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Built environment and its association with self-rated health in Brazilian elderly: National Health Survey 2013

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Abstract *The present study aims to investigate the association between the built environment and positive self-rated health among older adults from Brazilian capitals. It is a cross-sectional population-based study, which collected data from the National Health Survey 2013 and the Observatório das Metrópoles. The outcome was a positive self-rated health. The built environment was investigated by the Urban Wellbeing Index (IBEU, in Portuguese). Analyses were performed by multilevel logistic regression (95%CI). Among the 4,643 elderly individuals evaluated in this study, 51.5% reported a positive self-rated health (95%CI: 50.0-52.9). Elderly people living in capitals with higher IBEU terciles were more likely to have a positive self-rated health (OR: 1.42; 95%CI: 1.08-1.86 (T2); OR: 1.78; 95%CI: 1.35-2.33 (T3)). As for the dimensions of the IBEU, the following were associated with the outcome: urban infrastructure (OR: 1.56; 95%CI: 1.13-2.16), urban environmental conditions (OR: 1.49; 95%CI: 1.10-2.04), urban housing conditions (OR: 1.45; 95%CI: 1.05-1.99), and urban collective services (OR: 1.72; 95%CI: 1.30-2.27). A positive association was found between better conditions of the built environment and one's perception of health, regardless of individual characteristics. Promoting changes in the built environment can be effective in improving health levels, thus favoring healthy aging.*

Key words *Healthy of the elderly, Health status, Built environment, Health Surveys*

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Introduction

Population projection surveys in Brazil indicate that the country is experiencing a highly pronounced population aging[1], and a growing part of this population today lives in cities[2,3]. Both scenarios impose new challenges in terms of promoting healthy aging, that is, the process of developing and maintaining a functional capacity that enables wellbeing in old age and which also reflects the way in which elderly individuals interact with their surroundings, as well as the planning of cities with an inclusive and accessible urban environment that provides support for such a process[4].

In this sense, it is essential to evaluate the health conditions of the elderly population, as well as their determinants and conditions, especially at the population level. Thus, a measure that has proven useful for this purpose is self-rated health, an important indicator in the assessment of global health[5,6]. Self-rated health consists of objective and subjective aspects that must undergo an individual's judgment, thus representing a multidimensional construct that encompasses domains related to physical, social, and mental wellbeing[7].

Furthermore, self-rated health is considered to be a good predictor of morbidity and mortality, the use of health services, and functional decline among the elderly, highlighting the differences among more vulnerable subgroups[5,6,8]. Self-rated health is also influenced by several factors, the most widely investigated being those related to individual characteristics, such as demographic and socioeconomic conditions, multimorbidities, and lifestyle habits, relationships that are already well-established in the literature[7,9-12].

Moreover, considering the limitations of individual attributes when investigating the phenomena of health and disease, it is necessary to understand the variables related to the built environment where people live. There is a fair amount of evidence illustrating that individual health conditions, including self-rated health, vary depending on where people live[13-21], demonstrating that worse conditions in the built environment are associated with worse health conditions and a worse perception of it. By contrast, environments that provide safe and esthetically pleasing locations, with access to leisure destinations and services in general, positively influence the adoption of healthy habits and, consequently, one's health status.

Research also shows that such aspects are, in addition to the adoption of healthy behaviors, relevant to social interaction, functionality, and access to services, factors directly related to the self-rated health among the elderly[14-16]. However, most studies that have investigated the relationship between the built environment and self-rated health among the elderly were carried out in high-income countries, and the results indicate that the greater the socioeconomic disadvantage of the place of residence, the worse the self-rated health status of the elderly. However, individuals who reported that there was greater social cohesion in their neighborhoods were less likely to provide a negative perception of their health[17-20]. It is important to highlight that such associations occurred within a certain cultural, social, and physical infrastructure and may not have the same meaning for countries with different economic situations. Furthermore, the vast majority of studies conducted in Brazil which investigate self-rated health are limited to the adult population. They suggest that living in places with worse socioeconomic conditions, a lower population density, and physical and social problems (accumulated trash, a lack of pavement, security and public transport) tend to be associated with worse self-rated health[13,21-25], and a study conducted with the elderly population demonstrated that living in places with marked social inequalities was a factor related to a worse self-rated health[26].

