




All-cause mortality over a three-year period among community-dwelling older adults in Southern Brazil

Mortalidade por todas as causas em um período de três anos entre idosos não institucionalizados do Sul do Brasil

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ABSTRACT: *Objective:* To evaluate all-cause mortality in approximately three years of follow-up and related sociodemographic, behavioral and health factors in community-dwelling older adults in Pelotas, RS. *Methods:* This was a longitudinal observational study that included 1,451 older adults (≥ 60 years) who were interviewed in 2014. Information on mortality was collected from their households in 2016–2017 and confirmed with the Epidemiological Surveillance department of the city and by documents from family members. Associations between mortality and independent variables were assessed by crude and multiple Cox regression, with hazard ratio with respective 95% confidence intervals (95%CI). *Results:* Almost 10% ($n = 145$) of the participants died during an average of 2.5 years of follow-up, with a higher frequency of deaths among males (12.9%), ≥ 80 years (25.2%), widowhood (15.0%), no education (13.8%) and who did not work (10.5%). Factors associated with higher mortality were: being a male (HR = 2.8; 95%CI 1.9 – 4.2), age ≥ 80 years (HR = 3.9; 95%CI 2.4 – 6.2), widowhood (HR = 2.2; 95%CI 1.4 – 3.7), physical inactivity (HR = 2.3; 95%CI 1.1 – 4.6), current smoking (HR = 2.1; 95%CI 1.2 – 3.6), hospitalizations in the previous year (HR = 2.0; 95%CI 1.2 – 3.2), depressive symptoms (HR = 2.0; 95%CI 1.2 – 3.4) and dependence for two or more daily life activities (HR = 3.1; 95%CI 1.7 – 5.7). *Conclusion:* The identification of factors that increased the risk of early death makes it possible to improve public policies aimed at controlling the modifiable risk factors that can lead to aging with a better quality of life.

Keywords: Mortality. Risk factors. Health of the elderly. Aging.

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Conflict of interests: nothing to declare – **Financial support:** Postgraduate Program in Epidemiology, Universidade Federal de Pelotas; Coordination for the Improvement of Higher Education Personnel (Capes); master students in the 2013-2014 class; and National Council for Scientific and Technological Development (CNPq).

RESUMO: *Objetivo:* Avaliar a mortalidade por todas as causas em aproximadamente três anos de acompanhamento e os fatores sociodemográficos, comportamentais e de saúde em idosos comunitários de Pelotas, Rio Grande do Sul. *Métodos:* Foi um estudo observacional longitudinal que incluiu 1.451 idosos (≥ 60 anos) entrevistados em 2014. As informações sobre mortalidade foram coletadas nos domicílios em 2016–2017, confirmadas com o setor de Vigilância Epidemiológica do município e por documentos de familiares. As associações entre mortalidade e as variáveis independentes, por regressão de Cox simples e múltipla, foram apresentadas pelos riscos relativos com os respectivos intervalos de confiança (95%). *Resultados:* Quase 10% ($n = 145$) dos participantes morreram durante uma média de 2,5 anos de acompanhamento, sendo a maior frequência de óbitos em homens (12,9%), indivíduos com ≥ 80 anos (25,2%) e viúvos (15,0%). Estiveram associadas ao maior risco de mortalidade: sexo masculino (RR = 2,8; IC95% 1,9 – 4,2), ≥ 80 anos (RR = 3,9; IC95% 2,4 – 6,2), viuvez (RR = 2,2; IC95% 1,4 – 3,7), inatividade física (RR = 2,3; IC95% 1,1 – 4,6), tabagismo atual (RR = 2,1; IC95% 1,2 – 3,8), hospitalização no último ano (RR = 2,0; IC95% 1,2 – 3,2), sintomas depressivos (RR = 2,1; IC95% 1,2 – 3,6) e dependência para duas ou mais atividades diárias (RR = 3,1; IC95% 1,7 – 5,7). *Conclusão:* A identificação dos fatores que aumentaram o risco de óbito precocemente possibilita melhorar políticas públicas que visem controlar os fatores de risco modificáveis para um envelhecimento com melhor qualidade de vida.

