

Social Isolation and Loneliness among Community-Dwelling Older Chilean Adults: A Gender Perspective

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Abstract

Aim: This study examined the association among individual traits, socio-demographic factors, and health and lifestyle factors related to social isolation and loneliness among community-dwelling older adults in Chile, with emphasis on gender differences. **Methods:** Using a cross-sectional design, 6755 participants aged 60 and older from the National Quality of Life and Health Survey were analysed. Social isolation was assessed using both external and internal domains as defined by Zavaleta et al., while loneliness was measured using the Three-Item Loneliness Scale from Hughes et al. Gender-specific multivariable logistic regression models with average marginal effects were used to analyse the relationships among social isolation, loneliness, and the previously mentioned factors. **Results:** Findings indicate that rates of social isolation and loneliness increase with age, and women are more affected, mainly by loneliness. Key factors contributing to social isolation for both genders include lower educational attainment, living alone, loneliness, and work status. Sharing caregiving activities and moderate smartphone use both reduce the risk of social isolation among women. Common predictors of loneliness for both genders include educational attainment, living alone, depression, social isolation, experiences of discrimination, caregiving activities, dissatisfaction with oneself or family life, and a sense of not belonging in the neighbourhood. Retirement serves as a protective factor against loneliness for older women, while being overweight or underweight may protect older men. **Conclusions:** The study highlights important gender differences in social isolation and loneliness among older adults, demonstrating that psychosocial factors strongly influence these outcomes. These insights can inform the development of public policies and interventions to improve the mental health and well-being of this population.

Keywords

Social Isolation, Loneliness, Social Disconnection, Older Adults, Quality of Life, Gender Perspective, Chile

1. Introduction

By 2050, approximately 22% of the global population, or 2.1 billion people, will be aged 60 or older, with two-thirds residing in low- and middle-income countries (WHO, 2024). In South America, the number of people aged 60 or older increased from 8.6% in 2000 to 13.5% in 2022, with expectations of around 25% by 2050. This trend is particularly notable in Brazil, Chile, Argentina, and Uruguay (CEPAL, 2022). In Chile, the 2024 Census reports that 3,665,028 individuals are aged 60 or older, representing 19.8% of the population; women account for 55.6%. By 2050, older adults are expected to comprise nearly one-third of Chile's total population (INE, 2024).

This demographic shift is creating a demand for services and policies that support healthy ageing (CEPAL, 2022). The United Nations (UN) has declared 2021-2030 as the Decade for Healthy Ageing, urging countries to protect the rights of older people and combat age discrimination, neglect, abuse, and violence, as well as to reduce social isolation and loneliness among older persons, among other crucial issues (UN, 2020).

Healthy ageing means more than merely avoiding illness; it involves maintaining physical and social abilities while ensuring a safe environment. Strong social ties and community engagements significantly contribute to the health and well-being of older adults. Positive social connections lead to improved emotional support, increased information sharing, and enhanced opportunities for social participation (National Academies of Sciences, Engineering, and Medicine, 2020; Kim & Park, 2025). However, social isolation and loneliness can harm physical and mental health, leading to issues like depression, cognitive decline and premature mortality. According to the World Health Organisation (WHO), health encompasses complete well-being, highlighting the importance of social connections. These connections have structural, functional, and quality dimensions which significantly influence physical and mental well-being. Conversely, social disconnection refers to the lack of these connections, manifesting as social isolation, loneliness, inadequate support, low social capital, and negative experiences (Pomeroy et al., 2024; WHO, 2025).

Several theories explain how social connections affect the health of older adults. Berkman et al. (2000) suggest that the sociocultural environment shapes an individual's social network, impacting health through social support, influence, and engagement (Berkman et al., 2000). Umberson and Montez (2010) argue that poor-quality or limited social relationships can harm mental, physiological, and behavioural health over time (Umberson & Montez, 2010). Additionally, theories

focusing on the biophysiological and neuroendocrinological effects of social disconnection on health suggest that social isolation alters biological processes and inflammatory biomarkers, leading to increased frailty and chronic health issues and impairing overall functioning and health (Uchino, 2006; Cacioppo et al., 2015; Cudjoe et al., 2022).

Despite extensive research on social isolation and loneliness, these terms are often used interchangeably in social research; however, they denote distinct experiences (WHO, 2025; Nicholson, 2012; Asante & Tuffour, 2022). The confusion arises from their definitions: both indicate a lack of human connection, but the subjective and complex nature of loneliness complicates the distinction (Holt-Lunstad et al., 2017). Additionally, confusion surrounding the conceptualisation of these conditions is evident in the measurement methods used for both concepts, which often rely on instruments that incorporate elements of both social isolation and loneliness (National Academies of Sciences, Engineering, and Medicine, 2020; WHO, 2025; Hajek et al., 2023).

