

## Satisfaction with the neighborhood environment and health in older elderly: cross-sectional evidence from the Bambuí Cohort Study of Aging

Satisfação com a vizinhança e saúde entre idosos mais velhos: análise seccional do Estudo de Coorte de Idosos de Bambuí

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### Abstract

*In order to investigate the association between satisfaction with the neighborhood environment and self-rated health among older elderly, data from 814 participants of the eleventh wave of the Bambuí Cohort Study of Aging were analyzed using robust Poisson regression analyses. Those elderly with higher satisfaction with their neighborhoods (PR = 0.75; 95%CI: 0.63-0.87) were less likely to report worse self-rated health. The number of chronic diseases (two, PR = 1.69; 95%CI: 1.05-2.70, three or more, PR = 1.99, 95%CI: 1.27-3.13), difficulty in performing daily activities (PR = 1.51; 95%CI: 1.28-1.78), presence of depressive symptoms (PR = 1.68; 95%CI: 1.44-1.95) and frequency of leisure-time exercise in previous 90 days (less than once a week, PR = 1.24; 95%CI: 1.03-1.50) were all positively and significantly associated with poor self-rated health. This study provided empirical evidence that satisfaction with the neighborhood environment was associated with the health of the older elderly. The findings further suggest the potential importance of including this indicator in analyses of place and health among the elderly.*

*Aged; Urban Health; Health Status; Cohort Studies*

### Introduction

Self-rated health is one of the most widely used health indicators in health research <sup>1</sup>. The measure, that reflects an individual's global evaluation of their overall health, has shown robust validity as well as good test-retest reliability <sup>2</sup>. Because of these properties, some authors argue that, for research purposes, self-rated health may serve as a reasonable substitute for multi-item measures of health status <sup>3,4</sup>.

For the aged population, previous studies have documented that self-rated health is a consistent predictor of functional disability and mortality rates even after adjustment for sociodemographic characteristics and other clinically relevant factors or after controlling for more objective measures of health and health behaviours <sup>5,6,7</sup>. Moreover, self-rated health is also associated with increased rates of outpatient service utilizations and hospitalizations <sup>5</sup>.

Several worldwide studies have demonstrated that poor self-rated health among the elderly is associated with female gender <sup>6,8</sup>; low income <sup>9</sup>; presence of comorbidities <sup>10</sup>, depression <sup>10,11,12,13</sup>, disabilities <sup>6,12</sup>; lack of physical exercise <sup>12,14</sup>, inability to go out alone <sup>11</sup>; access to health services, including health care coverage and high outpatient use <sup>5,15</sup>. Less understood, however, is the neighborhood's influence on the health of older adults <sup>16</sup>.

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According to Stronegger & Titze<sup>17</sup>, neighborhoods are the most important place to establish connections with other individuals, daily routine activities and consumption habits, therefore their physical and social environments affect the health and health behavior of residents. This can be particularly relevant for the elderly, given the combination of declines in physical and cognitive functioning that tends to accompany aging, which leads to a greater dependence on the immediate residential neighborhood for their health and well-being<sup>16,18</sup>.

Despite the existence, in recent years, of considerable research examining how health outcomes vary according to where one lives<sup>19,20,21</sup>, there are relatively few available publications about the impact that neighborhood environment might have on the health of the elderly. Most of this evidence has been collected in developed countries and among elderly living in large cities<sup>16</sup>. Studies have revealed, for instance, associations between poor individual health and neighborhoods with low socioeconomic levels<sup>22,23,24</sup>. Similar associations were observed between perceived resources and/or problems (e.g., traffic, trash or litter, safety/crime) and health<sup>25,26,27</sup>.

Since the most basic environmental unit in which people live and conduct their daily activities is the neighborhood, its effects on health can be accessed through measures based on the perceptions of the residents therein. The purpose of this investigation is to ascertain whether there is an association between satisfaction with the neighborhood environment and self-rated health among older elderly living in a small Brazilian city, after adjusting for sociodemographic characteristics, health conditions and lifestyle risk factors.

## Methodology

### Study area and participants

The Bambuí Cohort Study of Aging is a population-based cohort study of older adults that has been conducted in Bambuí, a city of approximately 15,000 inhabitants located in the state of Minas Gerais in southeastern Brazil. The eligible population for the cohort consisted of all residents aged 60 years or older on 1 January 1997 (1,742 inhabitants), who were identified by a complete census of the city. A response rate of 92 per cent was achieved and 1,606 individuals participated in the baseline interview. Since the first contact, the whole cohort is invited to participate yearly in the research. The annual follow-up visits consist of standardized interviews at home

and verification of death certificates, conducted by trained interviewers. From 1997 to 2007, 641 participants died and 96 (6%) were lost to follow-up<sup>28</sup>. Specific questions on satisfaction with the neighborhood were added in the household survey in 2008 (eleventh wave of the study).