Given the above, it is essential to investigate whether or not the direction and/or magnitude of the associations between the characteristics of the built environment and the self-rated health differ from that of high-income countries, as well as among the elderly population. Thus, present study aimed to analyze the prevalence of positive self-rated health among Brazilian elderly individuals and its association with factors within the built environment in Brazilian capital cities. This study is based on the hypothesis that elderly individuals living in capital cities with better built environment conditions, represented in this study by the Urban Wellbeing Index (IBEU, in Portuguese), will have greater chances of achieving a positive self-rated health.

Methods

This is a cross-sectional study with secondary data from the National Health Survey (NHS), a nationwide population survey, conducted between 2013 and 2014 by the Brazilian Institute of Geography and Statistics (IBGE) in partnership with the Ministry of Health (MH).

The NHS was constructed to include a representative sample of adults, aged 18 years or over, living in private households in Brazil, with the exception of those located in special census sectors (barracks, military bases, temporary accommodations, camps, boats, penitentiaries, penal colonies, prisons, jails, nursing homes, orphanages, convents, and hospitals). This study sought to produce data, at a national level, on sociodemographic characteristics, health status, and lifestyles of the Brazilian population, as well as data on health care and the use of health services.

The sampling process was planned in order to obtain a representative sample, with geographic disaggregation, considering the country's macro-regions, states, and capitals. The NHS data were collected using a three-stage probabilistic sample. In the first stage, the primary sampling units (PSUs) consisted of census sectors or a set of sectors, selected through simple random sampling, households were selected as secondary units (10 to 14 households in each PSU), and adult residents (18 years or older) were selected as tertiary sampling units.

The NHS-2013 had a sample of 205,546 adults interviewed in 60,202 households, conducted using three data collection forms, referring to the household, the residents, and the individual. The interviews were pre-scheduled and data were collected on handheld computers (Personal Digital Assistants - PDAs). The present study used only information from individuals aged 60 years or over (n=23,815) selected with equiprobability among all adult residents of the household, whose information came from the final two forms. Further information on the 2013 NHS can be found in a previous study[27,28].

Study variables

Outcome variable

The outcome variable of the present study was self-rated health, measured through the following question: "How do you rate your health?" The available response categories were: very good, good, fair, bad, and very bad. For analysis purposes, the responses were grouped into two categories, based on the original, positive self-rated health (very good and good) and negative self-rated health (regular, bad, and very bad) (reference category).

Main exposure variable

To analyze the characteristics of the built environment, the Municipal IBEU[28] was used, which was calculated for all Brazilian municipalities, using information from the 2010 Demographic Census. The IBEU aims to evaluate the urban dimension of well-being enjoyed by citizens in terms of the social services provided by the State, relating it to the collective conditions of life in the city promoted by the built environment, in the scales of housing and the nearby neighborhood and through equipment and urban services.

The Municipal IBEU consisted of five dimensions: Urban Mobility (D1), Urban Environmental Conditions (D2), Urban Housing Conditions (D3), Urban Collective Services (D4), and Urban Infrastructure (D5). All of these dimensions were defined considering the necessary properties of urban space that can enable collective living conditions for its inhabitants, having in common the possibility of being understood based on urban conditions that favor greater or lesser wellbeing for its residents[29]. Chart 1 presents a description of the indicators that make up each of the dimensions.

To construct the IBEU, it was considered that each of the dimensions would have the same weight, being considered of equal importance to guarantee urban well-being. However, the composition of each dimension followed the quantity and characteristics of the indicators belonging to them. Finally, the values of each of the indicators were standardized and defined in the range between zero and one, and for each, the closer to one, the better their condition. For further information, IBEU data is available at the *Observatório das Metrópoles* website[29]. For the purposes of statistical analysis in the present study, both the IBEU and its dimensions were categorized into tertiles.

Individual level variables

The individual adjustment variables included were: sex (male/female), age group (60-69 years, 70-79 and 80 years or over); education (no education and incomplete elementary school, complete elementary school and incomplete high school, complete secondary school and incomplete higher education, and complete higher education); skin color (white, black, or brown), considering that, in the categorization of this variable, the yellow and indigenous categories were excluded as they represented less than 1.5% of the sample; lives with spouse or partner (yes and no); practicing physical activity during leisure time, and those participants who reported practicing at least 150 minutes per week of physical activity during leisure time were classified as

Chart 1. Definition of the dimensions and variables of the Urban Wellbeing Index (IBEU).

