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ARTICLE

Social participation and 5-year all-cause mortality in older Chilean people

Participación social y mortalidad por todas las causas durante 5 años entre personas mayores chilenas

Participação social e mortalidade por todas as causas em cinco anos entre idosos chilenos

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Abstract

We aimed to examine the degree to which social participation is associated with mortality risk in older adults in Chile. We used the Chilean National Survey on Elderly Dependency*, which is linked to vital statistics, in order to obtain death records. Four proportional risk regression models were estimated. Even with controlled sociodemographic, economic, family, and health variables, older adults who participate in social activities had a 22% lower risk of death than those who do not participate. We concluded that social participation is a strong and significant protective factor for mortality in Chilean older adults. Social participation should thus be promoted from a life course perspective considering its effect on mortality in older adults who maintained an active social life.*

Social Participation; Mortality; Older Adults

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Introduction

Over the last decades, the proportion of older adults has significantly increased in Chile and other Latin American countries because of the decrease in mortality and fertility rates and increased life expectancy. Between 1992 and 2020, the annual average growth of the population aged 60 years and older was 3.3%, three times higher than the 1% average growth of the population aged 0-59 years [1,2]. Currently, people aged ≥ 60 years represent 17.4% of the population (3.3 million) [2]. Chileans are likely enjoying longer lives because of health, social, and economic factors. Besides Costa Rica and Cuba, Chile is one of the countries with the highest life expectancy at birth and at age 60 in Latin America [2].

In North America [3], Europe [4,5], and Asia [6], studies have documented the association between social participation and mortality for at least 40 years. Moreover, older adults have been studied on their degree of social relationships and social engagement regarding functional limitations [6], mobility [7], cognitive impairment [8,9], and dementia [10,11]. However, the increasing proportion of the older population affected industrialized countries and is expected to virtually affect all countries [12], promoting interest in the association between social participation and mortality in older adults [3,13,14].

Studies show that maintaining an active social involvement is associated with lower mortality risk [13,14,15,16,17]. Berkman & Syme [3] studied four sources of social relationships (marriage, contact with family and close friends, church membership, and participation in formal or informal associations), finding that people who maintain social ties or relationships have lower mortality rates than those who do not. Minagawa & Saito [13] found that, even with controlled sociodemographic, health status, and family relations variables, older people in Japan who participated in at least one social group had a 27% lower death rate than those who did not participate in any social group. Similarly, Wu & Li [14] found that secular and religious social participation is related to lower risk of death among older people in China.

In Chile, older adults who participate in organizations are associated with higher subjective well-being [18], whereas older people who live alone have higher mortality rates than those who live with their partners, husbands, wives, and children [19]. However, analysis of the association between social participation and mortality rate in older adults in Latin America, particularly in Chile, is still incipient. This study therefore aimed to examine how social participation is associated with mortality risk in older adults in Chile. Considering the findings described for other societies, we expected to find a lower mortality risk among men and women who participate in social organizations.

Methods

Data

This study was based on data from the *Chilean National Survey of Dependence in Older People* (*Estudio Nacional de la Dependencia en Adultos Mayores*), a cross-sectional survey conducted from 2009 to 2010 in a probabilistic national representative sample of 4,766 people aged 60 years or older. From this sample, 160 individuals (3.3%) were excluded due to missing information in the variables of interest, totaling 4,606 analyzed older adults, among whom 708 died during follow-up. The survey data were linked with death records from the Civil Registration Service. The studied period corresponds to the application date of the survey (2009-2010) to April 7, 2015 (right-censored data).

Variables

During the 5-year studied period, the primary dependent variable was "risk of dying" and the main independent variable was "social participation". The survey included the question: "Do you participate in any community group, club, or organization?" (Answer 1. Yes or 2. No). For research purposes, social participation is considered older adults who declared participating in at least one of the social organizations included in the questionnaire.

