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PROGRESSIVE SEGMENTED HEALTH INSURANCE: COLOMBIAN HEALTH REFORM AND ACCESS TO HEALTH SERVICES

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SUMMARY

Equal access for poor populations to health services is a comprehensive objective for any health reform. The Colombian health reform addressed this issue through a segmented progressive social health insurance approach. The strategy was to assure universal coverage expanding the population covered through payroll linked insurance, and implementing a subsidized insurance program for the poorest populations, those not affiliated through formal employment. A prospective study was performed to follow-up health service utilization and out-of-pocket expenses using a cohort design. It was representative of four Colombian cities (Cendex Health Services Use and Expenditure Study, 2001). A four part econometric model was applied. The model related medical service utilization and medication with different socioeconomic, geographic, and risk associated variables. Results showed that subsidized health insurance improves health service utilization and reduces the financial burden for the poorest, as compared to those non-insured. Other social health insurance schemes preserved high utilization with variable out-of-pocket expenditures. Family and age conditions have significant effect on medical service utilization. Geographic variables play a significant role in hospital inpatient service utilization. Both, geographic and income variables also have significant impact on out-of-pocket expenses. Projected utilization rates and a simulation favor a dual policy for two-stage income segmented insurance to progress towards the universal insurance goal. Copyright © 2006 John Wiley & Sons, Ltd.

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INTRODUCTION

Social health insurance¹ is increasingly being adopted as a primary policy to deal with the fact of scarce health resources and poverty, in low income and transitional economies. As a matter of fact, governments opt for social insurance as a way to face the effects of incomplete coverage and rising medical costs. However, the costs of implementing social insurance programs could sweep away the benefits of major health service utilization. Such costs are linked to the complexity of designing and operating equalization funds, managing insurance contributions and coinsurance payments separate from general taxes, and the selection of proper rights and restrictions for those insured (Normand, 1999; Carrin *et al.*, 1999).

During the last decade, different countries adopted extensive health system reforms seeking improved access for its poorest populations to health services (Ensor, 1999; Atim, 1999; Criel *et al.*, 1999; Tangcharoensathien *et al.*, 1999; Desmet *et al.*, 1999; Ron, 1990; Bloom and Shenglan, 1990; Carrin

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¹Social health insurance relates to any insurance arrangement that links a solidarity component between populations. Its design usually includes different levels of government regulation.

et al., 1990). Several Latin American countries follow this policy trend (IADB *et al.*, 1995; OPS/OMS, 2002). However, substantial differences can be found in the policy designs for social insurance. These differences deal with various financial and operating policy options in the design of social insurance schemes. The insurance scale implies achieving efficient scales for national insurance coverage or specific vulnerable community group-oriented social insurance. The subsidy allocation strategy consists of targeting poor populations through capital accumulation or through income-guided selection. The insurance industrial organization scheme is a publicly controlled decentralized operation of social insurance management or a risk pooling approach with regulated public-private competition.

The ultimate effects of health insurance on the population constitute the golden rule for the final valuation given by the society. The population selection process is a main issue. There are different approaches supported by diverging theoretical basis and empirical studies dealing with the selection criteria (Sen, 1993; Birdsall and James, 1993). Some experiences attempt to protect specific populations such as mother and children, elderly, school populations. The access advances are then measured against reductions in diseases using a risk-homogeneous, controlled group (Yip and Berman, 2001; Deolalikar, 1995). A different approach could be targeting for population extended criteria such as socio-economic conditions. Theoretically, this approach may permit a regulated expansion of social security for different populations in a more comprehensive manner. Then access to health services become the main valuation effect. Some middle income countries such as Colombia and Mexico have adopted this policy to assure access for their vulnerable populations (Seguro Popular de Salud, 2004; Londoño and Frenk, 1997). Any segmented insurance is intended to gradually transform into a universal scheme with homogeneous coverage and equity in access for different populations.

The financing scheme is the main policy issue when a country opts for social insurance. Given the scarcity of resources, it is necessary to adopt a mix of different financial sources: general taxes, payroll-linked contributions, and donations. Income differences tend to be broad in low income, and transitional economies. So it is necessary to design solidarity schemes for cross-income group subsidies. Besides financing, countries implementing expanded social health insurance have additional issues with which to deal. They must ensure sufficient information and administrative schemes to regulate an insurance expansion program. They seek to maintain progressive coverage (linked to available resources) for the poor population without increasing the inequality among populations. They must choose suitable services and include them in the benefit plans. They must set a fair premium to reward insurers without depleting equalization funds as well as establish appropriate market and institutional arrangements for the participation of public and private insurers and health service providers. And finally, they must protect such markets against contract contingencies such as adverse selection and moral abuse.

The benefits of applying nationwide extensive socio-economically targeted insurance policies in countries with low or average development levels are rarely documented. This study was designed to collect and discuss empirical evidence of the effects of the social insurance policy adopted in the Colombian health reform. It was intended to go beyond the studies that linked the effects of financing in health service utilization as an overall question facing social health investment and utilization. Comparing out-of-pocket expenses and service utilization to the effects of social insurance was controlled by variables in developing societies such as income differences, urban/rural settings, etc. The study attempts to address the problems that the data provided by national surveys has, such as recall bias, seasonal demand, and insurance affiliation effects caused by changes in work status and working in the informal sector, both common facts in the Colombian society.

