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Association between socioeconomic factors and fruit and vegetable consumption in Brazilians aged ≥ 50 years: ELSI-Brazil data

Associação entre consumo de frutas, legumes e verduras e fatores socioeconômicos em brasileiros com 50 anos ou mais: dados do ELSI-Brasil

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Abstract

Objective: Daily fruit and vegetable consumption is a critical factor in health, especially aging. This study aimed to evaluate the association between socioeconomic factors and daily fruit and vegetable consumption in men and women aged ≥ 50 years.

Methods: This cross-sectional study used 2015–2016 data from the Brazilian longitudinal study of aging (ELSI-Brazil), which included 8665 individuals aged ≥ 50 years. Daily fruit and vegetable consumption was the dependent variable, and income, education, sex, age, and race were the independent variables. Associations between fruit and vegetable consumption and the independent variables were determined using Poisson regression.

Results: Individuals who had completed higher education (OR 2.40; 95% CI 2.07–2.78), whose income was > 3 times the minimum wage (OR 2.42; 95% CI 2.18–2.68), and those aged > 80 years (OR 1.44; 95% CI 1.27–1.63) were more likely to consume fruits and vegetables. However, men (OR 0.63; 95% CI 0.58–0.67), Blacks (OR 0.74; 95% CI 0.65–0.84), and people of mixed race (OR 0.68; 95% CI 0.63–0.73), were less likely to consume fruits and vegetables.

Conclusions: The results show inequality in fruit and vegetable consumption among people aged ≥ 50 years, which was lower among men, people of Black or mixed race, people with low income and education, and those with younger age. Interventions are needed to promote fruit and vegetable consumption, and thus healthy aging, among these groups.

Keywords: aging; diet; fruit; vegetables; socioeconomic factors.

Resumo

Objetivo: O consumo diário de frutas, legumes e verduras (FLV) é um fator primordial à saúde, especialmente no envelhecimento. Este estudo teve o objetivo de avaliar a associação entre fatores socioeconômicos e o consumo diário de FLV em pessoas com idade de ≥ 50 anos, de ambos os sexos.

Metodologia: Trata-se de um estudo transversal, com dados do ELSI-Brasil 2015 – 2016, realizado com 8.665 indivíduos com idade acima de 50 anos. O consumo diário de FLV foi a variável dependente e renda, escolaridade, sexo, idade e cor de pele foram as variáveis independentes. A regressão de Poisson foi usada para verificar a associação entre o consumo de FVL e as variáveis independentes.

Resultados: Indivíduos que possuíam ensino superior (*odds ratio* — OR 2,40; intervalo de confiança — IC95% 2,07 – 2,78), que recebiam mais que três salários-mínimos (OR 2,42; IC95% 2,18 – 2,68) e com idade superior a 80 anos (OR 1,44; IC95% 1,27 – 1,63) tinham maior probabilidade de consumir FLV. Por outro lado, homens (OR 0,63; IC95% 0,58 – 0,67) de cor de pele parda (OR 0,68; IC95% 0,63 – 0,73) e preta (OR 0,74; IC95% 0,65 – 0,84) tiveram menor chance de consumo de FVL.

Conclusões: Os resultados revelam desigualdades no consumo de FLV entre pessoas com idade acima de 50 anos, com maior magnitude entre os com baixa renda, baixa escolaridade, menor idade, sexo masculino e cor de pele parda e preta, demonstrando, assim, a necessidade de estratégias de intervenção para aumentar o consumo desses alimentos, buscando a promoção do envelhecimento saudável.

Palavras-chave: envelhecimento; consumo alimentar; frutas; vegetais; fatores socioeconômicos.

INTRODUCTION

Regular consumption of fruits and vegetables (FV) is critical to health, especially in older adults, since they contain micronutrients and bioactive compounds essential for weight maintenance, diet quality, and disease prevention.¹ However, in recent decades, their consumption has stagnated in Brazil due to an increasing trend toward foods with high energy density and low nutritional value, such as ultra-processed products.²

This has led to a higher average daily caloric intake, which has a direct relationship with the increased prevalence of overweight, chronic non-communicable diseases, and mortality from non-communicable diseases,² currently the leading cause of death in Brazil, which tends to increase with age,³ affecting around 62% of individuals aged 45–59 years⁴ and 76.3% of the country's older adult population,⁵ especially those with low income and education levels.⁶

FV consumption has become a global public health concern in recent decades. In 2002 it was estimated that around 2.7 million deaths annually were caused by health conditions related to low fruit and vegetable intake. Low fruit and vegetable intake is also responsible for around 31% of ischemic heart disease and 11% of strokes worldwide.⁷ According to 2017 data, health conditions related to insufficient fruit and vegetable consumption caused about 3.9 million deaths worldwide: 14% from gastrointestinal cancer, 11% from ischemic heart disease, and 9% from stroke.⁸

