Follow-up evaluation of the Fibra Study: sociodemographic, cognitive, and frailty characterization of older adults in Campinas and Ermelino Matarazzo, SP

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Abstract

Objective: To investigate and compare the sociodemographic, cognitive and frailty profile of participants from the Frailty in Brazilian Older Adults (Fibra) study regarding follow-up (FW) and baseline (BL) measurements carried out in 2016-2017 and 2008-2009, respectively. *Methods:* A total of 1,284 older adults living in Campinas and Ermelino Matarazzo (SP), Brazil, participated in the BL, comprising a pooled sample. At FW, 549 older adults (42.7%) were interviewed again; 192 had died (14.9%) and 543 were lost to follow-up (42.4%). Sex, age, education, marital status, family income, housing arrangement, cognitive status (Mini-Mental State Examination) and frailty phenotype (score ≥3 out of 5) were evaluated at both timepoints. Intergroup and intragroup differences were verified by Pearson's chi-square and McNemar's tests. Statistical significant level was set at $p<0.05$. *Results:* The survivors were younger (72.2±5.3 years) than the deceased (75.5±6.8 years) and individuals included in the FW were mostly married, higher educated, cognitively unimpaired and pre-frail. Between BL and FW there was an increase in the number of participants who lived alone (17.1% vs. 22.0%), had no partner (46.4% vs. 55.4%), a family income <3 minimum wages (52.2% vs. 62.2%), cognitive impairment (17.7% vs. 23.5%) and frailty (9.8% vs. 24.5%). *Conclusion:* Between BL and FW there was an increase in the physical, cognitive and social vulnerability of the older adults. These results reinforce the importance of public policies that favor the quality of life of older people and a reduction in health inequities throughout life.

Keywords: Aged. Aged, 80 and Over. Frailty. Mental Status and Dementia Tests. Phenotype. Longitudinal Studies.

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INTRODUCTION

Frailty is a complex clinical condition associated with aging that is characterized by a decline in functional reserve of different bodily systems and by greater individual susceptibility to negative outcomes in response to internal, environmental, and life-style event stressors[1]. A body of evidence gathered over the last few decades supports the association between frailty and increased risk of physical limitations, disabilities, falls, hospitalization, institutionalization, and death in older people[2,3]. The prevalence of frailty increases with advancing age[4,5] and is influenced by sex[5], assessment methods[5,6] and participant origin[6]. Meta-analysis studies estimate that the prevalence of frailty among non-institutionalized older adults is higher in low-to-middle income countries than in high-income nations[5,6].

In Brazil, the prevalence of frailty in older adults is estimated at 24%[6] and varies according to the assessment methodology used and recruitment site of participants[4,6]. Additionally, an estimated 53% of Brazilian adults are pre-frail[6], a statistic which reinforces the importance of preventive strategies, given there is a greater chance of pre-frailty being reversed compared to frailty[7]. According to data from The Brazilian Longitudinal Study of Aging (ELSI-Brasil), frailty is associated with advanced age, low education, single status, poor/very poor self-rated health, multimorbidity and limitations for performing activities of daily living[4]. Publications derived from the first wave of the Frailty in Brazilian Older Adults Study (Fibra Study; 2008-2009) showed that frailty was associated with multimorbidity, polypharmacy, cognitive impairment suggestive of dementia, depressive symptoms, dependence for activities of daily living, falls, hospitalization and mortality[8-10].

Akin to frailty, a decline and deficit in cognitive functions are conditions which directly impact the health of older people, increase the risk of disabilities and dependence, impair quality of life and contribute to other adverse outcomes[11]. Cognitive decline is a gradual ongoing and highly variable process, characterized by normal and abnormal changes in information processing speed, thinking, memory, reasoning and planning. Differences in the timing of onset, speed of progression and trajectories of age-related cognitive decline can be explained by the interaction of individual, environmental and lifestyle factors[12,13].

