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Intraurban Differences in the Use of Ambulatory Health Services in a Large Brazilian City

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ABSTRACT *A major goal of health systems is to reduce inequities in access to services, that is, to ensure that health care is provided based on health needs rather than social or economic factors. This study aims to identify the determinants of health services utilization among adults in a large Brazilian city and intraurban disparities in health care use. We combine household survey data with census-derived classification of social vulnerability of each household's census tract. The dependent variable was utilization of physician services in the prior 12 months, and the independent variables included predisposing factors, health needs, enabling factors, and context. Prevalence ratios and 95% confidence intervals were estimated by the Hurdle regression model, which combined Poisson regression analysis of factors associated with any doctor visits (dichotomous variable) and zero-truncated negative binomial regression for the analysis of factors associated with the number of visits among those who had at least one. Results indicate that the use of health services was greater among women and increased with age, and was determined primarily by health needs and whether the individual had a regular doctor, even among those living in areas of the city with the worst socio-environmental indicators. The experience of Belo Horizonte may have implications for other world cities, particularly in the development and use of a comprehensive index to identify populations at risk and in order to guide expansion of primary health care services as a means of enhancing equity in health.*

KEYWORDS *Health services, Health care utilization, Brazil, Health equity*

INTRODUCTION

The reduction of inequities in the access to services is one of the major challenges for health systems.[1] Equity in access is present when health needs constitute the principal determinant of health care use, and there are no additional systematic

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differences among population groups in the use of health services due to non-health-related factors such as socioeconomic conditions.[2] Even in universal health systems, social differences in the consumption of health services are observed,[3] be they between or within countries.[4,5] For example, in the province of Ontario, Canada,[6] and in Dublin, Ireland,[7] individuals with low socioeconomic status tend to use more medical services. On the other hand, a study representative of the Spanish population showed that those with higher socioeconomic status utilize more health services, even when results were adjusted for health needs.[8] The degree of inequity can also depend on the type of service evaluated and may differ among primary, specialty, or hospital care.[9,10] Most existing studies were carried out in highly developed countries, and there are currently few studies on equity in the utilization of health service in middle- and low-income countries. The objective of this study is to contribute to knowledge about disparities in the use of health services and their determinants within such settings.

Brazil is a middle-income country with a gross national product of 1.6 billion dollars[11] and nearly 190 million inhabitants.[12] Brazil has a National Health System called the *Sistema Único de Saúde* (SUS), established at the end of the 1980s, that is universal, free, and comprehensive, with coverage encompassing everything from preventive services to organ transplantation.[13] For approximately two-thirds of the Brazilian population, this public system is the sole source of care, while higher income segments of the population also have coverage from voluntary private health plans.[14]

The SUS has a decentralized administrative model: the municipality is the smallest administrative unit, and is responsible for the planning and delivery of health services. The emphasis on decentralization of the healthcare system can create disparities in the pattern of use of health services, because cities and municipalities with greater resources and better organizational capacity can potentially offer services with broader coverage and better quality. But this is not always the case; in a study of a middle-sized city in the south of Brazil, richer individuals were found to use more health services, while in a study of the capital city of the same region, poorer individuals tended to use the most health services.[15]

Given the possibility that municipal-level management of healthcare services can impact healthcare inequalities, we investigated if intraurban disparities exist in the use of health services in one of the Brazil's largest municipalities located in the wealthy southeast region of the country.

MATERIALS AND METHODS

Study Area and Databases

This study was carried out in the municipality of Belo Horizonte, the capital of the state of Minas Gerais, located in southeastern Brazil. Belo Horizonte is one of Brazil's largest cities with close to 2.4 million inhabitants. Although it ranks as the municipality with the fourth largest gross domestic product and has a high Human Development Index (0.839), there are great disparities in the distribution of wealth, of education, and health status among its residents.[16]

