

## Dependence for food-related activities in the elderly

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**Abstract** *The objective of this study was to describe dependence for the activities of food shopping, preparing meals and eating in elderly residents from the city of Pelotas, Rio Grande do Sul. Bivariate analysis and ordinal logistic regression were employed to assess the three dependencies and exposure variables studied. Of the 1,451 older adults assessed, 21.1% required assistance for some activities where this care was given predominantly by son/daughter and partners. The highest prevalence of dependence was for food shopping (20.7%), followed by preparing meals (11.5%) and eating (2.0%). Elderly aged 80 years or older were more likely to be in a greater dependence category than individuals aged 60-69 years, with odds ratios of 5.0 for men and 7.1 for women. The odds ratio in individuals who self-rated their health as regular, poor or very poor was approximately 2.3 times greater, proving similar for both genders. Women with no partner had a 1.7 times greater chance of dependence whilst individuals with greater educational level exhibited 70.0% protection for their reference category; men with lower socioeconomic level had a 5.3 times greater chance of dependence than individuals with higher socioeconomic level. These results highlight the most vulnerable subgroups for dependencies and the importance of a family caregiver.*

**Key words** *Cross-sectional studies, Activities of daily living, Assessment of disability, Eating behavior, Elderly*

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## Introduction

Population aging is defined as a shift in the age structure of the population in which there is an increase in people over a certain age, considered as the beginning of old age<sup>1</sup>. Worldwide, the proportion of older adults is growing faster than any other age group<sup>2</sup>. According to World Health Organization (WHO) estimates, between 1970 and 2025, the number of elderly people globally is set to rise by 223.0% or approximately 694 million individuals<sup>2</sup>.

As a consequence of this new demographic characteristic, aging-related diseases and conditions have become a focus of health actions and policies<sup>3,4</sup>. These activities tend to center on the prevention and treatment of chronic non-communicable diseases in this age group<sup>5</sup>, given they can lead to a debilitating process hampering or preventing the independent performance of activities of daily living (ADLs)<sup>6</sup>.

Functional disability, besides being a dynamic and progressive process, promoted by the health and physiological changes associated with aging, can be modulated by cognitive and psychological status and also by gender, educational level, social support, life-style and environmental factors<sup>7,8</sup>. Such disabilities can also impact the nutritional status of elderly individuals, where some factors can have a major influence on the patterns of meals and nutrient intake in aging, including physical factors such as functional capacity for performing ADLs<sup>9</sup>.

Some specific disabilities, such as difficulties acquiring and preparing foods and dependence for eating, are more directly associated with this situation and restrict or limit adequate nutrient intake<sup>10,11</sup>. In addition, given that the elderly population has specific characteristics which render this group especially vulnerable, difficulties performing these activities independently can pose an imminent risk of nutritional deficiency. This can lead to greater frailty among elderly<sup>12</sup>, impairing general health, increasing susceptibility to falls and fractures, hospital admissions, institutional care and death<sup>7,13</sup>.

Despite the relevance of the topic, specific studies on the functional assessment of food-related activities in elderly are scarce in Brazil<sup>14</sup>, with most investigations available in the international literature<sup>10,15</sup>. Therefore, the objective of the present study was to describe dependence for food-related activities in non-institutionalized elderly from the city of Pelotas, Rio Grande do Sul, Brazil.

## Methods

Pelotas is a medium-sized city located in the southern part of Rio Grande do Sul (RS) state and has a population of around 330,000 persons. Fifteen percent of its population comprises individuals age 60 years or older<sup>16</sup>. A cross-sectional population-based study was conducted in the urban area to determine the health characteristics of the city's non-institutionalized elderly. This study was carried out under the Post-graduate program in Epidemiology of the Federal University of Pelotas through joint collaboration via a single field study called a "research consortium"<sup>17</sup>. All students reading for Masters Degrees took part in the study and drew data from the research for their respective dissertations.

The number of households required to meet the objectives of all members of the research team was first determined. Based on a ratio of 0.4 elderly residents per household<sup>16</sup>, in order to include the number of residents required in samples for all the studies (1,649 elderly individuals), the study had to cover 3,745 households in the urban area of the city. The sampling process entailed two stages. In the first stage, the census sectors were ranked in increasing order of average income to allow systematic random selection of 133 sectors. Subsequently, these sectors were reviewed to update the number of households. Thirty-one households per sector were then systematically selected to enable identification of around 12 elderly individuals within each. Thus, the study encompassed a total of 4,123 households.