The marked disparities between Brazil and high-income countries[1,13-15] in terms of the social determinants of health that can influence the establishment and progression of cognitive decline and frailty, underscores the importance of conducting longitudinal studies to better understand the factors which worsen these conditions in older adults. Longitudinal studies can yield valuable information for the development of public policies aimed at identifying older adults at risk of developing frailty, and to help manage their symptoms in primary healthcare services for adults and older adults.

Therefore, the objective of the present study was to investigate the sociodemographic, cognitive and frailty profile of the participants of the Fibra Study from Campinas city, São Paulo state and from Ermelino Matarazzo, a subdistrict of São Paulo city, based on follow-up measurements made in 2016-2017 compared with baseline values collected in 2008-2009.

METHOD

The Fibra Study is a multi-center, multi-discipline, population-based study carried out in 17 Brazilian cities located in five major geographical regions of the country chosen by convenience. In 2008 and 2009, four large Brazilian public universities oversaw the process of recruitment and data collection for the study which had both a protocol common to the sites and protocols specific to each. The objective was to investigate associations between frailty and demographic, socioeconomic, health and psychosocial variables in Brazilian older adults aged ≥65 years. The city of Campinas and Ermelino Matarazzo (subdistrict of São Paulo city), both in São Paulo state, Brazil, were part of the group of sites belonging to the center coordinated by the State University of Campinas (Unicamp, São Paulo state).

At the Unicamp center, a total of 1,284 community-dwelling older adults (≥65 years) took part in the first wave of measurements of the Fibra Study. The

participants resided in family households located in randomly selected census sectors in Campinas and the Ermelino Matarazzo subdistrict. Households and points of flow of older adults from randomly selected areas of Campinas (90 census sectors) and Ermelino Matarazzo (62 census sectors) were visited by pairs of trained recruiters (Graduate students and Community Health Workers). The older adults identified who met the eligibility criteria were invited by the recruiters to attend a session entailing an interview and health measurements, lasting 60-90 mins, held at community centers, schools, clubs and churches on pre-defined dates and times. Additional quotas of 25% of the estimated samples for the two sites were invited as a strategy to cover any losses.

Eligibility criteria were being aged ≥65 years and having permanent residence in the city and household. Individuals presenting with memory problems suggesting dementia, severe complications of stroke, severe or unstable Parkinson´s disease, or visual/hearing deficits, were not included in the sample. Individuals who were bedridden, in a terminal state, had cancer or were undergoing chemotherapy treatment, were also excluded (details available in previous publication[16]).

Data collection was split into two blocks: in the first block, involving 1,284 participants, data for identification, sociodemographic, anthropometric and clinical (oral health and blood pressure) variables were collected, along with frailty and cognitive status. In the second part, which included only respondents who scored above the cut-off score on the cognitive screening test (Mini-Mental State Exam – MMSE) applied at the end of the first phase (n=991), comprised the variables self-reported physical and mental health, functional capacity, psychosocial aspects and stressful life events. The cut-off scores on the MMSE were 17 for illiterate individuals and those who had never attended school, 22 for individuals with 1-3 years of education, 24 for 5-8 years, and 26 for ≥9 years of formal schooling[17].

In 2016 and 2017, an average of nine years after the first wave of measurement collection or baseline, the second, follow-up wave was carried out. Recruitment of the participants was done at households based on addresses registered on the database at baseline. A total of three attempts were made to contact each participant. The individuals located were invited to take part in a follow-up assessment from Fibra 2008-2009 via a single session lasting around 80 mins conducted by previously trained researchers (graduate and undergraduate students). The same eligibility and exclusion criteria used in the previous wave were applied. In the event of difficulties answering items on health and functioning, the presence of another family member or proxy was requested to mediate the interaction between the interviewer and the respondent. For respondents who scored below the cut-off on the MMSE, the interview was performed with a family member or other proxy.

The following variables were selected for study: sex (options male or female); age (derived from question on date of birth); living alone (single question with yes/no answer); marital status (with alternatives spouse/partner, single, divorced or widowed); literate (yes or no); education with options never attended school, 1-4 years, 5-8 years, and ≥9 years of formal study); head of household (yes or no) and family income (<1.0, 1.1-3.0, 3.1-5.0 or >5.1 minimum wages).

