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Factors associated with social frailty in older adults in Colombia

Carmen-Lucia Curcio [a,*], Sebastian Villada [a], Laura Chica [a], Claudia Liliana Valencia [b]

[a] Research Group in Geriatrics and Gerontology, Faculty of Health Sciences, Universidad de Caldas, Manizales, Colombia
[b] Nursing Program, Catholic University of Manizales, Colombia

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ABSTRACT

Objectives: Social frailty (SF) has gained increasing attention in recent years. While several studies have examined SF among older adults living in the community, most have been conducted in specific countries, primarily in Asia, with limited research in Latin America. The main objective of this study was to identify the relationship between SF and demographic, health, and functional conditions among older adults in Colombia.

Methods: This study is a secondary analysis of the SABE Colombia study. Social frailty (SF) was assessed using the adapted HALFE Social Frailty Index. The main independent variables included demographic factors and health status indicators such as self-rated health, chronic conditions, depression, ADL/IADL dependence, mobility disability, and life-space assessment. Bivariate analysis and logistic regression in multivariate models were applied.

Results: The overall prevalence of SF was 66.3%, increasing with advancing age. Compared to individuals without SF, those with SF were more likely to have a low level of education (<6 years), mobility disability, dependence on IADLs, restricted life space (<55.5), be female, and report poor or very poor self-rated health. In multivariate logistic regression analyses, SF was associated with higher odds of years of education (<6), dependence for IADL, restricted life-space, being female, mobility disability, and bad and very bad self-rated health. In contrast, depressive symptoms, rural areas, and marital status lose significance.

Conclusion: SF is prevalent among Colombian elderly individuals, affecting nearly seven in ten community-dwelling older adults. It is also significantly associated with demographic, health, and functional conditions. Additionally, social issues such as economic status, social isolation, loneliness, and social participation are increasingly prominent among older adults. Thus, SF resulting from social issues requires greater attention, particularly in non-developed countries. Consequently, to promote healthy aging, it is imperative to implement measures aimed at preventing and mitigating SF among older adults in light of these findings.

1. Introduction

Social frailty (SF) has gained attention in recent years. It encompasses various social dimensions, including social activities, support networks, financial status, and living arrangements [1,2]. It is defined as the risk of losing or having already lost essential resources needed to meet one or more basic social needs [1–5]. In 2017, Bunt introduced the comprehensive concept of SF based on the social productive function theory. This theory suggests that individuals progressively lose one or more essential resources needed to meet basic social needs, leading to a decline in social behavior, activities, and self-management ability [1].

Notably, SF can precede and contribute to overall fragility [6], but its significance is often overlooked. Several studies have reported the prevalence of SF among older adults in different settings. The prevalence varies across countries and settings depending on the used SF measures [7].

Recently, several meta-analyses have revealed a high prevalence of SF among older adults, ranging from 3.5 % to 71.5 % [6]. Li et al. [8], reported a pooled prevalence of SF in community settings at 18.8 %, with variations between 13.4 % and 32.3 %, depending on the SF measures used. Zhang et al. found an aggregate prevalence of 47.3 % among hospitalized older adults and 18.8 % among those living in the community [7].

In Latin America, data from the Colombian Study on Health, Well-being, and Aging (SABE), designed to assess the association between social participation, support from children, relationships with children,

* Corresponding author at: Research Group on Gerontology and Geriatrics, Health Sciences Faculty, Carrera 25 N°48-57, Universidad de Caldas, Manizales, Colombia.
E-mail address: carmen.curcio@ucaldas.edu.co (C.-L. Curcio).

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and social frailty with falls among older adults living in the community, reported a prevalence of social frailty of 36.6 % [9]. However, it is important to note that although the study was conducted in Colombia, it employed a questionnaire different from the one used in our study.

Recent research has demonstrated that SF is strongly associated with various negative health outcomes in the elderly, including depression, anxiety, obesity, cardiovascular disease, increased hospitalization, disability, mortality, and cognitive impairment rates [10–15]. Additionally, several components of SF have also been shown to be associated with adverse health outcomes, such as infrequent social contact [16–19], reduced social activity [20–22], and living alone [23] Hence, SF and its components should be a serious public health concern.

Understanding the SF can help policymakers assess the scope and severity of the problem, facilitate continuous monitoring of at-risk populations, and guide clinical research efforts and public health surveillance. Some studies have examined SF among older adults living in the community, but the results are limited to specific countries [8]. Most studies have been conducted in Asia, with only a few focusing on older adults in Latin America [6]. The main objective of this study was to identify the relationship between SF and demographic, health, and functional conditions among older adults in Colombia.