For this study, a sample size of 1,192 elderly participants was calculated. This calculation was based on the prevalences found by Del Duca et al.<sup>18</sup> of 1.3% dependence for the activity of eating, 11.9% for shopping, and 8.7% for preparing meals, allowing for an acceptable error of 0.7 in dependence for eating, and sample design effect (DEF) of 1.1.

Data collection was carried out from January to August 2014 by trained interviewers using a previously tested questionnaire in digital form applied with the aid of netbooks.

The outcomes of the present study were dependence for activities of food shopping, preparation and intake. In order to allow comparison of results, dependence was investigated using three questions based on the Health, Well-being and Aging Survey (SABE)<sup>19</sup>: *At the moment, do you need somebody's help for eating, doing the food shopping; preparing your food, snacks or cof-*

fee?. Possible responses were: “no”, “yes, always”, “yes, sometimes”. For the activities of food shopping and preparing meals, the category “I don’t usually do it” was included. In the analysis, interviewees reporting the need for full or partial assistance were considered dependent for performing that activity. For determining the prevalence of elderly requiring some kind of assistance, dependence was defined as needing help for at least one of the activities studied.

Regarding the dependent variables, in cases where a need for help was cited, a further two questions were asked to characterize the help required. Possible responses were: “I receive no help”, “spouse/partner”, “son/daughter, stepson/step-daughter”, “parents/mother-in-law or father-in-law”, “brother/sister”, “son-in-law/daughter-in-law”, “other relative”, “caregiver”, “domestic”, and “other”. A question inquiring whether the help was paid was also asked, with answer alternatives of “no” or “yes”. Paid care was considered formal when performed by a caregiver or domestic, or informal when performed by others who were not paid for the task.

The following characteristics constituted independent variables: gender, age (collected as a discrete numeric variable and subsequently stratified into 60-69, 70-79 and 80 years or older), marital status (“married or living with partner”, “single or with no partner”, “separated”, “widowed”, socioeconomic level (collected according to the instrument proposed by the National Association of Research Companies (ABEP)<sup>20</sup> and categorized into classes A, B, C, D or E), educational level (collected under the categories “none”; “1<sup>st</sup> to 3<sup>rd</sup> series”; “4<sup>th</sup> series or 1<sup>st</sup> grade incomplete”, “1<sup>st</sup> grade complete or 2<sup>nd</sup> grade incomplete”, “2<sup>nd</sup> grade complete or higher education incomplete” and “higher education complete”), self-rated health (“very poor”, “poor”, “regular”, “good”, “very good”), weight (measured using a set of TANITA® brand digital scales (150Kg capacity and accurate to nearest 100g) and height. Stature was estimated based on knee height using the equation proposed by Chumlea & Guo<sup>21</sup>. This method is recommended for individuals aged 60 years or older, particularly in view of problems related to advanced age, such as being unable to stand and deformities of the spine<sup>22</sup>. Thus, knee height was measured using a child stadiometer incorporating a 100 cm scale (Indaiá® brand). The height of the individual was then estimated by an equation. The weight and height variables were then used to calculate Body Mass Index (BMI). The formula of BMI =

Weight (Kg)/[Height(m)]<sup>2</sup> was employed, with values categorized as follows: ≤ 22.0 kg/m<sup>2</sup> (underweight), > 22.0 and < 27.0 kg/m<sup>2</sup> (normal weight), ≥ 27.0 kg/m<sup>2</sup> (overweight)<sup>23</sup>.

All interviews, performed with the aid of *Netbooks*, were transferred weekly to a database held on the Stata 12.1® software program. After analyzing for inconsistencies, a descriptive analysis was performed to characterize the population studied. Prevalences of the three dependencies were calculated along with the number of dependencies, categorized into none, one, two or three. The relationship among the three dependencies was assessed by constructing a Venn Diagram. It should be noted that 180 individuals were excluded from the analysis because information for all three outcomes was not provided. Bivariate analysis was performed for each exposure of interest and each outcome using Pearson’s Chi-squared tests with calculation of the p-value for heterogeneity in categorical exposure variables. Also, ordinal regression was applied to determine which variables were associated with the presence of dependencies. Analyses were stratified for gender. A significance level of 5% was adopted for all associations. The complex sampling process was applied for all analyses using the *svy* command.

