

**SOCIODEMOGRAPHIC AND HEALTH FACTORS ASSOCIATED WITH THE RISK OF SARCOPENIA, FEAR OF FALLING AND LEVEL OF PHYSICAL ACTIVITY OF THE OLDER PEOPLE**

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**Highlights:** (1) The study highlights a significant association between sociodemographic factors like age and income with the risk of sarcopenia, fear of falling, and physical activity levels among older individuals. Specifically, those aged 60 to 70 years and with a monthly income exceeding three minimum wages were less likely to exhibit these risk factors. (2) The findings underscore the importance of subjective health perception in older adults. Individuals who perceived themselves to be in better health and had a positive health perception were less likely to experience sarcopenia, fear of falling, and low physical activity levels compared to their peers. (3) The study suggests a protective effect of physical activity against sarcopenia and fear of falling among older adults. Those who reported being physically active showed a lower risk of these conditions, emphasizing the importance of regular exercise in promoting health and reducing the likelihood of age-related health concerns.

PRE-PROOF

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## ABSTRACT

**Objective:** to analyze the sociodemographic and health factors associated with the risk of sarcopenia, fear of falling and level of physical activity among older people in the South and Southeast regions of Brazil. **Methodology:** cross-sectional study carried out with 116 older people. A questionnaire with sociodemographic and health questions, the International Physical Activity Questionnaire (IPAQ), the Falls Efficacy Scale – International (FES-I) and the Strength, Assistance in walking, Rise from a chair, Climb stairs, and Falls (SARC-F) were used. Data was analyzed by means of Pearson's Chi-square test ( $p < 0.05$ ). **Results:** there was a higher frequency of older people without risk of sarcopenia and fear of falling, who were physically active, belonging to the age group from 60 to 70 years, with a monthly income above three minimum wages, with a good health perception and who perceived themselves to be in better health than older people of the same age ( $p < 0.05$ ). **Conclusion:** it is concluded that some sociodemographic factors, such as younger age and higher income, and health factors, such as better health perception, are associated with the risk of sarcopenia, fear of falling and level of physical activity of the older people.

**Keywords:** Aging; Sarcopenia; Falls; Motor activity; Elderly.

## INTRODUCTION

Falls are responsible for reduced autonomy and increased pain and injuries in the older population. With aging, the risk of falls is multifactorial and is associated with sarcopenia, impaired balance, falls and psychological factors, such as fear of falling.<sup>1</sup> It is known that the fear of falling affects the older people more than the fall itself and that around 50% of the older people who have a fear of falling have not experienced a fall in the previous year.<sup>2</sup>

Absence of physical activity, often caused by fear of falling, has the potential to result in loss of strength and muscle mass, frailty and problems with balance and walking. In addition, aging and sarcopenia are also risk factors for future falls.<sup>3</sup> Sarcopenia is a muscle disease rooted in adverse muscle changes that accumulate throughout life, and is common among older adults, but can also occur earlier in life.<sup>4</sup>

The levels of sarcopenia can explain 09% of the fear of falling for the older individuals.<sup>5</sup> The pertinent literature suggests bidirectional results between sarcopenia and fear of falling<sup>6</sup>,

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where approximately 30% of the older people with sarcopenia have a fear of falling.<sup>2</sup>

An international study carried out with older people attending a hospital found that factors such as gender, anxiety symptoms and limitations in activities of daily living were associated with the fear of falling.<sup>2</sup> The socioeconomic profile of the older citizens can be an indicator of good or bad living conditions, reflecting on the quality of life of this population. For example, higher levels of income allow for the acquisition of better care services, support equipment and a more active social insertion, which has its own needs, not only because of age, but also because of the personal, family, social, economic and cultural characteristics of the older person.<sup>7</sup>

Some demographic characteristics, such as being female, long-lived and less educated, are associated with a greater fear of falling in community-dwelling older people.<sup>5</sup> Nonetheless, most studies have not taken into account the presence or absence of sarcopenia and the level of physical activity, which can result in a decline in physical function and increase the risk and fear of falls. Studies about the association among sarcopenia, fear of falling and other variables are limited.<sup>8</sup> In addition, older people have not been included in assessments, highlighting the need to investigate this population.<sup>9</sup>

Observational studies that simultaneously consider several determinants are necessary in order to increase knowledge about factors associated with the physical and psychological health of older citizens, so that preventive actions and treatment plans can subsequently be developed. Accordingly, this study aimed to analyze the sociodemographic and health factors associated with the risk of sarcopenia, fear of falling and level of physical activity of the older people.