The main study questions regarding the Colombian health insurance reform appear below. What are the differences in access for the populations affiliated to different social insurance plans defined in the segmented insurance scheme? If there are access differences, how preponderant were they in ambulatory services, inpatient services, and in medication utilization? How are access differences affected by the diverse geographic, socio-economic, family, and individual conditions that exist in countries with low or

average development levels? And what could be the best policy decisions aimed at universal coverage in the future?

BACKGROUND

By the year 1993, Colombian health reform (Congreso de la República de Colombia, 1993) addressed inequities in access to health services by establishing a segmented health insurance policy with solidarity financing by means of a crossed subsidy whereby high income workers contribute a portion of their pay to the poor population. It consisted of health insurance expansion from the worker to the entire family through payroll-linked insurance, formerly limited to the worker (Contributive Regime) and the establishment of a subsidized health insurance for the poorest, selected through a focalization and classification process (Subsidized Regime). Also worth mentioning was the continuance of some privileged insurance schemes (Special Regimes), mostly guaranteed through union agreements or aimed at special groups, such as military personnel, petroleum industry workers, and school teachers. Consequently, Colombians have three types of social health insurance being Contributive, Subsidized, and Special. In addition, there is private insurance available for those who want an expanded selection base of physicians and better inpatient accommodations. There are two additional groups as well, multi-affiliated persons, with multiple sources of social health insurance, and non-affiliated or non-insured persons. This study evaluates the impact of these six affiliation conditions on the probability of utilization and the amount of out-of-pocket expenditure.

The reform defined a set of health services through a health benefit plan. The contributive health plan covered most outpatient and inpatient services, regardless of the complexity and a comprehensive medication list, composed mainly of generic drugs. It has a co-payment rate depending on the individual's income.² The subsidized plan has similar coverage to the contributive plan, but it does not cover most intermediate level surgery. Special plans have different health packages, but all of them have at least the contributive package coverage. These plans tend to have lower co-payments. Health Services were prioritized for inclusion in health benefit packages using a cost-effective valuation approach (Plazas, 1997).

Law 100 permitted private insurance, when coupled with a compulsory affiliation to contributive social insurance, plus an entry restriction subject to consumers' choice at the point of service, to prevent dual payments from the social insurance. Private insurers, most of them competing in the contributive segment, have the freedom to commercialize different private plans with limited restrictions. Most of these plans are of the HMO type.

Financing for the Colombian health system comes from several governmental taxes and individuals' contributions through payroll. The contributive plan is financed through a compulsory contribution of 4% of each individual's salary. Workers also contribute with an additional 1% of solidarity contribution for financing subsidies. The subsidized regime also receives financing from general and local taxes. Financial resources are managed through an equalization fund (FOSYGA). This fund compensates adverse selection consequences among contributive regime insurers, based on gender and age group differences among the different risk pools. This compensation is based on a per capita cost unit representing the average health service consumption of an individual with average expenditures [per capita payment unit, UPC is the Colombian acronym]. The equalization fund also manages the different financing sources for subsidized regime and calculates a per capita payment unit for the

²Co-payment rates in Contributive insurance are charged according to salary income. For workers and their families with salaries lower than 2 mlms, the maximum co-payment is COP109.421 (USD46.70). Cap payment for people with salaries in the range of 2–5 mlms is COP438.725 (USD195.20). The maximum co-payment for incomes over 5 mlms is COP 877.450 (USD390.30). Subsidized insurance co-payments are set by focalization survey category (SISBEN). They vary from 0% of the service value for persons classified as Category I (the poorest) to 10% for Category III, the highest level of persons allowed to apply for subsidies.

subsidized regime (UPC-S) (Trujillo, 2003). The actual value of the annual contributive plan coverage premium was USD 128.95, the annual subsidized plan coverage premium was USD 69.41 (2001).

Colombian health social insurance was intended as a progressive policy with sequential coverage of the population through rapid expansion of Subsidized and Contributive Regimes [Article 2, Paragraph]. Law 100 specified a compulsory universal coverage objective, to be obtained by 2001. This universal coverage implies insuring all the population and equaling all health plans to the contributive health services package. Universal coverage under the Contributive Regime is projected for the whole Colombian population in the long term.

Empirical evidence from different surveys, such as the Colombian Household Survey (CHS), suggests insurance coverage growth during the first seven years from 15.7% in 1990 (Ministry of Health, 1990) to 57% of the total population (Ruiz *et al.*, 2001). This expansion was due to both new family members affiliated to the Contributive Regime and to poor population covered by the Subsidized Regime. This last group represented 12 954 900 persons for the year 2004 (July) (Consejo Nacional de Seguridad Social en Salud, 2004). However coverage expansion was stagnant during the 1998–2003 period. This was due to health budget general tax component restrictions, plus the effects of a macroeconomic recession which reduced the formal employment affecting the solidarity component which represents 46.29% of the solidarity funds in the equalization fund (FOSYGA) for the subsidized regime (República de Columbia, 2001).

