








## Evaluation of the clinical-functional vulnerability index in older adults

Arthur Alexandrino<sup>1</sup>   
Ellen Karolaine Lucena da Cruz<sup>1</sup>   
Pedro Yan Dantas de Medeiros<sup>1</sup>   
Caio Bismarck Silva de Oliveira<sup>1</sup>   
Djaine Silva de Araújo<sup>1</sup>   
Matheus Figueiredo Nogueira<sup>1</sup> 

### Abstract

**Objective:** To evaluate the clinical-functional vulnerability index (CFVI) of older adults and its relationship with socioeconomic, behavioral, clinical and therapeutic indicators. **Method:** A cross-sectional epidemiological study with a quantitative design was performed with 318 randomly drawn older adults registered with the Family Health Strategy. Data were collected through the CFVI-20 questionnaire and analysis was supported by descriptive, bivariate and multivariate statistics, with results with  $p$ -value  $<0.05$  considered significant. **Results:** most older adults (59.1%) were considered frail or potentially frail. Among the groups studied, there was a statistically significant difference in the CFVI for the variables age group ( $p<0.001$ ), functional literacy ( $p=0.001$ ), alcohol consumption ( $p<0.001$ ), physical exercise ( $p<0.001$ ), self-reported health problems ( $p<0.001$ ) and medication use ( $p<0.001$ ), as well as a positive correlation with stress ( $r=0.135$ ;  $p=0.016$ ). In the multiple linear regression model, the set of sociodemographic predictor variables explained the frailty of the elderly by 30.4% ( $R^2=0.304$ ). **Conclusions:** The advancement of age, as a non-controllable variable, indicates a need to encourage the maintenance of functionality in old age, based on the health care strategies that prolong longevity with safety, autonomy and vitality.

**Keywords:** Aging. Health of the Elderly. Frailty. Geriatric Assessment. Health Education. Health Vulnerability.

<sup>1</sup> Universidade Federal de Campina Grande; Unidade Acadêmica de Enfermagem. Cuité, PB, Brasil.

Funding: Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). Universidade Federal de Campina Grande - Bolsa de Iniciação Científica – Edital PROPEX N° 09/2018 PIBIC/CNPq-UFCG.

The authors declare there are no conflicts of interest in relation to the present study.

Correspondence  
Matheus Figueiredo Nogueira  
matheusnogueira.ufcg@gmail.com

Received: September 26, 2019  
Approved: March 05, 2020

## INTRODUCTION

Population aging is a contemporary reality that has occurred at different times and magnitudes in practically every country in the world<sup>1</sup>. The contingent of elderly people, evidenced on a global scale, especially in Brazil, has expanded considerably and rapidly, bringing important changes to how society is established<sup>2</sup>.

According to the Brazilian Institute of Geography and Statistics (or IBGE), older adults represent the portion of the population with the highest growth rate, especially in recent years<sup>3</sup>. In 2019, there were more than 32 million older adults in Brazil, and it is estimated that by the year 2025 the country will have the sixth largest contingent in the world<sup>4</sup>. This demographic scenario is mainly due to a more significant decline in mortality and fertility rates<sup>5</sup>.

Consequently, the increase in life expectancy has generated changes in the illness profile of older adults, with a predominance of chronic non-communicable diseases (CNCDS)<sup>6</sup>, in addition to an increase in degrees of dependence and disabilities. The changes that occur in the body, whether morphological, functional, biological or psychological, promote a decrease in functional capacity (FC), which in turn promotes greater vulnerability and a higher incidence of diseases, especially CNCDS<sup>7</sup>.

FC is defined as the ability of an individual to perform activities that allow them to exercise their autonomy and independence<sup>8</sup>. When an individual is in a frail state, the chance of being affected by comorbidities increases, thus augmenting the risks of falls, infections, hospitalization, institutionalization, disabilities and death, requiring, therefore, urgent health interventions<sup>9</sup>.

Thus, the clinical-functional vulnerability index (CFVI) is an essential tool for identifying the functional impairment of older adults and their needs. Assessment with the tool represents a systematic attempt to objectively verify the capacity of an individual to perform the activities necessary to care for oneself, based on the evaluation of different skills, and, therefore, allows the development of an interdisciplinary health care plan especially aimed at the optimization of the performance of older adults<sup>10</sup>.

The objective of the present study was to evaluate the clinical-functional vulnerability index in older adults, based on its relationship with socioeconomic, behavioral, clinical and therapeutic indicators.

## METHOD

The present study consists of a cross-sectional observational epidemiological investigation with a quantitative approach, carried out in the municipal region of Cuité (Paraíba, Brazil), located in the Western Curimataú microregion. Based on a total population of 3,041 elderly people in the municipal region, the sample calculation resulted in an equivalent number of 342 required participants, considering a 95% confidence level and a 5% sampling error. With the exception of sample losses and refusals, 318 elderly people monitored by Basic Health Units (BHUs) participated in the study and were selected through a systematic probabilistic sampling model. Two inclusion criteria were considered: age of 60 years old or older; and be properly registered with the Family Health Strategy (FHS).

