Health risk behaviors in elderly Brazilian widowers

Comportamientos de riesgo para la salud en hombres mayores brasileños viudos

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ABSTRACT The objective of this study was to compare the prevalence of health risk behaviors among elderly widowers with that of elderly partnered males, as well as single or divorced/separated men. Additionally, we set out to examine the prevalence of risk behaviors in elderly widowered men according to age, education level, and race/skin color. A cross-sectional study was conducted with elderly men ($\geq$ 60 years) who were interviewed through the Surveillance System of Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel) in 2016 (n = 5,384) and 2017 (n = 5,801). The Vigitel survey includes representative samples of adults residing in the capitals of Brazilian states and the Federal District, and of those surveyed, 886 were widowers. Identified risk behaviors included physical inactivity during leisure time, irregular consumption of fruits, vegetables and legumes, smoking and alcohol abuse. The prevalence of smoking was lower among partnered elderly men [PR = 0.68, CI95% (0.52-0.90)] than among widowers. There were no differences in the prevalence of other risk behaviors between widowers and other groups. When only widowers were taken into account, there was significant association of risk behaviors with age and educational level, but not with race/skin color.
KEY WORDS Health of the Elderly; Life Style; Cross-Sectional Studies; Widowhood; Aging; Brazil.

RESUMEN Se buscó comparar la prevalencia de comportamientos de riesgo para la salud en hombres mayores viudos con las de hombres mayores con pareja, solteros y divorciados/separados, así como la prevalencia de comportamientos de riesgo en hombres mayores viudos según rango de edad, escolaridad y raza/color. Se realizó un estudio transversal con hombres mayores ($\geq$ 60 años) entrevistados por el Sistema de Vigilancia de Factores de Riesgo y Protección para Enfermedades Crónicas por Encuesta Telefónica (Vigitel) en 2016 (n = 5.384) y 2017 (n = 5.801) que incluye muestras representativas de adultos de las capitales de los estados brasileños y del Distrito Federal. De ellos, 886 eran viudos. Los comportamientos de riesgo fueron: inactividad física en el tiempo libre, consumo irregular de frutas, verduras y legumbres, tabaquismo y consumo abusivo de alcohol. La prevalencia de tabaquismo fue menor entre los hombres mayores con pareja [RP = 0,68; IC95% (0,52-0,90)] que entre los viudos. En los demás comportamientos de riesgo no se observaron diferencias en la prevalencia de los viudos en relación a los demás grupos. Cuando se analizaron solamente los viudos, se observaron importantes asociaciones de los comportamientos de riesgo con las variables grupo de edad y escolaridad, pero no con raza/color.
PALABRAS CLAVES Salud de la Persona Mayor; Estilo de Vida; Estudios Transversales; Viudez; Envejecimiento; Brasil.

INTRODUCTION

The demographic and epidemiological transitions observed in Brazil in recent decades have been influenced by the aging of the population, with the increase in the number and proportion of elderly individuals. In association with these transitions, another important change in the Brazilian population profile is related to marital status. From 2000 to 2010, there was an increase in the proportion of widowed, divorced/separated, and single men and women. In 2010, Brazil had approximately eight million male and female widowed individuals, representing 4% of the population, suggesting that as the population ages, the number of widowers increases.[1,2] Another change is related to the country's morbidity and mortality profile and the leading role of chronic non-communicable diseases (NCDs).[3,4,5] Most of these diseases are caused by health-related behaviors, such as physical inactivity in leisure time, irregular consumption of fruits, vegetables, and legumes, smoking, and alcohol abuse.

In general, studies indicate that men tend to engage in more risk behaviors and less frequently seek health services, factors that are associated with a greater development of severe and chronic conditions and higher mortality compared to women.[6,7,8] Thus, it is also important to consider the dimension of gender and men's singularities and diversities within broader social relationships related to these differences. For example, the construction of male gender roles associates men with greater strength and virility, which often entails only seeking health services for more severe conditions. In addition, according to Gomes et al.[9] health services – especially primary care services – are often more directed towards women's health.

