

Alexandre Dias Porto  
Chiavegatto Filho<sup>I</sup>

Yuan-Pang Wang<sup>II</sup>

Ana Maria Malik<sup>III</sup>

Julia Takaoka<sup>III</sup>

Maria Carmen Viana<sup>IV</sup>

Laura Helena Andrade<sup>II</sup>

# Determinants of the use of health care services: multilevel analysis in the Metropolitan Region of Sao Paulo

## Determinantes do uso de serviços de saúde: análise multinível da Região Metropolitana de São Paulo

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### ABSTRACT

**OBJECTIVE:** To evaluate the individual and contextual determinants of the use of health care services in the metropolitan region of Sao Paulo.

**METHODS:** Data from the Sao Paulo Megacity study – the Brazilian version of the World Mental Health Survey multicenter study – were used. A total of 3,588 adults living in 69 neighborhoods in the metropolitan region of Sao Paulo, SP, Southeastern Brazil, including 38 municipalities and 31 neighboring districts, were selected using multistratified sampling of the non-institutionalized population. Multilevel Bayesian logistic models were adjusted to identify the individual and contextual determinants of the use of health care services in the past 12 months and presence of a regular physician for routine care.

**RESULTS:** The contextual characteristics of the place of residence (income inequality, violence, and median income) showed no significant correlation ( $p > 0.05$ ) with the use of health care services or with the presence of a regular physician for routine care. The only exception was the negative correlation between living in areas with high income inequality and presence of a regular physician (OR: 0.77; 95%CI 0.60;0.99) after controlling for individual characteristics. The study revealed a strong and consistent correlation between individual characteristics (mainly education and possession of health insurance), use of health care services, and presence of a regular physician. Presence of chronic and mental illnesses was strongly correlated with the use of health care services in the past year (regardless of the individual characteristics) but not with the presence of a regular physician.

**CONCLUSIONS:** Individual characteristics including higher education and possession of health insurance were important determinants of the use of health care services in the metropolitan area of Sao Paulo. A better understanding of these determinants is essential for the development of public policies that promote equitable use of health care services.

**DESCRIPTORS:** Health Services, utilization. Health Services Accessibility. Health Inequalities. Social Conditions. Social Inequity. Metropolitan Zones. Multilevel Analysis.

<sup>I</sup> Departamento de Epidemiologia. Faculdade de Saúde Pública. Universidade de São Paulo. São Paulo, SP, Brasil

<sup>II</sup> Instituto de Psiquiatria. Faculdade de Medicina. Universidade de São Paulo. São Paulo, SP, Brasil

<sup>III</sup> Departamento de Administração. Escola de Administração de Empresas de São Paulo. Fundação Getúlio Vargas. São Paulo, SP, Brasil

<sup>IV</sup> Departamento de Medicina Social. Universidade Federal do Espírito Santo. Vitória, ES, Brasil

#### Correspondence:

Alexandre Dias Porto Chiavegatto Filho  
Faculdade de Saúde Pública – USP  
Av. Dr. Arnaldo, 715 Consolação  
01255-000 São Paulo, SP, Brasil  
E-mail: alexdiasporto@usp.br

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## RESUMO

**OBJETIVO:** Analisar os determinantes individuais e contextuais do uso de serviços de saúde na Região Metropolitana de São Paulo.

**MÉTODOS:** Foram utilizados os dados do estudo *São Paulo Megacity*, a versão brasileira da pesquisa multicêntrica *World Mental Health Survey*. Foram analisados 3.588 indivíduos adultos residentes em 69 áreas da Região Metropolitana de São Paulo, SP (38 municípios adjacentes e 31 subprefeituras do município de São Paulo), selecionados por meio de amostragem multiestratificada da população não institucionalizada. Foram ajustados modelos multinível logísticos Bayesianos para identificar os determinantes individuais e contextuais do uso de serviços de saúde nos últimos 12 meses e a presença de médico de referência para cuidados de rotina.