In order to assure the quality of the information collected, 10% of the individuals were randomly selected for application of a short form of the questionnaire containing 19 questions. The question used in this study was: *At the moment, do you need somebody’s help for doing the food shopping?*. The expected concordance between responses was tested by calculating the Kappa statistic, which showed 41.0% repeatability.

The study project was approved by the Research Ethics Committee of the Federal University of Pelotas Medical School and all participants who agreed to take part in the study signed a Free and Informed Consent Form.

## Results

A total of 1,844 individuals eligible for the study were found in the 133 census sectors. After repeated attempts at contacting the eligible individuals, there were 393 losses and refusals (21.3%), predominantly females and aged 60-69 years. This gave a final sample of 1,451 elderly participants. In the assessment of dependence for eating, five individuals being tube fed at the time of the interview were excluded. The design effect for the three dependent variables was calculated

as 1.04 for dependence for eating, 1.39 for food shopping and 1.09 for preparing meals.

A full description of the sample, stratified by gender for the independent variables studied, is given in Table 1. The majority of the elderly (63.0%) were female and approximately 50.0% aged 60–69 years. Participants had a mean age of  $70.7 \pm 8.2$  years, minimum of 60 years and maximum of 104 years. Most men (76.1%) were married and 42.7% of women were widows. Approximately 56.7% of the elderly were classified as economic class C and 30.9% reported having studied to 4<sup>th</sup> series or incomplete 1<sup>st</sup> grade levels. With regard to self-rated health and nutritional status, over half of the individuals (53.0%) re-

ported having good or very good health and the majority (56.3%) were overweight.

The highest prevalence of dependence was found for food shopping (20.7%, 95%CI: 18.5–22.9), with rates of 24.7% (95%CI: 21.8–27.6) in women and 13.5% (95%CI: 10.4–16.6) in men. The prevalences of dependence for preparing meals and eating were 11.5% (95%CI: 9.8–13.3) and 2.0% (95%CI: 1.3–2.7), respectively, proving similar for both genders. Of all interviewees, 8.2% had no dependences, 12.0% had one, 8.0% two and 1.8% had all three dependencies. In addition, 7.9% of elderly were dependent for both preparing meals and food shopping, 10.9% for food shopping only and 1.1% for preparing

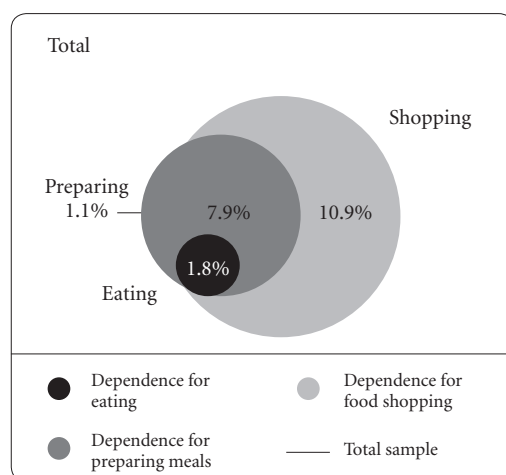
**Table 1.** Sample description according to demographic, socioeconomic and health variables, stratified by gender. Pelotas, RS, 2014 (n = 1,451).