Dimensions of IBEU	Data source	Description of variable composition
Urban mobility	Metropolis Observatory, 2010 Demographic Census	Built based on the home-work commute indicator.
Urban environmental conditions	Metropolis Observatory, 2010 Demographic Census	Built based on three indicators: afforestation around homes, open sewage around homes, and garbage accumulated around homes. Categorized into tertiles.
Urban housing conditions	Metropolis Observatory, 2010 Demographic Census	Built based on four indicators: subnormal agglomeration, household density, resident/bathroom density, and household wall material. The indicators in this dimension were selected based on the understanding of the conditions of the households, as well as their characteristics.
Urban collective service provider	Metropolis Observatory, 2010 Demographic Census	Built based on four indicators: adequate water service, adequate sewage service, adequate energy service and adequate garbage collection. Categorized into tertiles.
Urban infrastructure	Metropolis Observatory, 2010 Demographic Census	Built based on seven indicators: public lighting, paving, sidewalk, curb/guide, manhole, ramp for wheelchair users and public places. Categorized into tertiles

Source: Authors.

active during leisure time according to the World Health Organization (WHO) criteria regarding the weekly time spent[30].

Multimorbidity was assessed by cutting off ≥2 diseases, using a list of morbidities available in the NHS, and were investigated through a self-reported medical diagnosis. The question applied to measure each disease based on self-reported medical diagnosis was: "Has a doctor ever diagnosed you as having (each disease)?". The following diseases were included in the present study: systemic arterial hypertension (SAH), diabetes, high cholesterol, heart disease, stroke, asthma, arthritis or rheumatism, chronic back problems, depression, mental illnesses (schizophrenia, bipolar disorder, or obsessive-compulsive disorder), lung diseases (chronic bronchitis, emphysema, or chronic obstructive pulmonary disease), cancer, chronic renal failure, and work-related musculoskeletal diseases (WMSDs).

Statistical Analysis

Built environment variables relating to Brazilian capital cities and individual variables were combined into a single database. The resulting data consisted of a structure at two levels: individual (level 1) and capital (level 2).

The data were analyzed using the STATA SE 14 statistical program and all analyses took into account the design effect and sampling weights resulting from complex sampling. Initially, the sample was described through descriptive statistics, using absolute and relative frequencies with 95% confidence intervals (95%CI) for categorical variables.

The association between the built environment and self-rated health was analyzed through the construction of Multilevel Logistic Regression models, with the first level represented by individuals and the second level by Brazilian capital cities.

This approach was chosen to represent the two-level structure of the data and because multilevel modeling with random intercepts considers this cluster effect. Initially, the effect of level 2 (capital cities) on the outcomes was determined by calculating the Variance Partition Coefficient (VPC), defined as the ratio between the variability between the capitals divided by the sum of the variability between the capital cities and within the capital cities. In the logistic model, it is assumed that the variance of the first level is constant and equal to $\pi 2/3=3.29$[31]. To this end, firstly a null model was tested (with intercept, but without exploratory variables), to estimate

the proportion of the total variance in self-rated health attributed to the differences between capital cities (level 2).

After this step, multilevel models with mixed effects were developed, separated for each variable of the built environment (IBEU and each of its dimensions). Model 1 corresponded to the crude analysis, where the association of the outcome with each of the contextual variables was tested.

Multivariate analysis was performed using two models. First, the association between the outcome and each built environment variable was adjusted by sex, age group, skin color, marital status, and education (model 2). Next, physical activity and multimorbidity were included in the model (model 3).

For all analyses, 95%CIs were adopted and values of $p<0.05$ were considered statistically significant.

Results

The analytical sample of the present study totaled 4,643 elderly individual from the 26 Brazilian capital cities and the Federal District, with a range of 50 to 537 individuals in each capital. The general prevalence of positive self-rated health among the elderly was 51.5% (95%CI: 50.0-52.9). The capitals where the elderly reported better self-rated health were Florianópolis, Vitória, and Belo Horizonte, with prevalence levels of 67.7%, 67.2%, and 61.9%, respectively ($p< 0.001$) (data not presented in the tables).