The Bambuí Cohort Study of Aging was approved by the Ethics Research Committee of the Oswaldo Cruz Foundation (Fundação Oswaldo Cruz), Brazil. More details on the cohort can be seen elsewhere<sup>28,29</sup>.

This study consists of a cross-sectional analysis of the eleventh wave of Bambuí Cohort Study of Aging. All the 865 cohort members who were alive in 2008 were selected to participate in the present analysis.

### Outcome

The dependent variable was self-rated health status measured by a single question<sup>30</sup> as follows: *"In the actual moment, how would you rate your health: (1) excellent; (2) good; (3) fair; (4) poor?"*. Response options were treated as a dichotomous variable categorized as "excellent/good" (0) and "fair/poor" (1).

### Exposure

#### • Satisfaction with the neighborhood environment

The individual's satisfaction with the neighborhood was assessed through eight questions (yes/no answers), which were developed by our research team based on previous literature<sup>31</sup>: *"Do you feel comfortable in your neighborhood, that is, do you feel at home?"*; *"Are you satisfied with how your neighborhood is being taken care of?"*; *"Is your neighborhood a good place for you to live? Do you like your neighbors and your house?"*; *"Are you proud when you tell others where you live?"*; *"Would you like to move out of this neighborhood?"* (question recoded in reverse order to ensure data consistency); *"Are your neighbors willing to help each other?"*; *"Do children and young people in your neighborhood treat adults with respect?"*; *"Do you think your neighbourhood is a good place for children to play; and a good place to raise teenagers?"*. The eight items concerning the *Satisfaction with the Neighborhood Environment* were subjected to a principal components analysis (PCA) with a matrix of tetrachoric correlations<sup>32</sup> to create one summary measure. The question *"Would you like to move out of this neighborhood?"* was recoded in reverse order to ensure data consistency. PCA analysis resulted in one single extracted factor

that had an eigenvalue of 5.16 and explained 64.5% of the variation between the items. Subsequently, this one extracted factor was dichotomized about the median, forming the categories “low” and “high”, representing the indicator *Neighborhood Satisfaction* for analyses. In addition, an internal consistency test was performed to examine whether the eight items reflected one single dimension, i.e. satisfaction with the neighborhood. A Cronbach's alpha of 0.79 was found, indicating a high internal consistency of the calculated coefficient<sup>33</sup>.

### **Potential confounders**

The following groups of variables were included in the analysis as potential confounding factors: (1) sociodemographic characteristics: gender, age, education (0-3; 4-7 and > 8 complete years of schooling), marital status, monthly personal income (< 2; 2-3 and > 4 times the Brazilian minimum wage), head of the household (yes, no); (2) health conditions: number of selected chronic conditions, difficulty or inability to perform selected activities of daily living (ADLs), presence of depressive symptoms; (3) lifestyle risk factors: leisure-time physical activity in previous 90 days and current smoker (yes, no).

For chronic conditions we used a checklist of 10 conditions based on the report of previous medical diagnosis for hypertension, diabetes mellitus, stroke, arthritis/rheumatism, thyroid problems, myocardial infarction, angina pectoris, heart disease, chagas disease and depression. Difficulty or inability to perform selected activities of daily living was defined as having any difficulty to perform at least one of the following activities: bathing, dressing, getting out of bed, walking from room to room, using the toilet or eating. Presence of depressive symptoms was measured by the 12-item version of the *General Health Questionnaire* (GHQ-12); cut-off point  $\geq 5$  was used based on previous study in the elderly population of Bambuí<sup>34</sup>.

### **Statistical analyses**

All statistical analyses were carried out using the Stata software, version 10.0 (Stata Corp., College Station, USA).

Univariate and multivariate relationships between self-rated health and neighborhood satisfaction and also with other characteristics of the study population were analysed. All regression analyses were based on Poisson regression with a robust error variance<sup>35</sup>. The initial multivariate model included all independent variables with p-value less than 0.20 in the univariate analy-

sis. A backward elimination process eliminated non significant variables at p-value < 0.05. The prevalence ratio (PR), 95% confidence interval (95%CI), and p-value are presented.