Variable	Men (n = 537) n (%)	Women (n = 914) n (%)	Total (n = 1,451) n (%)
Age (full years) (n = 1,446)			
60 – 69	289 (53.9)	467 (51.3)	756 (52.3)
70 – 79	172 (32.1)	288 (31.7)	460 (31.8)
80 or older	75 (14.0)	155 (17.0)	230 (15.9)
Marital status (n = 1,447)			
Married	408 (76.1)	355 (38.9)	763 (52.7)
Single	21 (3.9)	70 (7.7)	91 (6.3)
Separated	37 (6.9)	97 (10.7)	134 (9.3)
Widowed	70 (13.1)	389 (42.7)	459 (31.7)
Socioeconomic level (ABEP) (n = 1,372)			
A	14 (2.8)	26 (3.0)	40 (2.9)
B	186 (36.6)	257 (29.8)	443 (32.3)
C	248 (48.8)	472 (54.6)	720 (52.5)
D	58 (11.4)	107 (12.4)	165 (12.0)
E	2 (0.4)	2 (0.2)	4 (0.3)
Educational level (n = 1,437)			
None	58 (10.9)	138 (15.3)	196 (13.6)
1 <sup>st</sup> to 3 <sup>rd</sup> series	147 (27.6)	190 (21.0)	337 (23.5)
4 <sup>th</sup> series or 1 <sup>st</sup> grade incomplete	169 (31.7)	276 (30.5)	445 (30.9)
1 <sup>st</sup> grade complete or 2 <sup>nd</sup> grade incomplete	55 (10.3)	88 (9.7)	143 (10.0)
2 <sup>nd</sup> grade complete or higher education incomplete	56 (10.5)	103 (11.4)	159 (11.1)
Higher education complete	48 (9.0)	109 (12.1)	157 (10.9)
Self-rated health (n = 1,442)			
Very good	49 (9.2)	102 (11.2)	151 (10.5)
Good	244 (46.0)	370 (40.6)	614 (42.5)
Regular	206 (38.8)	339 (37.2)	545 (37.8)
Poor	24 (4.5)	68 (7.5)	92 (6.4)
Very poor	8 (1.5)	32 (3.5)	40 (2.8)
Nutritional status (kg/m <sup>2</sup> ) (n = 1,364)			
Underweight	51 (10.2)	75 (8.7)	126 (9.2)
Normal weight	192 (38.3)	279 (32.3)	471 (34.5)
Overweight	258 (51.5)	509 (59.0)	767 (56.3)

meals only. This data is depicted in Figure 1 by a Venn Diagram.

The relationship between the presence of each dependence and exposure variables among men is shown in Table 2. It is evident that reliance on help for eating, preparing meals and food shopping was more frequent among elderly aged 80 years or older, and also in individuals who were single, separated or widowers. Socio-economic level was significantly associated only with the outcomes “preparing meals” and “food shopping” ( $p = 0.012$  and  $p = 0.028$ , respectively), where prevalences were higher among those with economic levels D and E. Also, individuals who rated their health as regular, poor or very poor had higher prevalences for both outcomes ( $p = 0.022$  and  $p = 0.007$ , respectively).

Similarly in women (Table 3), reliance on help for eating, preparing meals and food shopping was more frequent among those aged 80 years or older. There was a higher frequency of dependence for preparing meals and food shopping ( $p < 0.001$  for both) in single, separated or widowed women and among those with no education or who had studied up to the 3<sup>rd</sup> series. Women classed as economic levels D and E had higher prevalences of dependence for food shopping ( $p = 0.006$ ). Self-reported health was associated with all three outcomes, proving more frequent among women who rated their health as regular, poor or very poor.



**Figure 1.** Dependence of elderly for food shopping, preparing meals and eating, with intersections, depicted by Venn Diagram. ( $n = 1,271$ )

The crude and adjusted analyses of number of dependencies and the exposure variables by gender is shown in Table 4. The adjusted analysis revealed that men aged 80 year or older had a 5.0 times greater likelihood of being in a greater dependence category compared to individuals aged 60-69 years ( $p = 0.001$ ). This likelihood among women was 7.1 times greater ( $p < 0.001$ ). The variables marital status and education were associated only for women, where those who were single, separated or widows had a 1.7 greater chance of being in a greater dependence category than married women ( $p = 0.008$ ). Women who had completed 2<sup>nd</sup> grade or complete or incomplete higher education had 70% protection against being in a category of greater dependence compared to those with no education or who had studied up to the 3<sup>rd</sup> series ( $p = 0.001$ ). Socioeconomic level was associated only among men, where those with a lower economic level (class D/E) had 5.3 times more chance of being in a category of greater dependence than men with higher economic level (A/B class) ( $p = 0.007$ ). Moreover, elderly who rated their health as regular, poor, or very poor had a 2.3 times greater likelihood of being in a greater dependence category than those rating their health as good or very good, with no difference between genders. The nutritional status variable was not statistically significant on crude or adjusted analyses.