### **METHODOLOGY**

This is a quantitative, analytical, observational and cross-sectional study, approved by the Human Research Ethics Committee of the Cesumar University, under Opinion number 5.391.064.

#### *Participants*

A total of 116 older people from the South and Southeast regions of Brazil were assessed, and this sample was chosen non-probabilistically, intentionally and for convenience. Older people who did not answer all the forms were excluded. The sample included older

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people (aged 60 or older) of both genders, with access to the internet, who answered all the items on the forms, whether or not they had the help of a second person. Older people with neurological or cognitive deficits that impacted on understanding and solving the forms were excluded.

### *Instruments*

A sociodemographic and health questionnaire, drawn up by the authors, was used to characterize the older citizens, with questions regarding age, gender, age group, retirement, education, monthly income, physical exercise practice, use of medications, presence of illnesses, use of walking aids, region of residence in the country, history of falls and history of near falls.

The International Physical Activity Questionnaire (IPAQ) was used to assess physical activity. This instrument assessed physical activities performed during leisure time, such as commuting, household chores and occupational activities. A minimum of 150 minutes of physical activity per week was considered for the individual to be classified as physically active; for less than 10 minutes per week, the individual was considered sedentary; and those who performed at least 10 minutes, but did not reach 150 minutes, were considered insufficiently active.<sup>10</sup>

Fear of falling was assessed using the Falls Efficacy Scale – International (FES-I). This scale contains 16 domains with different activities of daily living (ADLs) with four possible answers and respective scores from 1 to 4 (“Not at all worried” to “Extremely worried”). The total score can vary from 16 to 64, varying from “no concern” to “extreme concern”, respectively, about falls while performing the specific activities in the questionnaire.<sup>11</sup>

In order to assess the risk of sarcopenia, the Strength, Assistance in walking, Rise from a chair, Climb stairs, and Falls (SARC-F) was used, which includes five components: strength (whether the individual can lift 2.5 kg), walking (whether the individual can walk across a room or in his/her bedroom), rising from a chair (whether the individual can rise from a chair), climbing stairs (whether the individual can climb 01 flight of 10 steps) and falls (whether the individual has suffered falls in the last year). The scores vary from 0 to 2 points, with the first four being interpreted as 0 = no difficulty, 1 = some difficulty and 2 = great difficulty or inability to perform, while the last one is interpreted as 0 = no falls in the last year, 1 = 1-3 falls in the last year and 2 = 4 or more falls in the last year. Older people with four points or more in the total sum of the scores for the five components scored for the risk of sarcopenia.<sup>12,13</sup>

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*Data collection protocol*

Data was collected using an online form made available free of charge by Google Forms. People who were interested in taking part in the research agreed to do so by signing the Free and Informed Consent Form (FICF) on the online form.

The link developed to host the electronic questionnaire for the study was made available online via the researchers' social networks (WhatsApp, Instagram, Twitter and Facebook). The online questionnaire was open for receiving answers for 90 days (from June 2022 to August 2022). During collection, the ethical precepts of non-exposure of the study participants were respected, thus guaranteeing the confidentiality of the information. The older people could answer alone or with the help of others.

*Data analysis*

The data was analyzed by means of SPSS 25.0 software, using descriptive and inferential statistics. Frequency and percentage were used as descriptive measures for categorical variables. Pearson's Chi-square test ( $\chi^2$ ) was used to analyze the sociodemographic and health factors associated with the risk of sarcopenia, fear of falling and level of physical activity of the older people.

## **RESULTS**

A total of 116 older people of both genders took part in the study (88 women and 28 men), aged between 60 and 98 years, with a mean age of 68.78 (SD=8.09) years. There was a predominance of older people aged between 60 and 70 (68.1%), with a partner (63.8%), with complete higher education (57.8%), white (88.8%), retired (83.6%) and with a monthly income above three minimum wages (54.3%). It is also noteworthy that 69.8% of the older people perceive themselves to be in good health, 54.3% also perceive themselves to be in better health than older people of the same age and 51.7% do not practice physical exercises.