Data collection took place between the months of December 2018 and February 2019, following approval by the Research Ethics Committee of the Hospital Universitário Alcides Carneiro (HUAC) (Opinion No. 3.021.189), complying with the ethical and scientific aspects proposed in Resolution 466/2012 of the National Health Council (or CNS) relating to research involving human beings<sup>11</sup>. To identify the older adults in the study, a survey of the addresses of the homes of the participants was carried out, with Community Health Agents helping to identify the locations. The interviewees were informed about the aspects covered in the research and their own contribution to the study. After any queries were resolved, an Informed Consent Form (ICF) was duly signed by the participants. The chief researcher, the participating researcher and seven students from the Center for Studies and Research in Aging and Quality of Life (or NEPEQ) took part in data collection.

Two instruments were used to obtain the information: I) a sociodemographic, behavioral and clinical-therapeutic questionnaire, which

included the variables: age, sex, skin color/race, marital status, education, family income, family arrangement, current occupation, body mass index, alcohol consumption, smoking, physical exercise, stress level, use of health services, use of medications and self-reported health problems; and II) Clinical-Functional Vulnerability Index 20 (CFVI-20), which includes multidimensional aspects about the condition of older adults, comprising 20 items distributed in eight sections (age, self-perceived health, functional disabilities, cognition, mood, mobility, communication and multiple comorbidities). Each section is assigned a specific score, totaling a maximum of 40 points<sup>12</sup>. The clinical-functional evaluation of older adults is determined as follows: a) 0 to 6: robust older adults; b) 7 to 14 points: older adults with risk of frailty; and c)  $\geq 15$  points: older adults in a frail condition, suffering functional decline and unable to manage their life<sup>13</sup>.

The data were entered and processed in the IBM SPSS (Statistical Package for the Social Sciences) software package version 20, to allow descriptive (univariate) and inferential analysis of the results that related the dependent and independent variables (outcome).

The Mann-Whitney and Kruskal-Wallis tests were applied when processing bivariate statistics in order to compare the difference between the groups with respect to the outcome (IVCF), while the Spearman Correlation Test was used for combinations of quantitative variables, with

significance represented by  $p$ -values of less than 0.05. Non-parametric tests were used as the set of quantitative data did not present normal distribution according to the Kolmogorov-Smirnov test. In the multiple linear regression model, the total CVFI score was considered as the outcome and the set of sociodemographic, behavioral and clinical-therapeutic variables were deemed the predictor variables, thus allowing the adjustment of the model based on the category of the variables previously identified as statistically significant and defining the coefficient of determination.

## RESULTS

For the overall assessment of CFVI, the measures categorized from the calculation of the total score of each participant were used. The results of the stratification of the CFVI-20 are shown in Table 1.

The highest percentage of elderly people in the study were robust (40.9%), however the sum of frail and potentially frail elderly people totaled 59.1%, representing the majority of the older population of Cuité.

In order to substantiate the results found in CFVI categorization, the descriptive analysis of the total score was also considered, as can be seen in Table 2, in which a mean score of 9.90 and a median score of 8 indicate potentially frail older adults (score from 7 to 14 points).

**Table 1.** Total categorized Clinical-Functional Vulnerability Index (CFVI) score in older adults treated by the Family Health Strategy. Cuité, Paraíba (n=318).

Variable	Categories	Older Adults Assessed n (%)
CFVI	Robust older adults	130 (40.9)
	Potentially frail older adults	115 (36.1)
	Frail older adults	73 (23.0)
	Total	318 (100.0)

Source: Study data, 2019.

**Table 2.** Descriptive data of the total Clinical-Functional Vulnerability Index (CFVI) score in older adults treated by the Family Health Strategy. Cuité, Paraíba (n=318).

Variable	n	Minimum/Maximum	Mean	Median	Standard-deviation
Total CFVI Score	318	0/38	9.90	8	±8.293

Source: Study data, 2019.

To identify the relationship between the CFVI and the socioeconomic, behavioral, clinical and therapeutic characteristics of the older adults in the study, 15 hypotheses were tested that allowed inferences between the different groups studied to be identified and elucidated the set of explanatory variables for the variation in the CFVI among the older adults. The results are shown in Table 3.

When comparing the difference between the groups in terms of CFVI, statistical significance was observed for the variables age group ( $p < 0.001$ ), functional literacy ( $p = 0.001$ ), alcohol consumption ( $p < 0.001$ ), physical exercise ( $p < 0.001$ ), self-reported health problems ( $p < 0.001$ ) and medication use ( $p < 0.001$ ).

For the quantitative independent variables, tests of correlation with the CFVI were performed. The results are shown in Table 4.