However, the main concern in evaluating the reform effects is its microeconomic impact, particularly the access effect and equity for different populations. Overall health spending has grown from 6.2% of GDP (1993) to 8.5% (2002) (Departamento Nacional de Planeación y Ministerio de la Protección Social – PARS, 2004). An important question is how much of this social investment has affected the welfare of poor populations. In addition, how can we improve the insurance coverage for the 17.8 million people still subject to the restricted services offered by a safety net composed of public hospitals and ambulatory centers, also financed by general taxes. This publicly funded safety net covers health services for the non-insured. This became separate financing, for public hospitals. Dual financing may generate transaction costs for the entire system. Another important question is how many rationing services there are for the non-insured and how to reduce the necessary high transaction costs linked to a very complex and transitional health system.

STUDY DESIGN AND ESTIMATION METHOD

The purpose of this study was to establish the access differences in a progressive segmented social insurance system. Access was measured both as medical service utilization and as out-of-pocket expenditures borne by individuals. Access was contrasted using a set of different variables that may affect individual patterns of utilization. These variables are important in countries with low or average development levels where the socioeconomic differences may restrict most of the families' purchasing power for health insurance coverage.

The study selected a prospective design for two main reasons: (1) to enhance, through follow-up, the sensitivity of instruments to collect utilization data due to recall bias in survey type studies, and (2) to control insurance groups against possible moral abuse effects caused by changes in coverage due to frequent changes in the insurance scheme. This analysis took population that kept the same insurance plan one whole year. Six insurance groups were studied, three social insurance plans defined by law: Contributive insurance, subsidized insurance, special insurance pools. In addition privately insured persons and those not insured were included. Multi-affiliated populations were studied separately, given their cost to the social insurance system, and the theoretically higher probability of moral hazard and social welfare losses. Colombia's multiple-affiliation rate is high due to deficiencies in the social security affiliation information system.

Selection bias is a quite relevant aspect in measuring the effects of health insurance. It may be generated by the presence of illness or by a self-perceived condition of bad health. The ill tend to avoid risk by ensuring or increasing their coverage. In order to evaluate the potential effects of selection bias, the study considers the three-stage model for insurance plan selection condensed by Ellis (1989). This model indicates sequential stages in consumer selection for insurance coverage. First, consumers decide whether to buy insurance coverage; then, they evaluate the characteristics of the different available benefit plan options. And finally, they choose an insurer based on the expected out-of-pocket expense, given the different benefit plan options. Under the conventional theory of expected utility (Friedman, 1974; van de Ven and van Praag, 1981), consumers optimize increased use, given their health condition and risk profile (Browne, 1992). However, said approach has been contrasted by an alternative theory of prospective utility (Marquis and Martin, 1986, 1996).

The Colombian social insurance model is designed to include different mechanisms to attenuate selection bias. First, it takes the decision-making process regarding taking out insurance away from the consumers and delegates it to their employers and municipalities. It is mandatory for all workers and their families to be affiliated by their employers to the contributive policy or to the special policy. Therefore, it is not a question of purchasing insurance but of meeting a legal obligation. Subsidized plan affiliation for the unemployed and for independent workers depends on available resources to fund the subsidies and on a population focusing process in which each municipality selects the beneficiaries from a population survey applied every three years.

Therefore, the non-affiliated group is mainly composed of families whose incomes are not sufficient to enable them to purchase private insurance. The non-affiliated group is covered by a public safety net maintained by a scheme of supply subsidies. There is only one benefit plan in each social insurance scheme. Therefore, there is no choice of benefit plan in social insurance. Premiums and co-payments are also independent from health condition, age or gender in social insurance. They are adjusted based on each affiliate's income.

Illness is a potential source of selection bias in private insurance because this scheme is individual, voluntary and there are various benefit plans offered with different premiums. Benefit plans tend to be more restricted in private insurance and it is mandatory to have a contributive plan before being eligible to buy private insurance. Private plan benefits focus on more liberty in choosing physicians, better in-patient accommodations and less waiting time to access diagnosis and out-patient procedures. All of the private insurance plans include pre-existing conditions and latent periods, to reduce consumer selection bias probability.

The study design only included individuals who remained insured or non-insured during the entire monitoring period, for the purpose of reducing selection bias probability, strengthening the statistical comparability between the insured and the non-insured, and maintaining the inference in out-of-pocket differences. The Colombian health reform also provides for the progressive transformation from supply subsidies to demand subsidies; therefore, a key aspect in evaluating the policy is to determine its effect on use and expense by the insured population and by the non-insured population.

The four part model developed by Duan and Chau (1987), Manning *et al.* (1987a, 1987b) and Duan *et al.* (1983, 1984) and utilized as part of the Rand Health Insurance Experiment (Newhouse, 1974, 1996) was used to assess the determinants in utilization and out-of-pocket expenses. The four part model is made up of two logit models that measure the service utilization probability, and two log-linear models that estimate the out-of-pocket expenses.

The multi-part model attempts to correct the problem of people not using medical services which results in a expense distribution problem for health expenditures. An important proportion of those affiliated to an insurance plan are non-users the year round. In addition, users have positive expenses that are highly deviated; these expenses are generally produced for a few heavy users. This problem is addressed by separating this consumer behavior into two stages: one, a decision to use medical services, and two, a decision about regarding the level of expenses. The skewness to the right depends more

heavily on inpatient services than on ambulatory expenses. Therefore, it is possible to separate inpatient users and strictly ambulatory users.