The data revealed that 21.1% of elderly ( $n = 306$ ) required some kind of assistance for the activities. The elderly were assisted on the three activities largely by family members, predominantly son/daughter or step-son/step-daughter, followed by spouse/partner. A relatively small percentage of elderly reported using paid help for food-related activities (formal caregiving): 13.8% for eating, 8.0% for preparing meals and 4.4% for food shopping (data not shown in table).

## Discussion

This study showed that 21.1% of the elderly required assistance for a food-related activity and that care was predominantly given by son/daughter or partner.

In the national and international literature, few studies assessing functional disability have focused on specific activities, such as those related to food<sup>10,14,15</sup>. Most studies have assessed a full range of basic activities of daily living (BADLs) or instrumental activities of daily living (IADLs),

**Table 2.** Frequency of dependence for eating, preparing meals and food shopping according to demographic and economic variables, self-rated health and nutritional status in men (n = 537).

Variable	Eating % (IC 95%)	p-value	Preparing % (IC 95%)	p-value	Shopping % (IC 95%)	p-value
Age (full years)		0.024		0.001		0.001
60 – 69	1.0 (0.0; 2.2)		5.7 (2.6; 8.7)		8.3 (4.5; 12.2)	
70 – 79	2.9 (0.0; 5.9)		13.4 (6.9; 20.0)		13.2 (7.6; 18.7)	
80 or older	6.8 (1.2; 12.3)		33.3 (21.9; 44.7)		37.9 (24.2; 51.7)	
Marital status		0.042		0.007		0.001
Married	1.7 (0.5; 3.0)		9.2 (5.5; 13.0)		10.4 (6.8; 14.0)	
Single/Separated/Widowed	4.7 (1.0; 8.4)		19.4 (12.0; 26.8)		24.3 (15.7; 32.9)	
Socioeconomic level (ABEP)		0.508		0.012		0.028
A/B	3.0 (0.8; 5.3)		10.7 (5.9; 15.4)		11.4 (6.4; 16.3)	
C	1.6 (0.1; 3.2)		9.7 (5.5; 13.9)		12.2 (7.7; 16.8)	
D/E	3.3 (0.0; 8.0)		24.5 (11.1; 37.9)		25.0 (12.4; 37.6)	
Educational level		0.154		0.737		0.066
None/1 <sup>st</sup> to 3 <sup>rd</sup> series	3.4 (0.6; 6.3)		13.1 (7.3; 18.9)		18.8 (11.7; 25.8)	
4 <sup>th</sup> series or 1 <sup>st</sup> grade incomplete/1 <sup>st</sup> grade complete or 2 <sup>nd</sup> grade incomplete	0.9 (0.0; 2.2)		11.4 (6.6; 16.1)		10.5 (6.2; 14.7)	
2 <sup>nd</sup> grade complete or higher education incomplete/complete	3.9 (0.4; 7.4)		9.6 (2.5; 16.8)		10.6 (3.9; 17.4)	
Self-rated health		0.337		0.022		0.007
Good/Very good	1.7 (0.3; 3.2)		8.1 (4.4; 11.7)		8.9 (5.1; 12.6)	
Regular/Poor/ Very poor	3.0 (0.8; 5.2)		15.0 (9.5; 20.5)		18.5 (12.2; 24.8)	
Nutritional status (kg/m <sup>2</sup> )		0.265		0.313		0.207
Underweight	0.00		10.8 (0.6; 21.0)		17.5 (6.2; 28.8)	
Normal weight	0.00		10.2 (4.2; 16.2)		11.2 (6.2; 16.2)	
Overweight	1.2 (0.0; 2.5)		5.9 (2.2; 9.5)		8.7 (5.0; 12.4)	

or both. However, comparisons can be drawn with the results found in the present study when prevalences of each activity are given separately.

The present study found that one in every five elderly reported needing help for food-related activities. According to Eberhardie<sup>24</sup>, dependence in elderly generally occurs gradually, where the majority have autonomy for the activity of eating and rarely exhibit dependence for this activity, even when they are no longer able to shop for and/or prepare their own meals. A study carried out between 2000 and 2001 in Finland with national representativeness involving 1697 elderly aged 65 years or older found a similar prevalence of need of assistance for eating activities (23.0%)<sup>15</sup>. However, a Canadian study in a sample of 193 volunteers aged over 55 years (61 recruited from geriatric clinics and 132 community-dwelling), found a higher prevalence than the present study of 29.5%<sup>10</sup>. This disparity may be due to the Canadian sample, which comprised both community-dwelling and institutionalized elderly.