There was a significant linear relationship between the CFVI and the variables years of schooling ( $\rho = -0.151$ ;  $p$ -value = 0.007) and self-reported stress ( $\rho = 0.135$ ;  $p$ -value = 0.016). Between the variable years of schooling and the CFVI, a negative (inverse) correlation was identified, in which elderly people with lower education had higher CFVI scores; for the self-reported stress variable and the CFVI the correlation was positive, suggesting a higher prevalence of stress among those with greater frailty.

In the multiple linear regression model, considering the total CFVI score as the outcome variable and the set of sociodemographic, behavioral and clinical-therapeutic variables as the predictor variables, the model was adjusted by category of variables, only included those whose significance statistic was previously identified. The result is shown in Table 5.

**Table 3.** Comparison of total CFVI score mean ranks according to the socioeconomic, behavioral, clinical and therapeutic variables of the older adults followed by the Family Health Strategy. Cuité, Paraíba (n=318).

Variables	CFVI		Sig. $p$ -value
	n (%)	Mean rank	
Sex**			
Men	137 (43.1)	150.75	$p = 0.139$
Women	181 (56.9)	166.12	
Age range ***			
60 to 74	192 (60.4)	124.12	$p < 0.001^*$
75 to 89	107 (33.6)	201.81	
Above 90	19 (6.0)	278.76	
Skin Color/Race ***			
White	114 (35.8)	171.07	$p = 0.067$
Brown/Mixed Race	167 (52.5)	146.22	
Yellow/Asian Brazilian	04 (1.3)	180.50	
Black/Afro-Brazilian	32 (10.1)	180.03	
Don't know/Did not respond	01 (0.3)	---	

to be continued

Continuation of Table 3

Variables	CFVI		Sig. <i>p</i> -value
	n (%)	Mean rank	
<b>Marital status***</b>			
Un married	35 (11.0)	177.10	<i>p</i> =0.061
Married	178 (56.0)	151.30	
Divorced	12 (3.8)	112.50	
Separated	04 (1.3)	143.38	
Widower	83 (26.1)	179.46	
Civil union	06 (1.9)	128.83	
<b>Family arrangement ***</b>			
Lives alone	30 (9.4)	122.33	<i>p</i> =0.079
Lives with spouse only	75 (23.6)	156.25	
Lives with spouse and children	52 (16.4)	151.86	
Lives with spouse, children, son-in-law or daughter-in-law	12 (3.8)	192.21	
Lives with children only	30 (9.4)	192.23	
Trigenerational arrangements	38 (11.9)	156.00	
Intragenerational arrangements	07 (2.2)	208.29	
Lives with grandchildren only	04 (1.3)	156.75	
Lives with non-family members	03 (0.9)	246.83	
Other arrangements	67 (21.1)	158.34	
<b>Functional literacy **</b>			
Yes	97 (30.5)	133.62	<i>p</i> =0.001*
No	221 (69.5)	170.86	
<b>Body mass index***</b>			
Underweight	65 (20.4)	169.01	<i>p</i> =0.403
Normal weight	143 (45.0)	161.97	
Overweight	110 (34.6)	150.67	
<b>Smoking **</b>			
Yes	50 (15.7)	157.43	<i>p</i> =0.862
No	268 (84.3)	159.89	
<b>Alcohol consumption**</b>			
Yes	38 (11.9)	95.12	<i>p</i> <0.001*
No	280 (88.1)	168.24	
<b>Physical exercise **</b>			
Yes	143 (45.0)	129.68	<i>p</i> <0.001*
No	175 (55.0)	183.87	
<b>Self-reported health problems **</b>			
Yes	254 (79.9)	172.37	<i>p</i> <0.001*
No	63 (19.8)	105.11	
Don't know / Did not respond	01 (0.3)	---	
<b>Use of medicines **</b>			
Yes	221 (69.5)	182.39	<i>p</i> <0.001*
No	96 (30.2)	105.15	
Don't know / Did not respond	01 (0.3)	---	

\*Statistical significance (*p*-value <0.05); \*\*Mann-Whitney Test; \*\*\*Kruskal-Wallis Test.

Source: Study data, 2019.

**Table 4.** Comparison of the total CFVI score mean ranks according to the variables *family income*, *years of schooling* and *self-reported stress* of older adults treated by the Family Health Strategy. Cuité, Paraíba (n=318).

Correlation	CFVI – Total score**
Family income	$\rho = -0.010$ $p\text{-value} = 0.866$
Years of schooling	$\rho = -0.151$ $p\text{-value} = 0.007^*$
Self-reported stress	$\rho = 0.135$ $p\text{-value} = 0.016^*$

$\rho$ : Correlation coefficient; \*\* Spearman's Correlation Test; \*Statistical significance:  $p\text{-value} < 0.05$ .

Source: Study data, 2019.

**Table 5.** Multiple linear regression model of CFVI and sociodemographic, behavioral and clinical-therapeutic variables. Cuité (Paraíba), 2019.

