SOCIOECONOMIC DETERMINANTS OF USE OF ANTENATAL CARE SERVICES IN COLOMBIA: EXPLORING THE ROLE OF COMMUNITIES

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ABSTRACT

The majority of maternal deaths occur in developing countries, and they are due to preventable causes related to pregnancy and childbirth. Despite the efforts of the Colombian Government to improve maternal health care, it is reported that the country will not reach its Millennium Development Goal to reduce maternal mortality by 2015. We examined the association between individual and community-level factors and the number of antenatal visits received by women in Colombia. Using data from the 2010 Colombian Demographic and Health Survey (DHS) multilevel logistic models were conducted. Our findings suggest that in addition to the socioeconomic background of the mothers, there are important contextual factors that have an influence on receiving an optimum number of antenatal checkups; e.g. women's autonomy (OR=2.622), regional inequalities and the barriers of access caused by distances (OR=0.0606), costs of the services (OR=0.0364), and/or a lack of confidence in the doctors (OR=0.0465). Our results highlight the existence of inequities in accessing an adequate number of antenatal visits and highlight the importance of including the community context in designing more effective maternal care policies in Colombia. Moreover, our findings at the individual level – besides supporting the evidence found in other countries – offer new perspectives regarding the association between community-level factors and a woman's number of antenatal visits.

KEY WORDS: Antenatal care, communities, multilevel modeling, socioeconomic determinants, Colombia.

INTRODUCTION

According to the World Health Organization (WHO),[1] approximately 800 women die in the world everyday as the result of preventable causes related to pregnancies and childbirth. About 99% of this maternal mortality occurs in developing countries, where the most socially and economically disadvantaged communities are the most affected.

Although Colombia is a country with an upper-middle income (a gross national income of USD 8,315 per capita based on a constant 2005 purchasing power parity), it has one of the most unequal income distributions in the world (Gini index, 58.5).[2] Approximately 34% of its population lives in conditions of poverty and 11% in extreme poverty.[3]

In recent years Colombia has made important progress in matters of maternal and infant health. However, regional inequalities continue to be the country's principal challenge. In 2008, the WHO[4] estimated that Colombia was the fourth country in South America (after Bolivia, Peru and Paraguay) with respect to the highest rate of maternal mortality (85 deaths per 100,000 live births). According to the National Planning Department (DNP),[5] it is most likely that Colombia will not meet its Millennium Development Goal to reduce maternal mortality to 45 deaths per 100,000 live births by 2015.

One of the key factors that can contribute to reducing maternal and perinatal mortality is access to antenatal care services. These services permit detect in time complications that can arise during pregnancies or childbirth, as well as ensure that women have access to educational programs, vaccinations, diagnostic tests and treatment for infectious diseases.[6,7]

In Colombia antenatal care –insofar as it is an intervention of interest to the public health sector– is standardized.[8] All mothers have free access to it (Resolution 3384 of 2000); and the enterprises administering the subsidized and contributory health regimes [a] (EPS-S and EPS-C) have the responsibility of carrying out activities, procedures and interventions for stimulating their demand (Agreement 117 of 1998).

The Colombian Government has established the need to guide the actions for reducing maternal mortality toward the access and quality to the health programs, especially to those programs focused on the antenatal care. Likewise, it has been proposed reach 90% live

births with four or more antenatal visits, as proposed for the Millennium Development Goal, in 2015. Although, governmental initiatives/programs have been set up in order to tackle inequalities in the access to those programs, so far, not much is known about the effectiveness of these public health programs in Colombia and whether all socioeconomic groups do benefit from the program provision at the community-level.

Against this backdrop, the objective of this study is to examine the impact of socioeconomic factors –at both the individual and community levels– with respect to accessing four or more antenatal visits in Colombia. The benefits of this analysis are twofold: First, the effects of the surrounding context can contribute to the design of more effective policies by providing the identification of the appropriate level of intervention of these policies, and second, by reducing place-based inequalities in health.