2. Methods

2.1. Setting and participants

This study is a secondary analysis of the SABE 2015 Colombia study, a population-based cross-sectional study that included 23,694 subjects aged 60 years or older and was representative of the Colombian population. The study included a questionnaire covering determinants of active aging. More information on this database can be found elsewhere [24]. Participants were selected using a probabilistic, clustered, stratified, and multistage design. Participants were included if they were 60+ years of age, were capable of communicating with the research team, and provided written informed consent. All interviews were conducted face-to-face between April and September 2015.

In the original study, at the beginning of the interview, individuals with a total score of <13 on the Folstein Mini-Mental State Examination were identified as having cognitive impairment. For these individuals, a proxy interview was conducted for most of the survey [24]. Participants whose proxies provided answers (4,690) were excluded from our analysis since they had cognitive impairment and were not permitted to answer specific questions related to the components of SF and other variables. This decision ensured the reliability of the assessments, given that cognitive decline can substantially affect social dimensions.

2.2. Study variables

Dependent variable:

The concept of social frailty (SF) encompasses five aspects: inability to help others, limited social participation, rare contact with friends/family, financial difficulty, and living alone. SF was assessed using the adapted HALFE Social Frailty Index [25]. To measure the ability to help others, participants were asked if they had been able to assist their friends or family within the past 12 months. A response of “no” was scored as 1. Limited social participation was assessed by asking participants if they had engaged in any social or leisure activities (including religious, sports, political, cultural, community, environmental, health-related, senior-focused, or physical exercise activities) in the previous 12 months. A response of “no” was scored as 1. Loneliness was defined as rarely contacting or visiting friends or family in the past month. A response of “no” was scored as 1. Financial difficulty was assessed with the question: "Do you think your income was sufficient to live on in the last 12 months?" Financial hardship was scored as 1 if participants reported their income as insufficient or very insufficient. Living alone was scored as 1 if participants lived alone. The total score on the HALFE scale ranges from 0 to 5, with a total score of 3 or more indicating social frailty.

2.3. Main independent variables

Demographic variables, including age, gender (male/female), marital status, urban/rural residence, and years of education, were included.

Health status variables included self-rated health (SRH), chronic conditions, depression, ADL/IADL dependence, and mobility disability. Self-rated health (SRH) was assessed by asking, “How would you evaluate your current health?”. Response options were dichotomized as "very good" vs. "fair," "bad," or "very bad." The presence of diseases was assessed by asking participants, “Have you been diagnosed with…?” for each of the following comorbidities: hypertension, diabetes mellitus, cancer (any type), chronic obstructive pulmonary disease, myocardial infarction, stroke, and arthritis/osteoarthritis. Multimorbidity was defined as the presence of two or more coexisting morbidities in an individual [26].

The presence of depression was assessed using the Yesavage Geriatric Depression Scale (GDS-15), which has a sensitivity between 80 and 90 % and a specificity of 70–80 % for a cut-off score of ≥6 ((27). The validated Spanish version, adapted for the older Colombian population, was used [27]. A cut-off value of ≥10 was selected to indicate clinically significant depressive symptoms.

For the functional variables, Activities of Daily Living (ADLs) were included. Respondents were asked whether they currently required assistance with six ADLs: eating, dressing, bathing, toileting, getting out of bed, and walking across a room. For each activity, participants indicated whether they (a) could perform the activity independently, (b) needed assistance, or (c) were unable to perform the activity. A dichotomous measure was constructed to represent limitations in ADLs, where 0 indicated full independence in all activities, and 1 indicated difficulty or inability to perform at least one activity.

Instrumental Activities of Daily Living (IADLs) were assessed by asking respondents whether they currently had any difficulties or required assistance with four tasks: grocery shopping, managing their own medications, using public transportation, and using the phone. A dichotomous measure was constructed to assess limitations in IADLs, where 0 indicated full independence in all activities, and 1 indicated difficulty or inability to perform at least one activity.

Mobility disability was defined as self-reported difficulty in walking 400 m or climbing a flight of stairs without resting [28]. Life-space mobility was measured using the University of Alabama Life-Space Assessment (LSA) questionnaire, which evaluates five levels of living space (ranging from within the home to out of town) during the month prior to assessment [29]. This tool has been validated in Spanish in the IMIAS studies [30]. For each level of life-space, respondents were asked about their frequency of travel (ranging from once a week to daily) and whether they relied on another person (yes/no) or assistive mobility devices (yes/no). Composite Life-Space (range: 0–120) was calculated based on level, frequency, and degree of assistance required (none, equipment, or personal). A dichotomous measure was used to define restricted life-space, with an optimal cutoff point of 55.5 for Colombia [31].