**RESULTADOS:** As características contextuais do local de residência (desigualdade de renda, violência e renda mediana) não apresentaram associação significativa ( $p > 0,05$ ) com o uso de serviços ou com a presença de médico de referência para cuidados de rotina. A única exceção foi a associação negativa entre residir em uma área com alta desigualdade de renda e a presença de médico de referência (OR 0,77; IC95% 0,60;0,99) após controle das características individuais. O estudo apontou uma forte e consistente associação entre algumas características individuais (principalmente escolaridade e presença de plano de saúde) com o uso de serviços de saúde e ter médico de referência. A presença de doenças crônicas e mentais associou-se fortemente com o uso de serviços no último ano (independentemente de características individuais), mas não com a presença de médico de referência.

**CONCLUSÕES:** Características individuais como maior escolaridade e ter plano de saúde foram determinantes importantes do uso de serviços de saúde na Região Metropolitana de São Paulo. A melhor compreensão desses determinantes é necessária para o desenvolvimento de políticas públicas que permitam o uso equitativo dos serviços de saúde.

**DESCRITORES:** Serviços de Saúde, utilização. Acesso aos Serviços de Saúde. Desigualdades em Saúde. Condições Sociais. Iniquidade Social. Zonas Metropolitanas. Análise Multinível.

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## INTRODUCTION

The Brazilian Unified Health System (SUS), established in 1988, was designed to be a decentralized system with an emphasis on community services, including the *Estratégia Saúde da Família* (ESF – Family Health Strategy). At present, SUS suffers from underfunding and lack of trained personnel, particularly in disadvantaged areas, and this has been limiting the equitable access of poor population groups to health care units.<sup>5</sup> On the other hand, increased use of health care services is observed in regions with better socioeconomic conditions, particularly for services related to specialized medical care provided by private health plans.<sup>2</sup>

The unequal use of health care services can affect the society as a whole. The systematic exclusion of population groups from health care services can lead to

the emergence and dissemination of new diseases, as observed in cases of limited access to immunization schemes.<sup>3</sup> Therefore, a study of the determinants of the use of health care services is essential for identification of population groups with no or limited access to these services and can help develop public health policies.

Previous studies have analyzed the individual determinants of the use of health care services and have identified historically excluded groups, including low-income, poorly educated, and immigrant groups.<sup>10</sup> However, the determinants of health and access to health care services are not restricted to individual factors. Multilevel analyses that evaluate the contextual determinants of the use of health care services are also necessary to better understand the complex network of

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<sup>a</sup> United States. Department of Health and Human Services. National healthcare disparities report 2011. Rockville (MD): AHRQ Publications; 2012.

access to these services. However, few Brazilian studies have addressed these topics.<sup>21</sup>

Other Brazilian studies have identified some individual determinants of access to health care services. An analysis of the use of dental care services indicated that wealthier individuals consulted dentists 2.8 times more often than poorer individuals in the past 12 months.<sup>4</sup> A study involving older people living in the municipality of Sao Paulo concluded that possession of health insurance was a determining factor for the use of health care services.<sup>16</sup> Another study analyzed data from the *Pesquisa Nacional de Amostragem de Domicilios* (PNAD – National Household Survey) and reported that the use of health care services was 1.8 times higher among patients with chronic diseases.<sup>1</sup>

Individual income (ability to pay for health care services) is often cited as the main factor involved in access to health care services in the international literature, particularly in the United States.<sup>b</sup> Studies conducted in countries with universal access to health services have helped to identify contextual factors that influence the use of health care services using a multilevel methodology. A study conducted in Canada revealed that the use of mental health services was higher among individuals with mental illnesses living in districts with better socioeconomic conditions.<sup>18</sup> Furthermore, a French study showed that residents of the richest areas use health care services more often, even after adjustments for individual characteristics.<sup>6</sup>

The place of residence can affect the use of health care services for several reasons. The geographical distribution and local availability of health care units can create barriers to the use of health services, and a short walking distance to health units is a good predictor of their use.<sup>17</sup> In addition, other studies have shown the importance of social capital (community participation and social cohesion). More equalitarian neighborhoods and those with less violence have greater social capital, which is associated with increased use of health services,<sup>13</sup> possibly because of the better information network on health care systems available for the local population. Another hypothesis is that individuals who live in neighborhoods with worse socioeconomic conditions have more health problems because of pollution and violence and therefore are more likely to use health services.<sup>23</sup>

The presumed universality of access and the known social inequality allow for interesting opportunities for analysis of the contextual determinants of the use of health services in Brazil, particularly with regard to

income inequality and violence, in which the Brazilian indicators are consistently worse compared with other developed countries.<sup>c</sup> Previous studies have indicated the contextual importance of income inequality and violence on the health of residents of Sao Paulo,<sup>7,8</sup> and this should stimulate an analysis of the use of health care services as a possible mediator of the correlation between contextual factors and health.