Demographic variables were considered as covariates, including: sex (men and women), age (60-69; 70-79; 80-89; and 90 or more years), and socioeconomic factors – schooling (0 to 6 years or 7 or

more years), occupation (employed or not employed), and living arrangements (living with a partner, living alone, living with a partner and children, living alone with children, living with others). Five variables were included as health status: (1) self-perceived health (good or poor health); (2) number of chronic diseases; (3) limitation in activities of daily living (ADL); (4) limitation in instrumental activities of daily living (IADL); and (5) dependency. The survey asks if the participant has been diagnosed by a physician or nurse with any of the chronic diseases addressed in the study (hypertension, diabetes, heart disease, lung disease, embolism, thrombosis, ischemia or stroke, depression, cancer, arthritis or osteoarthritis). The variable "number of chronic diseases" was created by grouping the two possible answers (1. Yes; 2. No) to each disease into one of four categories: (a) none; (b) one disease; (c) two diseases; and (d) three or more diseases. Moreover, the variable "dependency" was grouped into three categories: no dependency, mild or moderate dependency (requires assistance to perform 1. ADL; or 2. IADL), and severe dependency (is bedridden or has dementia or cannot perform two or more ADLs and IADLs).

Analytical strategy

A series of Cox proportional hazards models were estimated to study the association between social participation and mortality risk in older adults. The model specification without interaction terms is as follows:

$$lnh\,(t) = a\,(t) + b_1\,Social\ Participation + b_2\ \ Sex + b_3\,Age + \cdots + b_{11}\,IADL$$

Note that, survival time corresponds to years of survival.

Four models were considered. The first model examines the main association of social participation with mortality in older adults. Demographic variables (sex and age) were added in the second model considering that levels of mortality and social participation vary between men and women and social participation is likely to be higher in younger older adults, mainly women. Socioeconomic (education and occupation) and family (living arrangement) variables were added in the third model considering that socioeconomic conditions and living arrangements of older adults influence their mortality and social participation levels. Finally, the fourth model considered covariates related to improved health status, which favors social participation and is associated with lower risk of mortality. The implementation of the proportional hazards was tested using the *sphtest* command in Stata software (https://www.stata.com). This command performs a global test and independent tests for each predictor. All four models in this study support the proportional hazards assumption. The software Stata 14 was used to estimate the models.

Results

Table 1 details the analyzed sample, showing that 70% of older adults do not participate in any social association, out of which most (61%) are women and were aged under 80 years when they entered the study. Most older adults had low schooling levels (69.6%), were unemployed (81.3%), and lived in other living arrangements (45.3%), whereas 18% lived with their partner, 16.5% lived alone, and the remaining 19.9% lived with their partner and adult children (10.7%) or only with their adult children (9.2%). More than 50% declared having poor health whereas 48.3% declared having two or more chronic diseases. However, most reported no difficulties in performing ADL or IADL. Finally, regarding dependency, 74% were independent, while 9.1% had a mild-moderate level of dependency and 16.8% had a severe level (Table 1).

Figure 1 shows differences in the survival curves according to social participation for older men, older women, and the total sample. Those who did not participate in social activities had higher mortality during the 5-year follow-up, including all older people, only men, and only women. However, these groups have different survival curves (p-value = 0). Women who participate in social organizations had lower mortality than men.

Table 1

Characteristics of the baseline sample of older adults. Chile, 2009-2015.