The presence of cognitive deficit suggestive of dementia was reassessed using the MMSE, with cut-off scores adjusted for years of education, as established in a population-based study of Brazilian older adults[17].

Frailty was assessed based on the phenotype model, operationalized by Fried et al.[18], involving five components: unintentional weight loss in the 12 months prior to interview of 4.5kg or 5% of body weight; exhaustion/fatigue as indicated by always and almost always responses to the scaled items on fatigue taken from the Center for Epidemiologic Studies Depression (CES-D) scale; low hand-grip strength defined as a value in kg force below the 1st quintile of the distribution of means of the sample as measured by three consecutive attempts using a hand-held dynamometer (model Jamar) adjusted by sex and body mass index (BMI); slow walking speed as indicated by mean time in seconds taken to walk 4.6m in a straight line with usual gait, with values above the 80th percentile of the distribution for the sample, adjusted for sex and weight; and

low physical activity indicated by weekly energy expenditure below the value of the 1st quintile of the distribution of metabolic units spent by the individual over the past week in the cumulative performance of domestic chores and mild, moderate or vigorous intensity physical exercise, as per responses on selected items from the Minnesota Leisure Time Activities Questionnaire[19]. Individuals whose calculation of metabolic equivalents (METs) was below the 1st quintile for the sample, adjusted for gender, were classified as having low physical activity. The procedures, criteria and cut-off scores and adjustment variables adopted were those described by Fried et al.[18]

For participants who scored below the cut-off on the MMSE, frailty phenotype was determined using a validated scale[20] based on the model of Fried et al.[18], containing 6 items answered by proxies. Participants who scored for one or two criteria were classified as pre-frail; those scoring for ≥ three as frail, and those scoring on zero as non-frail or robust.

This study complied with the ethical principles provided for under National Board of Health Resolution no. 466/2012. All participants signed the Free and Informed Consent Form at both baseline and follow-up. The 2008-2009 study project was approved by the Research Ethics Committee of the States University of Campinas under permit nos. 208/2007 and 907.575, while the follow-up project was approved under permits no.1.332.651 and no. 2.952.507.

The relative frequencies of sociodemographic variables, cognitive status, and frailty status were calculated and are expressed according to participant status at baseline and follow-up (reinterviewed, deceased or lost to follow-up). The statistical significance of differences between quantities of participants found in the intergroup analyses was analyzed using Pearson´s chi-square test, where differences in results at baseline versus follow-up were assessed using McNemar´s test. The same sociodemographic variables of interest in the study were explored in both analyses. The level of significance adopted for both statistical tests was $p<0.05$.

RESULTS

The number of participants at baseline according to their distribution in the follow-up subsamples is given in Table 1. There was a similar percentage of participants from baseline in the three follow-up subsamples (reinterviewed, deceased, lost), but the Campinas site located and reinterviewed a greater number of individuals, had fewer respondents categorized as deceased and lower sample losses compared to the Ermelino Matarazzo site. Regarding the total sample, 549 participants (42.7%) were reinterviewed at follow-up, 192 (14.9%) had deceased since baseline, and 543 (42.4%) were deemed sample losses for different reasons (Table 1).

The main reason for sample loss was failure to locate the addresses or participants. Ermelino Matarazzo had the highest number of participants not found for lack of information on current address or due to errors in the address records retrieved from the baseline date. The proportion of baseline participants not included in follow-up, having been excluded by the study exclusion criteria (due to data collection session unconcluded or interviewers feeling unsafe at residence) proved similar for the two study sites (Table 2). The breakdown of these losses was: 57,9% not found at address; 34.5% refusal to participate; 5.5% dropout or withdrawal before end of interview; 1.6% met exclusion criteria; and 0.5% were not interviewed because interviewers deemed the area in the vicinity of the household unsafe (Table 2).

Table 1. Distribution of participants from baseline in follow-up subsamples. Fibra Study, Brazil. Older Adults, 2008-2009 and 2016-2017.