The aim of this study was to analyze the prevalence and factors associated with the use of health services by adults.

## METHODS

We analyzed the results of the Sao Paulo Megacity study (Andrade et al<sup>3</sup>).<sup>d</sup> The research was based on questionnaires given to a representative sample of the population aged  $\geq 18$  years living in the metropolitan region of Sao Paulo (MRSP), composed of the municipality of Sao Paulo (11,104,715 residents in 2007) and its 38 neighboring districts (8,844,543 residents).

Respondents were selected using multistratified sampling of the non-institutionalized population in the MRSP, comprising six distinct selection stages. The initial objective was to identify 5,000 households.<sup>22</sup> The questionnaires were administered between May 2005 and May 2007 by trained interviewers. The initial study population consisted of 5,037 individuals (response rate: 81.3%). Of these, 37 (0.7%) were excluded because of difficulties to identify the place of residence. Only subjects who lived in the same location for more than 5 years were included to avoid the misconception that the place of origin has immediate effect on the health and behavior of individuals.<sup>11</sup> A total of 3,588 individuals were included in the final analysis.

The questionnaires were administered during home visits with the support and supervision of the responsible academic staff. The collection instrument used was the Composite International Diagnostic Interview (WMH-CIDI) translated and adapted to Portuguese.<sup>15</sup> Use of health care services was analyzed by calculating the number of consultations with health professionals in the past 12 months, dichotomized between 0 and  $\geq 1$  owing to the distribution asymmetry, i.e., high frequency of zero values. Presence of a regular physician for routine care was analyzed by answering the following question: “Do you have a physician who you usually consult when you need routine care?”. The following individual variables were included in the multilevel models: age, gender, individual income (by tertiles because of non-linearity), and education

<sup>b</sup> Clements B, Coady D, Gupta S. The economics of public health care reform in advanced and emerging economies. Washington (DC): International Monetary Fund Publications; 2012.

<sup>c</sup> The World Bank. Data by country. Washington (DC); 2013 [cited 2013 Nov 1]. Available from: <http://data.worldbank.org/country>

<sup>d</sup> This study is the Brazilian part of the World Mental Health Survey multicenter initiative, which began in 2001, involves 28 countries, and is coordinated by the World Health Organization (WHO). It was conducted in Brazil by the Psychiatric Epidemiology Center of the *Instituto de Psiquiatria* of the *Hospital das Clínicas* of the *Faculdade de Medicina* of the *Universidade de São Paulo*.

(primary, high school, and higher education). Presence of chronic diseases in the past 12 months was evaluated, and each disease was assessed on an individual basis. The most prevalent diseases considered for analysis were as follows: cardiovascular diseases (heart attack, heart disease, hypertension, stroke), respiratory diseases (allergies, asthma, chronic obstructive pulmonary disease, and emphysema), and migraine. Major depression and anxiety disorders (panic disorder, agoraphobia, simple phobia, social phobia, generalized anxiety disorder, obsessive compulsive disorder, post-traumatic stress disorder, and separation anxiety) were the most prevalent mental illnesses in the initial study, identified using the WMH-CIDI questionnaire according to the operational criteria established by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)<sup>15</sup> in the last 12 months.

The second level of the multilevel analysis included 38 adjacent districts (average of 232,751 residents in 2007) in the MRSP in addition to the municipality of Sao Paulo (MSP), divided according to its 31 neighborhoods (average of 355,467 residents), totaling 69 areas. Median income, level of income inequality (measured by the Gini index), and level of violence (using the homicide rate adjusted for age as proxy) in each of the 69 neighborhoods were calculated using data from the Brazilian Institute of Geography and Statistics (IBGE) Census of 2010<sup>e</sup> and from *Departamento de Informática do SUS* (DATASUS – Department of Informatics of SUS).<sup>f</sup>

Multilevel Bayesian logistic models were adjusted using individuals as the first level and place of residence (municipality or districts) as the second level. Bayesian inference was adopted using the Markov Chain Monte Carlo (MCMC) method because of its effect on the decrease of bias in the multilevel logistic models.<sup>20</sup> It also allowed calculation of the deviance information criterion (DIC) to test the model fit (goodness-of-fit), in which lower values indicate better fit.