This study differs from others that have been done for Colombia[9,10] so far, taking into account the hierarchical structure of the data and using multilevel modeling to analyze the relative contribution of the individual and contextual factors as predictors of antenatal care. In addition, it explores the role played by factors from the community context, which are not usually taken into consideration; e.g. the level of women's autonomy and cultural barriers of access, such as the lack of confidence in the doctors.

DATA AND METHODS

Data

The data used in the analyses were drawn from the 2010 Colombian Demographic and Health Survey (DHS). This survey has been conducted in Colombia every five years since 1990 by Profamilia, a non-profit private institution and the main provider of sexual and reproductive health services in the country. The survey has national coverage and is representative at the urban and rural levels, by departments, regions (Atlantic, Eastern, Bogotá, Central, Pacific and Amazon and Orinoco) and subregions.

The DHS sample was obtained by a stratified, multistage, cluster sampling design. The

sample included 51,447 households located in urban and rural areas of 258 municipalities. Within the municipalities, households with geographical proximity were grouped to form clusters with an average of 10 households. In this study these clusters represent the community-level where the respondents live. Taking into account that the questions related to antenatal care, childbirth and postpartum care were asked for only the last birth, the sample of eligible individuals for the analyses corresponds to 14,296 women. For all the variables included, the values *"don't know"* or *"missing"* were excluded from the study. Thus, our final sample included 12,373 women of childbearing age (14-49 years) who had one child born in the five years prior to the survey and who received antenatal care for the most recent birth and for which there is complete information.

Variables

- *Dependent variable*. We analyzed whether the mother received the optimum number (at least four) of antenatal visits according to WHO standards.

- *Explanatory variables*. Predictors of the receiving the optimum number of antenatal visits included a set of characteristics of the mother, her partner, the household and the community where they live.

Characteristics of the mother included (i) age, measured in years; (ii) occupation, consisting of three categories (*farming/unskilled labor*, *clerical/sales/services/skilled labor*, *professional/technical/manager*); (iii) living with partner or not; (iv) type of affiliation to the social security system in health, consisting of three categories (*not affiliated, affiliated to the subsidized regime and affiliated to the contributory regime*); (v) the order and the interval between her children's births, combined in just one variable with 5 categories (*first birth, 2nd-3rd in order and <2 years between, 2nd-3rd in order and >2 years between, 4th in order or more and <2 years between, and 4th in order or more and >2 years between*); (vi) a composite indicator of the level of the mother's autonomy, constructed from questions related to her decisions about her own health, household purchases, visits to relatives, use of partner's earnings, food to be cooked, her studies and sexual intercourse (vii) the mother's and her partner's educational levels (*no schooling, primary, secondary and higher education*).

The socioeconomic characteristics of the household included the number of children under the age of five and a composite index of the household's socioeconomic status (SES), constructed on the basis of characteristics of the dwelling (electricity, type of sanitary facilities, water source and material used in floors and walls) and ownership of durable goods (radio, television, refrigerator, car/truck and motorcycle).

The household's SES index and woman's autonomy index were constructed using polychoric principal components analysis (PCA).[11] The indices were rescaled to range from 0 to 1, where 1 indicates the maximum level of richness and level of autonomy, respectively.

Given the importance that the communities have for this study, we evaluated specific characteristics of the community context. The community variables were constructed as averages or proportions by aggregating individual-level information and using information from the total of mothers included in the full sample (53,521 women). In order to evaluate the socioeconomic characteristics of the community, we included the mean educational level of the mothers in the community, the mean level of the community's socioeconomic status, the mean level of the women's autonomy, whether they reside in an urban or rural area, and their region of residence (Atlantic, Central, Eastern, Pacific, Amazon and Orinoco, and Bogotá).

Lastly, to capture the effect of possible barriers to the access to services of antenatal care, we included the percentage of women in the community who stated that they had not accessed maternal-infant health services due to geographic barriers (the service is too far away), economic barriers (the costs of transportation and of the health service are very high), the services offered (they consider the service to be of poor quality) and cultural barriers (they do not trust the doctors).