To confront this situation, in 2009 the Brazilian Ministry of Health launched the National Comprehensive Healthcare Policy for Men (*Política Nacional de Atenção Integral à Saúde do Homem* – PNAISH) with the objectives of promoting improvements in the health conditions of Brazilian men and helping to reduce morbidity and mortality in this population by attempting to facilitate access to health services.[10]

One factor that seems to be related to men's health is marital status. According to several studies, individuals who are married or in a stable relationship have better health indicators compared to those who are divorced/separated, single, and widowed. [11,12,13] These results are explained at least in part by the protective aspect of broader social, economic, and psychological support networks. Another factor is selection, according to which subjects with better health and economic conditions are more likely to maintain or enter into marital relationships.[7,11,12,13] Moreover, the positive factors associated with marriage seem to be more beneficial to men, largely as a result of the social construction of gender roles in marital relationships, in which the female partner tends to be responsible for performing various functions related to health care.[7,13,14,15] According to Gomes,[16] the dependence of men on the care provided by women is reinforced over generations and in the context of coexistence with the opposite gender.

In this context, widowhood is also a factor that seems to affect the health of individuals. In addition to being a recurrent event in any society and being present in the lives of most people, its significance varies according to social, cultural, economic, and personal contexts, such as the time lived with the partner, the quality of the relationship, age, and gender.[17,18] The social construction of widowhood has been historically characterized as female because most women marry older partners, have a longer life expectancy than men, and seek new marital relationships less frequently.[2,7,17] According to Motta,[19] male widowhood has a lower incidence even among the elderly and, unlike the case of women, the social repercussions are less drastic, which increases the likelihood that men will seek a new marriage.

Thus, the effects of widowhood on health seem to differ between men and women.[20,21] Evidence indicates that male widowhood is associated with higher mortality,[11,20,21]

greater engagement in health-related risk behaviors,[22,23,24,25,26] higher prevalence of hypertension and diabetes,[27] and higher health-care-related expenditures.[28] Most epidemiological studies dealing with these issues have been conducted in the United States[21,22,25] or Europe,[23,26,28] and to our knowledge no studies have been conducted in Latin America. Despite the importance of the topic, given that widowhood is a condition that many people experience and is present in any society, there seem to be few epidemiological studies that address it, especially in relation to men's health. As previously mentioned, this is due to the fact that widowhood is a condition more closely associated with women. Another important factor relates to the population aging observed in Brazil in recent years and the need to better understand the factors related to the health of the elderly – especially elderly men, as they have a lower life expectancy than women. Thus, such an approach may help foster a broader view of the health-disease process in elderly men and ensure more effective planning in health services.

Therefore, the objective of this study was to compare the prevalence of health risk behaviors in elderly male widowers with those of elderly men who have a partner or who are single or divorced/separated and to determine prevalence of risk behavior in elderly male widowers by age group, educational level, and race/skin color.

METHODS

This was a cross-sectional, population-based study of elderly individuals interviewed by the Surveillance System of Risk and Protective Factors for Chronic Diseases by Telephone Survey (*Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico*, or Vigitel) in 2016 (n = 5,384) and 2017 (n = 5,801). Vigitel was established in 2006, and since then, surveys have been conducted annually. The survey includes individuals over 18 years of age residing in the capitals of the 26 Brazilian states and the Federal District and is implemented by land telephone line. The Vigitel sampling process is probabilistic and is conducted as follows: 1) 5,000 residential telephone lines are drawn in each of the 26 capitals and the Federal District, and 2) an adult residing in each home is selected to answer the questionnaire. A total of 53,210 subjects were interviewed in 2016, and 53,034 were interviewed in 2017. To ensure the sample's representativeness of all adults in the surveyed capitals, post-stratification weights were applied to the variables gender, age group, and education level to equalize the sociodemographic distribution of the sample in relation to the estimated distribution of the adult population of each capital. More details can be found in the annual Vigitel reports.[29,30]

The 2016 and 2017 Vigitel questionnaires included questions with different topics related to sociodemographic characteristics, health-related behaviors, self-reported weight and height, self-assessed health status, and morbidities. We chose to use data from two separate years rather than using just one in order to increase the power of the statistical analyses.