The multilevel models were calculated separately for the two dependent variables: use of health care services in the past 12 months and presence of a regular physician for routine care. The models were initially adjusted without inclusion of the independent variables (null model) to test the initial variance attributable to the place of residence. Subsequently, the models were adjusted using the individual variables and contextual variables. After the model with the best fit (lower DIC) was identified, the most prevalent chronic diseases (cardiovascular diseases, respiratory diseases, and

migraine) and mental diseases (anxiety disorder and major depression) were included.

MLwiN 2.25 software, specialized in multilevel analyses, was used for statistical analysis. The models were adjusted using least squares generalized for the distribution values. The first 500 simulations were discarded as burn-ins, followed by 10,000 new iterations. Median odds ratios (MOR) were calculated to assess the percentage of variance attributable to the place of residence (second level of the model).

## RESULTS

The final study group consisted of 3,588 individuals. Of these, 56.3% were women, 84.0% were under 60 years, 14.9% had complete or incomplete higher education, and 41.4% reported having health insurance (Table 1).

More than 80.0% of the individuals reported at least one medical visit in the previous year. Simple logistic regression analysis indicated that women, individuals above 60 years of age, those with health insurance, those having higher education, and those with higher income were more likely ( $p < 0.05$ ) to have consulted a physician in the past year. On the other hand, individuals living in regions with high violence were less likely to have consulted in the past year.

In addition, 47.4% of the individuals reported having a regular physician for routine care. Simple logistic regression analysis also indicated that the correlation was statistically significant for women, individuals belonging to older age groups, those with higher education, those with health insurance, those with average individual income, and those living in areas with high median income and low violence. Presence of a physician for routine care was strongly correlated with possession of health insurance. In addition, 69.8% individuals with health insurance reported having a regular physician in contrast with 31.6% individuals without health insurance.

Table 2 presents the multilevel models for the individual and contextual determinants of the use of health care services in the past 12 months. In the null model, the variance attributable to the place of residence (second level) was not statistically significant ( $p > 0.05$ ) and the MOR was 1.24, i.e., area heterogeneity increased the chance of using a health care service in the past year by 24.0% for an individual chosen at random. The DIC was 3211.24. Inclusion of individual characteristics (model 1) decreased the DIC to 3043.99, indicating better model fit. Women, individuals with higher education, those with

<sup>e</sup> Instituto Brasileiro de Geografia e Estatística. Censo Demográfico 2010. Brasília (DF); 2013 [cited 2014 Nov 19]. Available from: <http://www.sidra.ibge.gov.br/cd/cd2010RgaAdAgsn.asp>

<sup>f</sup> Departamento de Informática do SUS. Informações de saúde. Brasília (DF); 2014 [cited 2014 Nov 19]. Available from: <http://www2.datasus.gov.br/DATASUS/index.php?area=02>

**Table 1.** Profile of the study population that used health care services in the past 12 months and the presence of a regular physician for routine care. Metropolitan region of Sao Paulo, Southeastern Brazil, 2007.