2.4. Statistical analysis

Proportions (%) were estimated for categorical variables, while continuous variables were expressed as means ± standard deviation (SD). Bivariate comparisons between SF and other covariates were conducted using the Chi-square test. Logistic regression was employed in multivariate models to estimate adjusted odds ratios and 95 % confidence intervals (95 % CI) for variables associated with SF. A p-value < 0.05 was set as the threshold for statistical significance. All analyses were performed using SPSS v26 for Windows.

3. Results

Participants included 16,747 older individuals with a mean age of 69.3 ± 7.1 years. One-third belonged to the 60–64 age group, while 3.2 % were aged 85 or older. Women comprised 56.8 % of the sample. A little more than half were married (56.4 %), and more than two-thirds lived in urban areas (76.7 %). Overall, the educational level was low, with an average of 4.8 years of schooling. Half of the participants (52 %) reported poor or very poor self-rated health. Multimorbidity (two or more comorbidities) was present in 39.6 % of individuals. Depressive symptoms were reported by 57.7 %. Around one-third of participants had IADL dependence (31.7 %), mobility disability (30.3 %), and 36.6 % had restricted life-space. (Table 1).

The global prevalence of SF was 66.3 %, with a noticeable increase with advancing age. A higher prevalence of SF was observed among older participants, women in rural areas, individuals with lower educational levels, poor or very poor self-rated health, ADL and IADL dependence, mobility disability, and restricted life-space. In the bivariate analysis, SF was significantly associated with all demographic variables, health conditions, and functional limitations (Table 1).

There are significant differences in the components of social frailty (SF). Slightly more than half of the studied population is unable to help others, with this proportion rising to 73.7 % in the SF group. A considerable percentage of participants experience financial difficulties—52 % among the non-frail and 85.5 % among those with SF. A similar pattern is observed in limited social participation, affecting 52.3 % of the non-frail group and 70.2 % of the SF group. The absence of social contacts also shows substantial differences, with 37.8 % of individuals with SF lacking social interactions compared to only 4.0 % of the non-frail group. Conversely, a smaller proportion of individuals with SF (6.8 %) live alone compared to those without SF (16.5 %), as shown in Table 2.

In additional analyses exploring the direct impact of each variable on social frailty (SF), the inability to help others had the highest standardized regression coefficient, followed by limited social participation, indicating that these factors contribute the most to SF. In contrast, living alone had the smallest impact. (Table 2)

In multivariate logistic regression analyses, SF was associated with higher odds of years of education (<6), IADL dependence (yes), restricted life-space, sex (women), mobility disability, and self-rated health (bad and very bad). In contrast, depressive symptoms, rural areas, and marital status lose significance. Multimorbidity was significantly associated with lower odds of social frailty, indicating a moderate and statistically robust protective effect (Table 3). The model explains 76 % de la variance (Table 3).

Table 1
Baseline characteristics of participants by social frailty status.

	Social Frailty $n = 11,101$ (66.3 %)	Non Social frailty $n = 5646$ (33.7 %)	Total $n =$ 16,747 (100.0 %)	p
Demographic Variables				
Age (mean, SD)	69.5 (7.3)	68.2 (6.6)	69.1 (7.1)	0.000
Age group				
60–64	30.9	36.3	32.7	0.000
65–69	25.5	27.0	26.0	
70–74	18.8	18.1	18.6	
75–79	13.5	11.7	12.9	
80–84	7.5	5.0	6.6	
85 and over	3.8	2.0	3.2	
Sex				
Men	44.9	39.8	43.2	0.000
Women	55.1	60.2	56.8	
Marital status				
Married	57.3	54.6	56.4	0.000
Widowed / separated	31.1	35.0	32.4	
Single	11.5	10.4	11.2	
Urban and rural areas				
Urban	79.5	75.3	76.7	0.000
Rural	24.7	20.5	23.3	
Years of education, (mean, SD)	4.3 (3.6)	5.8 (4.7)	4.8 (4.0)	0.000
0 - 5 years	77.5	63.8	73.1	0.000
6 and more years	22.5	36.2	26.9	
Health Conditions				
Self-Rated health				
Very good/good	44.8	54.5	48.0	0.000
Very bad/bad	55.2	45.5	52.0	
Comorbidities (2 o mas)	39.9	39.0	39.6	0.728
Depressive symptoms	57.7	57.0	57.7	0.004
Functional Conditions				
ADL dependence	17.7	11.3	15.5	0.000
IADL Dependence	34.2	22.7	31.7	0.000
Mobility disability (NAGI)	40.8	24.3	30.3	0.000
Restricted Life-Space (55.5)	40.1	29.9	36.6	0.000