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**Table 1** – Sociodemographic and health profile of the research participants. Maringá, PR, Brazil, 2022.

<b>VARIABLES</b>	<b><i>f</i></b>	<b>%</b>
<b>Gender</b>		
Female	88	75.9
Male	28	24.1
<b>Age group</b>		
60 to 70 years	79	68.1
71 to 79 years	25	21.6
80 years or older	12	10.3
<b>Marital status</b>		
With partner	74	63.8
Without partner	42	36.2
<b>Education</b>		
Illiterate	8	6.9
Incomplete elementary school	24	20.7
Complete elementary school	3	2.6
Complete high school	14	12.1
Complete higher education	67	57.8
<b>Color</b>		
White	103	88.8
Black	2	1.7
Yellow	11	9.5
<b>Retirement</b>		
Yes	97	83.6
No	19	16.4
<b>Monthly income</b>		
1 to 2 MW	36	31.0
2.1 to 3 MW	17	14.7
Above 3 MW	63	54.3
<b>Health perception</b>		
Good	81	69.8
Fair/Bad	35	30.2
<b>Health perception compared to other older people</b>		
Worse/equal	53	45.7
Better	63	54.3
<b>Physical exercise practice</b>		
Yes	56	48.3
No	60	51.7

MW: minimum wage(s).

Source: the authors.

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The data in Table 2 shows that most of the older people had no risk of sarcopenia (86.2%), were not afraid of falling (51.7%) and revealed an active/very active level of physical activity (63.8%).

**Table 2** – Risk of sarcopenia, fear of falling and level of physical activity among the older people participating in the research. Maringá, PR, Brazil, 2022.

<b>Variables</b>	<b><i>f</i></b>	<b>%</b>
<b>Risk of sarcopenia</b>		
Absence	100	86.2
Presence	16	13.8
<b>Fear of falling</b>		
No	60	51.7
Yes	56	48.3
<b>Level of physical activity</b>		
Sedentary/Irregularly active	42	36.2
Active/Very active	74	63.8

Source: the authors.

When comparing the proportions of sociodemographic and health variables between the older people with and without risk of sarcopenia (Table 3), there was a significant difference between the groups in terms of age ( $p = 0.004$ ) education ( $p = 0.001$ ), monthly income ( $p = 0.001$ ), health perception ( $p = 0.001$ ), health perception compared to other older people ( $p = 0.001$ ), physical exercise practice ( $p = 0.002$ ) and level of physical activity ( $p = 0.001$ ). There was a higher frequency of older people without risk of sarcopenia in the age group from 60 to 70 years ( $f=73$ ), with complete higher education ( $f=64$ ), with a monthly income above three minimum wages ( $f=61$ ), with a good health perception ( $f=78$ ), who perceived themselves to be in better health than other older people ( $f=62$ ) and who were physically active. There was also a higher frequency of older people at risk of sarcopenia and who do not practice physical exercises.

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**Table 3** – Comparison of the proportions of sociodemographic and health variables between older people with and without risk of sarcopenia. Maringá, PR, Brazil, 2022.

