

# Self-rated health in Brazilian adults and elderly: Data from the National Household Sample Survey 2008

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## Abstract

**Objective.** To investigate prevalence of poor self-rated health and its association with individual and household-level characteristics among adults and elderly in Brazil. **Materials and methods.** Cross-sectional study with Brazilian National Household Sample Survey 2008 (n=257 816). Crude and multilevel-adjusted Poisson regression models were fitted. **Results.** After adjusted analysis, poor self-rated health was significantly associated with higher household income, living alone, not having piped water nor garbage collection, lower education, not having health insurance, female sex, higher age, being a current or previous smoker, physical inactivity, having chronic diseases, having physical impairment. Subjects living in rural areas also had higher prevalence of poor self-rated health. The factors most strongly associated with the outcome were physical impairment and reporting three or more chronic diseases. **Conclusions.** Socioeconomic, health related behaviors, and physical health were associated with poor self-rated health.

Key words: cross-sectional studies; environment and public health; health inequalities; housing; income; multilevel analysis; socioeconomic factors; Brazil

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## Resumen

**Objetivo.** Investigar la prevalencia de la percepción negativa de salud y su asociación con características individuales a nivel de los hogares en adultos y adultos mayores de Brasil. **Material y métodos.** Estudio transversal con datos de la Encuesta Nacional de Hogares de 2008 (n=257 816). Se estimaron modelos de regresión de Poisson multinivel crudos y ajustados. **Resultados.** Después del análisis ajustado, la autopercepción negativa de salud se asoció significativamente con mayor ingreso, vivir solo, no tener agua corriente ni recolección de basura, baja educación, carecer de seguro de salud, sexo femenino, mayor edad, tabaquismo, inactividad física, enfermedades crónicas y deterioro físico. Los habitantes de zonas rurales también tuvieron mayor prevalencia de percepción negativa. Los factores más fuertemente asociados fueron impedimento físico y presentación de tres o más enfermedades crónicas. **Conclusiones.** Factores socioeconómicos, comportamientos relacionados con la salud y salud física se asociaron con la percepción negativa.

Palabras clave: estudios transversales; medio ambiente y salud pública; desigualdades en la salud; vivienda; renta; análisis multinivel; factores socioeconómicos; Brasil

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Self-rated health represents a multidimensional concept that encompasses multiple aspects, including socioeconomic, psychosocial and health status background.<sup>1</sup> The measure is used in several surveys and researches worldwide,<sup>2,4</sup> and strongly predicts morbidity and mortality.<sup>1,5</sup> Women, individuals with diseases, disabilities, unprivileged socioeconomic conditions, usually report poorer self-rated health.<sup>2,6</sup>

Pathways by which socioeconomic status influences health should be those that affect health more generally, as biological determinants, health care, environmental exposure, and health related behaviors.<sup>7,8</sup> People living in more deprived socioeconomic conditions are exposed to overcrowding, physical stressors, violence, lack of safe places for social interactions and other factors,<sup>2,7</sup> which can lead to a harmful lifestyle, including use and abuse of smoking, drugs, alcohol, poor diet, among others.<sup>9</sup>

Lately, a renewed interest in impact of collective factors in health has taken place in epidemiological studies, beyond individual variables. The role of structural factors on health has been highlighted.<sup>10</sup> Factors as contextual income, ethnic homogeneity, physical disorder, social capital,<sup>11</sup> violence, and others have been associated with several health outcomes.<sup>10</sup>

Brazilian population experienced changes in several health determinants, characterized with a society with high social inequalities.<sup>8,12</sup> In the last decades, the population living in urban areas has increased, and living conditions changed in both favorable and unfavorable ways. The impact of urbanization on health is not homogenous, it depends on social and historic aspects, in human relationship with the environment, and public policies.<sup>13,14</sup>

According to the Brazilian Census 2010, 84% of the population resided in urban areas.<sup>15</sup> The urbanization has traditionally been linked to development, which in turn is connected to health. Still, in several countries including Brazil, the urban population growth was reflected in the growth of slums, which are related to poor health.<sup>15</sup> However, few studies have been conducted to investigate associations between self-rated health, at individual and household levels, including urbanicity, in middle and low income countries, including Brazil.<sup>2,4,16</sup>

The aim of this study is to investigate the association between individual and household-level characteristics and self-rated health in the Brazilian population, using multilevel modeling techniques.