The World Health Organization and the Food Guide for the Brazilian Population recommend daily FV consumption (excluding starchy tubers, such as potatoes) to achieve adequate intake of micronutrients, dietary fiber, and beneficial bioactive compounds, as well as to prevent type 2 diabetes, obesity, heart disease, and other non-communicable diseases.^{7,9} The minimum recommendations for the general population are 400 g (5 servings) of F and/or V each day according to World Health Organization or 3 servings each according to the Food Guide for the Brazilian Population.^{8,9}

Although genetic factors and extrinsic factors, such as eating habits and socioeconomic status, play an important role in health outcomes among older adults,¹⁰ healthy eating is a pillar of disease prevention, such as malnutrition and non-communicable diseases, in this age group.¹¹ Therefore, it is essential to make healthy food choices that consider changes in energy requirements with increasing age to reduce the risk of disease¹¹ and promote healthy and active aging.¹² However, studies have shown that purchasing power, education, race, and social habits are determining factors in FV consumption.^{13,14}

FV consumption among individuals aged ≥ 50 years, especially its association with socioeconomic conditions, should be investigated to strengthen the national literature on the topic^{1,13,15,16} and encourage consumption, thus promoting healthy aging for the entire population. Therefore, the present study aimed to evaluate the effects of socioeconomic factors on the daily FV consumption in people aged ≥ 50 years.

METHODS

This cross-sectional study was conducted using data from the Brazilian Longitudinal Study of Aging (ELSI-Brazil), whose first wave took place in 2015–2016. ELSI-Brazil was designed to analyze the social and biological determinants of aging in the Brazilian population. To do this, it used a representative sample of people aged ≥ 50 years. Although the sample size was determined at 10,000 people, only 9,412 participated. The present study included 8665 individuals who responded to the food consumption questionnaire. This study complies with ethical principles for research involving human subjects and was approved by the Ethics Committee of Fiocruz, Minas Gerais (CAAE 34649814.3.0000.5091). All participants provided written informed consent for each procedure. ELSI-Brazil was funded by the Ministry of Health: DECIT/SCTIE (Processes: 404965/2012-1 and TED 28/2017); COPID/DECIV/SAPS (Processes: 20836, 22566, 23700, 25560, 25552 and 27510). More details about ELSI can be found on its homepage (<http://elsi.cpqrr.fiocruz.br>) and in a previous publication.¹⁷

The questionnaire consisted of the following modules: a household interview on characteristics and income; an individual interview on socioeconomic, health, and health service parameters; and a physical assessment. All interviews were conducted in the participants' homes by trained interviewers. Information on the residents' socioeconomic and demographic characteristics and daily FV consumption was selected for this analysis. The socioeconomic variables were education (none, complete or incomplete primary education, complete or incomplete secondary education, and complete higher education) and monthly per capita household income. The demographic variables were age (50–59 years, 60–79 years, or ≥ 80 years), sex (female or male), and race (White, Black, or mixed).

The per capita monthly household income was classified into 3 categories: < 1 , 1–2.99, and > 3 times the federal minimum wage, including any benefits received (eg, *Auxílio Brasil* and pension). The per capita monthly

family income was obtained by adding the gross income of all residents in the household and dividing it by the total number of residents.

Daily FV consumption was analyzed using the following questions: “On how many days of the week do you usually eat vegetables?”; “How many times a day do you usually eat vegetables?”; “How many days a week do you usually drink natural fruit juice?”; “In general, how many times a day do you drink natural fruit juice?”; “How many days a week do you usually eat fruit?”; “Do you usually eat fruit several times a day?”

Based on the Food Guide for the Brazilian population,⁹ the World Health Organization, and the Pan American Health Organization recommendations for healthy eating,¹⁸ the responses were divided into four dietary indicators: daily F consumption; daily V consumption; non-daily F consumption; non-daily V consumption.

A descriptive analysis was performed to characterize the sample. Categorical variables were presented as frequencies and percentages, and quantitative variables as means and SD. The Shapiro-Wilk test was used to determine the normality of quantitative variables. Student's *t*-test, the chi-square test, or the Mann-Whitney test were used to compare the variables according to daily FV consumption. Poisson regression was used to determine the association between FV consumption, family income, education, age, sex, and race. The significance level was set at 5%.

