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Determinants of vaccination after the Colombian health system reform

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Determinantes da vacinação após reforma do sistema de saúde na Colômbia

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Abstract

Objective
To assess the effects of individual, household and healthcare system factors on poor children's use of vaccination after the reform of the Colombian health system.
Methods
A household survey was carried out in a random sample of insured poor population in Bogota, in 1999. The conceptual and analytical framework was based on the Andersen's Behavioral Model of Health Services Utilization. It considers two units of analysis for studying vaccination use and its determinants: the insured poor population, including the children and their families characteristics; and the health care system. Statistical analysis were carried out by chi-square test with 95% confidence intervals, multivariate regression models and Cronbach's alpha coefficient.
Results
The logistic regression analysis showed that vaccination use was related not only to population characteristics such as family size (OR=4.3), living area (OR=1.7), child's age (OR=0.7) and head-of-household's years of schooling (OR=0.5), but also strongly related to health care system features, such as having a regular health provider (OR=6.0) and information on providers' schedules and requirements for obtaining care services (OR=2.1).
Conclusions
The low vaccination use and the relevant relationships to health care delivery systems characteristics show that there are barriers in the healthcare system, which should be assessed and eliminated. Non-availability of regular healthcare and deficient information to the population are factors that can limit service utilization.

Resumo

Objetivo
Analisar o efeito das características do indivíduo carente, da família e do próprio sistema de atendimento com a utilização da vacinação infantil, após a reforma do sistema de saúde, na Colômbia.
Métodos
Os dados foram colhidos numa amostra aleatória de assegurados em agregados familiares de baixo rendimento, em Bogotá, em 1999. O padrão analítico e conceitual utilizado baseou-se no Modelo Comportamental de Utilização de Serviços de Saúde

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de Andersen. Este considera duas unidades de análise para avaliar a vacinação e seus determinantes: 1) a população carente assegurada, inclusive características das crianças e suas famílias; e 2) o sistema de saúde. As análises estatísticas incluíram o teste do qui-quadrado com intervalo de confiança de 95%, modelos de regressão multivariada e coeficiente alfa de Cronbach.

Resultados

A análise de regressão mostra que a vacinação esteve relacionada com o tamanho da família (OR=4,3), a área da residência (OR=1,7), a idade da criança (OR=0,7) e os anos de escolaridade do chefe de família (OR=0,5). Também esteve relacionada com as características do sistema de saúde, tais como a disponibilidade de posto de atendimento (OR=6,0), e a informação sobre os programas e horários dos serviços de saúde (OR=2,1).

Conclusões

Os baixos níveis de vacinação e a importante relação que existe com o sistema de atendimento mostram barreiras que devem ser avaliadas e resolvidas. A inexistência de postos com atendimento regular e a deficiente informação à população são fatores que podem limitar a utilização dos serviços.

INTRODUCTION

Since the 1993 reform, Colombia has a market-oriented health care system based on compulsory insurance and individual free choice within a competitive market that includes insurer and provider organizations with different types of ownership (public and private for-profit and private non-profit).[12]

For the poorest population, the reform has introduced a type of insurer organization, called Subsidized Regime Administration Companies (ARS). The ARS began to perform their legal functions in 1996, among which managing the government financial subsidy to low-income people and providing a standardized benefit package including disease prevention services, primary care and restricted secondary and tertiary care.[16] The ARS had the legal responsibility of outlaying 10% of the financial subsidies for providing promotion and preventive services free of charge to the enrolled population, including childhood vaccination, before the year 2002.

In the new health care system, the poorest are identified by means of a door-to-door household survey carried out by the local governments, which considers socioeconomic variables and access to basic utilities, such as running water. The local governments also are responsible for paying a risk-adjusted premium to the certified health insurance organization chosen for the low-income people identified through the survey as being unable to pay. The insurer companies (ARS) either provide health services directly through integrated delivery systems or use selective contracting with independent providers.

According to official reports,[13] Colombia had a pro-

gressive decrease in the vaccination rates during the period after a new health system model was implemented, which included transferring the responsibility for childhood vaccination from vertical public programs to insurer organizations.