Palavras-chave: Mortalidade. Fatores de risco. Saúde do idoso. Envelhecimento.

INTRODUCTION

Brazil has been showing a new demographic pattern, characterized by a reduction in the population growth rate and by deep changes in the composition of age structure, especially seen by the increase in the representativeness of the elderly population¹. The percentage of older adults, which in the 1980s represented 6% of the Brazilian population, went to 9.8% in 2005 and 14.3% in 2015², and the estimates point to 33.4 million elderly people by 2025³, making Brazil rank 5th in the world in absolute numbers of people in this age group⁴.

Changes in the health-disease process are associated with this new demographic profile, which resulted in an increase in life expectancy and a change in the distribution of main death causes among the elderly¹. On the other hand, the planning of prevention and health promotion policies has not kept pace with the rapid aging of the population and, with regard to the increase in life expectancy of the population, not only the incidence and prevalence of chronic non-communicable diseases (CNCD) has increased, but also the mortality rate from these diseases¹.

Mortality can be considered an indicator of living conditions and social and economic development⁵, as possible risk factors can be identified in a given population. It is important to evaluate which groups are most vulnerable to mortality in this age group to contribute with the development of public policies aimed at promoting health and preventing death⁶.

Thus, the present study aimed to verify all-cause mortality in up to three years of follow-up and to identify factors associated in community-dwelling older adults who took part in the cohort study “COMO VAI?” (“HOW ARE YOU?”, in free translation), conducted in the city of Pelotas, Rio Grande do Sul.

METHODS

This longitudinal observational study derives from a larger study entitled “COMO VAI?” (“*Consórcio de Mestrado Orientado para a Valorização da Atenção ao Idoso*”, in English “Master Consortium Oriented to Enhance Elderly Care”). This cross-sectional study took place between January and August 2014, with the objective of evaluating demographic, economic and health characteristics of elderly residents in the urban area of the city of Pelotas, Rio Grande do Sul, Brazil. In 2010, according to data from the Brazilian Institute of Geography and Statistics (IBGE), Pelotas had 330,000 inhabitants (93.3% in the urban area), where approximately 15% were considered elderly, mostly women and individuals aged between 60 and 64 years⁷.

Elderly (individuals aged 60 or over), residents of the urban area, non-institutionalized (who were not in long-term care facilities for the elderly, prisons or hospitals) and who had physical and mental conditions to answer the questionnaire in the absence of a caregiver were eligible. The sample size was calculated to meet all the objectives of the study in 2014, considering an increase of 15% for possible confounding factors and 10% for losses and refusals. The estimate was at least 1,649 elderly people.

The sampling process had two stages. First, a cluster sampling was used, selecting census sectors using data from the 2010 IBGE Census⁷. The 488 census sectors in the urban area of Pelotas were listed, ordered according to the average income of each inhabitant. Sectors with 14 or less older adults were grouped to one or more adjacent, with similar average income, totaling 469 eligible sectors. The second phase consisted of selecting the households. The total number of households in the city was 107,152, which was divided by the number of sectors defined by a systematic strategy, with 806 households, implying the inclusion of 133 census sectors out of the 469 eligible. To reach the total estimated sample size, 3,745 households in the urban area should be sampled, systematically selecting 31 households per sector, to find at least 12 elderly people in each of these sectors (estimated 0.4 older adult per household).

The second contact with the sample occurred between November 2016 and April 2017, via telephone and in home interviews. In this second visit, in addition to calls on different days and moments, participants who were not contacted by telephone were contacted in at least four attempts at the addresses provided for the study. As the study was not initially planned to be longitudinal, these search strategies were important to allow the confirmation of basic information such as names and dates of birth, allowing to identify deaths in the Mortality Information System (SIM, acronym in Portuguese).

Mortality information was assessed in the 2016-2017 data collection and confirmed with the Epidemiological Surveillance sector, based on data from SIM of Pelotas and also on documents from family members certifying the death. In this study, deaths that occurred up to April 30, 2017 were considered. The older adults who refused to participate in the research, as well as those considered losses in the second interview, were considered to be alive due to the lack of information on death from the municipality authorities, as already reported in a previous publication⁸. Losses to follow-up were considered proportional over time. Thus, we assume that they were followed for the average period between the end of the first interview (August 31, 2014) and the beginning of the second interview (November 1, 2016), contributing with person-time at risk for half the period. The second visit or the date of death were used to obtain the follow-up time of the first interview.