The formal utilization model specification is composed of a two-part set:

Part One is a logit model estimating the probability an individual visiting a health care provider (MED_U) during a one year period

$$\text{Prob}(MED_U > 0) = \alpha X + \varepsilon_1 \quad (1)$$

where α is a vector of coefficients, and X represents a set of independent variables (S, G, I, RA). These independent variables include socioeconomic characteristics, geographic settings, and insurance plans. RA represents those variables defined by the current regulation for risk adjustment and reimbursement for the insured. Supply side characteristics of health services providers were not included because of difficulties in obtaining reliable data to link installed capacity to demand, in a very competitive market.

Part Two represents a logit model for the conditional probability of using inpatient services (INP_U) among those using at least one medical service during the one year period. This model divides users in two groups and controls expenses for ambulatory and inpatient services

$$\text{Prob}(INP_U > 0 | MED_U > 0) = \beta X + \varepsilon_2 \quad (2)$$

Parts Three and Four are log-linear models that estimate the incurrent level of out-of-pocket expenditures for ambulatory-only users and inpatient users

$$\ln(MED_E | MED_U > 0 \text{ and } INP_U < 0) = \delta X + \varepsilon_3 \quad (3)$$

$$\ln(MED_E | MED_U > 0 \text{ and } INP_U > 0) = \varphi X + \varepsilon_4 \quad (4)$$

The vectors of the coefficient estimates for the respective models are represented by $\alpha, \beta, \delta, \varphi$. The respective error terms are symbolized by $\varepsilon_1, \varepsilon_2, \varepsilon_3, \varepsilon_4$. It is assumed that $E(\varepsilon) = 0$.

Predicted values for service utilization and out-of-pocket expenses were calculated. These models evaluate the impact of the different insurance plans on each income group.³

Finally, a simulation for service utilization and out-of-pocket expenditures was performed under different health assurance scenarios for those not covered by any insurance plan. Predicted values were calculated using predictions of the models 1–4. Total out-of-pocket expected expenses in medical services were calculated as:

$$E(\text{expenses}) = \frac{1}{n} \sum_{j=1}^n p_{1j} [(1 - p_{2j})g_{3j} + p_{2j}g_{4j}] \quad (5)$$

where n represents the population where the expected out-of-pocket expenses are calculated, p_{1j} is the estimated probability of medical service utilization, p_{2j} is the estimated probability of inpatient hospital utilization, g_{3j} is the estimated expenses in medical services for outpatient service users, and g_{4j} represents the estimated expenses in medical services for inpatient hospital utilization.

³ Given error deviations in normal distribution in expense models, an estimation factor was applied to obtain more specific retransformations. This factor is the mean of the exponential residuals:

$$\Phi_i = \frac{1}{n} \sum_{j=1}^n \exp(\hat{\varepsilon}_{ij}) \quad (6)$$

where factors Φ_3 and Φ_4 were applied for each log-linear model estimation.

DATA AND VARIABLES

This study was designed to measure access for the population to health services. Differences in medical services use and out-of-pocket expenses between different insurance schemes were evaluated. Four population cohorts were followed for a complete one year period. Each cohort was representative for the population in one Colombian city. Families included in each cohort were randomly selected. Each individual part of a family group was followed to gather monthly information about utilization and out-of-pocket expenses. Field work covered the period from June 2000 to November 2001.

This is a study with a cohort sampling for the different types of urban settings that comprise the distribution of the Colombian population. Criteria used for city selection included both large metropolitan areas and rural settings. Using a commonly used city classification (Functional Urban Range index, ITF), one city was selected from out of four groups set by its index value⁴: (1) metropolis, (2) middle-sized cities, (3) rural towns, and (4) rural villages. Cities selected were: Bogota, metropolis; Manizales, middle-sized city; Campoalegre, rural town; Palermo, rural village. A probabilistic sample for households was selected for each city. The persons in each household who lived in the selected city were the final analysis unit. The sample sizes were 4000 households (15 744 individuals) in Bogota; 1440 households (5985 individuals) in Manizales; 450 households (1804 individuals) in Campoalegre, and 350 households (1398 individuals) in Palermo.

Three questionnaires were applied: (1) a baseline family survey collecting standard socio-demographic and social security information, (2) a monthly survey collecting day-to-day data on self-perception of health status, medical service utilization and out-of-pocket expenses for each individual, and changes in social security affiliation, (3) a final survey designed to capture changes in the family's socioeconomic conditions.

The household sample was selected assuming a sample loss of maximum 30% for the whole year. This high expected desertion rate is related to the high internal migration documented in Colombia due to the internal conflict. This situation mainly affects large cities. The threshold for maximum loss objective was attained. The final number of complete households monitored during one year was 2810 households with a 'no answer' rate of 29.8% in Bogota, 1252 households (13.1%) in Manizales, 449 (0.2%) in Campoalegre, and 326 (6.9%) in Palermo. A strict process for evaluating a 'no answer' was implemented; each household lost was carefully assessed before being dismissed. This included a protocol to document lost households, to recruit them anew or to dismiss them.

For the purpose of this study, only population that remained without changes in the insurance status was selected, this reduces a study population of 16 557. The distribution of the studied population between cohorts was Bogota, 9189 persons, Manizales, 4317, Campoalegre, 1862, and Palermo, 1189. The study sample included all individuals in the subset, despite age, social security, and health condition.

The five sets of variables listed below were considered for the study.