The Demography and Health National Surveys (DHNS)[17] conducted in 1990, 1995 and 2000, comparable survey methods which showed that the percentage of children who were up to date on their immunizations dropped from 66% in 1995 to 52% in 2000, whereas from 1990 to 1995 no significant changes in these rates had been observed (the period before the implementation of the Health Care Reform - HCR). In Bogota, the largest city in Colombia, DHNS 2000 also found that the coverage of child vaccination had decreased from 62.6% in 1995 to 58.2% in 2000.

With the new Colombian health system model, important progress has been made in providing medical coverage to the poorest populations. For instance, the insurance coverage of the lowest income decile of the population increased from 3.1% in 1993 to 43.7% in 1997.[6] Nevertheless, the effects on the utilization of specific high-priority services, such as the childhood immunization prevention program, did not seem to improve.

HCR proponents expected the immunization rates to remain the same or increase due to the introduction of diverse providers and suitable management after the implementation of the compulsory health insurance model and the need-based subsidy for low-income populations. This expectation was based on analyzing access barriers prior to the reform, which indicated that the population who did not use health

services attributed that fact to high costs and to the lack of a nearby health center.[14]

This population-based study explored the effects of the population and of the health care system features on vaccination utilization among the poor population, three years after the introduction of the insurer organizations.

METHODS

A cross-sectional study using the survey method was carried out. Interviews were conducted among the poor population affiliated to the ARS in 1999. The Javeriana University, sponsored by the District Health Secretariat (DHS), gathered the information in Bogota.

This city was chosen for this analysis because it is the largest city in Colombia, has the highest absolute number of poor people and is one of the cities with the greatest insurance coverage for these low-income populations.

Bogota had 20 geographic areas called localities. The survey covered 14 of these, in which the poor population live. The survey involved a random sampling of the population, with a 95% significance level, a 5% sampling error and a sampling formula for proportions of a binomial distribution (use or non-use of the healthcare). The final sampling unit was households selected from the DHS database listing the poor population benefiting from government subsidies (called AFILIA), using a random number table. A response rate of 89% was achieved with 1,676 families successfully interviewed.

The study analyzed children under six years of age who were affiliated to an ARS, therefore the study sample size was 510 infants who were potential consumers of the childhood vaccination service. That age cut-off was set because the mandatory immunization program should cover children up to this age (particularly the polio eradication initiative).

The conceptual and analytical framework used for this study was based on the Andersen's Behavioral Model of Health Services Utilization.[1] It considers two units of analysis for studying vaccination use and its determinants: 1) the insured poor population, including the children and their families characteristics; and 2) the health care system (Figure).

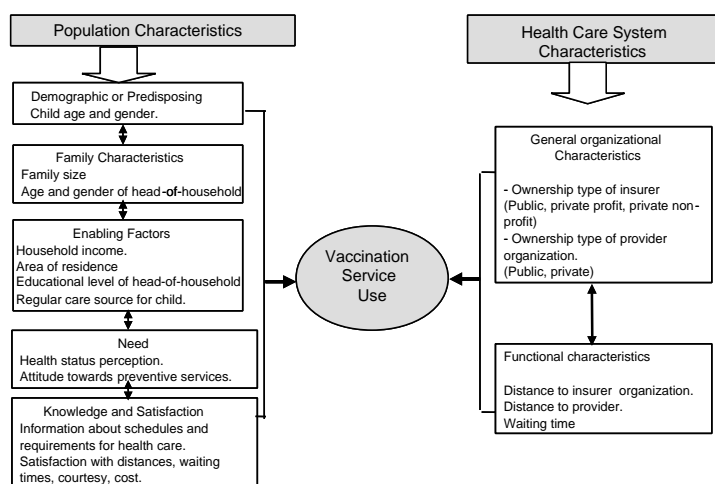In the first unit, there were included child/family

Figure - Conceptual model of factors related to vaccination service use.

characteristics associated with immunization use in other studies, such as predisposing demographic characteristics,[8] family features,[22] enabling factors (both family and community),[21] perceived need,[3] satisfaction[4] and knowledge.[9] In the second unit, the study model included both the characteristics of the insurers and their network of provider organizations (POs),[2] based on the features of the health care system for the poor population in Colombia.