Variables

Physical inactivity during leisure time

This variable was measured by questions about the practice of physical exercise or sports in the last three months, and if the participant responded affirmatively, questions about the duration and weekly frequency of this practice. According to the recommendations of the World Health Organization (WHO),[31] individuals who engage in less than 150 minutes per week of mild- or moderate-intensity physical activity or less than 75 minutes of vigorous-intensity physical activity are considered physically inactive during leisure time. For the construction of this indicator, the following activities were considered mild/moderate intensity: walking, treadmill walking, weight lifting, water aerobics, general exercise, swimming, martial arts, cycling, and volleyball. Running, treadmill running,

aerobics, soccer, basketball, and tennis were classified as vigorous-intensity activities.

Irregular consumption of fruits and/or vegetables

This variable was measured by two questions about the weekly frequency of consumption of these foods. For fruit, the question was "How many days of the week do you usually eat fruit?" For vegetables, the question was "How many days of the week do you usually eat at least one type of vegetable or legume (lettuce, tomato, kale, chayote, eggplant, zucchini), not counting potatoes, cassava, or yams?" For both, the response options were never, almost never, 1-2 days, 3-4 days, 5-6 days, and every day. Individuals who reported consuming at least one of the two foods fewer than five days per week were considered to have irregular consumption; in order to be considered to have regular consumption, the respondent had to select "5-6 days" or "every day" for both questions.

Smoking

This variable was measured by a simple question about whether the subject smoked. Individuals who answered yes to this question were considered smokers.

Alcohol abuse

This variable was measured by a question about whether the subject had consumed more than five doses of alcoholic beverages in a single day over the past 30 days. A can of beer, a glass of wine, or a shot of cachaça, whiskey, or any distilled beverage were considered one dose.

The independent variable was marital status. In Vigitel, subjects could choose the following options: widowed, married, stable union, divorced/separated, or single. For this study, the categories "married" and "stable union" were grouped into "partnered."

The confounding variables or variables used to stratify the sample were educational level (0 to 8, 9 to 11, and 12 or more years of schooling), age group (60 to 69, 70 to 79, and 80 years or older) and race/skin color (white or Asian and black/brown/indigenous).

Data analysis

The sample was characterized in terms of sociodemographic variables using descriptive data analysis via frequency analysis. To calculate the prevalence of health-related risk behaviors, all subjects in the sample were divided into widowers, partnered, divorced/separated, or single and stratified by age group, educational level, and race/skin color. For this analysis, the chi-square test was used, and the p-value was set to $p < 0.05$.

Lastly, the prevalence ratios of negative health behaviors were calculated, and two analyses were performed. In the first analysis, all marital statuses were considered according to age group, educational level, and race/skin color, with widowhood as the reference category. In the second analysis, only widowers were considered, and the prevalence ratio was calculated according to age group (60 to 69 years as the reference category), educational level (≥ 12 years as the reference category), and race/skin color (white/Asian as the reference category). For these calculations, 95% confidence intervals were set.

Free and informed consent was obtained orally at the time of the telephone interview. Vigitel was approved by the National Commission of Ethics in Research with Human Subjects of the Ministry of Health for each year of the study (CAAE: 65610017.1.0000.0008). The survey database can be freely accessed online. The identity of all respondents is kept confidential (http://svs.aids.gov.br/bases_vigitel_viva/vigitel.php).

RESULTS

Considering the overall sample, the majority were partnered (78.5%). Out of the elderly respondents, a total of 7.9% were widowers. Most of the widowers were 70 years old

or older (74.8%), had less than nine years of education (52.4%), and were categorized as white or Asian (88.3%). Comparing the characteristics of widowers with those of the other groups, significant differences were observed with respect to age group (in the other groups, the majority were 60-69 years old) and educational level (in the other groups, the majority had at least 9 years of education) (Table 1).

Regarding physical inactivity during leisure time, no differences in prevalence were observed according to marital status in general. However, after stratifying by age group and educational level, some differences emerged. Among elderly men aged 80 years and older, the highest prevalence of physical inactivity during leisure time was observed among partnered men (77.1%), and the lowest was observed among divorced/separated men (60.8%). Among elderly men with lower educational levels, physical inactivity during leisure time was higher for those that were partnered (77.4%), and was lower among un-married individuals (69.0%).

Overall, no significant association was found between the irregular consumption of fruits, vegetables, and legumes and marital status. However, we found an association between age group and marital status among 70- to 79-year-olds: the highest prevalence of irregular consumption was found among widowers (62.4%), and the lowest was found among those that were partnered (55.1%).