Subsamples	Campinas	Ermelino Matarazzo	Total
	n (%)	n (%)	N (%)
Reinterviewed	394 (43.8)	155 (40.3)	549 (42.7)
Deceased	129 (14.3)	63 (16.4)	192 (14.9)
Losses	377 (41.9)	166 (43.3)	543 (42.4)
Total	900 (100.0)	384 (100.00)	1284 (100.0)

Table 2. Frequency of sample losses according to reason for non-inclusion of baseline participants in follow-up sample. Fibra Study, Brazil. Older Adults, 2008-2009 and 2016-2017.

Subsamples	Campinas	Ermelino Matarazzo	Total Losses
	n (%)	n (%)	n (%)
Refusal	120 (31.8)	67 (40.4)	187 (34.5)
Not found	227 (60.2)	87 (52.4)	314 (57.9)
Exclusion criteria	20 (5.3)	10 (6.0)	30 (5.5)
Interruption/dropout	7 (1.8)	2 (1.2)	9 (1.6)
Risk to interviewers	3 (0.9)	0 (0.0)	3 (0.5)
Total	377 (100.0)	166 (100.0)	543 (100.0)

The baseline sample comprised predominantly individuals who were female (68.7%), aged 70-79 years (51.2%; M_{age} =72.6±5.8 years), lived alone (83.8%), and had a spouse or partner (50.9%). Most of the participants reported they were literate (78.1%) and had 1-4 years of education (56.4%); 43.9% had a monthly family income of 1.1-3.0 minimum wages and 58.2% reported being the breadwinner. Cognitive deficit and frailty were present in 22.8% and 11.6% of participants interviewed at baseline, with higher rates among deceased than those lost to follow-up. Statistically significant differences in age, literacy, education, cognitive performance and frailty level were evident between reinterviewed and deceased subsamples: the number of deceased individuals was proportionally greater among those who were male, aged ≥80 years, illiterate or never attended school, cognitively impaired and frail (Table 3).

With regard to frequency of deceased and losses, there were statistically significant differences for the variables sex, age, living arrangement, literacy, education and cognitive deficit. In the individuals lost to follow-up, the percentage of deceased was higher in the those who were male, aged ≥80 years, not living alone, illiterate or had never frequented school, and cognitively impaired. Comparison of the reinterviewed and lost to follow-up subsamples showed that only the variables living alone (14.8% of reinterviewed vs. 19.4% of losses) and cognitive deficit (17.7% of reinterviewed vs. 25.4% of losses) differed statistically (Table 3).

Between baseline and follow-up, there was a statistically significant increase in the percentage of respondents who lived alone (17.1% to 22.0%), had no partner (46.4% to 55.4%), a family income of ≤ three minimum wages (52.2% to 62,2%), cognitive deficit (17.7% to 23.5%) and frailty (9.8% to 24.5%). Conversely, there was a decrease in the number of respondents considered robust after the nine-year follow-up (from 33.6% to 18.6%) (Table 4).

Table 3. Comparison of percentage of participants at baseline and follow-up for sociodemographic variables, cognitive status, and frailty**.** Fibra Study, Brazil. Older Adults, 2008-2009 and 2016-2017.