The dependent variable was defined as the child's use or non-use of the immunization services to receive some vaccine, after affiliation to the ARS. It was analyzed use instead of completion rates of vaccination schedules because other studies have shown both the deficient information system or under-recording of the utilization of services in the ARS and the POs,[13] and a high percentage of households reporting the loss of the immunization card (from 49% to 25%).[17]

The independent variables were the population and health care system characteristics. The demographic features of the children that were measured included age in years and gender whereas the characteristics of the family that were gathered included family size and head-of-household age and gender. Family and community enabling variables included family income, socioeconomic status (governmental classification by living area), head-of-household's educational level and migration from other cities to Bogota, as well as the number of years affiliated to the ARS and having a regular health care provider and other health insurance for the child.

Measures of healthcare need included head-of-household's perception regarding the child's health status, as well as child's diseases during the past two weeks and hospitalization during the last year. The

head-of-household's attitude towards prevention was evaluated through a proxy variable that inquired about use of prevention services at least once a year. Finally, heads-of-household were asked about knowledge of ARS and PO schedules and requirements for obtaining services. They were also asked about their satisfaction with the health care system in aspects of courtesy, distances, schedules, costs and waiting times.

Health system features gathered included the child's type of ARS (public or private for-profit or private non-profit organization), the type of PO (public or private), the travel time and waiting times in these health care organizations.

The survey instrument was a structured questionnaire that was tested and adjusted in an initial pilot study. After informed consent was obtained, this questionnaire was filled in by interviewing the adult primarily responsible for the child's care.

Analysis was conducted using the Stata 7.0 software package. It was divided into two sections. The first included the description of the individuals and the health care system characteristics. The vaccination use was analyzed by type of insurer (ARS) and provider organizations (PO), and the differences were assessed by chi-square test with 95% confidence intervals (CIs).

In the second section, different models of determinants for vaccination use were analyzed. The models correspond to the successive analysis of each group of independent variables presented in the theoretical framework adopted (Figure). For each group, first it was analyzed the bivariate or unadjusted relationship between each independent variable and the vaccination program use, using the method of logistic regression and calculating the odds ratio (OR) as a measure of association with 95% CI. Variables with a p-value <0.25, and also variables with theoretical relevance, were entered as potential predictors into a second phase of multivariate analyses by each group. Finally, a multivariate model using a stepwise fitting was analyzed.

Inference statistics and standard errors were adjusted by the household's survey number to correct for the effect of intra-class correlation among the children who belonged to the same family. On the other hand, correlations among independent variables were evaluated for evidence of potential multicollinearity. In two situations in which the variables were correlated and belonged to the same theoretical construct (knowledge and satisfaction), the factor analysis technique with varimax rotation and developed scales based on the

main factors was used. To evaluate the internal consistency of scale scores, it was used Cronbach's alpha coefficient, which it was considered sufficiently reliable when estimates exceeded 0.60.

RESULTS

As Table 1 shows, the average age of the children was three years old and slightly more than half were girls (50.4%). The average family size was 4.2 persons, with a high percentage of women (64.1%) as heads-of-household. The average age of the head-of-household was 33.5 years, with a low educational level (5.9 years of schooling on an average) and a high rate of migration towards Bogota from other cities (35.2%).

The children's average number of years of affiliation to the ARS was about one year, with a very low proportion of children having other insurance (1.2%). The head-of-household reported more knowledge about schedules and requirements of the provider network through which to access the services (75.7% and 74.8%, respectively) than knowledge about the same aspects for the insurer (65.7% and 67.8%). Also, only 47.4% of the heads-of-household reported knowledge about the possibility of changing ARS annually. Most heads-of-household were satisfied with the overall quality of the services, the advantages of being affiliated to some ARS and the courtesy shown to them in the health care system, but they were less satisfied with the waiting times and the distances to the ARS and POs.