A study on functional disability for ADLs and IADLs in 598 elderly, based on data collected between 2007 and 2008 in Pelotas, reported similar prevalences to the rates found in the present study<sup>18</sup>. Another Brazilian study in 2142 elderly assessing eating behavior carried out in São Paulo between 2000 and 2001 revealed difficulties (or inability) for preparing meals in 5.0% and for food shopping in 14% of the group<sup>14</sup>.

Comparing international studies, the previously cited study carried out in Finland found that 4.3% of the elderly had problems eating without the assistance of others and around 22.0% had difficulties preparing meals<sup>15</sup>. The lower prevalences observed in the present studies may be explained by its younger sample, in which 81.4% of the elderly were under the age of 80 years. The Canadian study, despite including institutionalized elderly, had similar results to the present study, reporting 21.8% dependence for supermarket shopping and 13.5% for preparing meals.

Of the total elderly that reported needing

**Table 3.** Frequency of dependence for eating, preparing meals and food shopping according to demographic and economic variables, self-rated health and nutritional status in women (n = 914).

Variable	Eating % (IC 95%)	p-value	Preparing % (IC 95%)	p-value	Shopping % (IC 95%)	p-value
Age (full years)		0.012		0.001		0.001
60 – 69	0.9 (0.0; 1.7)		3.9 (2.2; 5.7)		13.7 (10.3; 17.1)	
70 – 79	1.8 (0.2; 3.3)		10.0 (6.8; 13.2)		27.6 (21.8; 33.4)	
80 or older	4.6 (1.2; 8.0)		41.2 (33.2; 49.3)		58.7 (50.2; 67.2)	
Marital status		0.498		0.001		0.001
Married	1.4 (0.2; 2.6)		4.3 (2.3; 6.4)		16.6 (12.3; 20.9)	
Single/Separated/Widowed	2.0 (0.9; 3.2)		16.3 (13.2; 19.4)		30.0 (26.0; 34.0)	
Socioeconomic level (ABEP)		0.660		0.098		0.006
A/B	2.2 (0.5; 3.8)		12.9 (9.4; 16.5)		18.8 (14.4; 23.1)	
C	1.3 (0.3; 2.3)		9.3 (6.5; 12.0)		25.3 (21.0; 29.6)	
D/E	1.8 (0.0; 4.4)		15.1 (8.8; 21.4)		33.7 (25.1; 42.2)	
Educational level		0.053		0.001		0.001
None/1 <sup>st</sup> to 3 <sup>rd</sup> series	2.8 (1.0; 4.5)		18.2 (14.0; 22.5)		34.8 (29.4; 40.2)	
4 <sup>th</sup> series or 1 <sup>st</sup> grade incomplete/1 <sup>st</sup> grade complete or 2 <sup>nd</sup> grade incomplete	1.9 (0.6; 3.3)		9.9 (6.9; 12.9)		24.3 (19.5; 29.2)	
2 <sup>nd</sup> grade complete or higher education incomplete/complete	0.00		4.4 (2.0; 6.8)		9.7 (6.1; 13.4)	
Self-rated health		0.001		0.001		0.001
Good/Very good	0.2 (0.0; 0.6)		6.8 (4.5; 9.1)		16.0 (12.6; 19.3)	
Regular/Poor/ Very poor	3.5 (1.9; 5.0)		16.7 (12.9; 20.4)		34.4 (29.8; 39.1)	
Nutritional status (kg/m <sup>2</sup> )		0.050		0.702		0.928
Underweight	0.00		11.3 (4.5; 18.0)		24.3 (13.9; 34.7)	
Normal weight	1.1 (0.0; 2.3)		8.7 (5.4; 12.0)		22.1 (16.8; 27.4)	
Overweight	0.00		8.3 (5.7; 10.8)		22.2 (17.9; 26.4)	

some kind of help performing the activities studied, less than a fifth paid the helper. Furthermore, it was also noted that this care was predominantly given by the son/daughter or step-son/daughter. By contrast, another study performed in Pelotas, specifically on home-based care, found this was given predominantly by the spouse (39.5%) followed by son/daughter (23.7%)<sup>25</sup>. This tendency has arisen as a consequence of the new demands of society, which include demographic aging and increased life expectancy, in which the number of elderly requiring assistance for activities of daily living has risen and the presence of the caregiver in their homes has become more common<sup>26</sup>. According to the Bambuí Project, which studies a cohort of Brazilian elderly, few studies in Brazil have explored this phenomenon<sup>8</sup>. The present study found that around 23.0% of elderly needed assistance from a caregiver, invariably informal and unpaid, such as a family member<sup>8,27</sup>. This shows that in Brazil, the family is largely responsible for the burden of care giving to elderly in the domestic setting<sup>27</sup>.