### **Results**

Among 865 individuals who were alive in 2008, 814 (94.1%) participated in the present analysis. Non-participation was due to lost to follow-up. Participants and non-participants were similar in age [mean (standard deviation – SD) age of 77.7 (5.7) and 78.2 (5.6) years, respectively, p = 0.550], but women were more likely to participate than men (95.5% vs. 91.5%, p = 0.015).

A description of the participants' characteristics is shown in Table 1. The participants were predominantly composed of individuals with less than seven years of schooling (91.1%), widows (52.2%), and with monthly income below twice the Brazilian minimum wage (79.2%). Almost half self-rated their health as fair or poor and reported difficulty in performing ADLs. The majority of the participants suffered from chronic illness (71.4% had two or more conditions) and were non-exercisers (67.3%). About one in four were not satisfied with how the neighborhood was being taken care of (23.1%), or were not proud when telling others where they live (18.4%) or even would like to move out of the neighborhood (18.7%).

The results of the univariate analyses of factors associated with self-rated health are displayed in Tables 2 and 3. Socio-demographic characteristics most strongly associated with worse self-rated health were: female gender (PR = 1.29; 95%CI: 1.07-1.54), schooling (4-7 years, PR = 0.77; 95%CI: 0.65-0.92), and with not being the head of the household (PR = 1.22; 95%CI: 1.03-1.46). With respect to the neighborhood environment, higher levels of satisfaction with the neighborhood showed protective effects on self-rated health (PR = 0.63; 95%CI: 0.54-0.75). Other socio-demographic characteristics such as age, marital status and monthly personal income were unrelated to self-rated health.

Among health characteristics and behavioral risk factors (Table 3), the highest number of chronic diseases (two, PR = 1.91; 95%CI: 1.16-3.17, three or more, PR = 2.82; 95%CI: 1.75-4.55), difficult to perform activities of daily living (PR = 1.88; 95%CI = 1.60-2.21), presence of depressive symptoms (PR = 2.17; 95%CI: 1.89-2.50) and lower frequency of leisure-time exercise in the previous 90 days (less than once a week, PR = 1.32; 95%CI: 1.08-1.62) were all significantly associated with self-rated health. No significant associations were found for current smoker.

Table 1

Selected characteristics of the study participants. The Bambuí Cohort Study of Aging, 2008.

Characteristics	Total (%)
Sociodemographic and socioeconomic characteristics	
Female gender	65.7
Age [mean (SD)]	77.7 (5.7)
Schooling < 7 years	91.1
Marital status (widow)	52.2
Monthly personal income < 2 minimum wages *	79.2
Head of the household (no)	24.4
Health status	
Self-rated health (fair/poor)	44.0
Number of self-reported chronic diseases > 2	71.4
Difficulty to perform ADL (yes)	44.7
Depressive symptoms [GHQ-12 $\geq$ 5] (yes)	20.8
Current smoker (yes)	8.4
Frequency of leisure-time exercise in previous 90 days (less than once a week)	67.3
Satisfaction with the neighborhood environment (no)	
Feels comfortable in the neighborhood, feels at home	8.5
Satisfied with how the neighborhood is being taken care of	23.1
The neighborhood is a good place to live. Likes the neighbors and the house	6.6
Proud when tell others where he/she lives	18.4
The neighbors are willing to help each other	10.1
Children and young people treat adults with respect	6.1
The neighbourhood is a good place for children to play; and a good place to raise teenagers	9.5
Would like to move out (yes)	18.7

ADL: activities of daily living; GHQ-12: 12-item version of the *General Health Questionnaire*.

\* In multiples of the monthly Brazilian minimum wage (total US\$ 250 during the study period).

In Table 4, we display the significant results of the multivariate analysis of factors associated with self-rated health. In the adjusted analysis, elders with higher satisfaction with the neighborhood (PR = 0.75; 95%CI: 0.63-0.87) were less likely to report worse self-rated health. In addition, the number of chronic diseases (two, PR = 1.69; 95%CI: 1.05-2.70, three or more, PR = 1.99; 95%CI: 1.27-3.13), difficulty to perform activities of daily living (PR = 1.51; 95%CI: 1.28-1.78), presence of depressive symptoms (PR = 1.68; 95%CI: 1.44-1.95) and frequency of leisure-time exercise in previous 90 days (less than once a week, PR = 1.24; 95%CI: 1.03-1.50) were all positively and significantly associated with poor self-rated health.