The factor analysis of the variables of knowledge and satisfaction with the health care system provided empirical evidence of two main dimensions in each one of these groups. For the head-of-household's knowledge variables, the first factor was highly related to the information on the schedules and requirements for obtaining the services in the PO and the second factor grouped the knowledge about the same aspects for the ARS. The summary scale that collapsed the correlated items in the first factor had an internal consistency of 0.83, and the alpha coefficient was 0.85 for the scale constructed with the second factor. For the satisfaction variables, the first factor showed the highest weight for courtesy in the PO and the head-of-household's perception of its overall quality and the second factor was dominated by the satisfaction with the waiting times and the distances to the ARS and to the PO. The alpha was 0.70 for the first scale and 0.61 for the second.

Table 2 presents the health care system characteristics for the poor population affiliated to the ARS.

Most of the children were affiliated to non-profit insurer organizations (85.9%, including public and private non-profit ARS) whereas the remainders were affiliated to for-profit ARS (14.1%, corresponding to private for-profit organizations). This preference for the type of ownership of the insurer was more equally divided for the type of provider that the children regularly attended: 52.7% used a private organization and 47.3% a public (government-run) PO.

In the study sample, 22% of the children used the immunization services to receive some vaccine after becoming affiliated to the ARS. This proportion varied slightly depending on the type of insurer: more children (29.2%) who were affiliated to for-profit organizations used the vaccination service than did children affiliated to non-profit ARS (20.8%). In contrast, these differences by PO type were the opposite: 30.7% of children who had a

Table 1 - Characteristics of the poor insured children and study families.

Variables (N=510)	Coding (Minimum–Maximum)	Frequency	(%)	Average	(SD)
Child's age (years)	(<1-5)			3.2	(1.5)
Child's gender (female)	0=Female, 1=Male	257	(50.4)		
Family characteristics					
Family size	(2-9)			4.2	(1.5)
Head-of-household's age (years)[a]	(17-83)			33.5	(9.8)
Head-of-household's sex (female)[a]	0=Female, 1=Male	295	(64.1)		
Enabling factors					
Socioeconomic status	(1-4)			2.1	(0.6)
*Family income (US$)[b]	(682.6-4095.3)			1455.2	(511.9)
Head-of-household's schooling (years)[a]	(0-11)			5.9	(2.7)
Child's years of affiliation to ARS[b]	(<1-3)			1.0	(0.7)
Regular care provider	1=Yes, 0=No	403	(79.0)		
Other insurance coverage[c]	1=Yes, 0=No	6	(1.2)		
Migration from another city[a]	1=Yes, 0=No	162	(35.2)		
Living area	1=Center/South, 0=North/West	257	(50.4)		
Factors of need and preventive attitude					
Health status perception[c]	1=Bad/Regular	103	(20.3)		
	0=Good/Very good	404	(79.7)		
Illness in the last two weeks[d]	1=Yes,0=No	44	(10.0)		
Hospitalization in last 12 months[e]	1=Yes,0=No	29	(5.8)		
Preventive consult once a year[a]	1=Yes,0=No	208	(45.2)		
Head-of-household's knowledge					
Schedules of the ARS[a]	1=Yes,0=No	302	(65.7)		
Requirements for care in the ARS[a]	1=Yes,0=No	312	(67.8)		
Annual possibility of ARS change[a]	1=Yes,0=No	218	(47.4)		
Requirements for care in the PO[a]	1=Yes,0=No	344	(74.8)		
Schedules of the PO[a]	1=Yes,0=No	348	(75.7)		
Head-of-house's satisfaction with the health services					
Requirement time in the ARS[f]	1= Long waiting time	77	(22.8)		
	2= Some waiting time	170	(50.3)		
	3= A very short time	91	(26.9)		
Distance to the ARS[f]	1= Too far	56	(16.6)		
	2= Some distance	118	(34.9)		
	3= Very near	164	(48.5)		
Requirement time in the PO[f]	1= Long waiting time	62	(18.3)		
	2= Some waiting time	167	(49.4)		
	3= A very short time	109	(32.3)		
Administrative courtesy of PO[f]	1= Very deficient	4	(1.2)		
	2= Fair	38	(11.2)		
	3= Excellent	296	(87.6)		
Medical courtesy of the PO[f]	1= Very deficient	2	(0.6)		
	2= Fair	18	(5.3)		
	3= Excellent	318	(94.1)		
Schedules of the PO[f]	1= Very inconvenient	35	(10.3)		
	2= A little Inconvenient	33	(9.8)		
	3= Very convenient	270	(79.9)		
Overall quality of the PO[f]	1= Very deficient	1	(0.3)		
	2= Fair	31	(9.2)		
	3= Excellent	306	(90.5)		
Distance to PO[f]	1= Too far	14	(4.1)		
	2= Some distance	69	(20.4)		
	3= Very near	255	(75.5)		
Service costs in PO[f]	1= Very expensive	17	(5.0)		
	2= Slightly Expensive	108	(32.0)		
	3= Very cheap	213	(63.0)		
Advantages of affiliation to ARS[g]	1= None	3	(0.9)		
	2= Some	8	(2.4)		
	3= Too many	226	(96.7)		