Regarding smoking, a significant association with marital status was observed both in the overall sample and when stratified by age group and educational level. Overall, divorced/separated men had a higher prevalence of smoking (14.2%), and those who were partnered had a lower prevalence (7.7%). When stratified by age group, the smoking rate was also higher among divorced/separated men (17.9%) and lower among partnered men (9.5%). Among those aged 70-79 years, smoking was more prevalent among single men (11.6%) and lower among those with a partner (5.7%). Regarding educational level, among those with 9 to 11 years and 12 or more years of schooling, the smoking rate was higher among single men (14.4% and 16.7%, respectively) and lower among partnered men (7.1% and 6.3%, respectively).

Table 1. Sociodemographic characteristics of elderly men (≥60 years old) living in state capitals and the Federal District (overall and stratified by age group and educational level) Vigitel, Brazil, 2016 and 2017 (n=11,185).

Variables	Widowed		Partnered		Divorced/ separated		Single	
	n	%	n	%	n	%	n	%
Total	886	7.9	8,785	78.5	840	7.5	674	6.0
Age range								
60 to 69 years	224	25.3	4,990	56.8	509	60.6	449	66.6
70 to 79 years	346	39.1	2,991	33.1	257	30.6	181	26.9
80 or more years old	316	35.6	884	10.1	74	8.8	44	6.5
Educational level								
0 to 8 years	464	52.4	3,124	35.6	296	35.2	232	34.4
9 to 11 years	193	21.8	2,378	27.1	240	28.6	208	30.9
12 years or more	229	25.8	3,283	37.4	304	36.2	234	34.7
Race/skin color								
White/Asian	543	88.3	4,979	89.6	496	89.2	368	86.2
Black/brown/indigenous	72	11.7	581	10.4	60	10.8	59	13.8

Source: System of Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel) 2016 and 2017, Ministry of Health, Brazil.

We found associations between marital status and alcohol abuse both overall and when the sample was stratified by educational level and race/skin color. In general, the highest prevalence of alcohol abuse was among divorced/separated men (15.1%), and the lowest prevalence was among widowers (8.2%). In elderly individuals with a lower educational level (0 to 8 years), the prevalence of alcohol abuse was higher among single men (10.3%) and lower among widowers (5.4%). Regarding race/skin color, white/Asian men showed a higher prevalence of smoking among divorced/separated men (14.1%) and a lower prevalence among widowers (7.4%) (Table 2).

Table 3 shows the prevalence ratio (crude and adjusted) of health-related risk behaviors in elderly men by marital status. Widowers were considered the reference group. Of the

Table 2. Prevalence of health risk behaviors in elderly men according to marital status (overall and stratified by age group and educational level) residing in the capitals and the Federal District, Vigitel, Brazil, 2016 and 2017 (n = 11,185).