	Baseline	Follow-up			
	Total N=1284	Reinterviewed n=549	Deceased n=192	Losses n=543	*p**
Variable	n (%)	n (%)	n (%)	n (%)	
Sex					
Male	402 (31.3)	165 (30.0)	77 (40.1)	160 (29.5)	0.017
Female	882 (68.7)	394 (70.0)	115 (59.9)	383 (70.5)	
Age					
65-69 years	455 (35.4)	195 (35.5)	46 (24.0)	214 (39.4)	<0.001
70-79 years	657 (51.2)	301 (54.8)	94 (48.9)	262 (48.3)	
≥80 years	172 (13.4)	53 (9.7)	52 (27.1)	67 (12.3)	
Living alone					
Yes	207 (16.2)	81 (14.8)	21 (11.0)	105 (19.4)	0.013
No	1073 (83.8)	467 (85.2)	170 (89.0)	436 (80.6)	
Marital status					
With partner	651 (50.9)	292 (53.4)	89 (46.6)	270 (49.8)	0.255
Single	85 (6.6)	33 (6.0)	13 (6.8)	39 (7.2)	
Divorced	93 (7.3)	31 (5.7)	13 (6.8)	49 (9.0)	
Widow(er)	451 (35.2)	191 (34.9)	76 (39.8)	184 (34.0)	
Literate					
Yes	997 (78.1)	444 (81.2)	128 (67.4)	425 (78.7)	<0.001
No	280 (21.9)	103 (18.8)	62 (32.6)	115 (21.3)	
Education (years)					
Never attended school	233 (18.2)	88 (16.0)	52 (27.1)	93 (17.2)	<0.001
1-4	723 (56.4)	325 (59.3)	105 (54.7)	293 (54.2)	
5-8	175 (13.7)	76 (13.9)	27 (14.0)	72 (13.3)	
≥9	150 (11.7)	59 (10.8)	8 (4.2)	83 (15.3)	
Head of household					
Yes	745 (58.2)	311 (57.0)	113 (58.9)	321 (59.2)	0.736
No	535 (41.8)	235 (43.0)	79 (41.1)	221 (40.8)	
Family Income (MW**)					
0-1	102 (9.2)	54 (9.9)	21 (11.1)	43 (7.9)	0.126
1.1-3.0	484 (43.9)	227 (41.3)	93 (48.4)	245 (45.1)	
3.1-5.0	282 (25.6)	146 (26.6)	53 (27.4)	130 (23.9)	
> 5.1	235 (21.3)	122 (22.2)	25 (13.1)	125 (23.1)	
Cognitive deficit					
Yes	292 (22.8)	97 (17.7)	57 (29.7)	138 (25.4)	<0.001
No	991 (77.2)	451 (82.3)	135 (70.3)	405 (74.6)	
Frailty					
Non-frail	386 (30.1)	184 (33.5)	39 (20.3)	163 (30.0)	0.002
Pre-frail	749 (58.3)	310 (56.5)	119 (62.0)	320 (58.9)	
Frail	149 (11.6)	55 (10.0)	34 (17.7)	60 (11.1)	

*statistically significant differences when p-value < 0.05; *P*earson´s chi-squared test; **MW: Number of minimum wages at time of registering data.

Table 4. Sociodemographic variables, cognitive deficit and frailty at baseline and follow-up. Fibra Study, Brazil. Older Adults, 2008-2009 and 2016-2017.

Variables	Baseline n (%)	Follow-up n (%)	*p**
Living alone			
Yes	74 (17.1)	95 (22.0)	0.018
No	358 (82.9)	337 (78.0)	
Marital status			
With partner	291 (53.6)	242 (44.6)	<0.001
Without partner	252 (46.4)	301 (55.4)	
Literate			
Yes	438 (81.3)	434 (80.5)	0.720
No	101 (18.7)	105 (19.5)	
Head of household			
Yes	303 (57.3)	299 (56.5)	0.815
No	226 (42.7)	230 (43.5)	
Family Income (MW**)			
1-3	224 (52.2)	267 (62.2)	<0.001
>3.0	205 (47.8)	162 (37.8)	
Cognitive deficit			
Yes	97 (17.7)	129 (23.5)	0.007
No	451 (82.3)	419 (76.5)	
Frailty			
Non-frail	184 (33.6)	102 (18.6)	<0.001
Pre-frail	310 (56.6)	312 (56.9)	
Frail	54 (9.8)	134 (24.5)	

*McNemar Test; **MW: Number of minimum wages at time of data collection.