RESULTS

A total of 8665 individuals aged ≥ 50 years were interviewed, of whom 56.27% were female, 49.24% were aged 60–79 years, 48.89% self-reported their race as mixed, 58.95% reported primary education, and 46.61% reported a family income $< 1 \times$ the federal minimum wage (Table 1). Daily V consumption was reported by 45.01%, daily F consumption was reported by 42.33%, and daily F+V consumption was reported by only 26.19%.

Table 2 shows the association between daily FV consumption and the independent variables (income, education, age, sex, and race). In multiple analysis, after adjusting for sociodemographic variables, greater FV consumption was associated with family income > 3 times the minimum wage (OR 2.42; 95% CI 2.18–2.68), higher education (OR 2.40; 95% CI 2.07–2.78), age > 80 years (OR 1.44; 95% CI 1.27–1.63), while lower FV consumption was associated with male sex (OR 0.63; 95% CI 0.58–0.67) and self-reported Black (OR 0.74; 95% CI 0.65–0.84) or mixed race (OR 0.68; 95% CI 0.63–0.73).

TABLE 1. Sociodemographic characteristics of the participants, aged ≥ 50 years ($n = 8665$).

Variables	n	%
Age (years)		
50–59	3703	42.74
60–79	4267	49.24
≥ 80	695	8.02
Sex		
Female	4876	56.27
Male	3789	43.73
Race		
White	3557	41.05
Black	872	10.06
Mixed	4236	48.89
Education		
None	1331	15.45
Complete or incomplete elementary school	5077	58.95
Complete or incomplete high school	1522	17.67
Complete higher education	682	7.92
Monthly household income per capita (times the federal minimum wage)		
< 1	4039	46.61
1–2.99	3923	45.27
> 3	703	8.11

DISCUSSION

The findings of this study revealed that higher income, higher education, age > 80 years, female sex, and self-reported White race increase the chance of daily FV consumption. Contrary to World Health Organization recommendations, approximately 75% of the participants did not consume FV daily.⁷

Retirement can improve the living conditions of older people, since it guarantees a fixed income,¹⁸ facilitating access to and more frequent consumption of FV. Furthermore, higher income is associated with higher educational levels, longer life expectancy, and higher diet quality,¹⁹ since people with higher education tend to value healthy eating, mainly as a form of disease prevention and control.¹⁴

A study using National Health Survey data from 2019 found that the probability of F and V consumption among older people with higher education is 60% and 80%, respectively.¹³ A literature review based on data from extensive national studies, such as Vigitel, the National Health Survey, and the National Food Survey, also found a direct association between education level and FV consumption.¹⁴

Social factors, such as education, demographic profile, race, disposable income, and financial stability influence people's eating habits, making them social determinants of food and

TABLE 2. Association between daily consumption of fruits and vegetables and income, education, age, sex, and race of individuals aged ≥ 50 years ($n = 8665$).

Variable	Daily V consumption			Daily F consumption			Daily F+V consumption		
	OR*	95% CI	p-value†	OR*	95% CI	p-value†	OR*	95% CI	p-value†
Age (years)									
50–59	1			1			1		
60–79	1.08	1.03–1.13	< 0.01	1.29	1.22–1.36	< 0.01	1.29	1.20–1.40	< 0.01
≥ 80	1.09	1.00–1.19	< 0.01	1.50	1.38–1.63	< 0.01	1.44	1.27–1.63	< 0.01
Sex									
Female	1			1			1		
Male	0.79	0.76–0.83	< 0.01	0.70	0.66–0.74	< 0.01	0.63	0.58–0.68	< 0.01
Race									
White	1			1			1		
Mixed	0.82	0.78–0.86	< 0.01	0.77	0.74–0.82	< 0.01	0.68	0.63–0.74	< 0.01
Black	0.87	0.81–0.95	< 0.01	0.75	0.69–0.83	< 0.01	0.74	0.65–0.84	< 0.01
Education									
None	1			1			1		
Complete or incomplete elementary	1.19	1.11–1.29	< 0.01	1.42	1.30–1.56	< 0.01	1.40	1.23–1.59	< 0.01
Complete or incomplete high school	1.49	1.37–1.62	< 0.01	1.76	1.59–1.93	< 0.01	1.98	1.72–2.27	< 0.01
Complete higher education	1.63	1.48–1.79	< 0.01	2.12	1.91–2.36	< 0.01	2.40	2.07–2.78	< 0.01
Monthly household per capita income (times the minimum wage)									
< 1	1			1			1		
1–2.99	1.28	1.22–1.36	< 0.01	1.44	1.37–1.52	< 0.01	1.65	1.51–1.78	< 0.01
> 3	1.59	1.49–1.71	< 0.01	1.91	1.77–2.04	< 0.01	2.42	2.18–2.68	< 0.01