Statistical Analysis: Multilevel Models

The role of the communities in determining whether a woman receives the optimal number of antenatal visits was examined using multilevel models. These models take into account

the hierarchical structure of the data and explore variances between and within the clusters. When there are hierarchical data (e.g. those of the DHS), the individuals from one cluster tend to be more similar among themselves than individuals from different groups. Thus the assumption of independence of the observations on which the standard statistical tests are based, is violated. Therefore, if the clustering is not taken into account, the standard errors will be underestimated, the confidence intervals will be much narrower, and the p-values much smaller, giving rise to numerous spurious significances.[12]

With the multilevel models, it is not only possible to obtain statistically efficient estimates of the regression coefficients, but also variables can be analyzed at different levels simultaneously.[13] When estimating the variance for each level, it is possible to differentiate between the proportion of variance that is due to characteristics of the individual-level in comparison to the contextual- (here: community) level.

In this study two-level logistic regression models with 12,373 women nested in 3,672 communities were estimated, taking into account the following general specification:

$$\log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_0 + \beta_1 X_{1ij} + \beta_2 Z_{2j} + u_j$$

Where π_{ij} is the probability of receiving four or more antenatal visits, X_{1ij} and Z_{2j} are the vectors of explanatory variables at the individual and community levels, respectively, β_0, β_1 and β_2 are the normally estimated regression coefficients, and u_j are the residuals at the community level, which it is assumed are normally distributed with mean zero and variance σ_u^2.

Lastly, it should be noted that the multilevel models presented here are not weighted by sample size. Like the majority of DHS, the sampling design of the survey for Colombia incorporates a weighting factor with the purpose of reducing the estimation bias due to the different selection probabilities. However, as many authors have argued for including the

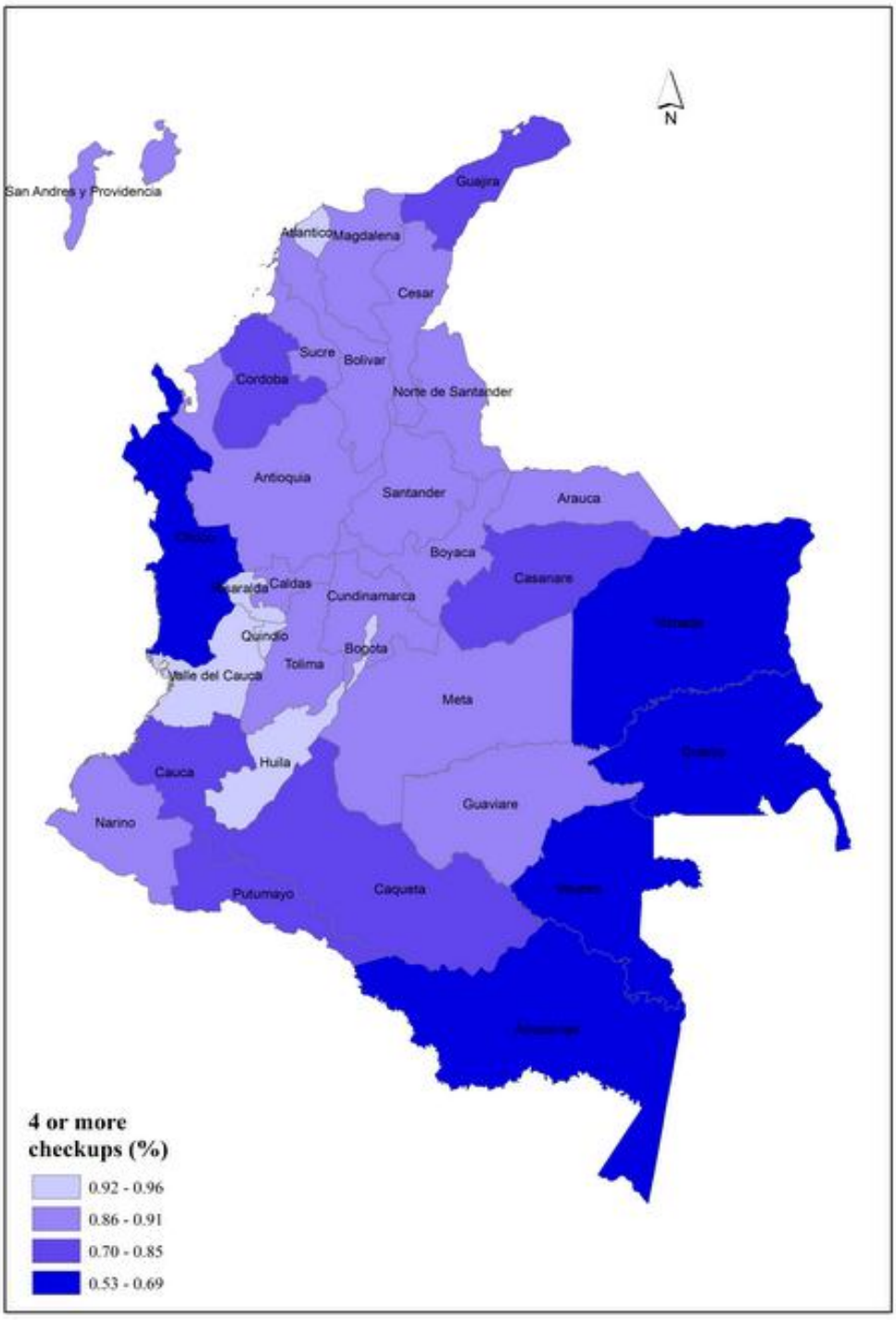
sampling weights in the context of the multilevel models, this is not simple; and the methods for doing so are still far from being developed.[14-16] To minimize this bias in the estimates, some authors have suggested controlling for variables relevant for the sampling design.[15] Therefore, our analyses included as explanatory variables the place of residence (urban-rural) and the region.