The independent variables assessed in 2014 were: sex (male, female), age in complete years (60–69, 70–79, ≥80 years), skin color (white, others), marital status (married or with a partner, single or divorced, widowed), complete years of study (none, <8, ≥8 years), currently working (no or yes), economic status (A/B – wealthier, C, D/E – poorer); from the 2013 Brazil Economic Classification⁹, we had: leisure-time physical activity (individuals who reported at least 150 minutes of weekly physical activity were considered active)¹⁰, smoking (one or more cigarettes per day, in all days, in the last 30 days), categorized as “never smoked”, “currently smokes” and “smoked in the past, but stopped”, having been hospitalized in the 12 months prior to the interview (yes or no) and depressive symptoms assessed by the presence of five or more symptoms investigated by the Geriatric Depressive Scale (GDS-10)¹¹. The perception of health was measured by the question “How do you define your health?”, with the following response options: very good, good, fair, poor, very bad, later categorized as very good/good, fair, poor/very bad.

The body mass index (BMI) (kg/m^2) was obtained from the height estimate by measuring the knee height, using the equation suggested by Chumlea and Guo¹², and by measuring body weight. The knee height was measured with a children’s wooden stadiometer, with a maximum measurement of 100 cm and accuracy of 0.1 cm (CMS Weighting Equipment; United Kingdom), while weight was measured using an electronic scale (Tanita brand, model UMB080), with maximum capacity of 150 kg and accuracy of 100 g. For the assessment of the nutritional status of the elderly, the BMI was categorized according to Lipschitz¹³, with a specific cutoff point for the elderly¹⁴: low weight ($<22 \text{ kg}/\text{m}^2$); eutrophy (≥ 22 and $\leq 27 \text{ kg}/\text{m}^2$); and excess weight ($>27 \text{ kg}/\text{m}^2$). Functional capacity was analyzed by the Katz et al.¹⁵ Scale, composed of six items that measure the individual’s performance in the following activities of daily living: food, sphincter control, transfer, personal hygiene, ability to dress and bathe. Participants were classified as: independent, dependent for one activity and dependent for two or more activities.

Statistical analyzes were performed on the software Stata 16.0 (Stata Corporation, College Station, USA). Initially, the description of sample characteristics and the outcome

was obtained in absolute and relative frequencies, with respective 95% confidence intervals (95%CI). The speed of death over the study period, according to each factor investigated, was assessed using Cox regression. Crude relative risks (RR) were adjusted for possible confounding factors and respective 95%CI. The statistical adjustment was made by hierarchical levels, the first level being composed of sociodemographic variables (sex, age, skin color, marital status, complete years of study, current work status and economic situation) and the second level, by behavioral variables (physical activity and smoking). In the third level, the health variables (nutritional status, health perception, having been hospitalized, depressive symptoms, and functional capacity) were inserted. Only variables with $p < 0.20$ (sex, age, marital status, work status and health perception) were maintained in the final analysis model, a process that was performed at each level. The level of statistical significance was set at 5% for all associations. The “survey” (svy) command was used in all analyses, considering the effect of sampling by clusters.

All stages of the study were approved by the Research Ethics Committee of the Medical School of Universidade Federal de Pelotas — CAAE: 54141716.0.0000.5317. The individuals who participated in the research, or their caregivers, signed the free and informed consent form, assuring data confidentiality. In 2016-2017, the informed consent form was signed by family members or informers of the occurrence of deaths. For the elderly people interviewed by phone, consent was given verbally by their acceptance to answer the questionnaire.

RESULTS

In 2014, 1,844 elderly people were allocated in the baseline study, 78.7% of whom were interviewed ($n = 1,451$). Losses and refusals totaled 393 individuals (21.3%), being higher among women (59.3%) and the aged between 60 and 69 years (59.5%). In the second follow-up, 1,298 elderly people were found (including 145 deaths identified), with a follow-up rate of 89.5% of 1,451 respondents in 2014.