Variables	PILT		p-value	ICFVL		p-value	SMK		p-value	AA		p-value
	n	%		n	%		n	%		n	%	
Widowed	627	70.8		525	59.3		77	8.7		73	8.2	
Married/stable union	6,123	69.7	0.175	5.003	56.9	0.186	678	7.7	<0.001	1.151	13.1	<0.001
Divorced/separated	566	67.4		503	59.9		119	14.2		127	15.1	
Single	450	66.8		398	59.1		95	14.1		101	15.0	
Age group												
60 to 69 years												
Widowed	155	69.2		145	64.7		26	11.6		32	14.3	
Married/stable union	3,426	68.7	0.462	2.945	59.0	0.289	476	9.5	<0.001	879	17.6	0.415
Divorced/separated	348	68.4		301	59.1		91	17.9		98	19.3	
Single	292	65.0		276	61.5		72	16,0		83	18.5	
70 to 79 years												
Widowed	239	69.1		216	62.4		39	11.3		30	8.7	
Married/stable union	2,015	69.2	0.919	1.603	55.1	0.019	166	5.7	<0.001	257	8.8	0.920
Divorced/separated	173	67.3		158	61.5		27	10.5		25	9.7	
Single	127	70.2		100	55.2		21	11.6		18	9.9	
80 or years or older												
Widowed	233	73.7		164	51.9		12	3.8		11	3.5	
Married/stable union	682	77.1	0.012	455	51.5	0.611	36	4.1	0.701	15	1.7	0.053
Divorced/separated	45	60.8		44	59.5		1	1.4		4	5.4	
Single	31	70.5		22	50.0		2	4.5		0	0.0	
Educational level												
0 to 8 years												
Widowed	345	74.4		315	67.9		44	9.5		25	5.4	
Married/stable union	2,419	77.4	0.017	2.206	70.6	0.386	303	9.7	0.089	279	8.9	0.042
Divorced/separated	223	75.3		215	72.6		42	14.2		30	10.1	
Single	160	69.0		170	73.3		26	11.2		24	10.3	
9 to 11 years												
Widowed	138	71.5		112	58.0		18	9.3		20	10.4	
Married/stable union	1,662	69.9	0.591	1.469	61.8	0.405	169	7.1	<0.001	356	15.0	0.303
Divorced/separated	160	66.7		158	65.8		33	13.8		39	16.3	
Single	150	72.1		131	63.0		30	14.4		33	15.9	
12 years or more												
Widowed	144	62.9		98	42.8		15	6.6		28	12.2	
Married/stable union	2,042	62.2	0.798	1.328	40.5	0.785	206	6.3	<0.001	516	15.7	0.105
Divorced/separated	183	60.2		130	42.8		44	14.5		58	19.1	
Single	140	59.8		97	41.5		39	16.7		44	18.8	
Race/skin color												
White/Asian												
Widowed	378	69.6		300	55.2		46	8.5		40	7.4	
Married/stable union	3,454	69.4	0.438	2.520	50.6	0.039	381	7.7	<0.001	610	12.3	0.003
Divorced/separated	335	67.5		277	55.8		75	15.1		70	14.1	
Single	242	65.8		188	51.1		61	16.6		47	12.8	
Black/brown/indigenous												
Widowed	54	75.0		47	65.3		10	13.9		6	8.3	
Married/stable union	427	73.5	0.540	408	70.2	0.647	44	7.6	0.159	81	13.9	0.627
Divorced/separated	39	65.0		44	73.3		6	10.0		8	13.3	
Single	43	72.9		44	74.6		8	13.6		8	13.6	

Source: System of Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel) 2016 and 2017, Ministry of Health, Brazil.
PILT=Physical inactivity during leisure time; ICFVL=Irregular consumption of fruits, vegetables and legumes; SMK=Smoking; AA=Alcohol abuse.

Table 3. Prevalence ratio of health-related risk behaviors in elderly men living in the Brazilian state capitals and the Federal District according to marital status, Vigitel, Brazil, 2016 and 2017 (n = 11,185).

Variables	Physical inactivity during leisure time				Irregular consumption of fruits, vegetables, and legumes				Smoking				Alcohol abuse			
	PR crude	95% IC	PR adjusted[1]	95% IC	PR crude	95% IC	PR adjusted[1]	95% IC	PR crude	95% IC	PR adjusted[1]	95% IC	PR crude	95% IC	PR adjusted[1]	95% IC
Widowed	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Partnered	0.98	0.94-1.03	1.04	0.98-1.10	0.96	0.91-1.02	0.98	0.91-1.05	0.89	0.71-1.11	0.68	0.52-0.90	1.59	1.27-1.99	1.08	0.81-1.44
Divorced/ separated	0.95	0.89-1.01	1.00	0.92-1.08	1.01	0.93-1.09	1.07	0.97-1.18	1.63	1.24-2.14	1.25	0.91-1.73	1.83	1.40-2.41	1.16	0.82-1.63
Single	0.94	0.88-1.01	0.99	0.91-1.08	1.00	0.92-1.08	0.98	0.88-1.10	1.62	1.22-2.15	1.31	0.93-1.84	1.82	1.37-2.42	1.00	0.69-1.45

Source: System of Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel) 2016 and 2017, Ministry of Health, Brazil.
[1]Adjusted for educational level, age group and race/skin color. PR= Prevalence ratio. 95% IC= 95% confidence interval.

four behaviors analyzed in the study, an association with marital status was found only for smoking, which was less prevalent among partnered men [PR = 0.68; 95% CI (0.52-0.90)] than among widowers.