SD: Standard deviation
ARS: Subsidized Regime Administration Companies
PO: Provider organization
[a](N=460), [b](N=405), [c](N=507), [d](N=442), [e](N=501), [f](N=338), [g](N=337)
*Annual income in US dollars (1999 average currency: 1758.1 Colombian pesos to one dollar)

Table 2 - Vaccination utilization and health care system characteristics for the poor population affiliated to the ARS.

Variables (N=510)	Coding (Minimum–Maximum)	Frequency (%)		Average (SD)	
Vaccination use	1=Yes, 0=No	122	(21.9)		
ARS ownership type	1=For-profit, 0=Non-profit	72	(14.1)		
*PO ownership type[a] (private)	1=Private, 0=Public	207	(52.7)		
Distance to ARS in minutes[b]	(2-120)			35.0	(21.4)
*Distance to PO in minutes[c]	(1-180)			27.9	(26.4)
**Waiting time for appointment[d]	(5-180)			22.3	(31.2)
**Time between appointment and consultation[d]	(5-5760)			1298.7	(1804.8)
**Waiting time for attention in PO[e]	(2-1440)			23.9	(34.4)

*Based on the regular care provider
**Time in minutes, based on regular care provider and recent visit
[a](N=393), [b](N=340), [c](N=337), [d](N=62), [e](N=65)

public PO as their regular care source used the vaccination program as compared to 22.7% of those who had a private PO. Despite the differences in immunization utilization by the type of ARS and PO, neither relationship was statistically significant. These findings are probably related to the sample size, which allowed to detecting a difference in utilization among these types of organizations of up to 17 percentage points, at a power of 80%.

Table 3 summarizes the multivariate models for the children's vaccination use, which included each group of independent variables considered in the theoretical framework, adjusted by the child's age, in order of increasing significance. The risks of developing the outcome (use or non-use), adjusting simultaneously for all other predictors included in the logistic regression model, are presented as adjusted odd ratios (OR) with 95% CI.

A child's additional year of age reduced the likelihood of vaccination use by 28% (OR=0.72), adjusted by the child's gender, a variable that had a non-significant relationship, but it was included as a theoretically relevant variable at this stage.

Belonging to a family with eight or more people increased the child's possibility of vaccination use than for those who did not have such a large family, with the head-of-household's age and gender held constant (these two variables were not significant).

Children with a regular health care provider had greater odds of vaccination use than for those who did not have one. Also, living in the East Central or the South area was related to greater likelihood of vaccination service use, than living in the North or West South. On the contrary, when the head-of-household had four or more years of schooling, the child had 45% less likelihood of using these preventive services.

Other enabling variables that were not relevant (p>0.25) in the first phase of bivariate analyses were socioeconomic status, household income, migration from another city to Bogota, number of years of affiliation to the ARS and the existence of other health insurance for the child.

None of the variables related to the child's health was significantly related to vaccination use: head-

Table 3 - Regression models of vaccination use among insured children under six years of age.