Variables	CFVI – Total score Sig. $p\text{-value}$	CFVI – Total score $R^2$
Sociodemographic		
Age range	$p < 0.001^*$	$R^2 = 0.304$
Functional literacy	$p = 0.001^*$	
Behavioral		
Alcohol consumption	$p < 0.001^*$	$R^2 = 0.114$
Physical exercise	$p < 0.001^*$	
Stress	$p < 0.001^*$	
Clinical-therapeutic		
Self-reported health-problems	$p < 0.001^*$	$R^2 = 0.004$
Use of medication	$p < 0.001^*$	

\* Statistical significance:  $p\text{-value} < 0.05$ ;  $R^2$  - Coefficient of Determination or Explanation.

Source: Study data, 2019.

The set of sociodemographic predictor variables has the highest Coefficient of Determination, with  $R^2 = 0.304$  or 30.4%. This confirms that the sociodemographic conditions represented by the variables *age group* and *functional literacy*, explain the frailty of the older adults, according to the CFVI, by 30.4%. It is worth mentioning that, taken alone, age group is the main variable responsible for explaining the variation in CFVI (29.1%).

## DISCUSSION

The impairment of FC and/or its effective risk clearly elucidated in the findings (59.1% of frail and potentially frail elderly) serves as a warning regarding the need for public policies aimed at the health of older adults, as well as for researchers, managers,

health professionals, family members and society in general, so that health promotion and disease prevention measures are adopted to improve the autonomy and independence of this group.

The robust elderly are those who manage to exercise their autonomy and independence without exhibiting a decline in FC; potentially frail elderly person have suffered a reduction in FC, while they can exercise autonomy and independence, there are chances of a risk of functional dependence; and frail older adults exhibit some decline in FC, and are unable to manage their life independently and autonomously<sup>14</sup>.

Another study found that older adults were frail or potentially frail, when compared to robust elderly<sup>15</sup>. In a study conducted in the municipal region of



Pombal (Paraíba), there was a predominance of potentially frail elderly<sup>9</sup>. Frailty increases the chances of older adults being affected by an adverse health event, meaning that greater care should be aimed at the risk of functional decline<sup>16</sup>. This decline, when viewed as a health problem for older adults, requires progressively strengthened coping strategies as the individual ages<sup>17</sup>.

In order to alleviate the effects caused by aging and to stimulate actions that promote the quality of life (QoL) of this population, the National Health Policy for Older Adults (or PNSPI) addresses the need to recover, maintain and promote the autonomy and independence of this portion of the population, through collective or individual measures, based on the principles and guidelines of the National Health System (or SUS)<sup>18</sup>.

When the data was analyzed in relation to age, it is observed that most of the participants (60.4%) were part of the young group of elderly people (60 to 74 years old), who are characterized as potentially active and have a participatory role in society. When comparing age group and CFVI, the highest mean rank was identified among older adults aged over 90 (278.76) with a statistically significant difference between the groups ( $p < 0.001$ ). Clinical-functional vulnerability and age group have a directly proportional dependency relationship.

In a study conducted in Fortaleza (Ceará), it was found that age is a predictive factor for the functional disability of older adults<sup>19</sup>. As age increases, basic and instrumental activities are affected. The greater the age, the greater the changes in the natural aging process, as well as the greater the limitations related to functional capacity. Elderly people aged 80 years and over also exhibited greater chances of having some functional impairment<sup>20</sup>.

In terms of the variable functional literacy, it was found that 69.5% of the interviewees were classified as functional illiterates, with a mean of 2.79 years of schooling. This fact negatively affects old age, especially in the capacity for social insertion and access to means of care. Corroborating this finding, another study found that 76.48% of older adults had an educational level of up to four years of schooling, considered very low<sup>21</sup>. This social determinant

potentiates the vulnerability of the individual when affected by certain diseases, as the lower the level of education, the greater the prevalence of functional disability, mainly due to the involvement of CNCDS<sup>22</sup>.

Still regarding functional literacy, when comparing the different groups, based on statistical significance ( $p = 0.001$ ), the highest CFVI mean rank was among illiterate elderly (170.86), suggesting education is an important determinant for the maintenance of vitality and successful aging. Functionally illiterate elderly people exhibit greater clinical-functional vulnerability. Similar data were found in a study in which participants with low schooling had a greater decline in FC<sup>23</sup>.

In order to improve the understanding and QoL of elderly people with low education levels, health professionals should assess the understanding and interpretation of health education actions, especially due to the difficulty of understanding some instructions<sup>23</sup>. In addition, this determinant impairs the adherence of healthy habits on the part of these elderly people and, therefore, promotes an increase in the use of health services due to the serious impairment of chronic disabling conditions that could have been prevented over time<sup>24</sup>.

Regarding the consumption of alcoholic beverages, 88.1% of older adults did not drink alcohol. A study carried out in the state of Michigan (USA) found that alcohol consumption was associated with a lower risk of worsening frailty<sup>25</sup>.