Access variables (U, E): Access was defined as health service utilization and out-of-pocket expenses. Medical service utilization comprises all health service events. Medical service utilization was also segmented into ambulatory services, hospital services, and medication utilization. Out-of-pocket expenditure is classified as insurance co-payments and out-of-coverage payments.

Socio-economic variables (S): This group includes household income, subsidies other than health subsidies, occupation. Household income was indirectly measured by valuating each member's contribution and the type of expense (food, lodging, public utilities, education and health, among others). Household income was measured as the average of the different contributions; it was indexed to

⁴ITF index combines different geographic, demographic, institutional infrastructure, goods market development, public services. Urban centers could be classified with the actual index value. Geographic convergence of urban centers, markets and services interdependence can be traced. The Colombian population is almost evenly distributed among the four selected urban categories (O'Meara *et al.*, 2003).

the minimum legal monthly salary (mlms) that was USD 127.50 for the year 2001. Subsidies were calculated as the number of subsidies obtained during the year. Occupation was rated as the total months at each occupation during the time period considered (working, looking for work, studying, household duties, rentier, retired, disabled, other activities).

Geographic variables (G): This included the variables identifying city cohort. Also includes socio-economic strata. This is a classification of the household localization which is extensively used for public service rating. The poorest neighborhoods are classified as group 1 whereas the most affluent are classified as group 6.

Social security variables (J): This set of variables distributed the study population by their social security segment, for the complete study term. Therefore, six insurance categories were considered: (1) persons affiliated to the contributive regime, who contribute through payroll, (2) persons affiliated to the subsidized regime, who receive a government subsidy, (3) persons affiliated to special regimes, (4) persons privately insured, (5) persons with multiple affiliations, who have more than one social insurance affiliation, and (6) persons without insurance coverage.

Risk adjustment variables (RA): Constitute risk linked information such as age, gender, health status. Health status indicates the perception of the disease, measured as the number of months during which each person was ill during the year.

RESULTS

Descriptive statistics

Table I presents the basic descriptive results for income, affiliation and health service utilization. The largest city (Bogota) has the highest insurance rate and Campoalegre, the remotest rural town, has the lowest. The average insurance coverage in three out of the four urban settings was slightly higher than the national average calculated at 57% for the year 2001. As may be seen in the table, the proportion of persons insured changes according to the income group (p -value = 0.000), measured by the number of minimum legal monthly salaries earned. It is important to point out that average income varies greatly among the four urban settings.

Average monthly household income was USD 374.57 in Bogota, USD 245.47 in Manizales, USD 176.25 in Campoalegre, and USD 165.62 in Palermo. The distribution of the households by income also varied; only 4.9% of the households earn less than one (1) minimum legal monthly salary (mlms) in Bogota, as compared to 16% in Manizales, 27.2% in Campoalegre, and 29.6% in Palermo. Also, 21.6%

Table I. Descriptive statistics by insurance condition

	Variable	Insured (%)	Non-insured (%)
Urban setting	Bogota (metropolis)	68.3	31.7
	Manizales (middle-sized city)	63.7	36.3
	Campoalegre (rural town)	39.6	60.4
	Palermo (rural village)	62.5	37.5
Household income	< 1 mlms	47.7	52.3
	1–2 mlms	55.4	44.6
	2–3 mlms	66.1	33.9
	3–4 mlms	72.3	27.7
	> 4 mlms	82.2	17.8
Type of service	Medical services	73.0	46.7
	Ambulatory	67.7	42.4
	Inpatient	5.3	4.4
	Medication	64.1	52.9

Table II. Utilization and out-of-pocket expense by insurance plan and type of service

Insurance coverage	Insurance plan	Ambulatory-only users		Inpatient users		Inpatient exclusive	
		Events	OOP expense USD	Events	OOP expense USD	Events	OOP expense USD
Insurance covered	Subsidized	2.95	1.87	4.26	15.90	0.96	13.27
	Contributive	3.63	4.90	6.26	33.19	1.09	29.12
	Special	4.31	2.28	5.61	11.51	1.07	11.06
	Private	3.96	29.52	7.30	205.90	1.21	58.66
	Multiple-affiliated	4.09	5.77	9.80	65.47	1.40	39.89
No covered	Subsidized	0.38	9.58	0.76	29.14	0.22	24.72
	Contributive	0.44	17.08	0.68	76.47	0.13	58.12
	Special	0.37	20.74	0.25	25.58	0.07	23.67
	Private	0.53	62.23	1.70	420.50	0.09	386.65
	Multiple-affiliated	0.47	20.81	0.20	84.09	0.00	76.04
	Non-insured	2.62	37.70	4.96	169.99	1.28	144.27
Mean		3.60	25.91	5.97	133.82	1.23	107.84

of Bogota's households earn more than 4mlms, as compared to 9.0% in Manizales, 2.0% in Campoalegre, and 2.2% in Palermo.

Differences in health service utilization between insured and non-insured are significant in each of the two types of services analyzed: ambulatory-only users, inpatient users (p -value = 0.000). These differences in affiliation may relate to geographic differences. With the exception of Campoalegre, the affiliation rate for individuals whose household income surpassed 4mlms is higher than 81%. The affiliation distribution by insurance plan in the study group is contributive insurance 40.3%, subsidized insurance 17.1%, special insurance 3.3%, private insurance 1.9%. About 36.5% of the population had no insurance. As to insurance coverage, the two most urban cities represent almost twice the coverage as the two rural towns. The population distribution by insurance plan depends significantly on the city and on the income group (p -value = 0.000).