The total refusals and losses in 2016–2017 were 61 and 92 (10.5%), respectively. Between 2014 and 2016–2017, men and women were followed up equally ($p = 0.319$). The same occurred according to the age of the elderly ($p = 0.305$). Widow(er)s were less likely to be followed up ($p = 0.001$). No statistical difference was found in follow-up rates as to skin color, education, economic level and health perception. Overweight ($p = 0.019$), physically active elderly ($p < 0.001$) and individuals who never smoked ($p = 0.015$) were more likely to be followed up (data not shown in table).

The sociodemographic characteristics of the interviewees in 2014 are shown in Table 1. Most of the 1,451 individuals interviewed were women (63.0%), aged between 60 and 69 years (52.3%), white skin color (83.7%), married or with a partner (52.7%), with <8 years of schooling (54.4%), not economically active (80.4%) and belonging to socioeconomic level C (52.5%).

Table 1. Description of the sample of elderly people living in Pelotas according to socioeconomic and demographic characteristics, Rio Grande do Sul, 2014.

Characteristics	n (%)	95%CI
Sex (male) (n = 1,451)	537 (37.0)	34.6 – 40.0
Age (n = 1,446)		
60–69	756 (52.3)	49.7 – 54.9
70–79	460 (31.8)	29.5 – 34.3
≥ 80	230 (15.9)	14.1 – 18.0
Skin color (others) (n = 1,447)	236 (16.3)	14.5 – 18.3
Marital status (n = 1,447)		
married	763 (52.7)	50.2 – 55.
single	225 (15.6)	13.8 – 17.5
widow(er)	459 (31.7)	29.3 – 34.2
Schooling (n = 1,437)		
None	196 (13.6)	12.0 – 15.5
1–7 years	782 (54.4)	51.8 – 57.0
8 years or more	459 (31.9)	29.6 – 34.4
Currently works (no) (n = 1,348)	1.084 (80.4)	17.6 – 21.8
Socioeconomic status (n = 1,372)		
A/B (richer)	483 (35.2)	32.7 – 37.8
C	720 (52.5)	50.0 – 55.1
D/E (poorer)	169 (12.3)	10.7 – 14.2

95%CI: 95% confidence interval.

As for behavior and health features (Table 2), most participants were classified as inactive for leisure-time physical activity (81.4%) and never smoked (54%). In addition, 56.2% of the sample was overweight and 53.1% rated their own health as good or very good. Around 12% had been hospitalized in the 12 months prior to the interview, 15.2% had depressive symptoms, and 63.9% were functionally independent.

In up to three years of follow-up (mean follow-up time = 2.5 years and SD = 0.6 years), almost 10% of the participants died (n = 145). The percentage of deaths was higher among males (p = 0.006), the aged 80 or over (p <0.001), widow(er)s (p <0.001),

Table 2. Description of the sample of elderly residents in Pelotas, according to behavioral and health characteristics, Rio Grande do Sul, 2014.

Characteristics	n (%)	95%CI
Physical inactivity ^a (yes) (n = 1,391)	1,133 (81.4)	19.3 – 20.7
Smoking (n = 1,446)		
Never smoked	781 (54.0)	51.4 – 56.6
Former smoker	483 (33.4)	31.0 – 35.9
Current smoker	182 (12.6)	11.0 – 14.4
Nutritional status (n = 1,364)		
Low weight	126 (9.3)	7.8 – 10.9
Eutrophy	471 (34.5)	32.1 – 37.1
Overweight	767 (56.2)	53.6 – 58.8
Health perception (n = 1,442)		
Good/very good	765 (53.1)	50.5 – 55.6
Regular	545 (37.8)	35.3 – 40.3
Bad/very bad	132 (9.2)	7.8 – 10.8
Hospitalization ^b (yes) (n = 1,447)	176 (12.2)	10.6 – 14.0
Depressive symptoms (yes) (n = 1,394)	212 (15.2)	13.4 – 17.2
Functional capacity (n = 1,440)		
Not dependent	920 (63.9)	61.4 – 66.3
Dependent (1 task)	395 (27.4)	25.2 – 29.8
Dependent (≥ 2 tasks)	125 (8.7)	7.3 – 10.3