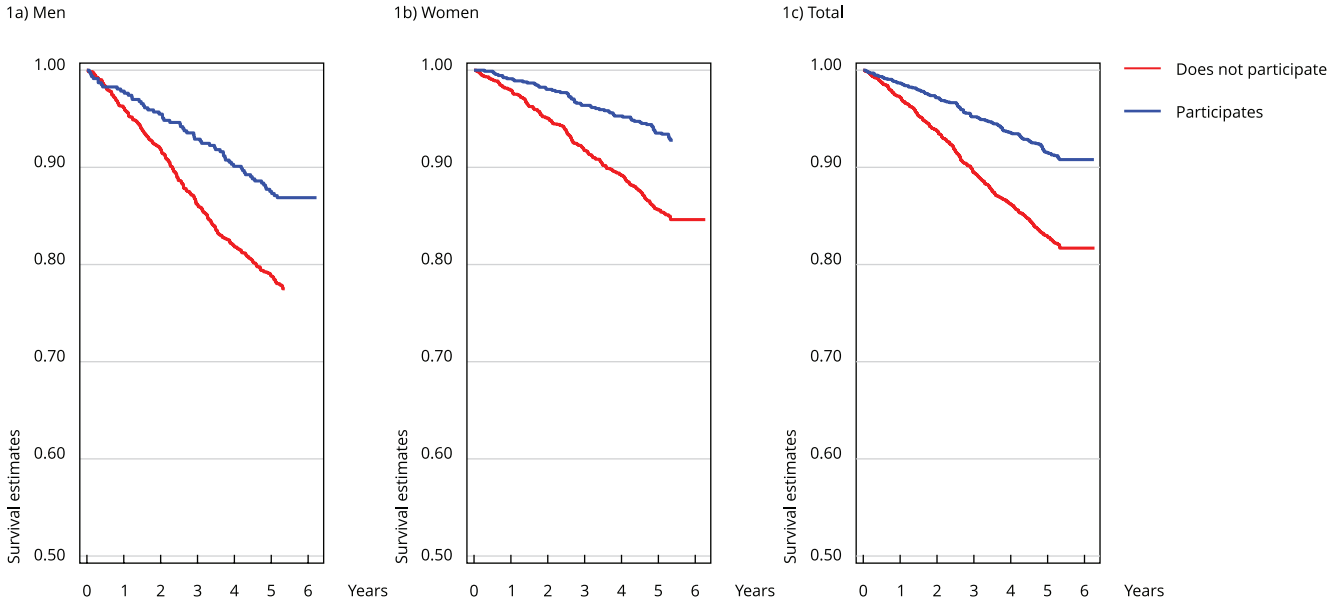
Covariates	n	Social participation		Total (%)
		Does not participate (%)	Participates (%)	
Social participation				
Participates	1,377	-	-	29.9
Does not participate	3,229	-	-	70.1
Gender				
Men	1,795	41.2	33.8	39.0
Women	2,811	58.8	66.2	61.0
Age (years)				
60-69	2,031	43.0	46.6	44.1
70-79	1,597	32.6	39.6	34.7
80-89	830	20.2	12.9	18.0
90 or more	148	4.2	0.9	3.2
Schooling level (years)				
0-6	3,204	72.1	63.7	69.6
7 or more	1,402	27.9	36.3	30.4
Occupation				
Employed	863	17.9	20.6	18.7
Unemployed	3,743	82.1	79.4	81.3
Living arrangements				
Living with partner	843	17.9	19.3	18.3
Living alone	759	15.7	18.2	16.5
Living with partner and children	493	10.2	11.8	10.7
Living alone with children	425	9.4	8.9	9.2
Living with others	2,086	46.8	41.7	45.3
Self-perception of health				
Good	1,962	40.1	48.4	42.6
Bad	2,644	59.9	51.6	57.4
Chronic diseases				
None	1,031	23.0	20.8	22.4
1	1,352	29.2	29.7	29.4
2	1,260	27.1	27.9	27.4
3 or more	963	20.6	21.6	20.9
Limitation in ADL				
No limitation	3,843	79.5	92.7	83.4
Limitation on at least one ADL	763	20.5	7.3	16.6
Limitation in IADL				
No limitation	3,031	60.4	78.4	65.8
Limitation on at least one IADL	1,575	39.6	21.6	34.2
Dependency level				
No dependency	3,410	68.3	87.5	74.0
Mild/Moderate	421	9.2	9.1	9.1
Severe	775	22.5	3.4	16.8
Deaths during 2009-2015 follow-up		583	125	708
Analyzed sample		3,229	1,377	4,606

ADL: activities of daily living; IADL: instrumental activities of daily living.