Statistical analyses were also performed for each age group, educational level, and race/skin color (not shown in the table), adjusted for demographic variables other than the one being considered as an independent variable. In these analyses, for elderly men aged 70 to 79 years, a lower prevalence of smoking was observed among those with a partner [PR = 0.52; 95% CI (0.35-0.77)] than among widowers. For elderly men with 9 to 11 years of education, a lower prevalence of smoking was also observed among those with a partner [PR = 0.52; 95% CI (0.31-0.87)] than among widowers. Among those with a higher educational level (12 years of schooling or more), the prevalence of smoking was higher for single men [PR = 2.23; 95% CI (1.21-4.13)] than widowers. It was also observed that for black, brown, or indigenous men, there was

Table 4. Associations of age group, educational level, and race/skin color with health risk behaviors among elderly male widowers living in the Brazilian state capitals and the Federal District according to age group, educational level, and race/skin color, Vigitel, Brazil, 2016 and 2017 (n = 886).

Variables	PILT				ICFVL				SMK				AA			
	PR crude	95% IC	PR adjusted[1]	95% IC	PR crude	95% IC	PR adjusted[1]	95% IC	PR crude	95% IC	PR adjusted[1]	95% IC	PR crude	95% IC	PR adjusted[1]	95% IC
Age group[1]																
60 to 69 years	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
70 to 79 years	1.00	0.89-1.12	0.86	0.74-0.98	0.96	0.85-1.10	0.93	0.79-1.10	0.97	0.61-1.55	1.01	0.56-1.80	0.61	0.38-0.97	1.06	0.57-1.98
80 years or older	1.07	0.95-1.19	0.97	0.86-1.10	0.80	0.69-0.93	0.78	0.66-0.93	0.33	0.17-0.63	0.32	0.15-0.65	0.24	0.13-0.47	0.35	0.15-0.83
Educational level[2]																
12 years or more	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
9 to 11 years	1.14	0.99-1.30	1.16	1.00-1.35	1.36	1.12-1.64	1.31	1.04-1.65	1.42	0.74-2.75	1.51	0.73-3.11	0.85	0.49-1.46	0.91	0.48-1.74
0 to 8 years	1.18	1.06-1.32	1.15	1.00-1.31	1.59	1.35-1.87	1.60	1.31-1.94	1.45	0.82-2.54	1.30	0.68-2.49	0.44	0.26-0.74	0.36	0.17-0.76
Race/skin color[3]																
White/Asian	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Black/brown/ indigenous	1.08	0.93-1.24	1.04	0.90-1.20	1.18	0.98-1.42	1.00	0.83-1.21	1.64	0.87-3.10	1.32	0.67-2.60	1.13	0.50-2.57	1.40	0.56-3.47

Source: System of Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel) 2016 and 2017, Ministry of Health, Brazil.
[1]Adjusted for educational level and race/skin color; [2]Adjusted for age group and race/skin color; [3]Adjusted for educational level and age group.
PILT=Physical inactivity during leisure time; ICFVL=Irregular consumption of fruits, vegetables and legumes; SMK=Smoking; AA=Alcohol abuse.

a higher prevalence of irregular consumption of fruits, vegetables, and legumes among divorced/separated men [PR = 1.27; 95% CI (1.02-1.58)] than widowed men (data not shown in tables).

No significant associations were observed for the remaining behaviors. However, at the lower limit of the confidence interval, borderline significance was found for differences in the prevalence of physical inactivity during leisure time among partnered men aged 70 to 79 years [PR = 1.11; 95% CI (1.00-1.23)] and partnered elderly men with an educational level of 8 or fewer years of schooling [PR = 1.07; 95% CI (1.00-1.16)] (data not shown in tables).

Table 4 shows the prevalence ratios of the associations of age group, educational level, and race/skin color with health risk behaviors among elderly widowers. In the present study, a lower prevalence of physical inactivity during leisure time was observed among widowers in the intermediate age range, those aged 70 to 79 years [PR = 0.86; 95% CI (0.74-0.98)]. Regarding educational level, the adjusted prevalence ratio was 1.16 for those with an intermediate educational level (9 to 11 years) and 1.15 for those with a lower educational level (0 to 8 years), and the lower limit of the confidence interval was at the threshold between the presence or absence of an association (i.e., 1.00) in both cases. Irregular consumption of fruits, vegetables, and legumes was lower among widowers aged 80 years or older [PR = 0.78; 95% CI (0.66-0.93)] and higher among those with up to 8 years of schooling [PR = 1.60; 95% CI (1.31-1.94)] and those with 9 to 11 years of schooling [PR = 1.31; 95% CI (1.04-1.65)] compared to the reference group (12 or more years of schooling). Regarding smoking, there was a lower prevalence among older widowers [PR = 0.32; 95% CI (0.15-0.65)], and the same was true for alcohol abuse [PR = 0.35; 95% CI (0.15-0.83)]. A lower prevalence of smoking was also observed among those with a lower educational level [PR = 0.36; 95% CI (0.17-0.76)].