With regard to care, the study by Del Duca et al.<sup>25</sup> found that 4.7% was provided by a formal caregiver. In the present study, the greatest need for a paid caregiver was for eating (13.8%) and the lowest need was for food shopping (4.4%).

Another result of the present study was the association of advanced age with greater prevalences of dependence for the three outcomes. This finding corroborates results of other studies showing a higher frequency of need for assistance with increasing age for eating<sup>15,28,29</sup>, preparing meals and food shopping<sup>15</sup>. Loss of muscle and bone mass, decline in basal metabolism and energy reserve, with consequent inability to react to stressors, are associated with advanced aging and can lead to the syndrome of frailty which exposes independent elderly to functional loss and dependence<sup>30</sup>.

Self-rated health was inversely associated with the outcomes food shopping and preparing meals for both sexes. Among women, this variable was also associated with the eating outcome. This highlights the link established between level

**Table 4.** Crude and adjusted odds ratio of number of dependences according to demographic and economic variables, self-rated health and nutritional status, by gender (n = 1,271).

Variable	Men (n = 429)			
	Crude OR	p-value	Adjusted OR	p-value
Idade (anos coAge (full years)		< 0.001		0.001
60 – 69	Ref.		Ref.	
70 – 79	1.7 (0.9; 3.2)		1.2 (0.9; 4.3)	
80 or older	7.0 (3.5; 13.9)		5.0 (2.0; 12.1)	
Marital status		0.001		0.149
Married	Ref.		Ref.	
Single/Separated/Widowed	2.6 (1.5; 4.5)		1.7 (0.8; 3.7)	
Socioeconomic level (ABEP)		0.010		0.007
A/B	Ref.		Ref.	
C	0.9 (0.5; 1.7)		2.6 (0.9; 7.3)	
D/E	2.9 (1.3; 6.1)		5.3 (1.5; 18.0)	
Educational level		0.298		0.132
None/1 <sup>st</sup> to 3 <sup>rd</sup> series	Ref.		Ref.	
4 <sup>th</sup> series or 1 <sup>st</sup> grade incomplete/1 <sup>st</sup> grade complete or 2 <sup>nd</sup> grade incomplete	0.7 (0.4; 1.9)		1.4 (0.7; 3.1)	
2 <sup>nd</sup> grade complete or higher education incomplete/complete	0.6 (0.3; 1.4)		2.7 (0.8; 9.6)	
Self-rated health		0.004		0.020
Good/Very good	Ref.		Ref.	
Regular/Poor/ Very poor	2.2 (1.3; 3.8)		2.4 (1.1; 5.0)	
Nutritional status (kg/m <sup>2</sup> )		0.161		0.346
Underweight	Ref.		Ref.	
Normal weight	0.6 (0.2; 1.5)		0.7 (0.3; 2.0)	
Overweight	0.4 (0.2; 1.0)		0.6 (0.2; 1.7)	
Women (n = 842)				
Variável	Crude OR	p-value	Adjusted OR	p-value
Idade (anos completos)		< 0.001		< 0.001
60 – 69	Ref.		Ref.	
70 – 79	2.5 (1.7; 3.6)		1.9 (1.3; 2.9)	
80 ou mais	11.0 (7.1; 17.2)		7.1 (4.2; 12.0)	
Situação conjugal		< 0.001		0.008
Casado(a)	Ref.		Ref.	
Solteiro(a)/Separado(a)/Viúvo(a)	2.3 (1.6; 3.2)		1.7 (1.2; 2.6)	
Nível socioeconômico (ABEP)		0.039		0.551
A/B	Ref.		Ref.	
C	1.3 (0.9; 1.9)		0.7 (0.4; 1.2)	
D/E	1.9 (1.2; 3.2)		0.8 (0.4; 1.5)	
Escolaridade		< 0.001		0.001
Nenhuma/1 <sup>a</sup> até 3 <sup>a</sup> série	Ref.		Ref.	
4 <sup>a</sup> série ou 1 <sup>o</sup> grau incompleto/1 <sup>o</sup> grau completo ou 2 <sup>o</sup> grau incompleto	0.6 (0.4; 0.8)		0.8 (0.5; 1.2)	
2 <sup>o</sup> grau completo ou nível superior incompleto/ Nível superior completo	0.2 (0.1; 0.3)		0.3 (0.2; 0.6)	
Autopercepção de saúde		< 0.001		< 0.001
Muito boa/Boa	Ref.		Ref.	
Regular/Ruim/Muito ruim	2.9 (2.1; 4.0)		2.3 (1.6; 3.4)	
Estado nutricional (kg/m <sup>2</sup> )		0.807		0.235
Baixo peso	Ref.		Ref.	
Peso adequado	0.8 (0.5; 1.5)		1.0 (0.5; 1.9)	
Sobrepeso	0.8 (0.5; 1.5)		1.3 (0.7; 2.4)	