## Discussion

The place of residence is endowed with both physical and social attributes that can affect the health of individuals<sup>36</sup>. This is corroborated by

the results of our study, which showed a significant association between satisfaction with the neighborhood environment and self-rated health among the older elderly residing in a small city. Additionally, despite the lack of other similar studies with which to make a direct comparison with this finding, our results are also in accordance with previous literature demonstrating association between different aspects of neighborhood environment and self-rated health among elderly living in large cities<sup>22,24,25,27,37</sup>. Although there are conceptual models suggesting the importance of environmental determinants of health among older adults, the mechanisms through which the neighborhood influences their health have yet to be elucidated<sup>16</sup>.

The uniqueness of this study was the simultaneous analyses of both individual and perceived neighborhood environment predictors on self-rated health in a very old population (mean age of 77.7 years). In previous studies, neighborhood attributes have been characterized in terms of

Table 2

Univariate association between socio-demographic characteristics, satisfaction with the neighborhood and fair/poor self-rated health. The Bambuí Cohort Study of Aging, 2008.

Characteristics	Self-rated health			p-value *
	Total	Poor (%)	PR (95%CI)	
Socio-demographic characteristics				
Gender				
Male	279	37.0	Reference	
Female	535	47.6	1.29 (1.07-1.54)	0.001
Age (years)				
71-74	291	43.2	Reference	
75-79	263	44.4	1.03 (0.85-1.25)	
80+	260	44.6	1.03 (0.85-1.26)	0.938
Schooling (years)				
0-3	504	48.5	Reference	
4-7	238	37.0	0.77 (0.65-0.92)	
8+	72	35.8	0.74 (0.53-1.03)	0.006
Marital status				
Married/Live together	292	40.7	Reference	
Divorced/Separated/Single	97	39.5	0.97 (0.71-1.31)	
Widow	425	47.2	1.16 (0.97-1.38)	0.164
Monthly personal income (minimum wages) **				
< 2	638	44.6	Reference	
2-3	121	40.4	0.91 (0.71-1.15)	
> 4	47	43.5	0.97 (0.69-1.37)	0.706
Head of the family				
Yes	611	41.8	Reference	
No	197	51.2	1.22 (1.03-1.46)	0.030
Satisfaction with the neighborhood environment				
Neighborhood satisfaction				
Low	321	55.0	Reference	
High	428	34.9	0.63 (0.54-0.75)	< 0.001

PR: prevalence ratio; 95%CI: 95% confidence interval.

\* Pearson chi-square test;

\*\* In multiples of the monthly Brazilian minimum wage (total = US\$ 250 during the study period).

the quality of the local environment, neighborhood satisfaction, social organization, local community and socioeconomic status of the neighborhood<sup>21,31,38,39</sup>. We used a composite measure representing *Satisfaction with the Neighborhood Environment*. This approach allowed us to assess more social aspects of the neighborhood, such as feelings about neighborhood qualities that could not be assessed through objective questions. In fact, studies suggest that subjective indicators may be more relevant for individual health than objective measures<sup>37,40</sup>. Such variables can be more proximal determinants of health, above and beyond socioeconomic influences<sup>40,41</sup>. According to Roosa et al.<sup>42</sup>, individuals develop

their own “filters” through which they perceive their environments. Therefore, individuals living in the same context may have different experiences about their neighborhoods.

Our definition of neighborhood refers to a person's immediate residential environment. There are multiple ways in which researchers define neighborhood environments<sup>19</sup>. Criteria can be historical, based on administrative boundaries, based on people's perceptions<sup>20</sup>. In this regard, however, it is important to remark that older adults tend to spend a greater proportion of their lives closer to home, therefore, their proximal environment could be more relevant to their health and well-being<sup>16</sup>.

Table 3

Univariate association between health characteristics and health behaviors and fair/poor self-rated health. The Bambuí Cohort Study of Aging, 2008.

Health characteristics and health behaviors	Self-rated health			p-value *
	Total	Poor (%)	PR (95%CI)	
Number of self-reported chronic diseases				
0	77	20.0	Reference	
1	156	31.8	1.59 (0.94-2.68)	
2	199	38.3	1.91 (1.16-3.17)	
3 +	382	56.5	2.82 (1.75-4.55)	< 0.001
ADL				
No	450	32.1	Reference	
Yes	364	60.5	1.88 (1.60-2.21)	< 0.001
Depressive symptoms (GHQ-12 $\geq$ 5)				
No	602	35.2	Reference	
Yes	158	76.6	2.17 (1.89-2.50)	< 0.001
Frequency of leisure-time exercise in previous 90 days (times a week)				
$\geq$ 3	221	35.5	Reference	
1-2	50	48.7	1.37 (0.95-1.99)	
Less than once a week	537	46.8	1.32 (1.08-1.62)	0.016
Current smoker				
No	745	43.6	Reference	
Yes	68	47.6	1.09 (0.83-1.44)	0.535

ADL: activities of daily living; GHQ-12: 12-item version of the *General Health Questionnaire*; PR: prevalence ratio; 95%CI: 95% confidence interval.