^aAt least 150 min/week; ^bin the last twelve months; 95%CI: 95% confidence interval.

individuals with lower education ($p = 0.033$) and who did not work in 2014 ($p = 0.003$) (Table 3). The highest proportion of deaths also included those who were physically inactive during leisure time ($p = 0.002$), individuals with low weight ($p = 0.003$) and participants who had been hospitalized in the year prior to the interview ($p < 0.001$). Among the elderly who had depressive symptoms, mortality was also higher compared to others without any symptoms ($p = 0.001$); those considered dependent for two or more functional activities of daily living ($p < 0.001$) also accounted for more deaths than those functionally independent (Table 4).

Table 3. Description and association of all-cause mortality of elderly people living in Pelotas, according to socioeconomic and demographic characteristics, Rio Grande do Sul, 2017 (n = 145).

Characteristics	n (%)	95%CI	Crude RR	p value	Adjusted RR	p value
Sex (male)	69 (12.9)	10.0 – 16.4	1.6 (1.1 – 2.2)	0.006	2.8 (1.9 – 4.2)	< 0.001
Age				< 0.001		< 0.001
60–69	41 (5.4)	4.1 – 7.2	Ref.		Ref.	
70–79	46 (10.0)	7.4 – 13.3	1.9 (1.2 – 2.9)		1.7 (1.0 – 2.7)	
≥ 80	57 (25.2)	19.6 – 31.8	5.2 (3.5 – 7.8)		3.9 (2.4 – 6.2)	
Skin color (others)	27 (11.4)	7.3 – 17.4	1.1 (0.7 – 1.7)	0.572	1.1 (0.7 – 1.7)	0.748
Marital status ^a	69 (15.0)	11.9 – 18.8	2.0 (1.5 – 3.0)	< 0.001	2.2 (1.4 – 3.7)	0.002
Schooling ^b	27 (13.8)	9.8 – 19.0	1.9 (1.0 – 3.2)	0.033	1.2 (0.6 – 2.1)	0.746
Currently works (no)	114 (10.5)	8.8 – 12.6	2.5 (1.4 – 4.4)	0.003	1.8 (1.0 – 3.4)	0.053
Socioeconomic status ^c	20 (11.8)	7.9 – 17.4	1.3 (0.8 – 2.3)	0.573	1.1 (0.6 – 1.9)	0.763

^aWidow(er)s as opposed to married people; ^bno schooling as opposed to 8 years or more of study; ^cclass D/E (poorest) as opposed to A/B (richest); 95%CI: 95% confidence interval; RR: relative risk.

In the adjusted analysis, there was a higher risk of death among men (RR = 2.8; 95%CI 1.9 - 4.2), individuals aged 80 years or older (RR = 3.9; 95% CI 2.4 - 6.2) and those who were widowed at the time of the interview (RR = 2.2; 95%CI 1.4 - 3.7) (Table 3).

After adjusting for possible confounding factors, there was a higher risk of death among inactive participants (RR = 2.3; 95%CI 1.1 - 4.6), smokers (RR = 2.1; 95%CI 1.2 - 3.6) and individuals showing depressive symptoms (RR = 2.0; 95%CI 1.2 - 3.4). In addition, those who had been hospitalized in the year prior to the 2014 interviews (RR = 2.0; 95%CI 1.2 - 3.2) and dependents for two or more functional activities (RR = 3.1; 95%CI 1,7 - 5,7) were also classified as the group with the highest risk of death. There was no statistically significant association with nutritional status and health perception (Table 4).

Table 4. Description and association of mortality of elderly people living in Pelotas, according to behavioral and health characteristics, Rio Grande do Sul, 2017 (n = 145).