The highest mean rank was observed among individuals who did not consume alcohol (168.24), suggesting that older adults who did not consume alcohol had a higher CFVI score, that is, they are more frail. Although there is no causal relationship, older adults who consume alcoholic beverages showed greater vitality, which is justified by the fact that this portion is composed of active, autonomous, independent people with good functionality. While the consumption of alcoholic beverages is considered something harmful to health, depending on the amount consumed and the situation, this habit can be related to the greater participation of older adults in social activities, indicating the maintenance of functionality<sup>26</sup>.

Regarding the practice of physical exercise, the majority of older adults (55.0%) did not perform any type of activity. However, the percentage of elderly people who did practice physical activity is relevant (45.0%). It is worth mentioning that the performance of physical exercise frequently has numerous health benefits, both physical and psychosocial, and constitutes an effective way of preventing the occurrence of future diseases<sup>27</sup>.

In the comparison between the groups, the highest CFVI mean rank was among sedentary individuals (183.87), suggesting that the practice of physical exercises is directly related to the maintenance of the FC among older adults, ratified by statistical significance ( $p < 0.001$ ). Sedentary elderly people have a higher prevalence of the decline of CF. Greater physical inactivity and the prevalence of CNCDs create a vicious circle between disease and disability<sup>28</sup>.

The decline in FC among older adults results in a reduction in resistance and a worsening of motor performance. Therefore, it is important to adopt measures to implement preventive actions such as physical exercise, since this intervention can improve, stabilize or even reverse this phenomenon, reducing the risk of falls and, consequently, improving the mobility and muscle strength of older adults<sup>29</sup>.

The variable self-reported health problems showed that a significant majority of older adults (79.9%) reported suffering a health problem. In the comparison between the groups, the highest CFVI mean rank was found among older adults who self-reported having health problems (172.37), indicating that FC was more affected than in the opposite group. The statistical significance of this finding reveals that health problems are considered a determinant of FC in older adults.

Regarding the variable medication use, it was observed that 69.5% of the older adults reported using medications. The impact of chronic diseases on older adults transforms this public into large-scale consumers of health services, as well as increasing their use of medications. This population, in turn, is the most medicalized part of society and the group with the greatest signs of the incidence and prevalence of comorbidities<sup>30</sup>. When comparing the difference in CFVI between the groups, a higher

mean rank was found among those who reported using medication (182.39), confirming that this group has a more frail FC.

Reinforcing these results, a study carried out in Erval Seco (Rio Grande do Sul) found that a large proportion of older adults interviewed reported making continuous use of medications, since they were frail or potentially frail<sup>31</sup>. In order to facilitate the maintenance of drug therapy and prevent damage or complications to older adults from the use of these drugs, health professionals can offer educational resources, guiding older adults in the best possible way, so that they can at least understand the dosage and the frequency to be followed<sup>8</sup>.

The occurrence of stress is related to the incidence of cognitive deficits, which can be expressed in a very harmful manner among older adults<sup>32</sup>. It is common that the decline in FC causes stress in an individual, since the older person has a change in identity, as well as in their body image. Thus, it can be said that FC directly influences the mental health of older adults, as it is linked to the performance of the activities of daily living (ADL) of the individual<sup>33</sup>.

In multivariate analysis, advancing age is shown to be an important risk factor for the decline of FC in older adults. This risk is explained by the decline in the functionality of the physiological systems that determine an individual's FC, which in turn will decline as age advances. From this perspective, it can be said that this relationship between advancing age and the decline of FC is simply a phenomenon common to older adults, thus requiring the development of strategies such as the follow-up care and monitoring of this population, aiming at lessening or avoiding these limitations<sup>34</sup>.

The World Health Organization (WHO) has warned that healthy aging should be considered a global priority, thus promoting the development of strategies to deal with the health problems of this population and the impact of CNCDs on the QoL of older adults<sup>35</sup>. As age is a variable that cannot be controlled, it is necessary to train health teams to care for this population, thus guaranteeing the maintenance of the functionality of older adults, in order to safely prolong longevity, autonomy and vitality.



As a technical limitation of the present study, the difficulty in locating the older adults selected through the sampling procedure should be mentioned, especially in rural areas. However, with the effective collaboration of community health agents in the municipal region, this difficulty was gradually overcome.

## CONCLUSION

Regarding the Clinical-Functional Vulnerability Index, the findings reveal a significant set of frail or potentially frail elderly people who deserve prioritized and qualified care in all social and health dimensions, in order to enhance their functional capacity.

Among the set of variables studied, it was statistically found that advanced age, physical

inactivity, functional illiteracy, high stress, the presence of health problems and the use of medications are factors associated with clinical-functional vulnerability in older adults. In the multivariate model, the sociodemographic conditions represented by age group and functional literacy explain the frailty of the older adults, as identified by the Clinical-Functional Vulnerability Index, by 30.4%.