*Poisson regression model. †significant at $p < 0.05$; OR: odds ratio; V: vegetable; F: fruit.

nutrition. Thus, public policy, the cost of essential services (eg, health care, education, and housing), and food prices in local markets shape these determinants.²⁰

In this study, age > 80 years was associated with the FV consumption. This corroborated National Health Survey data, which show a linear increase in FV consumption with older age, which was highest among individuals aged ≥ 75 years.²¹

One possible explanation for this association could be that older adults are more concerned about disease prevention and control, seeking more appropriate food consumption patterns for their health condition, including higher quantities of FV. Furthermore, people aged > 80 years developed their eating patterns in a historical context where FV consumption was frequent and processed foods were almost non-existent in the country.²² Another explanation for this finding may be reverse causality, ie, these surviving older adults are in good health because they have been “naturally selected” due to habitual FV consumption.

In this study, non-Whites were 30% less likely to consume FV daily; the lowest level of F consumption was among Blacks. Another study found similar results.¹⁴ More than

half of the Brazilian population is Black or of mixed race (56.2%), but these groups also represent 75.2% of the population with lower income and have lower rates of higher education than Whites⁸.

A survey of Brazilian older adults found that the majority of those whose income was ≤ 2 times the minimum wage were Black or of mixed race, and they were also a minority among those with higher education.²³ In a society with persistent racism, socioeconomic disparities between races significantly influence eating habits.¹⁴

In this study, daily FV consumption was 40% less likely among men, an association that has been observed in other studies.^{14–16,22} This might be explained by a greater preoccupation among women to maintain body weight and health, thus complying with dietary recommendations, in addition to a habit of cooking, which can improve food choices.²⁴

The present study also found that those who consume FV daily are a minority of the population ≥ 50 years of age. According to the Family Budget Study, daily FV consumption was lower in 2018–2019 than in 2008–2009, remaining well below recommended levels. F and V represented 5% and

2.2% of the calories consumed by older adults, respectively.²⁵ Considering that the recommended dietary allowance for these food groups is 9%–12% of the total energy value of a 2000 kcal diet,⁹ current consumption must be increased by almost 400%.

Since income, education, age, sex, and race have a significant impact on the food consumption and health in older adults,¹⁸ social inequality can compromise food quality, availability, access, use, and stability,²⁰ leading to decreased consumption and, consequently, a greater risk of disease and, as a result, greater cost to the health system.

As a way to decrease the cost of and increase access to FV, the 2014 Food Guide for the Brazilian Population suggests purchasing during the harvest season, purchasing where there are fewer intermediaries between producers and consumers, and purchasing directly from producers.¹² Having greengrocers in residential areas, for example, favors greater consumption of FV,²⁰ since they facilitate access for older adults and are often cheaper than supermarkets.

This study has strengths and limitations. Its strengths include an adequate sample size to analyze associations between variables. It also enriches the national literature with relevant data and encourages discussion about FV consumption and the aging process. Its greatest weakness was that the FV consumption questionnaire was short and did not allow analysis of portion size, only the frequency of consumption (number of times per day/week). However, the questionnaire type minimizes recall bias about dates or errors describing portions. These results can be used to determine a consumption profile for this population and encourage future research. Although this study was cross-sectional, the data can be explored in greater depth in association with other waves of ELSI-Brazil.

CONCLUSION

The present study found that low FV consumption among Brazilians aged ≥ 50 years is associated with income, education, age, sex, and race. These results should encourage public policies to promote consumption of these foods.

Due to sociodemographic differences, actions to promote FV consumption should prioritize men, people of Black or mixed race, people with low income and education, and those with younger age. It is also important to consider the characteristics of each educational stratum to tailor guidance on healthy eating habits for each audience. The causal relationships between these variables should also be investigated in longitudinal studies.

Declarations

The study complies with ethical principles for research involving human subjects and was approved by the Ethics Committee of Fiocruz, Minas Gerais (CAAE 34649814.3.0000.5091). The Equator Network reporting standards for cross-sectional studies were used. Regarding data sharing, users registered with ELSI-Brazil are not permitted to make data available to third parties or allow third parties access to data files. This means that each person in a specific scientific project using ELSI-Brazil data must register and download the data individually.

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Conflict of interests

The authors declare no conflicts of interest.

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Author contributions

ALC: Participated in all stages of this study, from organizing and analyzing the data to writing all versions of the manuscript. EVHF: Participated in the study's design, organization, and data analysis, as well as reading and correcting all versions of the manuscript. MLBMB: Participated in organizing the study, analyzing the data, and reading and correcting all versions of the manuscript.

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