The sample characteristics are presented in Table 1, considering the sample weights. The average age of the individuals was 70 years (±8 years), of which 60.2% were female. Furthermore, a predominance of elderly individuals reported white skin color (59.8%) and more than half of the individuals reported living with a partner. Regarding education, more than half of the individuals had no education or had incomplete elementary education. By contrast, the proportion of elderly individuals with a higher education degree was approximately 18%. Furthermore, it was observed that more than 80% of the elderly were classified as inactive during leisure time, and 48.8% had multimorbidity.

The prevalence of positive self-rated health according to individual characteristics is presented in Table 1. It was observed that this outcome was more prevalent in older males, aged between 60-69 years, with white skin color, and who had a complete higher education; in those classified as physically active; and in those who had less than two chronic diseases.

Regarding the characteristics of the built environment per Brazilian capital, as represented by the IBEU, it was observed that the capital cities with the best built environment indicators were Vitória (IBEU=0.90), Goiânia (IBEU=0.87), and Curitiba (IBEU=0.87) (Figure 1).

Table 2 presents the results of the prevalence of positive self-rated health according to the built environment represented by the IBEU and its dimensions. There was a higher prevalence of the outcome according to the highest tertiles of the IBEU, as well as its dimensions of environmental conditions, housing conditions, urban collective services, and urban infrastructure.

Regarding the association between positive self-rated health and the built environment, these results are shown in Table 3. Significant variability in positive self-rated health was found when comparing the capital cities in model 1 (null model), in such a way that the variation explained by the difference between Brazilian capitals for the outcome was 4.0% (ICC=0.039, $p<0.001$). In multilevel models 2 and 3, carried out with adjustments for individual variables, it was observed that in both, with the exception of urban mobility, all other contextual variables were associated with the outcome.

Thus, considering Model 3, it was found that the positive self-rated health was associated with the IBEU and its dimensions, not including urban mobility. Elderly individuals living in capitals with the highest IBEU tertiles (second and third tertiles) were 42% and 78%, respectively, more likely to report good self-rated health (OR: 1.42; 95%CI: 1.08-1.86; OR: 1.78; 95%CI: 1.40-2.33).

Regarding the associations between positive self-rated health and the IBEU dimensions, it was observed that elderly individuals who lived in capital cities with the highest tertile of environmental and urban housing conditions had a nearly 50% greater chance of achieving a positive self-rated health. Regarding the dimension of collective services, both the intermediate tertile and the highest tertile were positively associated with the outcome (OR: 1.42; 95%CI: 1.09-1.87; OR: 1.72; 95%CI: 1.30-2.27). Finally, the chance of reporting good self-rated health was 56% higher among elderly individuals living in capital cities with the highest tertile of urban infrastructure (Table 3).

Table 1. Sociodemographic characteristics, health conditions, and lifestyle habits of the elderly, as well as the prevalence of a positive self-rated health according to individual variables among elderly residents in Brazilian capital cities. National Health Survey, 2013 (n=4,643).

Individual variables	n (%)	Positive Self-Rated Health	p-value
		% (95%CI)	
Sex		0,446	0,446
Female	1,633 (60.21)	52.91 (50.22-55.58)	
Male	3,010 (39.79)	54.70 (50.97-58.38)	
Age range		0.070	0,070
60-69 years old	2,578 (55.21)	55.87 (53.01-58.69)	
70-79 years old	1,402 (29.38)	51.03 (47.01-55.03)	
≥80 years old	663 (15.41)	50.52 (45.07-55.97)	
Skin color		<0.001	<0,001
White	2,471 (59.87)	60.61 (57.77-63.39)	
Brown/black	2,172 (40.13)	43.19 (40.06-46.38)	
Lives with a partner		0.554	0,554
Yes	1,932 (51.81)	54.27 (51.02-57.48)	
No	2,711 (48.19)	52.93 (49.95-55.88)	
Level of Education		<0.001	<0,001
No education/incomplete elementary	2,452 (50.57)	42.62 (39.56-45.74)	
Complete elementary/incomplete secondary	501 (11.00)	48.96 (42.45-55.52)	
Complete secondary/incomplete higher education	897 (20.54)	64.53 (60.08-68.74)	
Complete higher education	793 (17.89)	75.06 (70.94-78.76)	
Leisure-time physical activity		<0.001	<0,001
Physically inactive (<150 min/week)	3,792 (82.06)	48.45 (46.03-50.87)	
Physically active (≥150 min/week)	851 (17.94)	77.31 (73.42-80.77)	
Multimorbidities		<0.001	<0,001
<2 diseases	2,349 (51.19)	60.67 (58.44-62.86)	
≥2 diseases	2,294 (48.81)	30.40 (28.16-32.74)	

95%CI: 95% confidence interval.