RESULTS

Descriptive Statistics

All the descriptive statistics were done using the command "svy" in Stata version 12. Figure 1 shows the percentage of women who received four or more antenatal visits per department. The map shows the great heterogeneity among the departments. While on average 90% of the women in Colombia reported having gone to at least 4 antenatal visits, this percentage by departments ranged from 53-96%. Women who reported less than the optimum number of visits resided in departments located in the periphery.

FIGURE 1. Proportion of women attending four or more antenatal checkups by department in Colombia (2010 DHS, N=12,373)*



*Compiled by authors

Table 1 presents the distribution percentages of women who attended to at least four antenatal visits by selected characteristics, such as education level and socioeconomic status. More than 90% of the women with secondary or higher education had the optimum number of antenatal visits, whereas only 62% of non-educated women had 4 or more check-ups. Women who do not work or who are dedicated to farming or unskilled labor activities had fewer antenatal visits as compared to those who had jobs that require greater skills. Almost all the women in the contributory regime (95%) had more than four antenatal visits. In terms of socioeconomic differences in the use of antenatal care, the descriptive findings showed that the percentage of mothers who had at least four antenatal visits increased with the educational level of their partners and their socioeconomic status. Further, there is a range of 24 percentage points between income quintiles. Differences were also observed between some regions, for example; in the capital of the country, 94% of the mothers had more than four antenatal visits versus 81% in the regions of the Amazon and the Orinoco.

Table 2 shows the descriptive statistics of the community variables. Great variability was observed among the communities, especially with respect to the barriers related to accessing the maternal-infant health services.