Social isolation refers to an objective lack of roles, relationships, or interactions with others. It involves a limited social support network and infrequent social interactions, regardless of personal feelings about social life. Social isolation reflects explicitly a deficit in the structural dimension of social connection, rather than involving the other dimensions. It is measured by the absence or weakness of a social support network (Institute of Medicine (US), 1992; WHO, 2025).

Loneliness is a subjective, negative emotional state that arises when a person's expectations of social connection differ from their actual experiences of social connection (Russell et al., 1980). It can stem from a lack of friends, support, or poor interactions. Unlike solitude, loneliness is usually involuntary and unwanted (Institute of Medicine (US), 1992). While occasional loneliness can be beneficial, long-term loneliness can lead to serious health and social issues. From an evolutionary perspective, loneliness is considered "double-edged": while short-term loneliness can be beneficial, chronic loneliness is harmful, resulting in various health issues and significant social and economic challenges (Institute of Medicine (US), 1992).

Recent meta-analyses across 27 countries indicate that social isolation affects 25.0% to 33.6% of older adults in the community (Teo et al., 2023; Hajek et al., 2023; WHO, 2025). The estimated prevalence of loneliness ranges from 12.0% to 33.0%, with significant differences observed between genders (WHO, 2021; WHO, 2025). Higher rates of loneliness are observed in low-income (24.3%) and lower-middle-income countries (19.3%), compared with 10.6% in high-income countries (Akhter-Khan et al., 2024; WHO, 2025). This disparity is linked to income and cultural differences, with lower income levels correlating with greater loneliness. Cultural factors also play a role; in collectivist societies, social support is greater, but it is diminishing in modern society due to rising individualism, changing family structures, socioeconomic inequalities, digital exclusion, and public insecurity (Yildirimer, 2025; WHO, 2025). Marginalised individuals and caregivers

also report significant social disconnection, with 21.0% to 52.7% of caregivers for mental health patients experiencing social isolation and loneliness, respectively (Guan et al., 2023; WHO, 2025).

Chile is experiencing a rapid demographic shift, with the proportion of adults aged 60 and over increasing from 16.2% of the population in 2017 to 19.8% in the 2024 Census, and projected to reach an estimated 32% by 2050 (INE, 2023). This change is primarily driven by the Baby Boomer generation, which has undergone significant social, political and economic changes. However, many baby boomers encounter challenges such as loss of identity after retirement, age-related prejudice, and a disconnect from family life due to dispersed families. High divorce rates lead many to live alone, heightening the risk of social disconnection (Leach et al., 2008; Lin & Brown, 2012; Lissitsa et al., 2021). They also face gaps in social protection and leisure services, emphasising the need for targeted public policies to promote healthy ageing.

The prevalence rates of social isolation and loneliness among older adults in Chile vary across studies and samples. A post-pandemic study in Santiago found that 42% of self-sufficient older adults faced social isolation, while 26% felt lonely (Gierke et al., 2024). The 2023 Social Wellbeing Survey indicated a loneliness rate of 32% (Observatorio del Envejecimiento, 2025). Loneliness is particularly high among certain ethnic groups in rural areas, with rates above 55%, except for Rapa Nui (9.0%) and Diaguaita (14.0%). In contrast, studies conducted within non-indigenous populations report loneliness rates between 42% and 45% (Carrasco et al., 2021; Herrera et al., 2021). A national study by Herrera et al. (2021) revealed increases in loneliness from 48% to 53% and in social isolation from 39% to 41% during the COVID-19 pandemic (Herrera et al., 2021).

Given the limited research on the social aspects of health among the baby boomer generation in Chile, this study aims to examine the associations between individual traits, socio-demographic factors and health and lifestyle issues with social isolation and loneliness among older adults living in the community. The goal is to identify potential risk factors associated with these issues and to examine gender differences. By enhancing our understanding of how social disconnection affects the quality of life and well-being of older adults, this research will contribute to the development of public policies and effective interventions that promote healthy ageing.

2. Method

2.1. Data and Sample Population

This observational cross-sectional study utilises data from the National Quality of Life and Health Survey (NQoLHS-2023/2024), conducted by Chile's Ministry of Health and the Institute of Sociology at the Pontifical Catholic University of Chile. It targets non-institutionalised Chileans and foreign residents aged 15 and older living in private homes for at least six months. The study assesses perceptions of health-related quality of life across all regions of Chile using a stratified sampling

method. Personal interviews were conducted between October 2023 and February 2024 with 16,590 participants, resulting in a sample of 6755 individuals aged 60 and over who responded independently (Ministry of Health, 2025).