Two data sources were used. The first was the Belo Horizonte Metropolitan Region Health Survey (*Inquérito de Saúde da Região Metropolitana de Belo Horizonte*, abbreviated ISBH in Portuguese), a household survey of adults aged 20 or older conducted between May and July of 2003. Subjects were selected by means

of a two-stage probabilistic cluster sample in which the census tract was the primary unit of selection, and the household was the sampling unit. The survey had a participation rate of 79%. For this study, only ISBH participants that resided in the municipality of Belo Horizonte (n=8,046 out of 13,701) were included because only those residents could be linked to the second data source described below. The ISBH was approved by the Ethics Committee of the Oswaldo Cruz Foundation in Minas Gerais. Further details are available in a prior publication.[17]

The second data source is the Health Vulnerability Index (HVI), which we view as a neighborhood-level indicator of social vulnerability. The HVI was created by the municipal government of Belo Horizonte to identify areas with the greatest health risks. The HVI is a census tract level indicator that uses data from the 2000 National Census and was calculated by applying different weights to its five components: (1) sanitation conditions (sewerage, water supply, and garbage removal/solid waste management); (2) household conditions (proportion of homes that are improvised and ratio of residents per dwelling); (3) educational attainment (illiteracy rate and percentage of heads of household with less than 4 years of formal education); (4) income (monthly income of the head of household); and (5) health and demographic conditions (mortality rate from cardiovascular diseases in the age range of 30 to 59 years, proportional mortality before age 70, mortality rate for children younger than 5 years of age, as well as the percentage of heads of household who are 10 to 19 years of age). Details of how the HVI is calculated are available in the original publication.[18] Using the value of the sum of the components of the HVI, census tracts were classified as areas with low, medium, and heightened vulnerability. We follow the definition of HVI strata as used in the municipality with areas of medium vulnerability (28% of the residential population) defined by the mean HVI plus or minus one-half (1/2) standard deviation. Below this range, areas were considered to be low vulnerability (28% of the population). Areas above the range were considered to be heightened vulnerability (34% of the population). All study participants' households were then geocoded by census tract and grouped according to the HVI of the census tract in which the household was located.

Study Variables

The dependent variable was the respondents' self-report of the number of outpatient doctor visits during the past 12 months. Independent variables were selected following a modified theoretical model proposed by Andersen[19] including: (1) factors which predisposed one to use health services (age, sex, education level, and presence of a spouse); (2) health needs (health status and health behaviors); (3) facilitating factors (enrollment in a private health plan and having a personal physician as a usual source of care); and (4) the HVI of the subject's residence. Education level was measured as having completed middle school (eight or more years of formal education) versus those who did not complete middle school. Poor health status was based on self-assessments of the number of the past 30 days spent in poor physical and/or mental health. Health-related behaviors included: current smoking, excessive consumption of alcoholic beverages in the past 30 days, daily intake of less than five portions of fruits and vegetable in the past 30 days, and insufficient leisure physical activity in the past 90 days. Current smokers had to have smoked at least 100 cigarettes during their lives and were still smoking on the day of the interview. Excessive consumption of alcoholic beverages was defined as the consumption of five or more doses of alcohol on a single occasion in the past 30 days. Insufficient physical activity was assigned to individuals who engaged in

physical activity of light or moderate intensity for 20–30 minutes fewer than three times per week. "Having a personal doctor" required an affirmative response to each of three questions: you have a doctor whose help you seek when you have a health problem; have you been seeing this doctor for at least 1 year; and can you name this physician. The last variable is the level of vulnerability of the residential area using the HVI.

Statistical Analysis

The statistical analysis first presents all variables stratified by the HVI that corresponds to the respondent's household. For categorical variables, Pearson chi-square tests were used to assess the association between each variable and the different HVI strata, and analysis of variance was used for continuous variables.

Given the interdependence among variables comprising indicators of health status and unhealthy behaviors, latent variables were created by means of principal components analysis to create a composite score for each domain.[20] The first score (termed "poor health status") included respondent's self-assessment of being in poor or very poor health and the number out of the past 30 days spent in poor mental and/or physical health. The "unhealthy behaviors" score included: whether the person was currently a smoker, excessive or binge drinking, and insufficient physical activity. The extracted scores were each divided into tertiles, with the top tertile (worst conditions) considered the exposure category compared to the bottom two tertiles combined, which serve as the reference category. All relevant interaction terms were tested, but only those statistically significant terms (HVI and gender) were retained in the final models.