DISCUSSION

When the prevalence of health risk behaviors was analyzed by marital status, important associations were found; however, when the differences between widowers and other groups were compared, the only association observed was a lower prevalence of smoking among partnered males. In analyses by age, educational level, and race/skin color, few differences emerged between widowers and other groups. However, when comparing the prevalence of risk behaviors among elderly widowers by age group, educational level, and race/skin color, important associations were observed with respect to age group (for all analyzed behaviors) and educational level (for irregular consumption of fruits, vegetables, and legumes as well as alcohol abuse). In contrast, no significant associations were found with race/skin color.

There were differences in the prevalence of risk behaviors attributable to marital status. These differences are consistent with those reported in previous studies.[22,25,26,27] Several factors may explain the differences observed with respect to marital status. On the one hand, having a partner (marriage or stable union) may be related to the adoption of healthy behaviors due to greater economic and social support; on the other hand, poor relationship quality could lead to the adoption of risk behaviors in subjects.[32]

With the exception of smoking, the prevalence of risk behaviors showed weak associations when comparing widowers with other marital statuses. Widowhood is typically associated with worse health indicators, which may be related to stressors such as the death of a partner, the loss of economic and social support, and the resulting need to start over and rebuild social bonds, which is more difficult for elderly men.[1,14,15,33] In contrast, widowhood may be related to a sense of starting over or a new life with greater freedom.[17]

As previously mentioned, a lower prevalence of smoking was observed among elderly men with a partner. Other studies have reported similar results for subjects who are

married or in a stable union.[14,24,34,35,36] A possible explanation for these results is the protective aspect of marriage, which is related to greater social, economic, and psychological support networks. In addition, another important factor relates to the issue of gender. In general, men still seem to benefit more from the economic, social, and healthcare support provided by their partner, and the absence of this care may facilitate the adoption of health risk behaviors in men.[14,17,24,33]

In the comparison of elderly men by age group, in men aged 70 to 79 years we found a lower prevalence of leisure-time physical inactivity than those aged 60 to 69 years. In contrast with this result, previous studies assessing leisure-time physical activity levels in the elderly found that the prevalence of leisure-time physical inactivity increased with age;[37,38] however, these studies did not conduct stratified analyses according to marital status. A possible explanation for the results of this study is survivorship bias; considering that physical inactivity is associated with mortality, it is possible that many elderly adults who die before age 70 years are on average less physically active during leisure time compared to those who live to be this age.[39,40,41] Another possible explanation is that there is likely a higher proportion of retirees among elderly individuals aged 70 to 79 years than among those aged 60 to 69 years; therefore it is plausible to imagine that retired people may be more active during leisure time than nonretired elderly individuals, due to the fact that they have more of it. Caution should be exercised when interpreting these findings, and new studies are needed to confirm whether trends among elderly widowers differ from those among elderly men with other marital statuses with respect to leisure-time physical activity according to age group; if differences are observed, further research is needed to elucidate the possible reasons for this specificity.

Regarding educational level, there was a higher prevalence of leisure-time physical inactivity among elderly men with intermediate (9 to 11 years of schooling) and low (0 to 8 years of schooling) educational levels, in comparison with those who had higher educational levels ($\geq$12 years of schooling). These results indicate that the relationship between educational level and leisure-time physical activity in elderly widowers is similar to that of the general population, as there is sufficient evidence to indicate that individuals with higher educational levels tend to be more active than those with lower education levels.[42,43,44,45]

Older elderly widowers ($\geq$80 years old) had lower rates of irregular consumption of fruits, vegetables, and legumes when compared with younger elderly widowers (60 to 69 years old). Studies indicate that this higher consumption among the elderly is associated with the prevention of chronic diseases and mortality.[46,47] One factor that may explain this finding is survivorship; it is possible that subjects who consumed fruits, vegetables, and legumes more irregularly had already died. In addition, older individuals may have more immediate concerns regarding their health, as well as more time to buy and prepare these foods, considering that it is likely that a higher proportion of elderly men in this study's younger age bracket were still working in comparison to the older groups. However, because this was a cross-sectional study, it was not possible to establish a causal relationship that could explain whether older elderly men ($\geq$80 years) changed their behaviors or maintained the same lifestyle that they had when they were 60 years old.