Source: Authors.

Discussion

The results found in the present study support the hypothesis that the characteristics of the built environment are associated with the self-rated health in elderly residents of Brazilian capital cities. In general, higher tertiles of the IBEU, as well as its dimensions of environmental conditions, housing conditions, collective services, and urban infrastructure were associated with greater chances of positive self-rated health.

More than half of the elderly people in this study reported a positive self-rated health. These findings are consistent with prior studies, which demonstrated a prevalence of between 50.4% and 53.1% when investigating elderly individuals living in municipalities in the South, Southeast, and Northeast regions of Brazil[7,32,33].

However, in two surveys, one carried out in Campinas-SP and another in the city of Rio de Janeiro-RJ, the authors found a higher prevalence of positive self-rated health among individuals aged 60 years or over (80.9% and 83%, respectively)[10,25]. This divergence in prevalence can be explained by the way the self-rated health was evaluated and categorized.

The results of this study showed that elderly individuals living in places with better urban environmental conditions, characterized by greater afforestation and less sewage or garbage accumulated around their homes, were more likely to report a positive self-rated health when compared to elderly people who lived in capital cities with the worst conditions of these indicators. These findings corroborate a British cohort study that followed up on 6,500 people, aged between 45

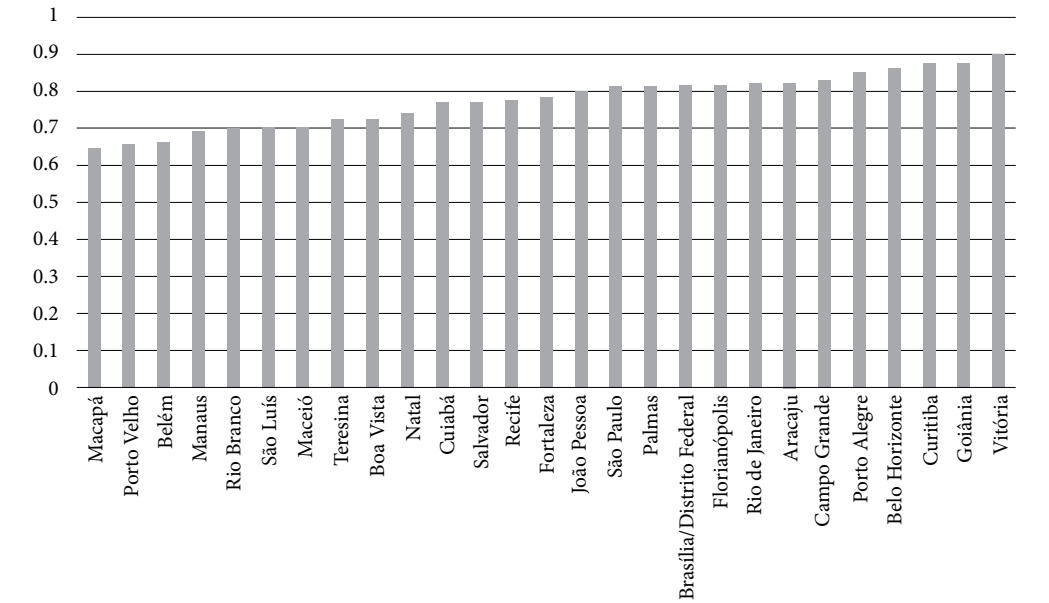

Figure 1. Urban Wellbeing Index according to the Brazilian state capitals.

Source: Metropolis Observatory, 2010 Demographic Census.

and 68 years, for 10 years, which revealed that living close to green spaces has the potential to increase physical activity, reduce self-reported anxiety, and mitigate noise and air pollution, factors that directly influence self-rated health[34].

Furthermore, studies conducted in Brazil demonstrated that elderly individuals report a greater tendency towards social and community interaction in wooded environments[35] and with lower urban density[36]. Hence, older individuals feel encouraged to socialize at the same time that they tend to be more physically active, and the literature shows that both factors are associated with a better self-rated health[7,33,37]. Furthermore, an English cross-sectional study, conducted with 999 elderly individuals, aged 65 years or over, showed a positive association between good health assessment and urban structure, characterized by the presence of places for leisure, availability of public transport, and pleasant places to walk. It should be noted that both the outcome and the exposure were measured through individual perception[38].