Characteristics	n (%)	95%CI	Crude RR	p value	Adjusted RR	p value
Physical inactivity ^a (yes)	110 (9.7)	8.1 – 11.7	2.9 (1.5 – 5.70)	0.002	2.3 (1.1 – 4.6)	0.019
Smoking (current) ^b	23 (12.6)	8.3 – 18.8	1.1 (0.9 – 1.3)	0.292	2.1 (1.2 – 3.6)	0.023
Nutritional status ^c	49 (6.4)	4.8 – 8.4	0.7 (0.5 – 1.1)	0.003	1.0 (0.6 – 1.6)	0.476
Health perception ^d	26 (19.7)	13.4 – 28.1	4.1 (2.5 – 7.6)	< 0.001	1.9 (0.9 – 3.8)	0.067
Hospitalization ^e (yes)	43 (24.4)	18.9 – 30.9	3.5 (2.4 – 4.9)	< 0.001	2.0 (1.2 – 3.2)	0.009
Depressive symptoms (yes)	31 (14.6)	10.6 – 19.9	2.0 (1.3 – 3.0)	0.001	2.0 (1.2 – 3.4)	0.005
Functional capacity				< 0.001		< 0.001
Not dependent	58 (6.3)	4.9 – 8.1	Ref.		Ref.	
Dependent (1 task)	31 (7.9)	5.6 – 10.9	1.2 (0.8 – 1.9)		1.0 (0.6 – 1.6)	
Dependent (≥ 2 tasks)	54 (43.2)	35.0 – 51.8	8.9 (6.1 – 12.9)		3.1 (1.7 – 5.7)	

^aLess than 150 min/week; ^bcurrent smoking compared to non-smoker; ^coverweight in relation to eutrophy; ^dperception of poor/very poor health in relation to perception of good/very good health; ^ein the last twelve months; 95%CI: 95% confidence interval; RR: relative risk.

DISCUSSION

This study aimed to identify the mortality rate in up to three years of follow-up and the factors associated with a higher risk of death. One in ten elderly people died during the follow-up period and the risk of dying was higher among men, older individuals and widow(er)s. The same relationship was observed for physical inactivity, being a smoker, having depressive symptoms, having been hospitalized, and presenting worse functional capacity.

Several studies show a higher risk of death among men¹⁶⁻¹⁸. The search for healthier lifestyles and the greater demand for and use of health services among the female population,

whether for promotion or prevention/assistance, are a possible explanation for this finding¹⁹. In addition, men tend to seek medical care at later stages or even ignore the symptoms of some diseases²⁰.

Mortality rates among elderly Brazilians increase with age for both sexes. Maia et al., when evaluating elderly people from the city of São Paulo in the multicenter study "Health, well-being and aging" (SABE), reported that being 75 years old or older was related to a higher risk of death¹⁷. The same risk was observed in a longitudinal study in developed countries, but the age group with the highest risk was 70-75 years²¹.

Regarding marital status, a meta-analysis showed that, in general, widow(er)s are related to a higher mortality rate, in addition to low satisfaction with life, poor economic situation and greater risk of serious and minor psychiatric conditions²². A cohort study carried out by Gomes et al., in the city of São Paulo, found that, among both male and female elderly, the mortality rate of individuals without a partner or in a situation of separation/divorce and widowhood was higher than the observed for married individuals, or those who lived with a partner²³. The feeling of loneliness is quite common among widow(er)s²⁴. In addition, increased loneliness and reduced social support are common consequences of later widowhood and are linked to a higher risk of mortality, especially among males²⁵.

Additionally, an exploratory analysis in our study showed that, among married individuals, 92.6% were part of the economic classes A/B and C; in this sense, a better economic situation, social support and control in better health behaviors are possible explanations for the protective effect of marriage for death causes that could be preventable in this population.

In view of the lower proportion of deaths among employed individuals, it is known that some countries have sought alternatives to "keep their elderly citizens socially and economically integrated and independent", by, for example, encouraging private systems to offer opportunities for the continuity of working life and employment in old age²⁶. In addition to the economic scope, work in the elderly positively influences their social participation, thus keeping them active, encouraging relationships with friends, cooperation and interactivity²⁶. The relationship between work and lower risk of death may be due to the younger age of the elderly who are still economically active, in addition to a lower occurrence of disability among them.