4. Discussion

In this nationwide study of Colombian older adults, we identified a high prevalence of SF of 66.3 %. Individuals with SF were more likely to have low education attainment, mobility disability, dependence in IADLs, restricted life-space mobility (score <55.5), poorer self-rated health (SRH) and to be female. These findings align with the conceptualization of SF as a multidimensional vulnerability state involving social, functional, and health-related factors.

Reported SF prevalence varies markedly across studies, ranging from 3.5 % to 71.5 % [7], largely due to differences in measurement tools, populations, and settings. Meta-analyses by Yu et al. [32] and Li et al. [15], which included community-dwelling older adults from multiple countries, reported pooled SF prevalences of approximately 20 % - 22 %, though with substantial heterogeneity. A recent review also found a pooled prevalence of 20 % [13]. In contrast, Sun et al. reported prevalence levels above 60 % in China [33], which are more comparable to our findings. These discrepancies highlight the need for clearer operational definitions and standardized assessment tools for SF.

A major contributor to prevalence variability is the lack of consensus regarding SF measurement. Li et al. identified over 11 different assessment instruments [8] with pooled prevalence ranging from 19 % using the HALFT scale to 23 % using MSFI. Such inconsistencies hinder cross-study comparability and demonstrate the importance of harmonizing SF metrics.

Cultural and regional factors also influence SF. Most studies included in prior meta-analyses were conducted in Asia, where Confucian traditions emphasize intergenerational support and co-residence.

In contrast, Latin America contexts -including Colombia - are characterized by more prevalent nuclear family structures and higher rates of older adults living alone, especially among widowed individuals [34]. Interestingly, in our study, living alone was less common among individuals with SF. This observation challenges the conventional

Table 2
Social frailty components.

	Social Frailty $n = 11,101$ (66.3 %)	Non Social Frailty $n = 5646$ (33.7 %)	Total $n =$ 16,747 (100.0 %)	Coefficients B*
Inability to help others	73.7	19.3	55.4	0.428
Limited social participation	70.2	16.7	52.2	0.419
Financial difficulty	85.5	52.3	74.8	0.335
Loneliness: Rarely contacts with friends/ family	37.8	4.0	26.4	0.236
Living alone	6.8	16.5	10.1	0.210

* Standardized regression coefficients.

Table 3
Multivariate analyses in association with social frailty.

Variables	OR	95 % C.I.	Sig.
Years of education (0–5 years)	1.651	1.539 - 1.771	<0.0001
IADL dependence (yes)	1.551	1.441 - 1.668	<0.0001
Restricted Life-Space (≤55.5)	1.445	1.348 - 1.549	<0.0001
Sex (women)	1.399	1.308 - 1.497	<0.0001
Mobility disability (yes)	1.388	1.284 - 1.501	<0.0001
SRH (bad, very bad)	1.265	1.184 - 1.352	<0.0001
Age (≥ 75)	1.084	1.001 - 1.174	0.048
Comorbidities (≥2)	.837	0.782 - 0.896	<0.0001
Rural	1.068	0.990 - 1.153	0.090
Depressive symptoms (Yesavage ≥ 10)	1.019	0.913 - 1.139	0.324
Marital status (Widowed separated, single)	.981	0.919 - 1.047	0.566

assumption that living alone inherently increases vulnerability and suggests a more nuanced interpretation. Older adults who live alone may indeed experience greater emotional loneliness; however, this does not necessarily translate into reduced social contact, weaker social networks, or diminished participation in social activities [35]. In this context, living alone may reflect a functional choice or a stable social environment rather than a marker of risk.

Macro-level socio-economic factors further shape SF vulnerability. Colombia exhibits high rates of poverty among older adults (43.8 %) [36], low social participation, limited income security, and marked socio-economic inequality according to Gini coefficient reached in 2022 (54.8) [37]. Additionally, older adults often lack robust social capital, and structural challenges such as violence and displacement are common [38]. These contextual conditions may partly explain the elevated SF prevalence observed. Prior research has reported increased FS risk in settings whit limited social protection and weaker welfare systems [39].