	Model	Adjusted OR	95% CI
1	Child's age	0.72***	0.64-0.83
	Gender: male vs. female	1.08 (NS)	0.71-1.67
2	Family size: ≥8 persons	4.37**	1.01-18.89
	Head-of-household's age	0.99 (NS)	0.96-1.02
	Head-of-household's sex: male vs. female	1.16 (NS)	0.66-2.03
3	Regular care source	7.41***	2.76-19.87
	Head-of-household's years of schooling: ≥4	0.55**	0.31-1.00
	Residential area: East Centre/South vs. North/ West South	1.68**	1.04-2.71
4	Head-of-household's preventive attitude	0.96 (NS)	0.56-1.63
	Health status perception: Bad/regular vs. Good/very good	0.93 (NS)	0.48-1.80
	Child's illness in the last two weeks	1.61 (NS)	0.71-3.64
	Child's hospitalization in the last 12 months	0.73 (NS)	0.23-2.30
5	Index 1: Knowledge of schedules and requirements of PO	3.30***	1.52-7.17
	Index 2: Knowledge of schedules and requirements of ARS	0.69 (NS)	0.37-1.28
6	Index 1: Courtesy and overall quality of PO	0.70 (NS)	0.45-1.10
	Index 2: Requirement time and distances to ARS and PO	0.83 (NS)	0.58-1.19
7	ARS ownership type: For-profit vs. Non-profit	1.87**	0.99-3.52

Models 2-7 included the variable "child's age", which showed similar coefficients to the first model; therefore, it is not presented in the subsequent models
NS: Not significant; OR: odds ratio
*p<0.10
**Significant at p<0.05
***Significant at p<0.01

Table 4 - Final model of best fit for factors related to vaccination use among insured children under six years of age.

Variables	O.R.	P>z	95% CI
Child age	0.69	0.00	0.60-0.79
Family size: >8 persons	4.34	0.05	1.01-18.74
Head-of-household's years of schooling: >4	0.52	0.03	0.28-0.95
Regular care source	6.04	0.00	2.28-16.00
Residential area: Centre/South vs. North/ West South	1.74	0.03	1.07-2.83
ARS ownership type: For-profit vs. Non-profit	1.61	0.18	0.80-3.23
Index 1 (schedules and knowledge of provider organization)	2.12	0.04	1.04-4.32

of-household perception about the child's health status, child's history of disease during the last two weeks and hospitalization during the last year. The head-of-household's prevention attitude (measured by answering the question, "Without being ill, but for prevention purposes, do you visit the doctor or dentist at least once a year?") was not significantly related to vaccination use either.

Analyses of health care system knowledge scales indicated a significant relation to the first factor. When the head-of-household reported knowledge of the requirements and schedules of the PO, the possibility of the child's vaccination use increased. The second factor, related to information on the same aspects for the ARS, did not show any significant relationship.

Neither the head-of-household's satisfaction scale of courtesy in the PO and the head-of-household's perception of the overall quality nor the scale of satisfaction with the waiting times and the distances to the ARS and the PO were related to the child's vaccination use.

This model indicated a significant relationship with the type of insurer (for-profit and non-profit organization): the affiliation to some for-profit ARS increased the possibility of the vaccination use, adjusted for the child's age. The other health care system features were not relevant in the former bivariate analysis (p>0.25): provider type (public or private organization), distance in minutes to the ARS and to the PO, and waiting times for receiving care.

Finally, a multivariate model was developed to predict the child's vaccination use, including the characteristics of the health care system and the population characteristics, using a stepwise fitting. It was found a significant and inverse relationship between the child's age and the head-of-household's years of schooling: older children with parents with a relatively high educational level were less likely to use the vaccination service whereas the relationship was directly related to the family size, to living in the South and East Central area, to having a regular health care provider, and to knowing the schedules and requirements for accessing services (Table 4).

Nevertheless, when it was included the variables with no missing data (excluding head-of-household's educational level and knowledge about the health system) in the multivariate model, the type of ARS (for-profit versus non-profit organizations) acquired marginal relevance (p=0.12). Belonging to a for-profit ARS increased the possibility of a child's vaccination, adjusted for child age, family size, for having a regular health care source and for living area.