Source: prepared by the authors using the *Chilean National Survey of Dependence in Older People* and death registry.

Figure 1

Kaplan-Meier survival estimates according to social participation for men, women, and total.



Source: prepared by the authors using the *Chilean National Survey of Dependence in Older People* and death registry.

Table 2 contains the hazard ratio for each estimated model. Model 1, which measures the effect of social participation on mortality risk, shows that older people who participate in at least one social association have 52% lower mortality risk than those who do not participate in any. Model 2, which includes the demographic variables sex and age, shows a lower effect of social participation on increased survival. However, its protective effect is still significant, reaching 41%. As expected, mortality risk was higher in men, increasing with age.

In Model 3, the effect of social participation is statistically significant ($p < 0.001$) despite decreasing with socioeconomic and living arrangement variables. Another expected result is related to the inverse association between schooling rate and mortality in older age, considering that older adults with lower schooling levels had a 30% higher mortality risk than those with higher schooling levels. Older adults who declared they continue to work had a lower mortality risk. Lastly, adults who lived with their husbands, wives, or partners had lower mortality risk than those living in another kind of arrangement.

Model 4 includes the covariates associated with health condition, showing that older people who participate in social associations or organizations (politics, sports, religion, neighborhood, etc.) had a 22% lower mortality risk than those who do not participate in any social group. That is, social participation significantly affects lifespan ($p < 0.05$) despite controlled demographic, socioeconomic, living arrangement, and health variables. Health covariates behavior shows expected results: worse health conditions in all studied dimensions are associated with higher mortality risk.

According to the Akaike information criterion (AIC) and Bayesian information criterion (BIC), among all models, Model 4 fits the best (lower AIC and BIC values).

Table 2

Hazard mortality ratios of older adults in Chile, 2009-2015.

Variables	Model 1 HR (95%CI)	Model 2 HR (95%CI)	Model 3 HR (95%CI)	Model 4 HR (95%CI)
Social participation (reference: does not participate)				
Participates	0.48 (0.40-0.58) *	0.59 (0.48-0.72) *	0.62 (0.51-0.75) *	0.78 (0.63-0.95) **
Demographics factors				
Gender (reference: women)				
Men		1.72 (1.48-2.00) *	1.94 (1.66-2.27) *	2.09 (1.78-2.45) *
Age (reference: 60-69 years)				
70-79		2.60 (2.10-3.22) *	2.28 (1.83-2.85) *	2.15 (1.72-2.69) *
80-89		5.83 (4.72-7.21) *	4.86 (3.89-6.08) *	3.44 (2.73-4.37) *
90 or more		10.1 (7.60-13.5) *	8.17 (6.05-11.0) *	4.73 (3.43-6.53) *
Socioeconomic factors				
Schooling level (reference: 7 or more years)				
0-6			1.28 (1.07-1.54) **	1.17 (0.97-1.41) ***
Occupation (reference: employed)				
Unemployed			1.63 (1.25-2.14) **	1.22 (0.92-1.61)
Living arrangement (reference: living with partner)				
Living alone			1.29 (0.99-1.68) ***	1.50 (1.15-1.96) **
Living with partner and children			1.37 (1.01-.1.86) #	1.23 (0.90-1.67)
Living alone with children			1.69 (1.26-2.27) *	1.67 (1.24-2.24) *
Living with others			1.32 (1.05-1.65) #	1.20 (0.95-1.50)
Health status				
Self-perception of health (reference: good)				
Bad				1.32 (1.09-1.60) **
Chronic diseases (reference: none)				
1				1.23 (0.97-1.55) ***
2				1.35 (1.07-1.70) **
3 or more				1.60 (1.26-2.05) *
Limitation in ADL (reference: no limitation)				
Limitation on at least one ADL				1.52 (1.24-1.87) *
Limitation in IADL (reference: no limitation)				
Limitation on at least one IADL				1.29 (1.01-1.64) #
Dependency level (reference: no dependency)				
Mild/Moderate				1.03 (0.76-1.39)
Severe				1.51 (1.13-2.00) **
AIC	11,751.35	11,333.89	11,310.83	11,164.78
BIC	11,757.79	11,366.06	11,381.62	11,287.05

95%CI: 95% confidence interval; ADL: activities of daily living; AIC: Akaike information criterion; BIC: Bayesian information criterion; HR: hazard ratio; IADL: instrumental activities of daily living.