Table II presents mean medical utilization and expenses, differentiating the type of events covered by co-insurance expenses and the out-of-plan utilization with the corresponding out-of-pocket expenses. These results differ depending on whether the persons exclusively used ambulatory services during the period of one year or if they used inpatient type services. There are significant differences in utilization and expenses among different insurance plans (p -value = 0.000), with the exception of the average overall utilization of inpatient services, which is not significantly different among plans (p -value = 0.366).

The non-insured have the lowest utilization frequency and the highest out-of-pocket expenses. The expense level among the privately insured is almost four times higher than the level among those subsidized who use ambulatory and inpatient services. The frequency of non-covered services is low among the socially insured, indicating high insurance coverage. However, out-of-pocket expenses for non-covered services are remarkably higher than co-payments for the insured's consumption. Out-of-plan expenditure is almost double among contributive and subsidized ambulatory-only users. Inpatient expense among contributive affiliates is twice as much as among subsidized affiliates and among special plan affiliates. There are outstanding differences in out-of-plan inpatient expenditure among the non-affiliated and among the privately affiliated, 5.8 and 14.5 times higher, respectively.

Inpatient consumption represents the greatest proportion of out-of-plan expenses. The frequency of this type of events is rather low but its impact in expense is high. This particularly affects those privately insured and those not insured. The privately insured's expenses may reflect non-covered services or plan exclusions. Non-insured expense represents the financial exposure of an already rationed population.

In addition, the private insured supports high coinsurance expenses other than the multi-affiliated whose consumption level is quite similar.

Four-part model estimates

Table III presents results for the health service utilization model comparing users vs non-users (Part 1) and ambulatory-only vs inpatient users (Part 2), with the corresponding error. Part 1 indicates a

Table III. Logit regression results for service utilization

Independent variable	Part 1: Users vs No users		Part 2: Inpatient users vs ambulatory-only users	
	Exp(β)	SE	Exp(β)	SE
<i>Socio-economic variables (S)</i>				
Less than 1 mls	1.062	0.070	0.871	0.156
From 1 to 2 mls	1.093**	0.045	0.901	0.099
§ From 2 to 3 mls	1.000		1.000	
From 3 to 4 mls	1.039	0.063	0.974	0.132
More than 4 mls	1.106*	0.059	0.647***	0.133
§ Head of Household	1.000		1.000	
Spouse	1.223***	0.065	1.223*	0.119
Son/daughter	0.734***	0.057	1.050	0.127
Another relative	0.571***	0.072	1.100	0.164
Another non-relative	0.526***	0.157	1.122	0.411
Number of months working	0.971***	0.004	0.995	0.008
Number of people in the home	0.886***	0.010	1.041*	0.023
<i>Geographic variables (G)</i>				
Bogota			1.558***	0.096
§ Manizales			1.000	
Campoalegre			1.662***	0.137
Palermo			1.670***	0.157
<i>Social security variables (I)</i>				
§ Subsidized	1.000		1.000	
Contributive	1.168***	0.055	0.712***	0.110
Special plans	1.353***	0.116	0.711	0.223
Private insurance	1.594***	0.156	1.534*	0.232
Multi-affiliated	2.155***	0.246	0.445*	0.475
Non-insured	0.390***	0.051	1.077	0.107
<i>Risk adjustment variables (RA)</i>				
Less than 1 year old	5.842***	0.181	0.795	0.247
From 1 to 4 years old	2.929***	0.078	0.629***	0.156
From 5 to 14 years old	1.440***	0.053	0.436***	0.138
§ From 15 to 44 years old	1.000		1.000	
From 45 to 60 years old	1.385***	0.057	0.604***	0.119
More than 60 years old	2.171***	0.077	0.674***	0.136
Female	1.513***	0.038	1.166*	0.087
§ Male	1.000		1.000	
Health condition			1.224***	0.017
Constant	3.183***	0.093	0.039***	0.234
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$				
§ Omitted				
Hosmer-Lemeshow (p -value)	0.000***		0.000***	
Classified correctly cases (%)	69.06		92.15	
Area under ROC curve	0.716		0.671	
Linktest Prediction value $p > Z $	0.000***		0.078*	
Prediction squared value $p > Z $	0.876		0.203	

significantly higher probability of utilization by any family member other than the head of household. The condition of working and large families tend to relate positively to higher usage. This indicates a progression in the insurance coverage, formerly restricted to selected family members. The social security affiliation relates significantly to higher usage; it also indicates higher unusual utilization among the multi-affiliated, indicating different coverage in distinct insurance plans. Risk adjustment variables corroborate higher utilization among children, women and the elderly.

Part 2 shows higher inpatient utilization rates linked to higher income populations, to infant and elderly populations, and to persons who believe that they are ill. The model also shows geographic differences that do not correspond to the size of the urban setting or to the economic activity level.

Table IV shows the results for the two log linear expense models. Part 3 indicates log linear regression for out-of-pocket expenditure among ambulatory-only users whereas Part 4 shows the results for inpatient users. These models had heterocedasticity problems and the Huber-White technique had to be used to correct them. Regression results for ambulatory-only users indicate significant lower out-of-pocket expenses for the two lower income groups. Similar results are found for the population with a low level of education, large families, females, and persons who believe that they are ill. These results indicate the important effect of financial protection for those covered by social insurance. On the contrary, the magnitude of the expenditure coefficient for the non-insured indicates a considerable financial burden for that population. These results also confirm the highest financial coverage for health risks among the subsidized population.