## Materials and methods

Cross-sectional study using microdata from the National Household Sample Survey (PNAD, in Portu-

guese) carried out in 2008 by the Brazilian Institute for Geography and Statistics (IBGE, in Portuguese).

The PNAD uses a three-stage complex probabilistic sample: cities, census tracts and households and is representative of the national regional and state levels. The variables that define the structure of the sampling plan, called stratum and primary sampling unit (PSU), and the sample weights need to be considered in the statistical analysis. In 2008, PNAD included in its questionnaire a health supplement. Information on all 391 868 people from 150 591 sampled households was obtained by means of interviews; it relies on self-reporting. The IBGE discusses these sampling processing in more detail elsewhere.<sup>17</sup>

Persons under 20 years old were excluded of the analysis. The outcome variable, self-rated health, was collected by the question: "In general, do you consider your own health as very good, good, fair, poor or very poor?". For the analysis, the variable was dichotomized considering poor self-rated health to be grouping of the categories poor and very poor. This categorization used for the results of this study is consistent with previous research that examined self-rated health from PNAD data.<sup>18,19</sup>

The independent variables investigated included socioeconomic behavioral, morbidity and demographic variables at the individual level, socioeconomic and environmental factors at the household level, and house-

Hierarchical levels		Variables	
Región level	IV	Country region household location (urban or rural)	
Household level	III	<i>Sociodemographic variables</i> Quartile of per capita domiciliar income Number of residence inhabitants Residence ownership	<i>Environment variables</i> Garbage collection Pipped water at least on room of the residence
Individual level	II	<i>Socioeconomic variables</i> Education Health insurance	<i>Demographic variables</i> Gender Age Skin color
	I	<i>Health related behaviors</i> Smoking Physical inactivity	<i>Morbidity</i> Chronic diseases (nor/1 or 2/3 or more) Physical mobility (without limitation, few limited/limited)
Outcome		Self-rated health (poor)	

**FIGURE 1. STUDIED VARIABLES ACCORDING TO HIERARCHICAL LEVELS OF ANALYSIS. BRAZIL, 2008**

hold location at the region level. The variables studied, according to their hierarchical levels of analysis, are presented in figure 1.

At the individual level the following variables were used: gender, age (measured in categories of 20-29, and 30-39, 40-49, 50-59, and 60 years and over), education level (0-3 completed years, 4-7 years, 8-10, and 11 years or more), health insurance (yes or no), skin color (white or yellow, and black, brown or indigenous), smoker (never, former and current), physical inactivity (yes or no), chronic diseases (none, 1 or 2, and 3 or more), and physical mobility (without limitation, a little restraint, and physical impairment).

In the PNAD, the variable current smoking was obtained through the questions: "Do you currently smoke any tobacco products?" and "Adding all cigarettes smoked in your lifetime, the total comes to at least five packs or a hundred cigarettes?". The variable was grouped into categories: smokers (individuals who had smoked at least five packs of cigarettes in their lives and who smoked at the time of conducting the research) former smokers (individuals who had smoked five packs but did not smoke at the time of conducting the research) and nonsmokers (individuals who did not smoke at least five packs in their lives).<sup>20</sup>

Physical inactivity was defined as when a person reported not to practice any physical activity in all areas studied (commuting, work activity, cleaning the home, environment and physical leisure activities).

The information on chronic diseases included the self-report of 12 specific conditions or diseases, namely: column or back disease, arthritis or rheumatism, cancer, diabetes, bronchitis or asthma, hypertension, heart disease, chronic renal failure, depression, tuberculosis, tendonitis or tenosynovitis and cirrhosis. For each of these conditions it was asked if a doctor or health professional had diagnosed the person.<sup>20</sup>

At the household level the following variables were used: quartile of household income per capita (poorest: 1st, 2nd, 3rd, and richest: 4th), type of household (tenant or owner), garbage collection (yes or no), and having piped water (yes or no).