Source: prepared by the authors using the *Chilean National Survey of Dependence in Older People* and death registry.

* $p < 0.001$;

** $p < 0.01$;

*** $p < 0.1$;

# $p < 0.05$.

Discussion

We associated a representative sample of older adults with the official vital statistics of Chile, showing that participating in social associations or organizations is statistically correlated with lower mortality risk in old age. Older adults who mentioned participating in any association had a 22% lower mortality risk than those who did not participate in any, even with controlled demographic, socioeconomic, living arrangement, and health variables. Similar results have been described for industrialized countries [3,13,14]. Our findings also suggest an inverse association between economic conditions (schooling level and occupation) and mortality for older ages. We found that older adults with higher education levels had a lower risk of mortality during follow-up than those with lower levels, corroborating with previous evidence from Chile [19,20] and other societies [21,22,23,24]. We also found that the type of living arrangement of older adults influences their longevity. As an example, those who live alone had higher mortality risk than those who live with their partners and children. These results corroborate with previous study [25]. However, Model 3 shows that this risk is higher for those who live in other types of arrangements and even those who live alone with their children, which could be associated with socioeconomic conditions. That is, those who live alone have access to greater material resources, institutional care, private medical services, and better overall health. On the other hand, in Model 4, health status variables increase the mortality risk of living alone compared to other living arrangements, possibly because other types of arrangement are more likely to receive direct care. Not all categories of the living arrangement variable were statistically significant in the full model (Model 4); however, a joint test (Wald test) indicates significance at 1% (p-value = 0.007).

As expected, the protective effect of social participation on mortality risk remains significant despite decreasing with added health status variables. Some studies support social activity as an essential component for healthy aging [26]. As aforementioned, social activity influences a series of health-related results, including lower risk of disability – such as performing basic personal and IADL – and cognitive ability, among other issues [3,6,7,8,9,10,11,13,14,27]. Regardless of the health results used, evidence shows that social participation is a stronger predictor of health and longevity.

For Latin America, effects of social participation on mortality in older adults are still indefinite. Gontijo et al. [28] found that in Brazil, specifically in the municipality of Bambuí, social participation is associated with a lower mortality rate among older adults. Similarly, Hill et al. [29] showed that, in Mexico, higher religious participation is related to lower mortality risk. This study results contribute to the literature on this topic available in Latin America, confirming that social life not only improves emotional, affective, and economic aspects but also increases longevity. Older adults who do not participate in any social activity thus hinder their opportunities of enjoying a long life.

This study has limitations. Firstly, we cannot know if the association between social participation and mortality varies with the frequency that an organization is visited – as other authors have suggested – because of the lack of information about the frequency of attendance in the different organizations. Today the literature diverges on how to operationalize the social participation variable. Some studies have elaborated synthetic indexes of social participation [4,5], another used the membership in social organizations or associations as a proxy [13], whereas others use different measures of social participation [15,16,17], including the division between secular and religious participation [14]. Nevertheless, regardless of the measure of social participation used, the results indicate that older adults should maintain an active life and a high attendance at social activities for a healthier and longer life.

Secondly, we could not measure the effect of possible variations in social participation on the mortality risk in older adults because of the cross-sectional nature of the data. Moreover, we believe that the effect of social participation on mortality in older age begins in the early years. Calvin et al. [30] found that, for Scotland, having an affiliation or membership in a club at 18 years old was related to a reduced risk of death in older ages, especially at 78 years old. In other words, the effect of social participation over mortality risk does not begin with the late stages of life, but results from an accumulative process throughout the life cycle. Future studies could address the factors that interact with social participation throughout a lifetime to identify how those interactions influence life expectancy.