Variable	Total		Use of health care services		Regular physician	
	n	%	n	%	n	%
Total	3,588	100	2,995	83.5	1,702	47.4
Gender						
Male	1,569	43.7	1,182	75.3	647	41.2
Female	2,019	56.3	1,813	89.8*	1,055	52.2*
Age (years)						
18 to 39	1,541	42.9	1,257	81.6	622	40.4
40 to 59	1,474	41.1	1,232	83.6	749	50.8*
≥ 60	573	16.0	506	88.3*	331	57.8*
Education						
Primary education	1,918	53.5	1,573	82.0	853	44.5
High school education	1,136	31.7	950	83.6	534	47.0
College/University education	534	14.9	472	88.4*	315	59.0*
Health insurance						
Yes	1,486	41.4	1,334	89.8	1,037	69.8
No	2,102	58.6	1,661	79.0*	665	31.6*
Income						
Low	1,175	32.7	947	80.6	469	39.9
Average	1,211	33.7	1,011	83.5	572	47.2*
High	1,202	33.5	1,037	86.3*	661	55.0*
Income inequality						
Low	1,219	34.0	1,024	84.0	576	47.2
Average	1,216	33.9	995	81.8	579	47.6
High	1,153	32.1	976	84.6	547	47.4
Median income						
Low	1,223	34.1	1,022	83.6	562	45.9
Average	1,198	33.4	984	82.1	549	45.8
High	1,167	32.5	989	84.7	591	50.6*
Violence						
Low	1,184	33.0	1,013	85.6	618	52.2
Average	1,205	33.6	1,006	83.5	548	45.5*
High	1,199	43.7	976	81.4*	536	44.7*

\* Significant difference ( $p < 0.05$ ) using simple logistic regression analysis in relation to the first category of the variable.

higher income, and those belonging to older age groups were more likely to have consulted a health professional in the past year ( $p < 0.05$ ). Health insurance was included in model 2 with a statistically significant presence. Model 2 showed the best fit (DIC = 2990.11) (Table 2). Inclusion of contextual variables (models 3, 4, and 5) did not produce statistically significant results. A marginally significant result (OR: 0.78, 95%CI 0.60;1.02) was observed only for average income inequality (compared with low income inequality). The variance in the second level (place of residence) was not significant ( $p > 0.05$ ) for the models with contextual variables, and the DIC value indicated worse fit compared with model 2.

Table 3 presents the multilevel models for the use of health care services in the past year with the inclusion of the most prevalent chronic diseases and mental disorders. Model 2 (Table 2) was included as the starting point in all cases because it presented the best fit. Chronic and mental illnesses were analyzed individually and showed statistically significant results in models 6, 7, 8, 9, and 10. As in previous models, the variance in the second level was not significant ( $p > 0.05$ ) in all cases. The model with the best fit was the one that included cardiovascular diseases (DIC = 2919.60). In model 11, which included all chronic and mental diseases evaluated, only depression was not statistically significant (OR: 1.21, 95%CI 0.82;1.78).

**Table 2.** Multilevel models for the individual and contextual determinants of the use of health care services in the past 12 months. Metropolitan region of Sao Paulo, Southeastern Brazil, 2007.

Variable	Null model		Model 1		Model 2		Model 3		Model 4		Model 5	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Gender												
Male	0.33	0.28;0.40	0.33	0.27;0.40	0.33	0.27;0.40	0.33	0.27;0.40	0.33	0.27;0.40	0.33	0.27;0.40
Age	1.02	1.01;1.02	1.01	1.01;1.02	1.01	1.01;1.02	1.01	1.01;1.02	1.02	1.01;1.02	1.02	1.01;1.02
Education												
Primary education												
High school education	1.43	1.15;1.79	0.23	1.00;1.60	1.25	0.99;1.57	1.27	0.99;1.57	1.27	1.01;1.60	1.27	1.01;1.60
College/University education	1.77	1.29;2.45	1.37	0.97;1.93	1.37	0.97;1.93	1.38	0.97;1.93	1.38	1.00;1.91	1.36	0.98;1.89
Individual income												
Low												
Average	1.20	0.97;1.49	1.08	0.86;1.36	1.09	0.88;1.36	1.10	0.88;1.36	1.10	0.88;1.38	1.09	0.87;1.37
High	1.30	1.02;1.65	1.09	0.84;1.40	1.10	0.86;1.42	1.11	0.86;1.42	1.11	0.86;1.43	1.09	0.85;1.41
Health insurance			2.21	1.79;2.73	2.24	1.80;2.78	2.21	1.80;2.78	2.21	1.79;2.74	2.23	1.69;2.94
Median income												
Low												
Average					0.81	0.61;1.07						
High					0.86	0.64;1.15						
Income inequality												
Low												
Average									0.78	0.60;1.02		
High									0.91	0.70;1.19		
Violence												
Low												
Average											1.03	0.78;1.37
High											0.97	0.73;1.27
Contextual variance (SD)	0.050	(0.035)	0.041	(0.031)	0.053	(0.033)	0.055	(0.034)	0.038	(0.034)	0.053	(0.033)
Mean odds ratio	1.24	1.09;1.48	1.21	1.03;1.39	1.25	1.11;1.42	1.26	1.09;1.42	1.20	1.03;1.40	1.25	1.06;1.41
DIC	3.211.24		3.043.99		2.990.11		2.990.93		2.991.70		2.992.91	