At the region level, the following variables were used: household location (urban or rural), region (Southeastern, Midwestern, Southern, Northern, and Northeastern).

The classification of the status of the household in urban or rural, depends on its location, and is based on current legislation at the completion of the previous census. Urban households are those located in city areas, villages or isolated urban areas. Rural households are those located in the entire area outside these limits.<sup>20</sup>

All analyses were adjusted for the sample design of the PNAD, including all the characteristics of the complex sampling design (weight, strata and primary sampling unit). The software STATA, version 10.0, was used to perform these analyses.

After description, bivariate analysis was conducted to estimate differences among proportions, through Fisher's exact test for categorical exposure variables and linear trend test for ordinal ones. The multivariate analysis, through multilevel Poisson regression with robust variance, was oriented by the hierarchic model shown in figure 1, using backwards regression, level by level. Variables that presented association with  $p$ -value  $p \leq 0.5$  were kept in the model, aiming to control for possible confounding. Confidence intervals (95%) were calculated. Associations with  $p \leq 0.05$  were considered statistically significant. In this paper, we have used standardized residuals to investigate if model assumptions such as homoscedasticity and normally distributed errors were violated.<sup>21</sup>

The database didn't identify the individuals who provided information, which preserves data anonymity. The study was conducted according to the ethical principles embodied in the Declaration of Helsinki and observing conditions of the Resolution n. 196 from the Brazilian National Health Council.

## Results

Sample was comprised of 257 816 individuals, 52.6% women and 47.4% men. Smoking prevalence in the investigated sample was nearly 16 and 41% for physical inactivity. About 40% of individuals presented at least one chronic disease and 85% lived in urban areas. Half of the individuals reported black skin, light skin or indigenous color, while others reported white or Asian skin color. Table I presents complete variables description.

Table II presents crude and adjusted analysis, through multilevel robust Poisson's regression, of the association between self-rated health and the independent variables. In the crude analysis, poor self-rated health was positively associated with residing in rural area, residing in the Southern, Northern and Northeastern regions, living alone, lower household income, having household property, not having garbage collection, not having water supply, lower education, not having private health insurance, female gender, higher age, being black, brown or indigenous, being current or former smoker, being physically inactive, having chronic diseases, having limitation in physical mobility. After the adjusted analysis, poor self-rated

Table I  
**SAMPLE CHARACTERISTICS. BRAZILIAN ADULTS, 2008**

Variables	n	%	na	%*
Self-rated health				
Good	244 151	94.7	119 288 362	94.7
Poor	13 665	5.3	6 739 943	5.4
Gender				
Female	135 690	52.6	66 203 749	52.5
Male	122 126	47.4	59 824 556	47.5
Age bands (years)				
20-29	68 846	26.7	32 800 819	26.0
30-39	58 415	22.7	28 100 121	22.3
40-49	51 825	20.1	25 377 119	20.1
50-59	37 461	14.5	18 711 162	14.9
60 and more	41 269	16.0	21 039 084	16.7
Skin color				
White + Asian	120 859	46.9	64 040 774	50.8
Black + Lighter black + Indigenous	136 815	53.1	61 917 881	49.2
Schooling (years)				
0-3	58 730	22.9	29 018 792	23.1
4-7	60 105	23.4	29 760 848	23.7
8-10	39 133	15.2	18 825 820	15.0
11 and more	98 798	38.5	47 942 806	38.2
Private health plan				
Yes	70 539	27.4	35 770 078	28.4
No	187 277	72.6	90 258 227	71.6
Smoking status				
Never	150 779	68.2	73 219 406	67.8
Former	34 783	15.7	16 995 804	15.7
Current	35 507	16.1	17 850 595	16.5
Physically inactive				
Yes	119 313	41.1	42 371 003	33.6
No	170 956	58.9	83 657 302	66.4
Chronic disease				
No	151 104	58.6	72 918 304	57.9
1-2	84 625	32.8	41 912 278	33.3
3 and more	22 087	8.6	11 197 723	8.9
Physical mobility				
No limitation	174 189	67.6	84 895 103	67.4
Small limitation	67 920	26.3	33 410 012	26.5
Limited	15 707	6.1	7 723 190	6.1
Number of household residents				
1 resident	14 114	5.5	6 892 716	5.5
2 to 4 residents	173 075	67.1	85 708 420	68.0
5 and more residents	70 627	27.4	33 427 169	26.5
Area localization				
Urban	245 045	84.4	107 168 620	85.0
Rural	45 224	15.6	18 859 685	15.0
Country region				
South	44 515	15.3	18 944 546	15.0
Southeastern	89 840	31.0	55 648 760	44.2
Midwestern	32 028	11.0	9 034 311	7.2
Northeastern	89 214	30.7	33 444 978	26.5
North	34 672	11.9	8 955 710	7.1