Multivariate analysis of factors associated with doctor visits during the past year was carried out using the Hurdle regression model,[21] a two-stage approach which combines analysis of factors associated with having had any doctor visits (versus those who had no visits), followed by analysis of factors associated with the number of doctor visits among those who had had at least one. This model is estimated using Poisson regression to model the dichotomous outcome of having had any doctor visit and a zero-truncated negative binomial regression for the count outcome (number of visits among those who had at least one). For each stage, we report prevalence ratios and 95% confidence intervals. The first stage uses a Poisson (instead of a logit) model due to the fact that the prevalence of having at least one doctor visit is not a rare event.[22,23] Use of the Hurdle model is further justified because of the presence of numerous individuals who used no medical care in the past year and the small number of individuals who used a large amount of care. This overdispersion violates a key assumption of a single-stage Poisson model. An alternative, the zero-inflated Poisson (or zero-inflated negative binomial) model is also inappropriate for this analysis because the probability that an individual in the sample would not have any doctor visits during the past year is not a fixed characteristic of any specific group within the sample. Thus, the Hurdle model allows for separate estimates of the factors associated with any visit and the intensity of use.[24] All independent variables in the study were utilized in the model and included simultaneously in order to capture all elements of the Anderson access model. The final model was tested for multicollinearity by calculating variance inflation factors, which had a mean value of 2.32 indicating a very low level of collinearity. The value of the cross-product of the interaction between gender and HVI was calculated using the LINCOM command of Stata software, Version 11.0 (Stata Corporation. Stata Statistical Software Intercooled. Texas, USA: 2009). All

analyses were carried out using Stata's procedures for complex samples, and included probability weights, design effect and clustering within household.

RESULTS

Of the 8,046 adults eligible for inclusion in this study, 6,830 had complete data for all the variables and were included in the analysis. Excluded individuals were not systematically different from the rest of the sample in relation to age (mean=41.7 and 41.6, respectively, $p=0.690$) or sex (men 44.8% and 48.7%, respectively, $p=0.066$).

The mean age of the study participants was 41.7 (with a standard deviation of 21.3 years). There were slightly more women (55.3%), and the population exhibited low levels of education (only 10% completed eight or more years of formal schooling). Enrollment in a private health plan was reported by 44.2% of participants, 27.8% reported having a personal doctor, and 82.8% had had at least one doctor visit in the prior year. The mean number of doctor visits was 3.0 (95% confidence interval (CI), 2.9–3.2). These and other characteristics of the study participants are presented in Table 1.

The results of univariate analysis of the characteristics of study participants according to level of residential vulnerability are presented in Table 2, demonstrating statistically significant differences for all characteristics investigated, except gender and mean number of doctor visits. In general, those residing in areas of greater vulnerability were younger, had less formal education, had spouses, had poorer health status indicators, and less healthy habits. In addition, the residents of the most vulnerable areas were less likely to be enrolled in a private health plan, reported less access to a doctor who knew them, and had a greater proportion of

TABLE 1 Characteristics of participants of the study sample

Characteristics	Mean (95% CI) or percentage (95% CI)[a]
Mean age, years	41.7 (41.2–42.0)
Women, %	55.3 (54.3–56.2)
Formal education ≥8 years, %	10.0 (9.3–10.8)
Presence of a spouse (marriage or other consensual relationship), %	55.1 (53.8–56.5)
Number of the past 30 days spent in poor physical health, mean	1.2 (1.1–1.2)
Number of past 30 days spent in poor mental health, mean	0.8 (0.7–0.9)
Poor or very poor self-rated health, %	3.8 (3.3–4.3)
Current smokers, %	19.7 (18.6–20.7)
Excessive consumption of alcohol in the past 30 days,[b] %	32.0 (30.7–33.2)
Insufficient physical exercise in the past 90 days,[c] %	80.1 (79.0–81.2)
Number of the past 30 days consumed <5 daily portions of fruits and vegetables, %	95.8 (95.2–96.4)
Enrolled in a private health insurance plan, %	44.2 (42.9–45.4)
Has a personal doctor, %	27.8 (26.6–29.0)
No doctor visits during the past year, %	17.2 (16.2–18.2)
One or more doctor visits during the past year, %	82.8 (81.8–83.8)
Number of doctor visits during the past year, mean	3.0 (2.9–3.2)