Research also shows that housing conditions have a great influence on health levels as well as individuals' self-rated health[39,40]. This association was also demonstrated in the present study, where older people with better housing conditions, represented by such indicators as household density, number of bathrooms per resident, and the material in which the home is built, were more likely to report a better self-rated health.

From this same perspective, most elderly people prefer to age in their own homes and maintain as much independence as possible. They also represents the portion of the population that spends more time at home. Thus, living in homes with adequate conditions can positively influence one's health, wellbeing, and autonomy of these individuals, which results in a better perception of their own health.

Likewise, the literature shows that collective public services, such as water treatment, sewage, and garbage collection, have a direct impact on the health of the population, especially concerning infectious and parasitic diseases, thus affecting the self-rated health of individuals who live in in places that do not provide such essential services[24,41]. This fact was proven by the present study, which demonstrated that elderly people

Table 2. Prevalence of positive self-rated health according to built environment variables among elderly residents of Brazilian capital cities. National Health Survey, 2013 (n=4,643).

Contextual level variables	Positive Self-Rated Health	
	% (95%CI)	p-value*
IBEU tercile		<0,001
Low	41.71 (36.89-46.69)	
Average	51.56 (48.17-54.94)	
High	59.20 (55.96-62.36)	
IBEU Urban Mobility tercile		0.401
Low	54.47 (51.45-57.45)	
Average	52.25 (48.67-55.80)	
High	51.73 (48.01-55.42)	
IBEU Environmental Conditions tercile		<0.001
Low	43.42 (39.15-47.79)	
Average	55.24 (51.73-58.70)	
High	55.02 (51.65-58.34)	
IBEU Housing Conditions tercile		<0.001
Low	44.17 (39.86-48.58)	
Average	54.17 (51.0-57.31)	
High	57.49 (54.44-60.48)	
IBEU Urban Collective Services tercile		<0.001
Low	42.05 (37.69-46.55)	
Average	53.75 (49.82-57.63)	
High	55.71 (52.77-58.62)	
IBEU Urban Infrastructure tercile		<0.001
Low	44.31 (39.81-48.90)	
Average	51.50 (48.31-54.67)	
High	56.35 (53.14-59.50)	

95%CI: 95% confidence interval. *Pearson Chi-square Test.

Source: Authors.

living in capital cities with good indicators for the provision of the aforementioned services were more likely to report a better self-rated health.

Furthermore, this finding is in line with the study carried out with the adult population of the 27 Brazilian capital cities, which showed that higher levels of coverage of sewage network, water supply, and garbage collection services were associated with a lower probability of a negative self-rated health[24]. Precarious access to water and sanitation is associated with scenarios of extreme poverty and, consequently, social inequality. This scenario of risk is related to the increased incidence of acute infectious diseases and the prevalence of chronic diseases[41].

Regarding the urban infrastructure of the capital cities, consisting of indicators of public lighting, sidewalks, curbs, and ramps, it was observed that better conditions of these factors were associated with greater chances of a positive self-rated health on the part of the elderly. Corroborating this finding, studies indicate that physical and mental health, social integration, and a better quality of life and self-rated health of the elderly are closely related to their active mobility. As this behavior occurs in external environments, this fact reinforces the importance of urban environments that offer safety and good infrastructure for pedestrians, such as sidewalks and public street lighting, as these are directly related to active mobility of the elderly population, and thus to better health conditions[14-16,42-44].

This study is one of the first conducted in Brazil to investigate the association between self-rated health and the built environment in the elderly population, showing significant associations among these factors. These results are important for several reasons: the elderly represent the fastest growing age group, especially in middle-income countries like Brazil, and they tend to have a worse self-rated health when compared to younger people. Furthermore, this target population is more susceptible to barriers or infrastructure in the built environment due to a decline in functionality and mobility, as well as the decrease in their social networks.

Therefore, these findings regarding the influence of the characteristics of the built environment on the self-rated health of the elderly population in Brazilian capital cities contributes to expanding scientific knowledge in the area of environmental determinants and conditions of health.