\* expanded number

**Table II**  
**ASSOCIATION AMONG POOR SELF-RATED HEALTH AND INDEPENDENT VARIABLES AMONG ADULTS FROM BRAZIL, 2008**

Variables	Prevalence (%)	Crude analysis PR (95%CI)	p	Adjusted analysis poisson robust PR (95%CI)	p
<b>Census area</b>					
Urban	5.04	1.00		1.00	
Rural	7.09	1.06 (1.05-1.08)		1.34 (1.28-1.40)	
<b>Region</b>					
Southeastern	4.51	1.00		1.00	
Midwestern	4.68	1.01 (0.99-1.02)		0.98 (0.92-1.05)	
South	5.42	1.05 (1.03-1.08)		1.10 (1.03-1.16)	
North	6.03	1.05 (1.03-1.07)		1.22 (1.15-1.29)	
Northeastern	6.69	1.19 (1.15-1.23)		1.30 (1.24-1.37)	
<b>Quartile of household per capita income</b>					
4	3.01	1.00		1.00	
3	5.85	1.47 (1.42-1.53)		1.94 (1.84-2.05)	
2	6.44	1.52 (1.46-1.59)		2.21 (2.09-2.34)	
1	7.08	1.53 (1.47-1.60)		2.32 (2.17-2.47)	
<b>Number of household residents</b>					
1 resident	7.99	1.00		1.00	
2 to 4 residents	5.14	0.65 (0.61-0.69)		0.54 (0.51-0.58)	
5 or more residents	5.33	0.71 (0.67-0.75)		0.48 (0.45-0.52)	
<b>Household ownership</b>					
Rented or lended	4.04	1.00		1.00	
Owned (paid or paying)	5.71	1.34 (1.28-1.41)		1.46 (1.39-1.53)	
<b>Garbage collection</b>					
Yes	5.04	1.00		1.00	
No	7.59	1.06 (1.05-1.08)		1.15 (1.06-1.25)	
<b>Piped water in at least one room of the home</b>					
Yes	5.10	1.00		1.00	
No	8.56	1.05 (1.04-1.06)		1.20 (1.12-1.29)	
<b>Schooling (years)</b>					
0-3	12.81	1.00		1.00	
4-7	5.74	0.69 (0.68-0.70)		0.66 (0.63-0.68)	
8-10	3.11	0.67 (0.66-0.68)		0.47(0.44-0.50)	
11 and more	1.49	0.42 (0.41-0.43)		0.29 (0.27-0.31)	
<b>Private health plan</b>					
Yes	2.92	1.00		1.00	
No	6.31	1.88 (1.79-1.98)		1.24 (1.17-1.31)	
<b>Gender</b>					
Female	4.97	1.00		1.00	
Male	5.69	1.08 (1.06-1.10)		1.09 (1.06-1.13)	
<b>Age bands (years)</b>					
20-29	1.39	1.00		1.00	
30-39	2.51	1.38 (1.31-1.46)		1.55 (1.42-1.68)	
40-49	4.68	2.07 (1.95-2.20)		2.77 (2.56-2.99)	
50-59	8.18	2.85 (2.68-3.03)		4.50 (4.17-4.87)	
60 and more	13.61	4.67 (4.37-5.00)		6.44 (5.95-6.97)	