TABLE 1. Percentage distribution of women attending four or more antenatal checkups, according to selected characteristics (2010 Colombian DHS, N=12,373)

Variable	4 or more prenatal checkups
Mother's educational level	
No schooling	0.62
Primary	0.82
Secondary	0.92
Higher	0.97
Mother's occupation	
Not working	0.85
Farming/unskilled labor	0.82
Clerical/sales/services/skilled labor	0.91
Professional, technical, manager	0.98
Mother's health system affiliation	
None	0.85
Subsidized	0.87
Contributor	0.95
Child's birth order and length of preceding birth interval	
First birth	0.94
2nd-3rd and <2 years	0.80
2nd-3rd and >2 years	0.92
4th + and <2 years	0.71
4th + and >2 years	0.80
Mother living with partner	
No	0.88
Yes	0.91
Partner's educational level	
No schooling	0.73
Primary	0.85
Secondary	0.92
Higher	0.97
Household's socioeconomic status	
Very poor	0.72
Poor	0.86
Medium	0.90
Rich	0.94
Very rich	0.96
Place of residence	
Rural	0.83
Urban	0.93
Region	
Pacific	0.89
Atlantic	0.89
Eastern	0.89
Central	0.91
Bogotá	0.94
Amazon and Orinoco	0.81

TABLE 2. Descriptive statistics of community-level characteristics (2010 Colombian DHS, N=12,373)

	Mean (SD)	Min.	Max.
Mean years of mother's education	8.616 (2.38)	0.41	18.17
Mean level of socioeconomic status index	0.747 (0.16)	0.00	1.00
Mean level of women's autonomy	0.466 (0.11)	0.00	1.00
% women reporting no access to maternal-child health services because:			
service is too far	0.032 (0.079)	0.00	0.83
transportation is too expensive	0.019 (0.029)	0.00	0.83
service is of bad quality	0.010 (0.059)	0.00	0.33
service is too expensive	0.009 (0.028)	0.00	0.29
they do not trust doctors	0.008 (0.027)	0.00	0.33

Multilevel Logistic Regression Models

Table 3 shows the results of the multilevel logistic models for the optimum antenatal visits (four or more antenatal checkups). Three sequential models were estimated: (i) model 0 (null model), which does not include explanatory variables, observes the effects of the community-level on the propensity to use maternal health services; (ii) model 1, which controls for characteristics of the mother, her partner and the household; and (iii) model 3, in which the community variables are added. The models were fitted using the command "xtmelogit" in Stata version 12.

The null model shows that 34.7% of the variance in the probability of receiving antenatal checkups is due to differences between communities and thus, can be explained by characteristics of communities. When the individual and household characteristics (model 1) are included, this variance is reduced to more than half (Variance Partition Coefficient-VPC=16.8%). When the community variables are included (model 2), the variance is reduced to 7.1%.

Model 1 shows the effect of individual and household factors on the propensity to receive four or more checkups. The results show that older women with a higher educational level, more autonomy, who are affiliated to the health system, have more educated partners, and

live in households with a better socioeconomic status have a greater possibility of receiving the optimum antenatal visits. In contrast, as the number of children under five years increases in the household, the possibility of receiving the antenatal visits is reduced (odds ratio, OR=0.812). Similarly, mothers with more than one child are less likely to receive the optimum visits than those who have only one child. Compared with women who do not work, those who are dedicated to farming activities or unskilled labor have less possibility of receiving at least four antenatal visits (OR=0.660).

The community variables are included in model 2. The findings indicate that one of the variables with the most positive influence on the possibility of receiving the minimum number of visits recommended by WHO is a woman's average level of autonomy. To the extent that the average level of autonomy increases, the possibility of receiving optimum antenatal visits is 2.6 times greater.

Those who have the least possibility of accessing the optimum antenatal visits are those women who are in communities where there is a greater percentage of women who report not having access to maternal-infant health because the services are too far away (OR=0.0606), costs are very high (OR=0.0364), or they do not trust the doctors (OR=0.0465). On the other hand, except for the Orinoco and Amazon regions (OR=0.653), being in any of the other regions increases the possibility of having the minimum number of antenatal visits as compared with being in the Pacific region.