DISCUSSION

The present cohort study analyzed the profile of variables at baseline (2008-2009) versus follow-up (2016-2017) in a sample of urban older adults recruited at households aged ≥65 years at baseline and ≥74 years at follow-up. Regarding attrition between waves, a total of 42.7% of participants were located and reinterviewed nine years after baseline measurements. This rate is similar to those found by other longitudinal studies investigating frailty in older people. For example, in a study involving Mexican Americans, Ottenbacher et al.[21] reassessed 38% of the original sample after 10 years. In another two studies[22,23], albeit with shorter intervals between first and second waves (seven and six years, respectively), 46% and 63% of participants were available for reinterview. In the three studies cited[21-23], the proportion of participants who either died or were lost between baseline and follow-up ranged from 20% to 44% and 18% to 24%, respectively. These rates differ somewhat to the rates found in the present study of 14.9% deceased and 42.3% lost to follow-up. While it was not possible to ascertain all cases of death among the losses registered, the interviews conducted at the households, together with the input of proxies, likely reduced the prevalence and incidence of losses due to physical limitations and/or cognitive impairment.

Losses over time are inevitable in cohort studies involving older populations. This lack of retention can be explained, in part, by the variables mortality and morbidity[24]. Level of sample attrition due

to uncontrollable losses of participants tends to increase with longer interval between first and last assessments. In addition, attrition also tends to be greater in older cohorts than younger samples[24-26]. In cohort studies involving the older population, poorer health and socioeconomic status are factors associated with loss of control over the sample conditions as a whole and, thus, also associated with attrition. Participants requiring more care have a greater likelihood of not being included in the follow-up assessment[26,27]. As a result, the data on the remaining participants may become biased in that they more strongly reflect the characteristics of those individuals whose health status allowed continuation in the study than the characteristics of the overall sample. A similar phenomenon gives rise to a 'healthy survivor effect', often evident in older cohorts[27]. Despite the knowledge that the representativeness of follow-up samples tends to deteriorate over time, deaths are expected and thus tend to introduce less bias than attrition due to other factors[28].

In the present study, participants who died before the follow-up were older and had lower educational level than survivors reinterviewed at follow-up. The rates of cognitive impairment and frailty at baseline were also significantly higher in the deceased group than the reinterviewed group. These data are consistent with results of studies which found differences for sociodemographic variables, cognitive state and health conditions between individuals not reinterviewed due to death or other reasons, and those interviewed again at follow-up[25,26].

In a 10-year longitudinal study, Cacioppo and Cacioppo[25] reported that all-cause attrition was associated with age, education, family income and retirement. Conversely, participant retention in the sample was associated with better cognitive function and more social relationships. In another investigation[26], also with a 10-year follow-up, being older, male, socially isolated, physically inactive and presenting cognitive impairment at baseline predicted loss in subsequent waves. For every additional year of age at follow-up, there was a 2.8% greater risk of attrition, while for each extra point on the MMSE at baseline, this risk was reduced by 6.0%[26].

Besides mortality, cognitive impairment also numbers among the common causes of attrition in longitudinal studies involving older adults. According to Chatfield et al.[29], who conducted a systematic review of factors associated with attrition in cohort studies involving older adults and greater cognitive impairment were independent determinants of sample dropout at follow-up, excluding attrition due to participant death. The authors found high dropout rates among participants that had cognitive deficit, lived alone and were single.

In the present study, no statistically significant differences were evident for age, sex, education, family income and frailty at baseline between the reinterviewed group and the group lost to follow-up. In a follow-up of a subsample of the Fibra network of Juiz de Fora (MG), Barbosa et al.[30] also found no introduction of significant bias in the sample studied, except for a higher proportion of individuals who lived alone at baseline among the sample losses at five-six-year follow-up, a result partially in line with the findings of the present study. It is important to note that methodological differences in data collection at follow-up between the study by Barbosa et al.[30] compared with the present investigation, namely, a shorter time interval between assessments, exclusion of cognitively impaired subjects and interviews conducted by telephone, may have contributed to the disparities in results.