DIC: deviance information criterion

**Table 3.** Multilevel models for the correlation between the presence of chronic and mental illnesses and the use of health care services in the past 12 months. Metropolitan region of Sao Paulo, Southeastern Brazil, 2007.

Variable	Model 6		Model 7		Model 8		Model 9		Model 10		Model 11	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Gender												
Male	0.34	0.28;0.42	0.35	0.29;0.43	0.37	0.30;0.44	0.34	0.30;0.38	0.34	0.29;0.41	0.40	0.33;0.48
Age	1.00	1.00;1.01	1.01	1.01;1.02	1.02	1.01;1.02	1.01	1.01;1.02	1.01	1.01;1.02	1.01	1.00;1.01
Education												
Primary education												
High school education	1.27	1.00;1.61	1.23	0.96;1.57	1.32	1.05;1.66	1.27	1.01;1.60	1.29	1.01;1.64	1.29	1.02;1.62
College/University education	1.43	1.02;1.99	1.30	0.92;1.83	1.43	1.02;2.00	1.35	0.98;1.87	1.35	0.96;1.90	1.42	1.01;1.99
Individual income												
Low												
Average	1.14	0.91;1.44	1.09	0.88;1.37	1.10	0.87;1.38	1.09	0.87;1.37	1.08	0.86;1.36	1.15	0.90;1.45
High	1.16	0.90;1.50	1.09	0.85;1.41	1.12	0.87;1.44	1.10	0.85;1.42	1.10	0.85;1.42	1.16	0.90;1.51
Health insurance	2.32	1.87;2.86	2.21	1.77;2.77	2.22	1.78;2.76	2.23	1.86;2.67	2.24	1.81;2.78	2.29	1.83;2.86
Cardiovascular disease	3.08	2.32;4.08									2.74	2.09;3.61
Respiratory disease			1.99	1.53;2.59							1.77	1.36;2.31
Migraine					1.70	1.35;2.16					1.41	1.11;1.78
Depression							1.63	1.14;2.33			1.21	0.82;1.78
Anxiety									1.85	1.40;2.45	1.54	1.14;2.07
Contextual variance (SD)	0.050	(0.040)	0.052	(0.035)	0.45	(0.037)	0.053	(0.033)	0.047	(0.033)	0.051	(0.036)
Mean odds ratio	1.24	1.04;1.44	1.24	1.08;1.42	1.22	1.03;1.41	1.25	1.03;1.40	1.23	1.03;1.41	1.24	1.00;1.42
DIC	2.919.6		2.965.09		2.972.92		2.991.70		2.973.26		2.882.44	

DIC: deviance information criterion

Furthermore, model 11 presented the best fit among the models analyzed (DIC = 2882.44).

Tables 4 and 5 followed the same methodology to evaluate the presence of a physician for routine care. As in the other variables, the variance attributable to the place of residence was not statistically significant ( $p > 0.05$ ) in any model evaluated. Women, individuals belonging to older age groups, and those with more education had a greater correlation with the presence of a regular physician in all models evaluated. The variable of having health insurance was most strongly correlated with the presence of a regular physician in all models evaluated. The contextual characteristics of the place of residence showed no significant correlation with the presence of a regular physician. The exception was income inequality: living in regions with high income inequality was correlated with a lower probability of having a regular physician after controlling for individual factors (Table 4, model 4). In the models that included only one chronic or mental illness (Table 5, models 6-10), presence of cardiovascular or respiratory diseases was correlated with having a regular physician. Only cardiovascular diseases were significantly correlated with having a regular physician when all diseases were included in the model.

## DISCUSSION

The results indicate that the contextual characteristics of the place of residence are not a statistically significant barrier to the use of health care services in the MRSP, contrary to the situation observed in other municipalities.<sup>18,19</sup> In contrast, individual factors, including education and possession of health insurance, were the determinants of the use of health care services in the past 12 months as well as the determinants of having a regular physician.