of independence for ADLs and the elderly person's self-perceived health status, representing an important aspect to consider<sup>31</sup>.

With regard to the other factors associated with dependence, elderly individuals with no partner, lower economic level and less education were also more dependent. Elderly individuals with no partner, including widowers, can suffer a situation of isolation and display less care about their health, negatively impacting functional capacity<sup>32</sup>. The higher the individual's level of education and income, the lower the likelihood of reporting worse functional capacity<sup>33,34</sup>. Individuals with a higher level of education are less likely to expose themselves to risk factors for diseases or to subject themselves to inadequate working conditions. This group also has greater access to information, propensity for modifying lifestyle, adopting health habits and seeking health services<sup>35</sup>. Conversely, elderly with lower incomes are less inclined to seek health services and have poorer access to treatment and medications<sup>34</sup>.

Moreover, the probability of being in a greater dependence category when assessed in ordinal form, was higher among individuals aged 80 years or older and in those who rated their health as regular, poor or very poor, for both sexes. For men, this probability was higher among those with lower income, whereas for women this was higher among single, separated or widowed individuals and lower in those with higher educational level. However, specific studies allowing comparison with the present study are not yet available, precluding further discussion on these relationships.

Several limitations of this study should be noted. Given the cross-sectional design of the study, its main limitation is the possibility of reverse causality bias for the variable "self-rated health", especially since the individual's perception of life, expectations and concerns can all influence their health and autonomy<sup>36</sup>. On the other hand, the negative perception of health

may stem from the fact they are debilitated, encompassing biological, social and psychosocial dimensions<sup>37</sup>. Underestimation of outcomes may also be due to survival bias, whereby the most dependent elderly, and thus with worse health, may have already died.

A possible explanation for the low Kappa value found when testing expected concordance, besides chance among responses, on the questionnaire used for data quality control, may be differences in participants' interpretation of perceived dependence between the time of application of the initial interview and performance of the quality control. Another limitation is a lack of statistical power for detecting associations between outcomes and some exposure variables such as nutritional status.

The study has several noteworthy strengths, including internal validity, conferred by the representative sample of the elderly population from the city of Pelotas, as well as external validity, given the data can be extrapolated to similar populations. The cluster sampling used in the study meant the analyses took into account the effect of this sampling process on results. However, only dependence for food shopping exhibited a design effect in the sample, indicating homogeneity of this dependence within clusters and heterogeneity among clusters, clearly due to the economic difference between them.

In conclusion, even within a domestic setting, we observed that one in every five elderly required assistance for food-related activities, and that this care was provided largely by the family. Given that the caregiver plays an important role in maintaining the health and wellbeing of the elderly person, in this case related to food, it is crucial that this individual has the necessary preparation to provide this care.

The results of the present study can contribute by elucidating the context of dependence of elderly for food-related activities, and informing the planning of actions in this area.

### **Collaborators**

IO Bierhals and MCF Assunção were involved in all stages of the study, including the idea conception, devising the project, data analysis and writing the article. FO Meller was involved in devising the project, reviewing the study and contributing suggestions during the work.

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