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Skin color				
White + Asian	4.78	1.00	1.00	
Black + Lighter black + Indigenous	5.91	1.12 (1.10-1.15)	0.99 (0.95-1.03)	0.785
Smoking status				
Never	3.99	1.00	1.00	
Former	9.39	1.27 (1.25-1.29)	1.12 (1.07-1.16)	
Current	6.75	1.14 (1.12-1.16)	1.23 (1.18-1.29)	
Physically inactive				
No	3.24	1.00	1.00	
Yes	9.52	1.69 (1.65-1.73)	1.62 (1.57-1.69)	
Back pain				
No	3.41	1.00		
Yes	13.35	1.60 (1.57-1.63)		
Chronic disease				
No	1.21	1.00	1.00	
1-2	7.25	2.89 (2.76-3.04)	2.60 (2.44-2.77)	
3 and more	25.21	3.77 (3.57-3.99)	5.57 (5.20-5.97)	
Physical mobility				
No limitation	0.95	1.00	1.00	
Small limitation	11.63	4.31 (4.08-4.56)	4.53 (4.23-4.86)	
Limited	26.54	3.32 (3.16-3.50)	7.88 (7.32-8.48)	

PR: Prevalence ratios

health was associated with all these variables, except for skin color.

In the adjusted analysis, the variables most strongly associated with self-rated health were physical mobility and chronic diseases. For those variables, the prevalence ratios in the adjusted analysis were higher than those observed in the crude analysis. Individuals presenting limited physical mobility had a 688% higher probability of evaluating poorly their health than those who did not report limited physical mobility. Individuals who reported having three or more chronic diseases had a 457% higher probability of having poor self-rated health than those who did not report those diseases. Having 60 years of age and belonging to the first quartile of household income per capita were also strong risk factors for having poor self-rated health.

## Discussion

This paper aimed to evaluate households and individual factors associated with poor self-rated health in the Brazilian population. Most of the socioeconomic and demographic variables located in all analysis levels

(individual household and region) were associated with the outcome.

Among the household variables investigated, the presence of basic assets as garbage collection, piped water, as well as the condition of owning other own house, were positively associated with better self-rated health, and those associations remained even after adjustment for other individual level variables. The association among a variety of socioeconomic measures and self-rated health has been demonstrated in several studies.<sup>2,22,23</sup> That factor indicates a strong and persistent socioeconomic disadvantage in health for people in the bottom of the social scale.

In Brazil, garbage collection is a particular issue, considering that besides being a marker of living conditions in the area of residence, and health problems related to the accumulation of garbage, there is an additional concern for dengue transmission, since the uncollected garbage serves as breeding site for the mosquito vectors.<sup>24</sup>

A constellation of pathways connecting socioeconomic disadvantage and poor health outcomes has been identified in epidemiological literature. Socioeconomic status underlies three major determinants

of health: health care, environmental exposure, and health behavior. In addition, chronic stress associated with lower socioeconomic status may also increase morbidity and mortality.<sup>7</sup>

People living in rural areas presented higher prevalence of poor self-rated health. In other study using the same database, De Moraes and colleagues<sup>25</sup> found that after controlling for individual and environmental factors, the association between household location area and self-rated health was modified and lost their statistical significance. It is important to point out that in that study they work with self-rated health in an ordinal instead of dichotomized form of categorization. However, authors observed significant interaction among household location area and gender, skin color, self-reported morbidity, ownership of basic assets and percentage of households with adequate dwelling quality.<sup>25</sup>

The percentage of rural Brazilian population experienced important declines in last decades. In 1960, most of the country population was living in rural areas, except in the Southeastern region (57% in urban area). In the 2010 Brazilian census, 15.6% of the population was residing in rural areas, varying in range from 7 to 26%, in Southeastern and North and Northeastern regions, respectively.<sup>17,26</sup>