After including the contextual (community) factors, the effect of the individual and household variables remains significant, except for the woman's occupation. Moreover, when controlled for the characteristics of the community, the odds ratio (OR) of the socioeconomic status of the household is reduced significantly.

Lastly, we could not find a statistical significant association between access to optimum antenatal visits and community factors such as, community place of residence, community socioeconomic status, community maternal education and the proportion of women in the community who report not accessing antenatal visits because the transportation costs are very high or the services are of poor quality. At the level of the individual, there was no

association found for living with the partner and mothers´ occupation.

TABLE 3. Multilevel logistic regression models for attending four or more antenatal checkups, (2010 Colombian DHS, N=12,373)

	Model 0 null model OR [95% CI]	Model 1 individual OR [95% CI]		Model 2 Community OR [95% CI]	
Individual-level characteristics					
Age (years)		1.057***	[1.04,1.07]	1.054***	[1.04,1.07]
Age squared		0.997***	[1.00,1.00]	0.997***	[1.00,1.00]
Mother's educational level (ref = no education)					
Primary		1.568**	[1.16,2.11]	1.504**	[1.12,2.03]
Secondary		2.300***	[1.67,3.16]	2.052***	[1.49,2.83]
Higher		2.767***	[1.80,4.26]	2.469***	[1.60,3.81]
Mother's occupation (ref=not working)					
Farming/unskilled labor		0.660***	[0.71,1.98]	1.21	[0.73,2.02]
Clerical/sales/services/skilled labor		1.153	[0.98,1.36]	1.161	[0.99,1.37]
Professional/technical/manager		1.185	[0.53,0.82]	0.905	[0.73,1.13]
Health system affiliation (ref=no affiliation)					
Subsidized		1.530***	[1.28,1.83]	1.595***	[1.34,1.90]
Contributory		1.587***	[1.26,2.00]	1.604***	[1.28,2.01]
Mother's autonomy index		2.463***	[1.87,3.24]	2.055***	[1.55,2.73]
Child's birth order and preceding birth interval (ref=1st birth)					
2nd-3rd and <2 years		0.414***	[0.31,0.55]	0.396***	[0.30,0.52]
2nd-3rd and >2 years		0.592***	[0.49,0.72]	0.606***	[0.50,0.74]
4th + and <2 years		0.239***	[0.17,0.33]	0.238***	[0.17,0.33]
4th + and >2 years		0.302***	[0.23,0.39]	0.334***	[0.26,0.43]
Living with partner (ref =no)					
Yes		1.061	[0.90,1.25]	1.171	[1.00,1.38]
Partner's educational level (ref=no education)					
Primary		1.216	[0.94,1.57]	1.228	[0.95,1.58]
Secondary		1.372*	[1.05,1.80]	1.425**	[1.09,1.86]
Higher		1.638*	[1.12,2.39]	1.856**	[1.28,2.70]
Household's number of under-five children		0.812***	[0.75,0.88]	0.837***	[0.77,0.91]
Household's socioeconomic status (ref =very poor)					
Poor		1.846***	[1.56,2.18]	1.235*	[1.02,1.49]
Medium		2.820***	[2.32,3.42]	1.661***	[1.32,2.08]
Rich		3.924***	[3.19,4.82]	1.980***	[1.53,2.56]
Very rich		4.932***	[3.52,6.92]	2.466***	[1.69,3.60]
Community-level characteristics					
Mean years of mother's education				0.975	[0.93,1.02]
Mean level of socioeconomic status index				1.437	[0.74,2.80]
Mean level of women's autonomy				2.622**	[1.43,4.81]
Barrier access: ***Service is too far***				0.061***	[0.03,0.14]
Barrier access: ***Transportation too expensive***				1.124	[0.37,3.43]
Barrier access: ***Service of bad quality***				0.331	[0.06,1.69]
Barrier access: ***Service too expensive***				0.036***	[0.01,0.20]
Barrier access: ***Do not trust doctors***				0.046***	[0.01,0.23]
Place of residence (ref =rural)					
Urban				0.873	[0.73,1.04]
Region (ref = Pacific)					
Atlantic				1.825**	[1.25,2.66]
Eastern				1.164	[0.80,1.70]
Central				1.669**	[1.15,2.43]
Bogotá				1.467	[1.00,2.16]
Amazon and Orinoco				0.653*	[0.45,0.94]
Random effect variances					
Variance at community-level	1.751***	0.666***		0.253***	
Variance Partition Coefficient (VPC)	0.347	0.168		0.071	
Likelihood ratio test	ref	1367.49		380.22	