This study estimated a series of models, including demographic, economic, living arrangements, and health variables. However, social participation can also be associated with mortality risk based on other factors, including psychological or neuronal aspects that affect social participation in older

people. Future investigations must therefore explore the association between social participation and mortality in old ages by separately analyzing the engagement and frequency in the different social organizations, which we grouped in a single variable. Moreover, we believe that including questions regarding older adults' use of time is essential. According to the *National Time-use Survey* (2015) [31], older people become more involved in social activities that take place during weekdays than other age groups (3.6% older people vs. 2.7% total population), and women usually have higher social participation than men (3 hours vs. 2 hours and 31 minutes, respectively).

Gender differences in the association between social participation and mortality risk must also be studied considering the differences in which men and women construct their processes of social participation in old age, which somehow protect some more than others.

Finally, as the country moves forward regarding longitudinal data collection, we believe that this information could support in-depth investigations on the changes of the social participation variable and covariates over time, especially those related to health conditions and their association with mortality risk in older adults.

Conclusion

This study results confirm that social participation significantly protects people against mortality in old age in highly unequal societies, including that of Chile. Since it can be modified by public policies, we consider that our study is useful to elaborate public policies that promote the social participation of older adults, especially in Latin American countries, where the older population will increase at varying rates because of a demographic transition.

This study contributes to the Chilean literature on the association between social participation and mortality in advanced ages by an empirical examination in the country. Our results can be used to design public policies that promote social participation both in Chile and other Latin American countries since they establish an association between social participation and life expectancy.

Finally, Chile must promote active aging and social participation for both late and early stages of life with several public policies, considering the association between social participation and mortality. Corroborating with evidence from other regions, we found that active participation or engagement in social organizations greatly contributes to improved health and survival.

Contributors

All the authors contributed to the study design, data analysis, and critical review of results; collaborated in writing the paper; and approved its final version.

Additional informations

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Resumen

Nuestro objetivo es examinar el grado en el que la participación social está asociada con el riesgo de mortalidad en mujeres y hombres mayores en Chile. Usamos el Estudio Nacional de la Dependencia en Adultos Mayores*, que está vinculada a estadísticas vitales para obtener los registros de defunción. En total, estimamos cuatro modelos de riesgo proporcionales. Incluso controlando las variables sociodemográficas, económicas, familiares y de salud, observamos que estos adultos mayores que se implicaban en actividades sociales tenían un 22% de riesgo más bajo de morir, comparados con quienes no participaban socialmente. En conclusión, la participación social es un factor protector fuerte y significativo de mortalidad en edades avanzadas en Chile. Por ello, es necesario promover la participación social desde una perspectiva de curso de vida, puesto que el efecto en la mortalidad en edades avanzadas puede ser un reflejo de la acumulación de ventajas entre quienes a lo largo de su vida mantuvieron una vida social activa.*

Participación Social; Mortalidad; Anciano

Resumo

O estudo teve como objetivo analisar a associação entre participação social e risco de mortalidade em homens e mulheres idosos no Chile. Utilizamos a Pesquisa Nacional sobre Dependência do Idoso*, que está relacionada aos dados vitais, para obter os registros de óbitos. No total, estimamos quatro modelos de regressão de risco proporcional. Mesmo depois de ajustar para variáveis sociodemográficas, econômicas, familiares e de saúde, observamos que idosos envolvidos em atividades sociais têm risco de morte 22% mais baixo em relação aos que não participam socialmente. Como conclusão, a participação social é fator de proteção forte e significativo contra a morte entre idosos chilenos. Portanto, é necessário promover a participação social a partir de uma perspectiva do curso de vida inteiro, uma vez que a mortalidade nas idades mais avançadas pode ser reflexo do acúmulo de desvantagens provocadas pela falta de atividade social ao longo da vida.*

Participação Social; Mortalidade; Idoso

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