There is some evidence that health indicators are not only better in urban than rural areas (especially in less wealthy nations) but that the urban poor fare better than the nonurban poor.<sup>27</sup> Vlahov and colleagues<sup>27</sup> reviewed the hypothesis about the urban "advantage" in health, and point out some explanations, including: "the proximity of wealth and poverty within cities brings benefits to those less well-off, the availability of higher levels of social support and greater social cohesion in urban than nonurban areas, the offer of more access to the necessities of life, a physical environment that is conducive to health, and finally, cities through their size and density offer the potential for political mobilization and social movements, enabling urban populations to win more resources for health, another possible route to a health advantage".<sup>27</sup>

In Brazil, the urban population is heterogeneous. Urban areas shelter not only the people with the best socioeconomic conditions, but also those with very poor living conditions, particularly the population that lives in slums.<sup>28</sup> However population living in rural areas experience lower socioeconomic conditions, including lower monthly per capita income (less than half part of urban), the illiteracy in people with 15 years or more is 7.5% in urban against 23.5% in rural area. Furthermore, one third of inhabitants in rural areas do not have piped water, while in cit-

ies this proportion doesn't reach 3%, and the health insurance coverage is lower in rural areas.<sup>29</sup> Those are some possibilities that can partially explain the higher prevalence of poor self-rated health among poor residents in rural areas.

In this study, those that adopted healthy behaviors, as never smokers and people who practice physical activity presented better health. The association between engagement in health related behaviors and self-rated health has been demonstrated in other studies.<sup>30</sup> Health related behaviors represent one of the mechanisms behind higher socioeconomic advantage in health outcomes.<sup>7</sup> Kim,<sup>31</sup> studying a Korean population, observed that engaging in regular exercise significantly mediated the relationship between education and self-rated health as well as between poverty and self-rated health. Finally, poverty and regular exercise had a greater impact on self-rated health in old age than in middle age.<sup>31</sup>

The variables most strongly associated with self-rated health in this study were physical impairment, and reporting of three or more chronic diseases. Health status variables and self-rated health were consistently associated in most studies. In fact, the self-rated health variable is sensitive to changes like physical health decay.<sup>5,32</sup> The effect of disease in health is associated with the complexity of the therapeutic process and the psychological and financial resources available to the individual to deal with the illness. Disease jeopardizes people's quality of life, altering the reproduction of social conditions for existence by limiting the performance of their everyday and occupational activities.<sup>33</sup> In a study conducted among a workers' population, Höfelmann and Blank<sup>34</sup> found that psychosocial (-25.59%), socioeconomic (-9.29%), and occupational variables (10.54%) were important confounders in the association between self-rated health and chronic diseases and/or symptoms.

The limitations of the present study are related, mainly, to methodological aspects from the PNAD database. The prevalence of chronic disease and other self reported measures could be underestimated.<sup>35</sup> The cross-sectional design of the study does not allow drawing of causal inferences, since the information about exposure and outcome was obtained at the same time.

A potential source of bias is related to the use of proxy respondents for some information. Several authors have studied that limitation in PNAD data,<sup>36,37</sup> including its implication for self-rated health prevalence.<sup>19,38</sup>

Furthermore, it is known that individuals with worse socioeconomic position experience lower

survival rates. Thus, their participation in the research may be underrepresented in the sample due to survival bias. As a result, socioeconomic lags may be even stronger than those observed in the studied population.<sup>39,40</sup>

Some variables that would allow for a more detailed analysis, such as size of the municipality, were not available in the data set. It is recommended for future studies to explore such variables.

Despite of all those facts, we found important socioeconomic gradients between self-rated health, and both individual and household level variables were associated with the outcome. Furthermore, health related behaviors and physical health status were associated with poor self-rated health.

Our findings reinforce the importance that measures to reduce inequalities in health should be multidisciplinary, involving different civil society sectors, and focused in providing better living conditions to socioeconomic unprivileged groups, which can be more vulnerable to physical problems in health.

*Declaration of conflict of interests.* The authors declare that they have no conflict of interests.

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