[a]Estimates include probability weights and correct for the complex sample design
[b]Five or more drinks in a single day
[c]Leisure exercise for 20–30 min less than three times per week

TABLE 2 Characteristics of participants of the study sample by residential Health Vulnerability Index[a]

Characteristics	Residential Health Vulnerability Index[a]			
	Low (*N*=1,741)	Medium (*N*=3,177)	High (*N*=1,912)	
	Mean or % (95% CI)[b]	Mean or % (95% CI)[b]	Mean or % (95% CI)[b]	
Mean age, years	44.5 (43.6–45.3)	41.3 (40.7–41.9)	39.2 (38.5–40.0)	*
Women, %	55.7 (53.7–57.7)	55.5 (54.1–57.0)	54.3 (52.7–56.0)	
Formal education ≥8 years, %	5.1 (4.1–6.2)	13.1 (11.8–14.5)	11.3 (9.8–13.1)	*
Presence of a spouse (marriage or other relationship), %	50.4 (47.7–53.1)	55.1 (53.1–57.1)	59.4 (57.0–61.8)	*
Number of the past 30 days spent in poor physical health, mean	0.9 (0.7–1.0)	1.3 (1.2–1.5)	1.2 (1.0–1.4)	*
Number of past 30 days spent in poor mental health, mean	0.6 (0.4–0.7)	0.9 (0.8–1.0)	0.8 (0.7–1.0)	*
Self-assessment of health as poor or very poor, %	1.6 (1.0–2.2)	4.1 (3.3–4.8)	6.1 (4.8–7.3)	*
Current smoker, %	16.5 (14.6–18.4)	20.2 (18.6–21.7)	21.1 (19.1–23.1)	*
Excessive consumption of alcohol in the past 30 days,[c] %	36.2 (33.6–38.8)	32.3 (30.4–34.2)	25.8 (23.7–27.9)	*
Insufficient physical exercise in the past 90 days,[d] %	72.5 (70.1–74.9)	81.2 (79.6–82.8)	87.1 (85.5–88.7)	*
Number of the past 30 days consumed fewer than five daily portions of fruits and vegetables, %	91.6 (90.0–93.2)	96.9 (96.3–97.4)	98.6 (98.1–99.2)	*
Enrolled in a private health plan, %	71.4 (69.0–73.8)	39.8 (37.9–41.8)	20.9 (18.9–22.9)	*
Has a personal doctor, %	38.9 (36.4–41.6)	25.8 (24.1–27.5)	18.6 (16.7–20.5)	*
No doctor visits in the past year, %	13.4 (11.6–15.2)	17.5 (15.9–18.9)	20.5 (18.5–22.5)	*
One or more doctor visits in the past year, %	86.6 (84.8–88.4)	82.5 (81.0–84.0)	79.5 (77.5–81.5)	*
Number of doctor visits in the past year, mean	2.9 (2.7–3.1)	3.2 (2.9–3.4)	3.0 (2.8–3.3)	

[a]Strata (levels) defined according to the Health Vulnerability Index comprised of socio-demographic indicators (sanitation, habitation, education, income, and age of the head of household) and mortality (mortality rate for death from cardiovascular diseases in individuals aged 30 to 59 years, proportional deaths in those younger than 70 years, and the mortality rate for children under 5 years of age)

[b]Estimates include probability weights and correct for the complex sample design

[c]Five or more drinks in a single day

[d]Leisure exercise for 20–30 min less than three times per week

*p value<0.01 for differences among strata of vulnerability (chi-square test for differences among frequencies or analysis of variance for differences between means

individuals who had no doctor visits during the past year (13.4% in the areas of low vulnerability versus 20.5% in areas of high vulnerability). The mean number of doctor visits did not differ significantly according to the level of residential vulnerability: 2.9 (95% CI, 2.7–3.1) in the high risk areas, 3.2 (95% CI, 3.0–3.4) in the medium risk areas and 3.0 (2.8–3.3) in the low risk areas ($p=0.064$). The total number of doctor visits, however, was higher ($p<0.001$) among women (mean=3.8; 95% CI, 3.6–3.9) than among men (mean=2.2; 95% CI, 2.0–2.3) and among those enrolled in a private health plan (mean=3.4; 95% CI, 3.2–3.5) as compared to those who relied exclusively on the national (public) health system (mean=2.8; 95% CI, 2.6–3.0).