It is suggested that other studies should be devised and executed to assess the functional capacity of older adults, in order to improve the robustness of scientific knowledge in this area and encourage the adoption of measures to promote health and prevent diseases to enhance the autonomy and independence of older adults, thus ensuring a better quality of life.

Edited by: Ana Carolina Lima Cavaletti

## REFERENCES

1. Moura MMD, Veras RP. Acompanhamento do envelhecimento humano em centro de convivência. *Physis* [Internet]. 2017 [acesso em 26 jun. 2019];27(1):19-39. Disponível em: <https://www.scielo.org/pdf/physis/2017.v27n1/19-39/pt>
2. Freire RMH, Carneiro Junior N. Scientific production on housing for autonomous elderly persons: an integrative literature review. *Rev Bras Geriatr Gerontol* [Internet]. 2017 [acesso em 26 jun. 2019];20(5):713-21. Disponível em: <http://www.scielo.br/pdf/rbagg/v20n5/1809-9823-rbagg-20-05-00713.pdf>
3. Brasil. Instituto Brasileiro de Geografia e Estatística. Brasil: uma visão geográfica e ambiental no início do século XXI [Internet]. Rio de Janeiro: IBGE; 2016 [acesso em 26 jun. 2019]. Disponível em: <https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=297884>
4. Brasil. Instituto Brasileiro de Geografia e Estatística. IBGE divulga as estimativas da população dos municípios para 2019 [Internet]. Rio de Janeiro: IBGE; 2019 [acesso em 27 jul. 2019]. Disponível em: <https://agenciadenoticias.ibge.gov.br/agencia-sala-de-imprensa/2013-agencia-de-noticias/releases/25278-ibge-divulga-as-estimativas-da-populacao-dos-municipios-para-2019>
5. Miranda GMD, Mendes ACG, Silva ALA. Population aging in Brazil: current and future social challenges and consequences. *Rev Bras Geriatr Gerontol* [Internet]. 2016 [acesso em 27 jun. 2019];19(3):507-19. Disponível em: <https://www.redalyc.org/pdf/4038/403846785012.pdf>
6. Silveira EA, Vieira LL, Souza JD. Elevada prevalência de obesidade abdominal em idosos e associação com diabetes, hipertensão e doenças respiratórias. *Ciênc Saúde Colet* [Internet]. 2018 [acesso em 27 jun. 2019];23(3):903-12. Disponível em: <http://www.scielo.br/pdf/csc/v23n3/1413-8123-csc-23-03-0903.pdf>
7. Vieira CPB, Nascimento JJ, Barros SS, Luz MHBA, Valle ARMC. Prevalência referida, fatores de risco e controle da hipertensão arterial em idosos. *Ciênc Cuid Saúde* [Internet]. 2016 [acesso em 28 jun. 2019];15(3):413-20. Disponível em: <http://www.periodicos.uem.br/ojs/index.php/CiencCuidSaude/article/view/28792/18281>
8. Pinto AH, Lange C, Pastore CA, Llano PMP, Castro DP, Santos F. Capacidade funcional para atividades da vida diária de idosos da Estratégia de Saúde da Família da zona rural. *Ciênc Saúde Colet* [Internet]. 2016 [acesso em 28 jun. 2019];21(11):3545-55. Disponível em: <http://www.scielo.br/pdf/csc/v21n11/1413-8123-csc-21-11-3545.pdf>