With regard to behavioral factors, it is known that physical inactivity, excessive alcohol consumption and smoking tend to occur concurrently²⁷. These behaviors are the main predictors of morbidity and mortality in the elderly²⁸. It is also known that the greater the longevity, the less likely the practice of physical activity in the elderly²⁸. Recently, a cohort study showed that elderly people with cardiovascular diseases and cancer can get substantial benefits in longevity by becoming more physically active, regardless of past levels of physical activity and established risk factors²⁹.

Regarding smoking, an association between mortality and smoking was found, as previously observed in other studies^{20,30,31}. Tobacco use is associated with worse health status

and quality of life, in addition to being a risk factor for premature mortality and disabilities due to cardiovascular diseases, chronic obstructive pulmonary disease (COPD), cancer, among others³¹.

Health perception has been used as a marker capable of pointing, among others, mortality rates, but this association was not found in the present study. Elderly people who report their health negatively have a higher risk of all-cause mortality when compared to elderly people who perceive their health positively¹⁷⁻²⁰. With regard to the number of hospitalizations, in the same direction observed in this study, Schonberg et al. found that elderly people who had been hospitalized were 1.8 times more likely to die; for those who had been hospitalized twice or more, mortality was 3 times higher³².

Regarding depressive symptoms, a study carried out with elderly people in Brazil found that 14.2% had depressive symptoms (GDS-15), a value close to ours (15.2%)³³. A recent meta-analysis that evaluated depression and mortality in the elderly in low- and middle-income countries, including Brazil, reported a positive association between depression and mortality in the elderly³⁴. Untreated depression, associated with existing pathologies, can aggravate illnesses, worsen the quality of life of the elderly and increase mortality rates³⁵⁻³⁷. In Greece, moderate to severe depression (GDS-15) was significantly associated with a 51% increase in all-cause mortality³⁵.

The presence of morbidities associated with aging and the natural losses that occur in this age group also corroborate an early functional decline and, consequently, a worse quality of life and high mortality rates^{33,35}. A cohort study conducted in the city of Florianópolis, Santa Catarina, indicated a prevalence of 31.5% of functional disability and highlighted the difficulty/inability to walk and bathe, which increased the risk of mortality by almost three times³⁶. In the United States, 18% of the elderly were reported to be dependent for at least one daily activity and had a greater chance of early mortality³⁴. These results support the hypothesis that most mortality predictors in old age do not vary between populations.

The growing presence of elderly people in society imposes the challenge of inserting the theme of population aging in the formulation of public policies and of implementing prevention and care actions directed to their needs. Thus, it is essential to orientate the planning of public policies and services to the strengthening of autonomy and the promotion of a healthy life for the elderly by physical activity, control of overweight and identification and treatment of depression, in order to ensure adequate care to their needs³⁷.

This study has different positive and negative characteristics. Positive points are: the research is population-based, with a representative sample of the elderly. It is also worth mentioning the double checking of deaths (registration in SIM and households) and the information about different social, demographic, behavioral and health characteristics. Some of the negative aspects are: the time of the study may have been insufficient to check some associations, but it made it possible to identify associations with more proximate determinants of mortality, such as physical inactivity, smoking, depressive symptoms, hospitalizations, and functional capacity. The fact that less than

10% of the sample perceived their health as very poor/poor health may have reduced the statistical power to find an association between worse health perception and mortality. Survival bias should also be considered. The sample consisted of people who have reached old age, that is, they have survived at least six decades, and individuals more exposed to risk factors are more likely to die prematurely, reducing the magnitude of the associations found.

Sociodemographic, behavioral and health characteristics associated with a higher risk of mortality in the elderly were identified. The use of mortality as an indicator of living conditions and social/economic development⁵ allows to understand which factors influence the mortality of the elderly, helping to improve public policies for this population, aiming to fight preventable or modifiable health factors and allowing them to enjoy longevity with a better quality of life.

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Received on: 06/27/2020

Revised on: 10/16/2020

Accepted on: 10/20/2020

Authors' contribution: RMB, ADB, ET, FFD and MCG participated in the conception and design of the study. ACLGS, CCB and RMB contributed with data analysis and interpretation, and by critically reviewing and approving the final version. ADB, ET, FFD and MCG collaborated with the revision of the final version of the manuscript.