Some limitations must be considered when interpreting the results of this study. First, the use of a cross-sectional design limits the identification of a causal link between built environment variables and self-rated health; however, it does indicate the magnitude of the associations, potentially bringing new approaches to the development of the study area. Second, the use of self-reported measures may overestimate the prevalence of the outcome. Furthermore, the sample used is representative of the elderly population living in the 27 Brazilian capitals, making it impossible to interpret the results for other areas of the country. Furthermore, in this study, the total variance in individual self-rated health was not substantially explained by the contextual level of the capital cities, but it is important to

Table 3. Association between characteristics of the built environment and positive self-rated health among elderly residents of Brazilian capital cities. National Health Survey, 2013 (n=4,643).

Variables at the contextual level	Model 1*	Model 2**	Model 3***
	OR (95%CI)	OR (95%CI)	OR (95%CI)
IBEU			
Low	1		1
Average	1.55 (1.21-1.98)	1.31 (1.02-1.69)	1.42 (1.08-1.86)
High	2.11 (1.66-2.69)	1.62 (1.26-2.09)	1.78 (1.35-2.33)
IBEU Urban Mobility			
Low	1	1	1
Average	0.75 (0.51-1.11)	0.77 (0.57-1.04)	0.81 (0.57-1.15)
High	0.87 (0.59-1.27)	0.95 (0.70-1.29)	0.98 (0.69-1.39)
IBEU Environmental Conditions			
Low	1	1	1
Average	1.57 (1.16-2.12)	1.26 (0.95-1.66)	1.28 (0.95-1.73)
High	1.64 (1.21-2.23)	1.35 (1.02-1.81)	1.49 (1.10-2.04)
IBEU Housing Conditions			
Low	1	1	1
Average	1.34 (0.97-1.85)	1.14 (0.84-1.53)	1.29 (0.93-1.78)
High	1.71 (1.24-2.36)	1.35 (1.01-1.82)	1.45(1.05-1.99)
IBEU Urban Collective Services			
Low	1	1	1
Average	1.62 (1.26-2.08)	1.34 (1.04-1.72)	1.42 (1.09-1.87)
High	2.03 (1.57-2.62)	1.59 (1.23-2.06)	1.72 (1.30-2.27)
IBEU Urban Infrastructure			
Low	1	1	1
Average	1.33 (0.99-1.79)	1.14 (0.88-1.49)	1.21 (0.90-1.61)
High	1.77 (1.27-2.48)	1.48 (1.10-1.98)	1.56 (1.13-2.16)

*Model 1 Unadjusted; **Model 2 adjusted for: sex, age range, skin color, marital status, and level of education; ***Model 3 adjusted for: sex, age range, skin color, marital status, and level of education, physical activity, and multimorbidities. OR: Odds Ratio; 95%CI: 95% Confidence Interval.

Source: Authors.

note that there was a statistically significant association between the characteristics of the built environment and self-rated health, even after considering individual characteristics.

Conclusion

The results demonstrated that better conditions in the built environment, represented by higher tertiles of the IBEU, as well as its dimensions of urban infrastructure, urban environmental and housing conditions, and urban collective services are associated with greater chances of positive self-rated health among elderly individuals living in Brazilian capital cities, corroborating the hypothesis that the environment influences individual health.

Self-rated health is a widely used indicator to assess the general health status, especially of the elderly population, as it is capable of predicting physical conditions, such as morbidity and mortality and functional decline, as well as mental health and wellbeing. To improve the health conditions of the Brazilian elderly population, it is necessary that the built environment of cities be optimized by increasing the availability of appropriate places for active mobility, physical activity, and other leisure activities, and by augmenting the provision of urban services, such as garbage collection and sanitation, in order to promote healthy habits and reduce the risk of diseases and illnesses common to this population.

Therefore, it is necessary to integrate health policies into urban planning. Resulting from such integration, the potential benefits related to improving the built environment include better health conditions and, consequently, a more positive self-rated health among the elderly population.

Collaborations

MC Antunes, HN Zardeto and SL Pscheidt participated in the analysis and interpretation of data and the write-up of the article. DN Mello and G Custódio participated in the write-up of the article. MWC Giehl is responsible for the conception and planning of the study, analysis and interpretation of the data, and the write-up of the article. All authors critically reviewed the work, approved its final version, and are responsible for all aspects of the work.

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