Recent studies have indicated a correlation between the place of residence in the MRSP and presence of chronic and mental diseases.<sup>7,8</sup> However, in the present study, use of health care services appeared to be unaffected by the place of residence. In the null model, without the inclusion of individual or contextual independent variables, the variance attributable to the place of residence was not statistically significant for any of the dependent variables studied. Furthermore, contextual variables (median income, income inequality, and violence) were not statistically significant for most cases, except for the correlation between living in a region with high inequality and lower probability of having a regular physician.

These results have implications for planning the distribution of health care services in the MRSP. Living in poorer, more unequal, or more violent areas does not appear to significantly affect the use of health care services. This may be the result of the planning strategies for health care services, such as the expansion of the ESF, which has benefited areas with worse

socioeconomic conditions and reduced inequalities in access to health care in the past decade.<sup>12</sup>

On the other hand, possession of health insurance had a strong and consistent importance in the use of health care services. Possession of health insurance was significantly correlated with the use of health care services in the past year and with the presence of a regular physician in all models. In addition, presence of chronic and mental illnesses was strongly correlated with the use of health care services in the past year. On the other hand, having a regular physician showed a weak correlation with the presence of chronic and mental illnesses, except for cardiovascular diseases.

Possession of private health insurance was correlated with an increased likelihood of using health care services and of having a regular physician even when individual variables such as education and income were included in the model. This indicates an independent correlation between possession of private health insurance and access to health care services and goes beyond the correlation with socioeconomic factors. This may be because individuals with more severe health problems are more likely to purchase health insurance (this phenomenon is known as adverse selection in economic theory).<sup>24</sup> Another possibility is that possession of health insurance unquestionably increases the use of health care services, particularly in relation to preventive and routine care.<sup>14</sup>

Education was an important variable correlated with the use of health care services and its effect was greater than that found for individual income. This is in line with theories that argue that the effect of income on health would be, to some extent, a proxy for the effect of education on health, in which people with more education would be more willing to invest in their own health.<sup>9</sup> Therefore, regardless of the presence or absence of serious health problems (such as chronic and mental illnesses), individuals with higher education would use health care services more frequently, particularly for preventive and routine care.

The present study has some limitations. Use of health care services in the past year was analyzed retrospectively, i.e., the analysis depended on the memory of individuals. Despite the short study period (12 months), this analysis cannot overlook the occurrence of recall bias. Moreover, it was not possible to establish a temporal relationship between the onset of chronic and mental illnesses and the use of health care services. One possibility is that individuals living in areas with worse socioeconomic conditions or in areas with social inequalities would have access to health care services but would take more time to consult a health care professional after the onset of the disease. Another limitation is that it was not possible to assess the quality of health care services on an individual basis.



**Table 4.** Multilevel models for the individual and contextual determinants of the presence of a regular physician for routine care, Metropolitan region of Sao Paulo, Southeastern Brazil, 2007.

Variable	Null model		Model 1		Model 2		Model 3		Model 4		Model 5	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Gender												
Male	0.61	0.53;0.70	0.58	0.50;0.68	0.58	0.50;0.67	0.58	0.50;0.67	0.58	0.50;0.67	0.58	0.50;0.67
Age	1.03	1.02;1.03	1.03	1.02;1.03	1.03	1.02;1.03	1.03	1.02;1.03	1.03	1.02;1.03	1.03	1.02;1.03
Education												
Primary education												
High school education	1.56	1.32;1.84	1.24	1.03;1.49	1.23	1.02;1.49	1.24	1.02;1.49	1.24	1.03;1.49	1.23	1.02;1.49
College/University education	2.02	1.61;2.52	1.25	0.98;1.59	1.27	1.00;1.61	1.27	1.00;1.61	1.27	1.00;1.63	1.26	0.97;1.63
Individual income												
Low												
Average	1.24	1.05;1.46	0.95	0.79;1.15	0.96	0.80;1.16	0.95	0.80;1.16	0.95	0.79;1.15	0.95	0.79;1.14
High	1.40	1.17;1.67	0.88	0.71;1.08	0.90	0.74;1.09	0.88	0.74;1.09	0.88	0.72;1.09	0.88	0.72;1.08
Health insurance			5.31	4.49;6.27	5.32	4.52;6.28	5.33	4.54;6.26	5.32	4.54;6.26	5.32	4.54;6.23
Median income												
Low												
Average			0.87	0.68;1.12					0.89	0.70;1.12		
High			0.83	0.65;1.05					0.77	0.60;0.99		
Income inequality												
Low												
Average												
High												
Violence												
Low												
Average											1.01	0.78;1.30
High											1.02	0.79;1.33
Contextual variance (SD)	0.043	(0.030)	0.031	(0.021)	0.058	(0.032)	0.059	(0.033)	0.056	(0.031)	0.066	(0.036)
Mean odds ratio	1.22	1.03;1.38	1.18	1.04;1.09	1.26	1.11;1.42	1.26	1.11;1.43	1.26	1.10;1.41	1.28	1.12;1.45
DIC	4.955.52		4.758.92		4.310.18		4.310.62		4.309.70		4.312.08	

