	YES	YES	NO	NO	YES	YES
Observations	484,005	484,005	409,905	409,905	467,777	467,777	393,677	393,677

Robust standard errors *** p<0.01, ** p<0.05, * p<0.1

SHI: Supplementary health insurance; AMI: Average Monthly Income; HT: Hypertension; CKD: Chronical Kidney Disease, DM; Diabetes Mellitus; UTI: Urinary Tract Infection; URTI: Upper Respiratory Tract Infection; COPD: Chronical Obstructive Pulmonary Disease.

Table 4. Activities of primary and secondary prevention and relation with supplementary health insurance purchase.

	FULL SAMPLE				Sample without individuals who had supplementary health insurance in 2010			
	FEMALES		MALES		FEMALES		MALES	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pap smear	0.824*** (0.0737)	0.783*** (0.0747)			0.908*** (0.0865)	0.885*** (0.0876)		
Mammography	-0.0529 (0.0350)	-0.0397 (0.0357)			-0.0870* (0.0487)	-0.0558 (0.0497)		
PSA			0.255*** (0.0269)	0.286*** (0.0282)			0.231*** (0.0390)	0.276*** (0.0406)
Vaccination	-0.946*** (0.106)	-0.857*** (0.102)	-0.313** (0.157)	-0.0278 (0.145)	-1.002*** (0.125)	-0.919*** (0.122)	-0.106 (0.190)	0.119 (0.184)
Age	0.0300*** (0.00103)	0.0362*** (0.00116)	0.0410*** (0.00125)	0.0493*** (0.00135)	0.0132*** (0.00133)	0.0190*** (0.00150)	0.0276*** (0.00159)	0.0349*** (0.00171)
AMI 2010	0.985*** (0.0399)	0.933*** (0.0399)	0.868*** (0.0424)	0.809*** (0.0427)	1.265*** (0.0458)	1.214*** (0.0458)	1.064*** (0.0496)	1.011*** (0.0499)
Hospital services 2010		0.00608*** (0.000869)		0.00333*** (0.000742)		0.00528*** (0.000977)		0.00341*** (0.000799)
Ambulatory services 2010		0.00389*** (0.00110)		0.00292* (0.00162)		0.00165 (0.00158)		0.000742 (0.00217)
Constant	-17.26*** (0.538)	-16.69*** (0.537)	-16.74*** (0.566)	-16.18*** (0.570)	-20.72*** (0.619)	-20.11*** (0.619)	-19.20*** (0.662)	-18.68*** (0.665)
Municipality control	YES	YES	YES	YES	YES	YES	YES	YES
Diagnosis control	NO	YES	NO	YES	NO	YES	NO	YES
Observations	140,476	140,476	170,561	170,561	132,879	132,879	165,248	165,248

Robust standard errors *** p<0.01, ** p<0.05, * p<0.1

AMI: Average Monthly Income; PSA: Prostate-Specific Antigen.