Part 4 shows important differences in the effect of the different insurance plans on inpatient-related expenditure, with significantly higher financial coverage for those affiliated to special insurance plans and a higher burden for the non-insured. Out-of-pocket log-linear models also evidence the significant yet low magnitude of co-payment contributions in ambulatory and inpatient expenditure.

Table V presents predicted utilization and out-of pocket expenses among different insurance groups. It also indicates expected medical service expense. Outpatient usage probabilities are similar for all social insurance schemes. Predicted probabilities for the privately insured and multi affiliated are higher. There are striking differences between subsidized insurance and the other social insurance plans. The non-affiliated have low outpatient utilization probability and high inpatient hospital utilization probability. Predicted out-of-pocket expenses appear fairly low in subsidized, and remarkably higher in private insurance and non-affiliated groups. High predicted out-of-pocket expenses in both groups may be influenced by the strong expenses of the population with higher incomes.

The expected out-of-pocket medical service expense shows strong differences among the insurance plans. It is more than ten times higher for the privately insured than for the subsidized. The multiple insured, special plan insured, and contributive plan insured face higher expected expense. The non-insured have higher expected medical expense than the subsidized population but lower than the expected medical expense calculated for the remaining social insurance schemes.

Simulation

Table VI presents the results for three simulation scenarios. It illustrates different policy options that the Colombian government has to deal with the non-insured population. The first policy option includes all of the non-insured in the subsidized regime. The second scenario affiliates all of the non-insured to the contributive regime. The third scenario combines both options, breaking down the non-insured population by income: (1) the non-affiliated with income equal to or lower than two monthly legal minimum salaries are assigned to the subsidized regime; (2) the non-affiliated with income higher than 2 mlms are assigned to the contributive regime.

A change in the affiliation from non-affiliation to affiliation in subsidized plan increases the probability of utilization by 7.0%, it also reduces out-of-pocket expenses. The scenario with a change to

Table IV. Log linear regression for out-of-pocket expenses

Independent variable	Part 3: Out-of-pocket expenditures for ambulatory-only users		Part 4: Out-of-pocket expenditures for inpatient users	
	β	E.S.	β	E.S.
<i>Socio-economic variables (S)</i>				
Less than 1 mlsm	-0.891***	0.112	-0.226	0.298
From 1 to 2 mlsm	-0.486***	0.064	-0.262	0.253
§ From 2 to 3 mlsm	1.000		1.000	
From 3 to 4 mlsm	-0.010	0.082	0.233	0.352
More than 4 mlsm	0.244***	0.084	0.437	0.428
§ Without studies	1.000		1.000	
Primary	-0.263**	0.105	-0.596	0.333
Secondary	-0.157	0.111	-0.462	0.371
Higher learning studies	-0.029	0.135	0.399	0.472
Number of months working	0.002	0.005	-0.007	0.020
Number of months obtaining income	0.028	0.021	0.036	0.039
Number of people in the home	-0.079***	0.016	-0.009	0.061
<i>Geographic variables (G)</i>				
Bogota	0.378***	0.057	0.087	0.222
§ Manizales	1.000		1.000	
Campoalegre	1.109***	0.093	1.284***	0.279
Palermo	0.949***	0.120	0.404	0.394
<i>Social security variables (I)</i>				
§ Subsidized	1.000		1.000	
Contributive	2.130***	0.099	0.297	0.308
Special plans	-2.126***	0.231	-4.128***	0.874
Private insurance	2.936***	0.208	0.765	0.522
Multi-affiliated	0.899***	0.322	-0.527	1.741
Non-insured	3.820***	0.095	2.188***	0.295
<i>Risk assessment variables (RA)</i>				
Less than 1 year old	-0.016	0.187	-0.774	0.739
From 1 to 4 years old	-0.109	0.137	-0.550	0.493
From 5 to 14 years old	-0.128	0.084	-0.141	0.390
§ From 15 to 44 years old	1.000		1.000	
From 45 to 59 years old	0.078	0.076	0.428	0.259
More than 60 years old	-0.014	0.095	0.208	0.318
Female	0.106**	0.052	-0.531**	0.190
§ Male	1.000		1.000	
Medical services co-insurance expenses	4.14E-06***	0.000	1.28E-06***	0.000
Health condition	0.472***	0.015	0.348***	0.045
Constant	5.838***	0.191	9.029***	0.661
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$				
§ Omitted variables				
Prob > F	0.000***		0.000***	
R-Squared	0.381		0.300	
Ramsey RESET test Prob > F	0.000***		0.000***	

contributive insurance increases utilization by 14.2% and increases estimated out-of-pocket expenses by 23.7%. A policy for affiliating low income population to the subsidized plan and affiliating higher income groups to the contributive plan can enhance the utilization probability by 10.4% in the lower income group and by 19.4% in the higher income population. This policy also reduces out-of-pocket expenses by 16.8% in the poorest population.