DIC: deviance information criterion

**Table 5.** Multilevel models for the correlation between the presence of chronic and mental illnesses and the presence of a regular physician for routine care. Metropolitan region of Sao Paulo, Southeastern Brazil, 2007.

Variable	Model 6		Model 7		Model 8		Model 9		Model 10		Model 11	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Gender												
Male	0.59	0.51;0.69	0.59	0.51;0.69	0.60	0.51;0.69	0.59	0.50;0.68	0.59	0.51;0.68	0.61	0.52;0.72
Age	1.02	1.01;1.03	1.02	1.02;1.03	1.03	1.02;1.03	1.03	1.02;1.03	1.03	1.02;1.03	1.02	1.01;1.03
Education												
Primary education												
High school education	1.25	1.03;1.51	1.21	1.01;1.45	1.24	1.03;1.49	1.24	1.03;1.49	1.23	1.03;1.47	1.26	1.03;1.52
College/University education	1.30	1.01;1.66	1.22	0.96;1.56	1.25	0.98;1.61	1.26	0.98;1.61	1.24	0.97;1.59	1.30	1.00;1.68
Individual income												
Low												
Average	0.97	0.80;1.17	0.95	0.79;1.14	0.96	0.80;1.16	0.94	0.79;1.13	0.95	0.79;1.14	0.97	0.81;1.16
High	0.91	0.73;1.12	0.88	0.72;1.08	0.89	0.73;1.10	0.87	0.72;1.06	0.88	0.72;1.08	0.90	0.73;1.09
Health insurance	5.45	4.61;6.45	5.32	4.52;6.26	5.32	4.54;6.23	5.33	4.52;6.28	5.32	4.54;6.24	5.45	4.66;6.38
Cardiovascular disease	1.62	1.36;1.94									1.58	1.31;1.90
Respiratory disease			1.19	1.00;1.41							1.14	0.95;1.36
Migraine					1.12	0.95;1.32					1.04	0.88;1.24
Depression							1.05	0.83;1.34			0.97	0.75;1.24
Anxiety									1.15	0.95;1.40	1.10	0.91;1.34
Contextual variance (SD)	0.066	(0.034)	0.066	(0.034)	0.057	(0.032)	0.060	(0.032)	0.060	(0.032)	0.063	(0.034)
Mean odds ratio	1.28	1.11;1.44	1.28	1.13;1.44	1.26	1.10;1.41	1.26	1.12;1.42	1.26	1.11;1.42	1.27	1.09;1.43
DIC	4.283.38		4.307.45		4.310.46		4.311.49		4.309.20		4.288.01	

DIC: deviance information criterion

Use of and spending on health care services has increased worldwide, and the trend is that this growth will continue for decades.<sup>b</sup> Identification of determinants that preclude individuals from using health care services is an important issue in public health. The present study indicates that the contextual characteristics of the place of residence are not a significant barrier to the use of health care services in the

MRSP. At the same time, education and possession of health insurance are important determinants of the use of these services. At present, when access to health care services for the Brazilian population is being extensively discussed in the media and in the political sphere, it is important to understand these determinants with the view of implementing policies that promote equitable use of these services.

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