VARIABLES	Risk of Sarcopenia		X <sup>2</sup>	p-value
	Absence (n=100)	Presence (n=16)		
	f (%)	f (%)		
<b>Gender</b>				
Female	75 (75.0)	13 (81.2)	0.294	0.588
Male	25 (25.0)	3 (18.8)		
<b>Age group</b>				
60 to 70 years	73 (73.0)	6 (37.5)	8.359	<b>0.004*</b>
71 to 79 years	19 (19.0)	6 (37.5)		
80 years or older	8 (8.0)	4 (25.0)		
<b>Education</b>				
Illiterate	6 (6.0)	2 (12.5)	16.835	<b>0.001*</b>
Incomplete elementary school	14 (14.0)	10 (62.5)		
Complete elementary school	3 (3.0)	0 (0.0)		
Complete high school	13 (13.0)	1 (6.3)		
Complete higher education	64 (64.0)	3 (18.7)		
<b>Color</b>				
White	88 (88.0)	15 (93.8)	0.349	0.555
Black	2 (2.0)	0 (0.0)		
Yellow	10 (10.0)	1 (6.2)		
<b>Retirement</b>				
Yes	86 (86.0)	11 (68.8)	2.997	0.083
No	14 (14.0)	5 (31.3)		
<b>Monthly income</b>				
1 to 2 MW	23 (23.0)	13 (81.3)	19.496	<b>0.001*</b>
2.1 to 3 MW	16 (16.0)	1 (6.3)		
Above 3 MW	61 (61.0)	2 (12.5)		
<b>Marital status</b>				
With partner	65 (65.0)	9 (56.3)	0.457	0.499
Without partner	35 (35.0)	7 (43.8)		
<b>Health perception</b>				
Good	78 (78.0)	3 (18.8)	22.983	<b>0.001*</b>
Fair/Bad	22 (22.0)	13 (81.3)		
<b>Health perception compared to other older people</b>				
Worse/Equal	38 (38.0)	15 (93.8)	17.276	<b>0.001*</b>
Better	62,0 (62.0)	1 (6.2)		
<b>Physical exercise practice</b>				
Yes	54 (54.0)	2 (12.5)	9.513	<b>0.002*</b>
No	46 (46.0)	14 (87.5)		
<b>Level of physical activity</b>				
Sedentary/Irregularly active	30 (30.0)	12 (75.0)	12.093	<b>0.001*</b>
Active/Very active	70 (70.0)	4 (25.0)		

\*Significant difference – p < 0.05: Chi-square test.

Source: the authors.

MW: minimum wage(s).

When comparing the proportions of sociodemographic and health variables between older people with and without fear of falling (Table 4), there was a higher proportion of older



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people without fear of falling in the age group from 60 to 70 years ( $p = 0.001$ ), with a monthly income above three minimum wages ( $p = 0.038$ ), with a partner ( $p = 0.009$ ), with a good health perception ( $p = 0.001$ ), who perceived themselves to be in better health than older people of the same age ( $p = 0.002$ ) and who were physically active ( $p = 0.003$ ).

**Table 4** – Comparison of the proportions of sociodemographic and health variables between older people with and without fear of falling. Maringá, PR, Brazil, 2022.

VARIABLES	Fear of falling		X <sup>2</sup>	p-value
	No	Yes		
	(n=60) f (%)	(n=56) f (%)		
<b>Gender</b>				
Female	44 (73.3)	44 (78.6)	0.434	0.510
Male	16 (26.7)	12 (21.4)		
<b>Age group</b>				
60 to 70 years	49 (81.7)	30 (53.6)	13.518	<b>0.001*</b>
71 to 79 years	10 (16.7)	15 (26.8)		
80 years or older	1 (1.7)	11 (19.6)		
<b>Education</b>				
Illiterate	3 (5.0)	5 (8.9)	3.342	0.068
Incomplete elementary school	9 (15.0)	15 (26.8)		
Complete elementary school	2 (3.3)	1 (1.8)		
Complete high school	7 (11.7)	7 (12.5)		
Complete higher education	39 (65.0)	28 (50.0)		
<b>Color</b>				
White	53 (88.3)	50 (89.3)	0.033	0.855
Black	1 (1.7)	1 (1.8)		
Yellow	6 (10.0)	5 (8.9)		
<b>Retirement</b>				
Yes	52 (86.7)	45 (80.4)	0.842	0.359
No	8 (13.3)	11 (19.6)		
<b>Monthly income f (%)</b>				
1 to 2 MW	13 (21.7)	23 (41.1)	4.312	<b>0.038*</b>
2.1 to 3 MW	10 (16.7)	7 (12.5)		
Above 3 MW	37 (61.7)	26 (46.4)		
<b>Marital status f (%)</b>				
With partner	45 (75.0)	29 (51.8)	6.758	<b>0.009*</b>
Without partner	15 (25.0)	27 (48.2)		
<b>Health perception</b>				
Good	51 (85.0)	30 (53.6)	13.580	<b>0.001*</b>
Fair/Bad	9 (15.0)	26 (46.4)		
<b>Health perception compared to other older people</b>				
Worse/Equal	19 (31.7)	34 (60.7)	9.849	<b>0.002*</b>
Better	41 (68.3)	22 (39.3)		

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<b>Physical exercise practice</b>				
Yes	33 (55.0)	23 (41.1)	2.250	0.134
No	27 (45.0)	33 (58.9)		
<b>Level of physical activity</b>				
Sedentary/Irregularly active	14 (23.3)	28 (50.0)	8.918	<b>0.003*</b>
Active/Very active	46 (76.7)	28 (50.0)		

\*Significant difference –  $p < 0.05$ : Chi-square test.