Comparing baseline with follow-up, there was a statistically significant increase in the number of respondents who lived alone, had no partner, a low family income, and cognitive deficit. In addition, there was a decrease in the proportion of non-frail individuals and an increase in frail participants. A five-year evaluation of a cohort of oldest old individuals by Rhor et al.[31] reported that a third of participants were socially isolated at follow-up. This group was older and had lower MMSE scores, where most had no partner and lived alone. Data from the ELSA (English Longitudinal Study of Ageing)[32] showed that eight-year mortality risk was higher in older adults who had started living alone during the follow-up, whether because of divorce or widowhood, and also in participants that had depression, loneliness

and reduced mobility. In situations of widowhood, irrespective of changes in income, older adults can subsequently start living with their adult children and grandchildren, a shift which can often negatively impact their own well-being[33].

Of the changes observed after nine years, cognitive performance merits attention because it has a negative impact on health, increases risk of disability, reduced quality of life and contributes to other adverse outcomes[11]. Aging-related cognitive decline varies among individuals, where some people maintain relatively high levels of cognitive function in late life, while others experience rapid decline[16,35]. According to the review by Wu et al.[34], different trajectories in cognition can take place. Social determinants of health commonly associated with more favorable trajectories include high educational level, social engagement and physical activity, whereas depressive symptoms, physical limitations, diabetes and smoking number among the risk factors[34].

In international studies involving follow-ups of six to 10 years[21,22], changes in frailty status were found to follow the same pattern identified in the present study, i.e. a decrease in the proportion of non-frail, accompanied by an increase in frail individuals. To the best of our knowledge, few studies in Brazil have tracked changes in life and health conditions in older adults for longer periods[21,22]. Fhon et al.[35], observed a rise in frailty after six years, and estimated an increase in mean frailty score of 0.5% for each additional year of age and of 8.4% for living without a partner or spouse. Akin to the pattern seen in the present study, the authors observed an increase in the number of participants classified as frail (17.6% vs. 50.4%) and a decrease in the number of non-frail (59.5% vs. 28.6%) individuals, between baseline and follow-up[35]. Worsening frailty appeared to be associated with different factors, predominantly older age, female gender, presence of neurodegenerative diseases, cognitive impairment and unfavorable socioeconomic conditions. By contrast, other factors (male gender, education, social support, cultural engagement and physical activity) had potential protective effects[14].

The present study has several limitations, such as the high dropout between baseline and follow-up. Given that part of this attrition occurred due to unavoidable events typically expected in aged cohorts, including death and cognitive decline, we believe no bias was introduced to the sample and thus the older adults reinterviewed were representative of Brazilian oldest-old. Another limitation inherent to the study was the long interval between baseline and follow-up measurements, or the absence of additional collection interim timepoints. Future longitudinal studies should address this shortcoming, thereby improving the likelihood of identifying direct and indirect determinants of negative outcomes, such as cognitive deficits, frailty, disability and multimorbidity.

The high financial costs, most of which enjoy no immediate return, the lack of permanent well-prepared teams for planning and executing longitudinal research projects, along with a shortage and discontinuity of physical and human resources are factors underlying the low number of longitudinal studies in Brazil. However, further longitudinal studies are pivotal to elucidate the repercussions of aging on the health and well-being of this population.

The second wave of the Fibra study included a sample of oldest-old recruited within family households, a segment of the population that has been poorly investigated to date. Estimates for the coming decades project a rise in the number of poor oldest-old with low educational level and poor state of health[15]. This study reflects a concerted effort to gain a clearer picture of this group and plan more effective interventions to improve their lives, negatively impacted by adversities both old and new.

CONCLUSION

After the nine-year follow-up period, an increase in physical, cognitive and social vulnerability of the participants was evident. Furthermore, those who died during the period differed at baseline for age, education, cognitive status and frailty status compared with survivors. These data highlight the need for public policies that favor not only the quality

of life of oldest-old, but which also reduce health inequalities over the lifespan. Thus, by identifying changes in the profile of the older population over time, individual and collective preventive strategies can be better planned and implemented. Such strategies should be aimed not only at the wellbeing of older individuals and their families, but also seek to attenuate the burden of Brazilian population aging on the national health and social service systems. Therefore, longitudinal cohort studies involving representative samples of the population with more regular measurements over time are needed to help inform public policies aimed at older adults, both preventive and for long-term care.

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