\* Pearson chi-square test.

Table 4

Statistically significant results for the multivariate analysis of factors associated with fair/poor self-rated health. The Bambuí Cohort Study of Aging, 2008.

Health characteristics	PR (95%CI)
Neighborhood satisfaction	
Low	Reference
High	0.75 (0.63-0.87)
Number of self-reported chronic diseases	
0	Reference
1	1.49 (0.91-2.43)
2	1.69 (1.05-2.70)
3 +	1.99 (1.27-3.13)
ADL	
No	Reference
Yes	1.51 (1.28-1.78)
Depressive symptoms (GHQ-12 $\geq$ 5)	
No	Reference
Yes	1.68 (1.44-1.95)
Frequency of leisure-time exercise in previous 90 days (times a week)	
$\geq$ 3	Reference
1-2	1.34 (0.97-1.86)
Less than once a week	1.24 (1.03-1.50)

ADL: activities of daily living; GHQ-12: 12-item version of the *General Health Questionnaire*; PR: prevalence ratio; 95%CI: 95% confidence interval.



Number of chronic diseases, difficulty to perform activities of daily living, presence of depressive symptoms and frequency of leisure-time exercise in previous 90 days remained significantly associated with self-rated health among the older elderly. These results confirm previous observations of the existence of association between self-rated health and medical conditions<sup>10,11,12,13,14</sup> and also between self-rated health and health behaviors<sup>12,14</sup>.

Our study's strengths include its population basis, the very low rate of non-response and the fact that it represents, to the best of our knowledge, the first effort at examining the association between self-rated health and satisfaction with the neighborhood environment among the older elderly. On the other hand, although our findings suggest that neighborhood satisfaction may have a role to play in determining self-rated health, some caveats must be considered when interpreting this result. Due to the cross-sectional design of the study we cannot deduce causal relationships between self-rated health and related factors, but merely describe probable associations,

even though the main purpose of our analyses of such risk factors was to estimate the magnitude of these associations. The use of self-reported data for both the outcome and the neighborhood characteristics could generate same-source bias, that is, the possibility of a spurious association between the two because the measurement errors in both reports are correlated or because the outcome affects the perception or report of the neighborhood attribute<sup>36</sup>.

In conclusion, this population-based study provided empirical evidence that satisfaction with the neighborhood environment was directly associated with the health of the older elderly in a small Brazilian city. These results support the potential importance of including this indicator in analyses of place and health among the elderly. Our results also provide evidence supporting the need to develop area-based programs and strategies related to the built environment. Therefore, the ways in which the elderly perceive their neighborhoods may be beneficial to their health and well-being.

## Resumo

*Para investigar a associação entre a satisfação com a vizinhança e a percepção de saúde entre idosos mais velhos, foram analisados os dados de 814 participantes do 11º seguimento do Estudo de Coorte de Idosos de Bambiú, por meio da regressão de Poisson robusta. Idosos mais satisfeitos com sua vizinhança apresentaram melhor percepção de saúde (RP = 0,75; IC95%: 0,63-0,87). A percepção de saúde foi significativamente pior para idosos com múltiplas condições crônicas (duas, RP = 1,69; IC95%: 1,05-2,70 e três ou mais, RP = 1,99; IC95%: 1,27-3,13), para aqueles com dificuldade de realizar atividades da vida diária*

*(RP = 1,51; IC95%: 1,28-1,78), com sintomas depressivos (RP = 1,68; IC95%: 1,44-1,95) e com menor frequência de exercícios físicos durante os períodos de lazer nos últimos 90 dias (menos que uma vez por semana, RP = 1,24; IC95%: 1,03-1,50). Os resultados evidenciam a existência de associação entre satisfação com a vizinhança e percepção de saúde, bem como apontam para a necessidade de incluir esse indicador em futuras pesquisas sobre saúde urbana entre idosos.*

*Idoso; Saúde da População Urbana; Nível de Saúde; Estudos de Coortes*

## Contributors

T. C. B. Luz and F. A. Proietti participated in the design, data analysis, interpretation of the results of the study and drafting the manuscript. C. C. César contributed with the statistical modeling and interpretation of the statistical findings. M. F. Lima-Costa contributed in the analysis, interpretation of data and the writing of the manuscript. All authors critically revised and approved the final manuscript.

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