A higher prevalence of irregular consumption of fruits, vegetables, and legumes was also observed in subjects with lower educational levels (0 to 8 and 9 to 11 years); this was a linear association that pointed to a greater disadvantage on the part of those with the lowest educational levels (0 to 8 years). In general, associations between lower educational levels and low consumption of fruits, vegetables, and legumes are reported in the literature.[48,49,50,51,52,53] According to Silveira *et al.*,[50] educational level is related to increased knowledge, which favors the adoption of better health-related behaviors. Subjects with higher educational levels are more likely to be more informed regarding the adoption of

healthy behaviors because they have a greater capability to seek and understand information to support maintaining or adopting positive habits. In addition, higher educational levels are generally associated with greater purchasing power. In the Brazilian context, the cost barrier for the purchase of these foods seems to be an important factor. Santos et al.[48] conducted a cross-sectional study that assessed the main barriers to the consumption of fruits, vegetables, and legumes and found that subjects with up to four years of education had a greater odds of indicating "the cost weighs on the family budget" as a barrier to purchasing fruits and vegetables.

Comparing the prevalence of smoking among elderly widowers in terms of demographic variables, we found a lower prevalence among older elderly men (≥80 years old). This may also be related to survivorship bias, as there is clear evidence in the literature indicating the relationship between smoking and mortality.[54,55,56,57,58] According to Zaitune et al.,[54] the lower prevalence of smoking observed in older elderly adults may be explained by the early onset of diseases associated with cigarette smoking, leading to recommendations to quit, greater chances of early death, and increased concern regarding health status, thereby encouraging older elderly adults to adopt healthier behaviors. In light of this, we performed an additional analysis that showed that the proportion of former smokers among the widowers in our sample increased with age (data not shown: 52.2% among those aged 60 to 69 years; 56.6% among those aged 70 to 79 years; and 62.0% among those aged 80 years or older).

A lower prevalence of alcohol abuse was observed among elderly widowers with lower educational levels. It seems that individuals with lower socioeconomic status are more vulnerable to the problems and consequences of alcohol abuse.[59,60] In addition, similar to the findings for other risk behaviors, survivorship bias among the elderly may be a factor.

The limitations of this study include its cross-sectional design, which makes it impossible to establish causal relationships between exposure variables and outcome variables. In addition, the fact that sampling was limited to the 26 Brazilian state capitals and the Federal District and that the survey was conducted by land telephone line may affect the accuracy of information on health risk behaviors, especially with regards to the possible difficulty that some elderly adults may have in answering questions by telephone.

In contrast, the study's strengths include the fact that it may be the first of its kind conducted in Latin America. Additionally, we were able to reveal findings about the prevalence of five health risk behaviors in a representative sample of elderly men from all state capitals and the Federal District.

Our results demonstrate the complexity of the topic and the need for further research, including longitudinal studies to examine the impact of widowhood on the adoption of health-promoting and health risk behaviors. It is also suggested that future studies should take into account aspects that may mediate the relationship between widowhood and behavior, such as social support networks. Qualitative studies seeking a deeper understanding of widowhood may also be of great consequence.

This study found moderate associations between the prevalence of health risk behaviors and widowhood compared with other marital statuses in elderly men; only in the case of smoking was a lower prevalence observed among partnered men in comparison with widowers. Among elderly widowers, associations with health risk behaviors were found according to age group and educational level, but not race/skin color. Given this context, it is important that healthcare professionals adopt a broader perspective on care and a more humanized view of the various factors that may contribute to the health-disease-care process in men, especially elderly men. Thus, this study may be relevant for planning concrete actions as well as the promotion of healthy behaviors among men.

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