In Table 3, the results of the multivariate Hurdle analysis are presented. Women, older ages, having a spouse, having poorer health status, being enrolled in a private health plan, and having a personal physician were positively associated with having at least one doctor visit during the past year, while having less healthy behaviors or being a resident of an area of high vulnerability increased the likelihood of having no doctor visits during the past year. Educational attainment and residing in an area of medium vulnerability were not associated with having had a medical consultation. The interaction between sex and residential vulnerability was significant: women who lived in areas of medium and high vulnerability were more likely than women living in low-vulnerability areas to have had at least one doctor visit (combined OR for the interaction was 1.10 and 1.19, respectively).

As a rule, most factors mentioned above had stronger associations with the number of doctor visits than with the binary indicator of any doctor visit. Thus, larger positive associations with the intensity of use of health services were observed for women, older ages, poorer health status, and having a personal doctor, while a stronger negative association was observed for those in the highest tertile of the unhealthy behaviors score. Having a spouse, enrollment in a private health plan, and the vulnerability of the residential area, which had been significantly associated with any doctor visit, were not significantly associated with the number of visits among those who had at least one. Educational attainment was negatively associated with the number of physician visits.

DISCUSSION

This study examined the factors associated with the use of healthcare in a large Brazilian city with the objective of discerning which factors affect the use of health services and their intensity. The findings showed that some inequalities exist in health service utilization, but that the groups traditionally considered most disadvantaged were not always those who had the worst access: women and the elderly had the greatest predisposition to visit a doctor, but educational level was not a significant predictor of use. Instead, health needs appear to be among the most important factors determining the use and intensity of doctor visits. Being enrolled in a private health insurance plan and being able to identify a doctor as a usual source of care also influenced the use of services, while the number of doctor visits was not associated with access to private insurance. The Hurdle model was able to show that many of the factors associated with any use differed from those associated with greater subsequent utilization.

If one of the principal objectives of health policy is a reduction of inequities, then health systems need to promote horizontal equity: the principal that individuals with the same health needs have the same level of access to health care, independent of their socioeconomic status, geographic location, or other non-health-related

TABLE 3 Multivariate analysis of the factors associated with utilization of medical consultations, using the Hurdle regression model, based on Poisson and zero-truncated negative binomial regression

	Factors associated with having had at least one doctor visit (yes or no)	Factors associated with the number of doctor visits among those who reported having at least one.
	RP (95% CI)	RP (95% CI)
Predisposing factors		
Gender: female (vs. male)	1.07 (1.03–1.11)***	1.39 (1.13–1.71)**
Age (in 5-year intervals)	1.01 (1.01–1.02)***	1.04 (1.02–1.06)***
Formal education ≥8 years (vs. ≤8 years)	0.98 (0.94–1.02)	0.84 (0.71–0.99)*
Presence of a spouse (vs. absence)	1.08 (1.05–1.10)***	1.04 (0.93–1.16)
Health needs		
Poor health status (highest tertile vs. lowest 2 tertiles[a])	1.03 (1.02–1.03)***	1.36 (1.30–1.41)***
Unhealthy behaviors[b] (highest tertile vs. lower 2 tertiles)	0.98 (0.97–0.99)**	0.91 (0.87–0.96)***
Facilitating factors		
Enrolled in a private heath insurance plan (vs. not enrolled)	1.14 (1.11–1.17)***	1.06 (0.93–1.20)
Has a personal physician (vs. not)	1.13 (1.11–1.16)***	2.11 (1.88–2.37)***
Level of residential vulnerability[c] (vs. lowest)		
Medium	0.95 (0.90–1.00)	1.20 (0.96–1.50)
High	0.91 (0.85–0.97)***	1.21 (0.90–1.63)***
Medium* gender	1.10 (1.05–1.16)***	1.13 (0.86–1.47)
High* gender	1.19 (1.11–1.27)***	1.17 (0.85–1.62)