Source: the authors.

MW: minimum wage(s).

When comparing the proportions of sociodemographic and health variables of the older people according to their level of physical activity (Table 5), there was a higher proportion of physically active older people in the age group from 60 to 70 years ( $p = 0.001$ ), with complete higher education ( $p = 0.001$ ), with a monthly income above three minimum wages ( $p = 0.001$ ), with a good health perception ( $p = 0.001$ ), who perceived themselves to be in better health than older people of the same age ( $p = 0.001$ ) and who practiced physical exercises ( $p = 0.001$ ).

**Table 5** – Comparison of the proportions of sociodemographic and health variables according to the level of physical activity of the older people. Maringá, PR, Brazil, 2022.

VARIABLES	Level of physical activity		X <sup>2</sup>	p-value
	Sedentary/Irregularly active (n=42)	Active/Very active (n=74)		
	f (%)	f (%)		
<b>Gender</b>				
Female	31 (73.8)	57 (77.0)	0.151	0.697
Male	11 (26.2)	17 (23.0)		
<b>Age group</b>				
60 to 70 years	20 (47.6)	59 (79.7)	12.332	<b>0.001*</b>
71 to 79 years	14 (33.4)	11 (14.9)		
80 years or older	8 (19.0)	4 (5.4)		
<b>Education</b>				
Illiterate	5 (11.9)	3 (4.1)	14.277	<b>0.001*</b>
Incomplete elementary school	16 (38.1)	8 (10.8)		
Complete elementary school	1 (2.4)	2 (2.7)		
Complete high school	3 (7.1)	11 (14.9)		
Complete higher education	17 (40.5)	50 (67.5)		
<b>Color</b>				
White	37 (88.1)	66 (89.2)	0.010	0.920
Black	1 (2.4)	1 (1.4)		
Yellow	4 (9.5)	7 (9.4)		
<b>Retirement</b>				
Yes	36 (85.7)	61 (82.4)	0.211	0.646

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No	6 (14.3)	13 (17.6)		
<b>Monthly income</b>				
1 to 2 MW	22 (52.3)	14 (18.9)		
2.1 to 3 MW	7 (16.7)	10 (13.5)	16.320	<b>0.001*</b>
Above 3 MW	13 (31.0)	50 (67.6)		
<b>Marital status</b>				
With partner	25 (59.5)	49 (66.2)	0.520	0.471
Without partner	17 (40.5)	25 (33.8)		
<b>Health perception</b>				
Good	20 (47.6)	61 (82.4)	15.413	<b>0.001*</b>
Fair/Bad	22 (52.4)	13 (17.6)		
<b>Health perception compared to other older people</b>				
Worse/Equal	29 (69.0)	24 (32.4)	14.476	<b>0.001*</b>
Better	13 (31.0)	50 (67.6)		
<b>Physical exercise practice</b>				
Yes	9 (21.4)	47 (63.5)	19.004	<b>0.001*</b>
No	33 (78.6)	27 (36.5)		

\*Significant difference –  $p < 0.05$ : Chi-square test.

Source: the authors.

## DISCUSSION

The main results of this study indicate that older people who are not at risk of sarcopenia have no fear of falling. Those who are physically active are the youngest, with the highest levels of education and income, with the best self-perceived health, who perceive themselves to be in better health than older people of the same age. It was also found that those who live with a partner are the ones who have no fear of falling. Older people who do not practice physical exercises are the ones who have a higher risk of sarcopenia.

As can be seen, the older people who were not at risk of sarcopenia had no fear of falling. Kirk et al.<sup>14</sup> and Merchant et al.<sup>8</sup> found an increased risk of fear of falling in older people with sarcopenia. One possible hypothesis related to this association is due to lower physical performance and the changes resulting from sarcopenia in physical capacity.