* p<0.05,** p<0.01, *** p<0.001

OR: odds ratio, 95% CI: confidence interval

VPC: measures the proportion of total variance that is due to differences between-communities $\sigma_u^2 / \sigma_e^2 + \sigma_u^2$

DISCUSSION

This analysis is the first study to our knowledge that investigates community effects on the use of antenatal care in Colombia. Moreover, it is the first study that addresses the role of woman's autonomy in the community as a determinant of the number of antenatal visits.

Among the different community factors that appear to be the most influential on the likelihood of receiving four antenatal visits is the average level of a woman's autonomy. The significance of this factor highlights the importance that the empowerment of women has –not only within the household but also in the community– because it permits the mothers to have a greater decision-making power with respect to their health and to benefit from the practices and attitudes of other women in the community. At the individual-level, our findings are consistent with those of other research studies that have found that when women are the ones who decide about their own medical care have higher probability of receiving professional antenatal attention.[9,17]

Similar to what is found in other developing countries,[17-20] we found in this study regional inequities in accessing the antenatal checkup services. Despite the fact that in the national aggregate it is foreseen that Colombia will reach 90% live births with four or more antenatal visits, as proposed for the Millennium Development Goal in 2015,[5] there are still territorial/regional inequities, primarily in the cases of the Pacific region and the Amazon and Orinoco region. In these regions a large part of their populations are inaccessible to the health services, both geographically and culturally[21], because their level of economic development is low, there is little presence of the Government, the environment is hostile, and there are a large number of ethnic minorities.[22,23]

The barriers of access due to distance also have a negative impact on the possibility of receiving an adequate number of antenatal visits. Similar results have been found in Cambodia[24] and Kenya.[20] In Indonesia a quantitative study showed that the distances and costs of transportation make the access to the antenatal services difficult, primarily in the rural zones.[25] Similar results were found in rural areas in Mali[26]. In Colombia, there was no

evidence of an association between transportation costs and access to antenatal visits; but our analysis showed other barriers that affect the access to antenatal checkups, such as the cost of the health services and the lack of confidence in the doctors.

In this research, as in other national[10] and international[20,24] studies, we did not find an association between the area of residence (urban-rural) and the number of antenatal visits. It is possible that the effect of place of residence is being captured by other variables like the household's socioeconomic position. Some authors have found a strong association between household's poverty[26] or neighborhood's poverty[29] and the lower possibility of accessing to antenatal checkups in rural areas in Mali and Haiti. For other countries, however, some studies have revealed that the likelihood of not receiving antenatal care or receiving fewer visits is higher in rural areas.[17,27,28]

Previous studies have shown an association between antenatal visits and the level of education in the community.[24] When we controlled for individual and contextual variables (Model 2), the community-level education was not significantly related to the outcome. However, we found a positive and statistically significant association with education in the community (unreported results), which only disappears when the mother's educational level is introduced into the model. These findings suggest that although the mean educational level in the community can have an influence on the possibility of receiving four or more antenatal visits, the most important determinant in Colombia is woman's own educational level.

The findings at the individual level are in line with findings from other international studies and for Colombia.[9,10,20,24,30] Characteristics such as older age of the mother, fewer children and a greater interval between them, higher educational levels, health coverage and a woman's greater autonomy turned out to be associated with a greater possibility of accessing optimum antenatal visits.