PR (CI 95%): prevalence rations and 95% confidence intervals simultaneously adjusted for as variables listed in the column and estimated by means of the Hurdel Regression Model using the Poisson regression for the variable "utilization of consultations" and negative binomial regression with zeros truncated for the variable "number of consultations among those who had at least one consultation", estimates include probability weights and correct for the complex sample design

[a]Latent variable estimated by Principal Component Analysis considering the number of days in which physical and/or mental health were not good and self-rated health classified as poor or very poor. The highest tertile superior indicates the worst health status

[b]Latent variable estimated by Principal Component Analysis considering current smoking, insufficient physical exercise, excessive consumption of alcohol, and consumption of fewer than five portions of fruits and vegetables per day. The highest tertile indicates the worst health-related behaviors

[c]Based on the Health Vulnerability Index of the area of residence: The Index is comprised of socio-demographic indicators (sanitation, habitation, education, income, and age of the head of household) and mortality (mortality rate for death from cardiovascular diseases in individuals aged 30 to 59 years, proportional deaths in those younger than 70 years, and the mortality rate for children under 5 years of age)

*$p<0.05$, **$p<0.01$, ***$p<0.000$ (Wald Test)

factors.[3] Various international studies have evaluated healthcare inequities by comparing health needs with the use of health services. Analysis of population surveys conducted in Canada evaluated utilization trends from 1978 to 2003, and concluded that people with worse health status generally had more doctor visits than healthy individuals, and that those who were poor and had less education were less likely to have had any doctor visits overall. The poor who did gain access had a greater number of doctor visits once they initiated care.[25] A study based on Netherlands Health Interview Surveys (1990–1998) showed that lower socio-economic groups use more healthcare services partly because they suffer from more illnesses.[26] Another study used data from a sample of Spanish subjects and

concluded that there is inequity in GP visits favoring the lower socioeconomic groups, probably representing an overuse of public healthcare services.[27]

In the present study, residents of disadvantaged areas had more health needs and fewer facilitating factors for the use of health services. This was to be expected, given the nature of the HVI used to assess the level of area vulnerability. Even so, as with other international studies, after adjusting for health needs and other factors, education level (our main measure of socioeconomic status) was not associated with getting an initial doctor visit; moreover, among those who had one or more doctor visits, those with the highest levels of education had lower utilization rates.

The HVI measure of the local environment was associated with initial doctor visits: residents of areas with the highest level of vulnerability had more difficulty in obtaining it, but once they accessed care, characteristics of the area of residence were not associated with the intensity of healthcare utilization. One possible explanation for this discrepancy might be socioeconomic differences in the use of preventive and routine care, which might be lower in populations living in poorer areas. It has been argued elsewhere that the use of preventive services is more associated with predisposing and enabling factors, while the use of curative services is more associated with health needs.[28] If multiple doctor visits are an indicator of health need, then those who live in vulnerable areas and who have the highest health needs are the ones who actually use health services most frequently—a potential indicator of horizontal equity, which seems to be in the process of expanding in the municipality under study. Furthermore, some health services are strongly associated with ability to pay, such as dental services.[29] However, the ability to pay is not an issue for the type of medical care discussed here since public services are available to all Brazilian citizens free of charge, and the public system is used exclusively by over two-thirds of the population.

Among the predisposing factors for the use of health services considered in this study, age and female gender were independently associated both with obtaining an initial consultation and the number of doctor visits. The association of age with greater utilization of services is widely known[30] and is explained at least in part by increased prevalence and incidence of chronic diseases at older ages, an association that persisted even after adjusting for health needs. Women used more health services than men, which is an observation consistent with other studies.[31] In the present study, women were more likely than men to have had at least one doctor visit and much more likely to have greater overall levels of utilization. One intriguing observation was the existence of an interaction between gender and the use of health services in areas of medium and high vulnerability, indicating that women living in disadvantaged areas were more likely than men to overcome barriers to obtaining at least one yearly doctor visit. The explanations for this finding are not obvious, and further investigations are necessary for a better understanding of these trends. The finding that those who were married or living with someone were more likely users of services—perhaps due to greater social support—is observed in other Brazilian studies.[32,33]