Consistent with previous evidence, we found that female sex, older age, and lower educational attainment were independently associated with SF. Higher SF prevalence among women has been reported in multiple cohorts, including the LASI study [40], and may reflect gendered disparities in longevity, health status, financial security, and social roles [36,41,42]. Women's social networks tend to be more spouse-centric, making widowhood particularly detrimental to social connectedness [8]. Educational attainment also demonstrated a graded association, with lower schooling linked to higher SF prevalence, potentially through pathways involving communication skills, social participation, health literacy, and income [40,43–45].

SF prevalence increased with age, especially among individuals $s >$ 75 years, consistent with prior studies [8,13,19,37,40]. Age-related sensory, physical, and cognitive decline, shrinking social networks post-retirement, and higher rates of widowhood collectively contribute to this pattern [8]. Poor SRH, also associated with SF may be mediated by socioeconomic status, access to healthcare, and loneliness [22,40,46,47].

As reported elsewhere, SF was associated with disability in both Basic Activities of Daily Living (BADL) and Instrumental Activities of Daily Living (IADL) [48,49]. Proposed mechanisms include physical frailty, cognitive impairment, and poor SRH [40,50,51]. Social engagement has been shown to enhance subjective physical well-being and support functional independence [40]. Community based programs such as the local centers used in Japan, illustrate how structured social and physical activities can help maintain IADL function [41]. However, due to the cross-sectional design of our study, causality cannot be inferred.

We also found a strong association between restricted life space mobility (LSA) and SF. Social networks, participation, and isolation influence mobility, and a bidirectional relationship has been suggested [42]. Larger life-space areas are linked to greater social integration, companionship, and reduced loneliness- domains central to SF constructs (55). This highlights the importance of considering environmental and spatial factors when addressing SF among older adults [44]. Despite its relevance, few studies have examined LSA in relation to SF, representing an important area for future research.

The observed association between multimorbidity and a lower likelihood of social frailty contrasts with existing evidence showing that the accumulation of chronic conditions typically increases social vulnerability in old age [1,2,26]. However, recent studies suggest that, in certain contexts, multimorbidity may promote greater contact with healthcare services and formal support networks, which could mitigate the risk of social isolation [18].

A key strength of this study is the use of a representative, population-based sample of older adults in Colombia drawn from the SABE study. Another important strength is the detailed characterization of demographic, health, and functional factors linked to social frailty, along with the identification of the components within the construct that most strongly contribute to its diagnosis. Together, these findings may pave the way for new evidence that, from a public health perspective, can inform strategies to address the determinants of this condition.

This study has some limitations. Due to its design, establishing causality between SF, health, and functionality was not possible. However, the probability sampling methodology ensures that the sample is representative of the older Colombian population living in the community. Excluding proxy-reported participants may bias results by omitting more impaired individuals, likely underestimating social frailty and affecting key associations. Thus, the findings should be interpreted with caution. Additionally, the scale used in our study was derived from data available in the SABE Colombia database, making direct comparisons with studies conducted in other populations challenging. Nonetheless, to the authors' knowledge, this study is a pioneering effort in establishing the prevalence of frailty among Latin American older adults.

In conclusion, SF is highly prevalent among Colombian older adults, affecting nearly seven in ten community-dwelling individuals. Moreover, it is significantly associated with demographic, health, and functional conditions. Social challenges faced by older adults, including economic hardship, social isolation, loneliness, and limited social participation, are also on the rise. Therefore, SF driven by social factors warrants greater attention, particularly in developing countries. To promote healthy aging, it is imperative to implement strategies aimed at preventing and mitigating SF among older adults in light of these findings.

Ethics approval and consent to participate

As this was a secondary data analysis, there was no need for consent for ethics approval. The SABE study was approved by both the Institutional Human Ethics Committee of University of Valle (Colombia) and the Bioethics committee of University of Caldas (Colombia) (Records number 09–014, O11–015, and code CBCS-021–14, respectively). All survey respondents gave informed consent before participation and all information was collected confidentially. The Ministry of Health of Colombia manages the SABE study dataset, which is publicly available. All respondent identifier information has been removed. Requests can be made by emailing repositorio@minsalud.gov.co

Availability of data and materials: Requests can be made by emailing repositorio@minsalud.gov.co

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CRediT authorship contribution statement

Carmen-Lucia Curcio: Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Formal analysis, Data curation, Conceptualization. **Sebastian Villada:** Writing – review & editing, Methodology, Conceptualization. **Laura Chica:** Writing – review & editing, Investigation, Conceptualization. **Claudia Liliana Valencia:** Writing – review & editing, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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