9. Freitas FFQ, Rocha AB, Moura ACM, Soares SM. Fragilidade em idosos na Atenção Primária à Saúde: uma abordagem a partir do geoprocessamento. *Ciênc Saúde Colet* [Internet]. 2019 [acesso em 29 jun. 2019]. Disponível em: <http://www.cienciaesaudecoletiva.com.br/artigos/fragilidade-em-idosos-na-atencao-primaria-a-saude-uma-abordagem-a-partir-do-geoproc-essamento/17107?id=17107&id=17107>
10. Moraes EN, Carmo JA, Moraes FL, Azevedo RS, Machado CJ, Montilla DER. Clinical-Functional Vulnerability Index-20 (IVCF-20): rapid recognition of frail older adults. *Rev Saúde Pública* [Internet]. 2016 [acesso em 30 jun. 2019];50(81):1-10. Disponível em: [http://www.fsp.usp.br/rsp/wp-content/uploads/articles\\_xml/0034-8910-rsp-S1518-87872016050006963/0034-8910-rsp-S1518-87872016050006963-pt.pdf](http://www.fsp.usp.br/rsp/wp-content/uploads/articles_xml/0034-8910-rsp-S1518-87872016050006963/0034-8910-rsp-S1518-87872016050006963-pt.pdf)
11. Brasil. Resolução nº466 de dezembro de 2012. Aprova diretrizes e normas regulamentadoras de pesquisa envolvendo seres humanos [Internet]. *Saúde Legis*. 2012. Disponível em: [http://bvsms.saude.gov.br/bvs/saudelegis/cns/2013/res0466\\_12\\_12\\_2012.html](http://bvsms.saude.gov.br/bvs/saudelegis/cns/2013/res0466_12_12_2012.html)
12. Carmo JA. Proposta de um índice de vulnerabilidade clínico-funcional para a atenção básica: um estudo comparativo com a avaliação multidimensional do idoso [dissertação]. Belo Horizonte: Universidade Federal de Minas Gerais; 2014.
13. Moraes EM, Moraes FL. Avaliação Multidimensional do Idoso. 4ª ed. Belo Horizonte: Folium; 2014.
14. Freitas FFQ. Fatores associados à fragilidade em idosos no contexto da atenção primária [tese]. Belo Horizonte: Universidade Federal de Minas Gerais; 2018.
15. Pagno AR, Gross CB, Gewehr DM, Colet CF, Berlezi EM. Drug therapy, potential interactions and iatrogenesis as factors related to frailty in the elderly. *Rev Bras Geriatr Gerontol* [Internet]. 2018 [acesso em 03 jul. 2019];21(5):588-96. Disponível em: <http://www.scielo.br/pdf/rbagg/v21n5/1809-9823-rbagg-21-05-00588.pdf>
16. Rodrigues RAP, Fhon JRS, Pontes MLF, Silva AO, Haas VJ, Santos JLF. Frailty syndrome among elderly and associated factors: comparison of two cities. *Rev Latinoam Enferm* [Internet]. 2018 [acesso em 04 jul. 2019];26:e3100 [2 p.]. Disponível em: <http://www.scielo.br/pdf/rlae/v26/0104-1169-rlae-26-e3100.pdf>
17. Matos FS, Jesus CS, Carneiro JAO, Coqueiro RS, Fernandes MH, Brito TA. Redução da capacidade funcional de idosos residentes em comunidade: estudo longitudinal. *Ciênc Saúde Colet* [Internet]. 2018 [acesso em 05 jul. 2019];23(10):3393-3401. Disponível em: <http://www.scielo.br/pdf/csc/v23n10/1413-8123-csc-23-10-3393.pdf>
18. Brasil. Portaria n. 2.528 de 19 de outubro de 2006. Aprova a Política Nacional de Saúde da Pessoa Idosa [Internet]. *Saúde Legis*. 2006. Disponível em: [http://bvsms.saude.gov.br/bvs/saudelegis/gm/2006/prt2528\\_19\\_10\\_2006.html](http://bvsms.saude.gov.br/bvs/saudelegis/gm/2006/prt2528_19_10_2006.html)
19. Nogueira PSF, Marques MB, Coutinho JFV, Maia JC, Silva MJ, Moura ERF. Factors associated with the functional capacity of older adults with leprosy. *Rev Bras Enferm* [Internet]. 2017 [acesso em 27 jul. 2019];70(4):711-18. Disponível em: <http://www.scielo.br/pdf/reben/v70n4/0034-7167-reben-70-04-0711.pdf>
20. Sousa FJD, Gonçalves LHT, Gamba MA. Capacidade funcional de idosos atendidos pelo programa saúde da família em Benevides, Brasil. *Rev Cuid* [Internet]. 2018 [acesso em 25 jul. 2019];9(2):2135-44. Disponível em: <http://www.scielo.org.co/pdf/cuid/v9n2/2346-3414-cuid-9-2-2135.pdf>
21. Aquino GA, Cruz DT, Silvério MS, Vieira MT, Bastos RR, Leite ICG. Factors associated with adherence to pharmacological treatment among elderly persons using antihypertensive drugs. *Rev Bras Geriatr Gerontol* [Internet]. 2017 [acesso em 07 ago. 2019];20(1):111-22. Disponível em: <http://www.scielo.br/pdf/rbagg/v20n1/1809-9823-rbagg-20-01-00111.pdf>
22. Francisco PMSB, Marques PP, Borim FSA, Torres SF, Neri AL. Disability relating to instrumental activities of daily living in the elderly with rheumatic diseases. *Rev Bras Geriatr Gerontol* [Internet]. 2018 [acesso em 08 ago. 2019];21(5):570-78. Disponível em: <http://www.scielo.br/pdf/rbagg/v21n5/1809-9823-rbagg-21-05-00570.pdf>
23. Melo BRS, Diniz MAA, Casemiro FG, Figueiredo LC, Santos-Orlandi AA, Haas VJ, et al. Cognitive and functional assessment about elderly people users of health public service. *Esc Anna Nery* [Internet]. 2017 [acesso em 10 ago. 2019];21(4):e20160388 [8 p.]. Disponível em: <http://www.scielo.br/pdf/ean/v21n4/1414-8145-ean-2177-9465-EAN-2016-0388.pdf>
24. Barbosa KTF, Costa KNFM, Pontes MLF, Batista PSS, Oliveira FMRL, Fernandes MGM. Aging and individual vulnerability: a panorama of older adults attended by the family health strategy. *Texto & Contexto Enferm* [Internet]. 2017 [acesso em 14 ago. 2019];26(2):e2700015 [10 p.]. Disponível em: <http://www.scielo.br/pdf/tce/v26n2/0104-0707-tce-26-02-e2700015.pdf>
25. Chamberlain AM, St. Sauver JL, Jacobson DJ, Manemann SM, Fan C, Roger VL, et al. Social and behavioural factors associated with frailty trajectories in a population-based cohort of older adults. *BMJ Open* [Internet]. 2016 [acesso em 15 ago. 2019];6:e011410 [10 p.]. Disponível em: <https://bmjopen.bmj.com/content/bmjopen/6/5/e011410.full.pdf>