As expected, the component of health needs most strongly associated with the utilization of services was poorer health status, given that those who considered themselves to be in the worst mental and physical health had 36% more doctor visits then those in the best health. In addition, adults with less healthy behaviors consulted a doctor less often in the prior year and, among those who had initial contact with services, the intensity of consultations was lower. These results are consistent with studies carried out in other countries[5] and in the south of Brazil,[34]

demonstrating a relationship—usually inverse—between these unhealthy behaviors and the use of health services. This is a worrisome situation, because in addition to being more frequently exposed to situations that are harmful to health, these individuals are less likely to receive health promotion education and advice since they access care less frequently.

One of the principal findings of this study was the strong relationship between having a regular doctor and having had a doctor visit in the past year, demonstrating that this, in fact, is a facilitating factor for utilization. It is known that having a personal physician tends to generate greater utilization because the professional encourages routine and follow-up visits.[35] This association may be explained by the fact that this variable is also measuring unobserved needs. For example, people who are in need of care are more likely to seek it out and are thus more likely to have contact and identify with a specific family doctor. On the other hand, people without a regular doctor may not have one because of limited availability, which would then reduce their likelihood of visiting a doctor. Despite these possible explanations, this finding suggests that health policies and models of organizing services that foster the doctor–patient relationship can have a positive effect on the healthcare system in terms of equity and improved access.

This study has strengths and limitations. Its principal strength is the large population base of the study, which is representative of all the adult residents of one of Brazil's largest cities. The large sample size permits identification of intraurban differences in health status and in the distribution of predisposing factors influencing the use of health services, as well as examination of the influence of these factors on the use of health services.

On the other hand, the principal limitation of this study is its cross-sectional nature, which does not permit the analysis of temporal relationships between the independent variables and the use of health services. Nevertheless, it is unlikely that the results presented here are due to reverse causation, as it is probably not reasonable to assume that the use of health services has led to worse health conditions or worse health behaviors as measured in this study. To further protect against this possibility, we did not include the presence of chronic disease as an indicator of health status, although this information was available in the database. It was not incorporated into the health needs index because morbidity attributed to chronic diseases is based on previous medical diagnosis, and this information is influenced by the use of health services, or in other words, the greater the utilization, the greater the probability of diagnosis.[36] Health needs were measured by general health conditions, and some residual confounding is a possibility that cannot be excluded. In this case, our results are likely to err on the side of being more conservative. Finally, this study was based on the number of doctor visits and did not include measures of quality, the reason for the visit, or whether the visit resulted in resolving the health problem for which the patient sought care. We were not able to differentiate between access to different types of outpatient services, and use of hospital services (which might show a very different pattern) were not available for analysis. Another factor only partially addressed in this study is the question of supply. Demand for services is not always translated into utilization because it depends on other factors such as the availability of services (hours of operation and transportation), the interpersonal communication style of the healthcare personnel, and the ability of an individual to navigate the healthcare system.[37] These themes will be addressed in future publications.

CONCLUSION

In conclusion, the findings of this study demonstrate that in the municipality of Belo Horizonte, the greatest utilization of health services occurred among women and the elderly and was determined primarily by health needs and having a doctor who knew the patient, even among residents of areas of the city with the worst socio-environmental indicators. Some of these conclusions may be due to the fact that the organization of public healthcare services in this municipality has prioritized primary health care, and that planners have used the HVI to not only identify but also prioritize investments in primary care expansion to areas of the city with the worst access to care and the greatest concentration of social vulnerability.[38] In this context, the experience of Belo Horizonte may have implications for other world cities, particularly in the development and use of a comprehensive index to identify populations at risk and using this index to prioritize healthcare investments (particularly in the area of primary health care) towards areas of highest socio-environmental risk as a means of enhancing equity in health. Before such lessons can be transferred to other settings, however, further studies are needed to explore whether expansion of primary health care has indeed taken place in the most vulnerable areas, and whether such investments have actually improved the quality of services and their impact on health outcomes among vulnerable populations.

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