DISCUSSION

The study results suggest that, besides the group of population characteristics, such as child's age, head-of-household's educational level, family size and living area, another relevant group of vaccination use determinants also exists. These correspond to barriers and health care system factors, characteristics susceptible to intervention by national policies and local actions in the health system. These short- and midterm changing variables include a regular health care provider and information to those enrolled regarding the schedules and requirements for obtaining services at the PO.

These findings agree with the results of other studies, which have shown that, for insured populations, not having a regular physician is a strong predictor of delay in seeking care or not going to the physician's;[19] whereas having a regular care provider is an important factor for achieving continuity in health care.[10] Deficient information to the population regarding how the new Colombian health system is supposed to work or what benefits the poorest population has are difficulties also found in other research,[16] and these are factors that can limit service utilization.

Although, in the present study, the parent's attitude toward prevention services was measured only through a proxy variable, the absence of a relationship with vaccination use is in agreement with the results of another study that focused on these factors.[20] Even so, it is acknowledged that cultural factors and individual behavior are very complex aspects and that the effect of variables, such as social preferences and competing needs, require more extensive analysis.

Several studies on poor urban populations have also shown that sociodemographic factors and individual characteristics of the population, including their attitudes and beliefs, did not fully explain their vaccination use. Furthermore, these studies have emphasized the relevance of health care system features.[5] In the present study it is relevant that the type of ownership of the insurer organization is borderline-significantly related to vaccination use. This relationship has also been found in other studies in poor urban populations.[2,22]

The assumption is that the main goal of for-profit private organizations is profit maximization and, therefore, they may behave differently from non-profit enterprises. The latter have legal limitations regarding profit distribution and can be expected to pursue other non-monetary goals and perform more number of marginally profitable activities than their counterparts.[18] On the other hand, more private system promoters question the merits of public versus private health systems, emphasizing the value of competition and stronger incentives for efficient performance.

Nevertheless, the type of ownership is probably a feature that may be confused with other health system variables. For instance, other studies have emphasized that the provision of cost-free vaccination or the improvement of the financing mechanisms for obtaining health care services in poor populations (such as insurance with government resources) did not guarantee adequate immunization coverage. They emphasized that certain barriers in the health care system, including lack of flexibility in scheduling and long waiting times, may still remain.[3,8,9] In the present study these variables are probably not significant because of the limited number of observations found, due to the fact that these variables were based on the regular care provider and on the last visit to the PO for any reason.

Currently, there is a debate regarding the government's role and whether high-priority public health programs, such as childhood immunization, should be the subject of a trade-off in a market-oriented health system or whether they should persist with the characterization of a public service and be subject to regulation and provision by government organizations.

In general, although health service utilization is broadly studied, approaches that have dealt with the mediation of the health care delivery system features have been limited in their conceptual considerations and empirical analysis.[7] This deficiency is relevant in the current context, characterized by reforms which introduce health system models that involve changes in ideological concepts (free-market distribution justice), new forms of health care delivery organizations (public/private mix, introduction of third-party actors such as insurer companies and managed care models), and changes in financing (insurance, diverse payment mechanisms for providers).[11] These proposals demand critical reflection on the conceptual bases and analytic methods of the influence and performance of these changes in service use and in the health care service provision.

In conclusion, the study results suggest the influence of healthcare system characteristics, in particular, the provision of a regular health care source and the information to those enrolled on the schedules and requirements for obtaining services at the PO. These factors are susceptible to policy and action intervention within the health system. On the other hand, the study limitations, such as the fact that it is population-based, that is has a cross-sectional design and that it used a limited theoretical model of health care service utilization, left many questions unanswered.

Further investigation is required to fully evaluate the effect of the new insurance system on childhood vaccination in poor populations, an activity that has showed high cost-effectiveness for health systems. The increase in mortality and morbidity caused by vaccine-preventable diseases, such as outbreaks of pertussis and measles, as a result of the drop in vaccination rates in industrialized countries,[15] must alert all to the importance of a more in-depth analysis of the utilization of these services, the monitoring and improvement of the provision of these interventions in all health systems being reformed.

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