Regarding the history of falls and its association with fear of falling, Canever, Danielewicz and Avelar<sup>15</sup> reported this association with a history of falls and probable sarcopenia, thus showing fear of falling when compared to those who did not report the same conditions. In turn, Gadelha<sup>16</sup> observed that the fear of falling was greater for volunteers classified at any stage of sarcopenia. In addition, Minoru et al.<sup>17</sup> report that the incidence of falls and fear of falling are more prevalent in sarcopenic older people than in non-sarcopenic older people.

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Table 5 shows that the physically active older people are also those with higher levels of education and income. The educational level has an impact on various aspects of the older person's life. Higher levels of education may be associated with higher incomes and, therefore, presents a positive factor for better living conditions during aging.<sup>18</sup> According to Modeneze et al.,<sup>19</sup> income is an important socioeconomic factor in the older person's life, where a good socioeconomic situation is related to a better quality of life and access to physical exercises.

As for their financial situation, some older people believe that good health depends on a good economic situation, determining better access to goods and services.<sup>20</sup> It is worth underlining that, in this study, 67.6% of the older people were economically stable.

Table 5 also shows that the physically active older people are the youngest, a fact that is justified by the understanding that advanced age interferes with muscle strength and mass, balance, agility and mobility in general, also reducing the level of physical activity over time.<sup>21</sup> In the study by Rocha et al.,<sup>20</sup> the physically active and younger older people had a perception related to healthy aging, with good mobility, and without loss of muscle strength.

It was found that younger older people are the ones who better perceive their health as good, and they perceive their health as better than older people of the same age, a fact that may be justified by the numerous changes and illnesses that generally affect older people, which can have an impact on a better individual assessment of their own lives.<sup>22</sup> Positive self-assessment is justified by better self-perception related to health, indicating good mental health, correlating with an adjusted life, which makes the older person more confident and secure.<sup>18</sup>

Table 5 also reveals that those who live with a partner are the ones who have no fear of falling. This may be due to the fact that these older people have better physical and psychological well-being, mainly due to the greater social support they receive in married life.<sup>23</sup> It could also be explained by the long and lasting marital relationships common among the older people. Daily help from spouses, specifically emotional support, may be associated with a lower prevalence of physical symptoms.<sup>24</sup>

It was noted that older people who do not practice physical exercises are the ones who have a higher risk of sarcopenia. It is known that physical inactivity is an aggravating factor in the loss of muscle mass and the quality of muscle function in the older people. However, when the older people are subjected to regular physical activity, they can acquire the reinnervation of some muscle fibers, preventing the occurrence of the diagnosis of sarcopenia.<sup>25</sup> According to Manso et al.,<sup>26</sup> the risk of sarcopenia in the older people is evident when they do not participate regularly in moderate to vigorous intensity physical activities, preserving skeletal muscle mass,

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strength and physical function.

Physical inactivity is one of the factors that most causes losses and worsens sarcopenia. Physical exercise is therefore seen as the greatest ally in the treatment and prevention of this muscular disease.<sup>27</sup> Fidelis et al.<sup>28</sup> reinforce that, in order to minimize the loss of muscle strength, it is necessary to practice physical exercise, which could result in improved independence of the older citizens, gains in flexibility and muscular strength, in addition to their social insertion.

Despite the important results found in this study, it has some limitations: 1) it is a cross-sectional and observational study, which prevents inferring cause and effect between the variables; 2) the researched sample was focused only in the South and Southeast of Brazil, mainly because the authors are from these regions of the country; 3) bias in advertising/recruitment on social media; 4) bias in online answers and profile of online respondents; 4) online research (access and understanding of those assessed); 5) cognitive ability cannot be assessed, due to the fact that data collection was carried out online during the Covid-19 pandemic.

### **CONCLUSION**

It is concluded that sociodemographic factors, such as age and income, and health factors, such as health perception, are associated with the risk of sarcopenia, fear of falling and level of physical activity among the older people.

As for practical implications, the need for health professionals who work with the older patients to know the sociodemographic profile of this clientele should be highlighted, in order to better understand their impact on health-related variables.

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