26. Virtuoso Junior JS, Martins CA, Roza LB, Paulo TRS, Ribeiro MCL, Tribess S. Prevalence of disability and associated factors in the elderly. *Texto & Contexto Enferm* [Internet]. 2015 [acesso em 17 ago. 2019];24(2):521-9. Disponível em: <http://www.scielo.br/pdf/tce/v24n2/0104-0707-tce-24-02-00521.pdf>
27. Silva PVC, Costa Junior AL. Efeitos da atividade física para a saúde de crianças e adolescentes. *Psicol Argum* [Internet]. 2017 [acesso em 19 ago. 2019];29(64):41-50. Disponível em: <https://periodicos.pucpr.br/index.php/psicologiaargumento/article/view/19915/19213>
28. Ribeiro AQ, Salgado SML, Gomes IS, Fogal AS, Martinho KO, Almeida LFF, et al. Prevalência e fatores associados à inatividade física em idosos: um estudo de base populacional. *Rev Bras Geriatr Gerontol* [Internet]. 2016 [acesso em 22 ago. 2019];19(3):483-93. Disponível em: [http://www.scielo.br/pdf/rbgg/v19n3/pt\\_1809-9823-rbgg-19-03-00483.pdf](http://www.scielo.br/pdf/rbgg/v19n3/pt_1809-9823-rbgg-19-03-00483.pdf)
29. Fhon JRS, Rodrigues RAP, Santos JLF, Diniz MA, Santos EB, Almeida VC, et al. Factors associated with frailty in older adults: a longitudinal study. *Rev Saúde Pública* [Internet]. 2018 [acesso em 24 ago. 2019];52:1-8. Disponível em: <http://www.scielo.br/pdf/rsp/v52/0034-8910-rsp-S1518-52-87872018052000497.pdf>
30. Bezerra TA, Brito MAA, Costa KNFM. Caracterização do uso de medicamentos entre idosos atendidos em uma unidade básica de saúde da família. *Cogitare Enferm* [Internet]. 2016 [acesso em 27 ago. 2019];21(1):1-11. Disponível em: <https://revistas.ufpr.br/cogitare/article/view/43011/27630>
31. Liberalesso TEM, Dallazen F, Bandeira VAC, Berlezi EM. Prevalência de fragilidade em uma população de longevos na região Sul do Brasil. *Saúde Debate* [Internet]. 2017 [acesso em 29 ago. 2019];41(113):553-62. Disponível em: <https://www.scielo.org/pdf/sdeb/2017.v41n113/553-562/pt>
32. Freitas V, Melo CC, Leopoldino A, Boletini T, Noce F. Influência do nível de atividade física e da mobilidade sobre o estresse emocional em idosos comunitários. *Rev Psicol Deporte* [Internet]. 2017 [acesso em 30 set. 2019];27:75-81. Disponível em: [https://ddd.uab.cat/pub/revpsidep/revpsidep\\_a2018v27n4/revpsidep\\_a2018v27n4p75.pdf](https://ddd.uab.cat/pub/revpsidep/revpsidep_a2018v27n4/revpsidep_a2018v27n4p75.pdf)
33. Possatto JM, Rabelo DF. Condições de saúde psicológica, capacidade funcional e suporte social de idosos. *Rev Kairós* [Internet]. 2017 [acesso em 30 ago. 2019];20(2):45-58. Disponível em: <https://revistas.pucsp.br/kairos/article/view/2176-901X.2017v20i2p45-58/23394>
34. Tavares DMS, Pelizaro PB, Pegorari MS, Paiva MM, Marchiori GF. Functional disability and associated factors in urban elderly: a population-based study. *Rev Bras Cineantropom Desempenho Hum* [Internet]. 2016 [acesso em 01 set. 2019];18(5):499-508. Disponível em: <http://www.scielo.br/pdf/rbcdh/v18n5/1415-8426-rbcdh-18-5-0499.pdf>
35. Veiga B, Pereira RAB, Pereira AMVB, Nickel R. Evaluation of functionality and disability of older elderly outpatients using the WHODAS 2.0. *Rev Bras Geriatr Gerontol* [Internet]. 2016 [acesso em 06 set. 2019];19(6):1015-21. Disponível em: <http://www.scielo.br/pdf/rbgg/v19n6/1809-9823-rbgg-19-06-01015.pdf>