In an earlier study of Colombia,[10] the father's education was not related to the probability that women would have at least one antenatal checkup; however, we found that the mothers

with more educated partners had a greater possibility of receiving the optimum number of antenatal visits. Therefore, our findings are consistent with studies done in other countries.[17,24,30,31] Education provides a greater access to and knowledge of the adequate practices during pregnancies, strengthens the empowerment of women, and is associated with the level of income. In addition, more educated partners can be more efficient in the use of available information on maternal and child care as well as more persuasive about healthy practices ensuring safe motherhood.

Our results show that women who are dedicated to unskilled labor or to farming have less possibility of receiving antenatal checkups than those who do not work. However, this association loses statistical significance when we control for the community variables. Similar results were found in Nepal when controlling for socio-demographic characteristics.[27] In other studies conducted in Colombia, being employed was not a significant determinant of receiving antenatal checkups.[9]

Our results also corroborate those women who are poorer and disadvantaged socially and economically are the most vulnerable in terms of receiving an adequate number of antenatal visits, indicating a social gradient in the use of antenatal services. Findings for inequalities in the access or use of antenatal care have also been reported for metropolitan areas of European countries [32] and for developing countries.[29,30]

Limitations

Given that this study used household surveys, it is not exempt from the response bias, as the measures used to approximate the effect of the community in terms of barriers of access were constructed from the individuals' self-reports. We suggest that future research explores the possibility of including objective community variables. In addition, the cross-sectional nature of this study does not allow us establish causal relationships.

Our results highlight the importance of including the characteristics of the community for the design of more effective maternal care policies. However, after controlling for individual, household and community characteristics, we found that there was still

significant variance at the community level, which suggests that there are other factors that were not taken into account and that could be influencing the possibility of receiving at least four antenatal visits. For instance, socially accepted behaviors and practices that can affect maternal care, as well as levels violence and safety conditions where mothers live.

Conclusions

Despite the fact that Colombian regulations protect women by guaranteeing their right to antenatal care, the findings of this research reveal inequalities related to accessing at least four antenatal visits, highlighting the need to make an effort to improve monitoring of the mothers who begin the antenatal visits in order to guarantee their continuity. Likewise, the existence of barriers of access associated with the cost of the services is an indication that there are still problems in complying with the regulations.

The limited possibility of receiving at least four antenatal visits when the socioeconomic conditions at the individual and community levels are adverse is evidence of the lack of capacity of some groups in the population to access health services. Moreover, this has a negative impact –not only on the well-being of women but also on economic development of the country– given the harmful effect this can have on maternal morbi-mortality and perinatal mortality. Thus, in order to increase the capacities of the most vulnerable population of women, the government, through the different regional authorities, should work on improving some of the key social structural conditions such as education, the barriers of accessing the health system, and poverty.

This study provides evidence that Colombian mothers face inequalities in accessing an adequate number of antenatal visits and sheds light on policy elements that can be crucial in redressing this situation. Among these elements there is a need to:

- Include the characteristics of the community as a determinant of antenatal care in the design of maternal-infant health policies.
- Improve the monitoring carried out by the managing firms of the subsidized and

contributory health regimes of the mothers who begin the antenatal visits with the purpose of ensuring their continuity.

- Promote access to antenatal visits for the poorest women, who have lower educational levels and who live in the regions with the least economic development (peripheral region).
- Design strategies to bring the sexual and reproductive health services to the communities with the greater geographic and cultural barriers (Pacific region and the Amazon and Orinoco region).
- Promote programs designed to strengthen women's autonomy, taking into account the positive spillover effects that can be derived from the degree of autonomy of other women in the community.
- Target social expenditures to reduce the socioeconomic gaps among the regions.

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FOODNOTES

[a] The Colombian social security system in health, basically consists of two regimes: i) the contributory regime, which have access employees and people who can pay for it, and ii) the subsidized regime, which have access the lowest-income people who have been classified as such by the beneficiary identification system (SISBEN).