Table V. Predicted utilization and out-of-pocket expenses by insurance plan

Predicted/expected	Insurance plan						Mean
	Subsidized	Contributive	Special	Private	Multiple-insured	Non-insured	
Probability of medical visits	0.688	0.738	0.778	0.797	0.852	0.634	0.467
Probability of inpatient services	0.079	0.058	0.059	0.117	0.039	0.077	0.070
Out-of-pocket expenditure, only outpatient visits (USD)	11.44	21.98	23.02	91.75	26.59	37.70	25.91
Out-of-pocket expenditure, any inpatient service (USD)	45.05	109.66	37.09	626.40	149.56	169.99	133.82
Expected expense for medical services (USD)	4.93	11.07	12.66	56.16	18.13	8.01	9.89

Table VI. Simulation results

Policy scenarios	Non-affiliated		
	Predicted probability of medical visits	Predicted probability of inpatient services utilization	Expected out-of-pocket medical expenses (USD)
Base Line	0.467	0.070	8.007
Scenario 1. Non affiliated covered by subsidized plan	0.538	0.077	7.371
Scenario 2. Non affiliated covered by contributive plan	0.609	0.066	9.906
Scenario 3. Non affiliated with income < 2 mlms covered by subsidized plan	0.571	0.076	6.660
Non affiliated with income > 2mlms covered by contributive plan	0.661	0.063	10.779

DISCUSSION AND CONCLUSIONS

Evidence from the study indicates that social insurance increases the likelihood of using medical care and reduces the financial burden of health utilization for all studied populations. This is evident for all types of social insurance. It is noticeable how subsidized insurance present remarkable access differences with those non-insured in all analyzed types of services: ambulatory medical services, inpatient hospital services and medication consumption. Results on out-of-pocket expenditures are conclusive in the financial burden assumed by the population still not covered by the different social insurance schemes. The subsidized regime appears to efficiently adjust an adequate utilization level and low financial risk for the insured. Utilization rates and avoided out-of-pocket financial risk appear reasonable. The similar predicted probabilities for medical visits and the low expected expenses among the subsidized affiliated and the contributive affiliated indicate how benefit plan differences may vanish when insurance doors are opened. This may illustrate gains in prospective wellbeing from insurance as soon as rational populations find a door open to services.

The combination of a predicted higher utilization and lower out-of pocket expenditure among the socially insured shows a high equity burden for the non-insured. The Colombian decision to prefer an expanded social insurance to a specific target population scheme (i.e. Mother and child group. School-enrolled children) involves a trade off between the higher transaction costs of allocating subsidies to the general population and the social equity losses from not subsidizing non-specific populations. Access evaluation models applied to target populations have documented significant improvement in access to such insurance schemes in some developed countries (Deolalikar, 1995). However, it is difficult to

contrast the two schemes because most countries only select one scheme. Finally, economic policy arguments may play a role in the approach that each country selects.

There are important differences in patterns of utilization and out-of-pocket expenses among the six studied plans. The subsidized plan appear more adjusted to the paid premium, given the values of predicted probabilities of utilization and expected out-of-pocket expenses for the population covered. Contributive plan higher out-of-pocket expenditures may point to imbalances in the compensation system. Special regime high utilization and lower out-of-pocket expenses suggest effects from adverse selection and moral abuse. This will become a restriction to the insurance expansion in the near future. Law 100 selected the contributive regime as the long-term universal plan. However, the adjusted of the subsidized plan and lower costs are arguments for its future projection.

Results also point to the concern whether actual differences in the utilization rates and out-of-pocket expenses between those insured and those not insured have put more inequity on those non-affiliated. Persons gaining access through subsidized insurance may have reached a higher utilization level. Increasing the breach with those not insured. These segregated populations may be mainly rural low income populations as long as the results show greater likelihood for access as the populations become more urban. Utilization models point several socioeconomic variables as determinants in access differences. Family size, working conditions, family status may restrict access. These conditions should be considered in the insurance expansion policy.

The private insured expected utility appears rather low for the consumers. This could be the cause of stagnant affiliation rates in recent years. A complementary private insurance without stringent restrictions on medication and aggregates, such as improved room facilities and more open physician selection, could be a positive way to increase the demand for private insurance. This finding determines how a segmented insurance scheme may produce different health consumption curves. The moral hazard of the multi-affiliated and the specially insured may maintain inequalities and capture important sources to finance the non-affiliated. Policy should target a segmentation strategy based on the most adjusted insurance scheme. These results and implications must also take into consideration factors not covered in this study such as factors related to supply: primary and preventive health service quality, availability of inpatient hospital facilities and technology, availability of medication, and differences in local insurance operator efficiency.

When Colombia made its choice for a social insurance scheme with solidarity financing, it was assumed that universal insurance coverage would be attained at a short term. Social insurance policy included a strategy for the segmentation of the non-insured population in different benefit plans, and an equalization of progressive plans that would be reached in a determined scenario of economic grow and high employment rates. Despite impressive initial gains in insurance coverage, as long as the economy was slow, affiliations were at a standstill. These events led to a multi-segmented social security with unequal gains in wellbeing for the different population groups. This is the scenario of a policy deadlock where the social insurance scheme is continuously forced to expand access while it has to maintain equity and feasibility.

The simulation results favor a dual policy for future assurance: expand the coverage for the lower income population through subsidized insurance with total subsidy or subsidy combined with co-insurance. The average-income populations may be affiliated to the contributive plan. Other options such as partial subsidy for those in mid-income ranges may be considered.

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