2.2. Dependent Variables

Based on the theoretical framework proposed by Berkman and Syme (1979), which suggests that social ties and relationships are crucial in determining health status (Berkman & Syme, 1979) and addressing the limitations of current tools for measuring social isolation in community-dwelling populations, as noted by Kim and Park (2025), the social isolation concept was operationalized using a 6-item measure adapted from the approach of Zavaleta, Samuel, and Mills (2017), which evaluates domains from both external and internal perspectives of social isolation (Zavaleta et al., 2017).

External indicators of social isolation include: 1) Current marital or civil status (1 = married, civil partner, or cohabitant; 0 = other statuses), 2) Social participation (1 = participates in one or more social organizations, including religious groups; 0 = does not participate), 3) Social network support (If you were in financial trouble, would you have relatives or friends you could count on for help? 1 = yes; 0 = no), 4) Emotional support (When you have problems, do you have anyone you trust to ask for help or advice? 1 = yes; 0 = no). Internal indicators of social isolation include: 1) Level of satisfaction with time shared with family (Are you satisfied with how you and your close family share time together? 1 = yes; 0 = no), and 2) Sense of belonging to the community (How often do you feel like you belong to your neighbourhood, a social group, or similar? 1 = always/often; 0 = never/rarely). Because the SI is a negative construct, the value of each indicator was reversed before counting the total score. The total score ranges from 0 to 6, and because the distribution of total scores was negatively skewed, the cut-off score was set at the 67th percentile. A score of 3 or more indicates social isolation. With these criteria, 2222 individuals were identified as socially isolated. SI was categorised as a binary variable (1 = socially isolated; 0 = not socially isolated).

Loneliness was measured using the Three-Item Lonely Scale (TILS) from Hughes et al. (2004), which is part of the Revised UCLA Loneliness Scale (R-UCLA; Russell, 1996) (Hughes et al., 2004; Russell, 1996). It includes questions about lack of companionship, feeling left out, and feeling isolated. Responses are scored on a 1 - 3 scale, yielding total scores from 3 to 9. A cut-off score at the 75th percentile (5 or higher) was operationally defined to better capture loneliness. Only those who scored 5 points were classified as lonely if they answered “often” to the first question. This method identified 1785 individuals experiencing loneliness.

2.3. Independent Variables

2.3.1. Socio-Demographic Factors

The models for social isolation and loneliness examined various factors, including age, gender, education, income, employment, retirement status, and household

size. Participants were categorised by age into the following groups: 60 - 64 years (reference), 65 - 69 years, 70 - 74 years, and 75 years and older. In the social isolation model, gender was binary, with women as the reference group; in the loneliness model, men served as the reference group. Education level was categorised into four groups: illiterate/elementary, high school, technical, and graduate, with the latter used as the reference group. Household income was categorised into quintiles, with the fifth quintile as the reference. Employment status and retirement status were treated as binary in their respective models, with individuals who were neither employed nor retired as reference groups. Lastly, household size was categorised into four groups: 1 person, 2 people, 3 people, and 4 or more people, with the latter serving as the reference group.

2.3.2. Health and Lifestyle Factors

Both social isolation and loneliness models considered factors like self-rated health, sensory deficits, multimorbidity, disability level, depression/anxiety or other mental health issues, physical activity, and nutritional status. Physical mobility—the ability to move from one place to another—was included only in the social isolation model.

Self-rated health was categorised into three groups: very poor/poor, fair, and good/very good, with the latter group serving as the reference. Sensory deficiency, including blindness and/or deafness, was a binary variable, and individuals without sensory deficits served as the reference group. Multimorbidity was assessed by the number of self-reported physician diagnoses of 14 chronic diseases. These conditions include hypertension, diabetes mellitus, acute myocardial infarction, heart failure/arrhythmias, stroke, arthritis/osteoarthritis, depression, anxiety or other mental health disorders, chronic obstructive pulmonary disease (COPD), liver cirrhosis/chronic liver damage, cataracts/glaucoma, chronic pain (lasting more than 3 months), urinary incontinence, chronic kidney failure and other chronic diseases. Multimorbidity was defined as having at least two of the fourteen selected conditions mentioned above, and was categorised as a binary variable (1 = multimorbidity; 0 = none or one chronic disease).

The disability level was a binary variable, with those with moderate or severe disability as the group of interest, and those with mild or no disability as the reference group. Depression/anxiety or other mental health disorders were included as a binary variable (1 = yes; 0 = no). According to WHO guidelines, older adults should engage in 150 to 300 minutes of moderate-intensity or 75 to 150 minutes of vigorous-intensity aerobic activity, or an equivalent combination of both throughout the week (WHO, 2020). Physical activity was included as a binary variable: individuals who met the WHO recommendations were classified as physically active, whereas those with no activity or lower levels of activity were classified as the control group. Physical mobility was measured with the question, “How well do you get from one place to another?” Responses ranged from “very bad” to “very good”. Responses were grouped into three categories: “very bad/bad”, “neither good nor bad”, and “good/very good”, with the last category as the reference

group.

The WHO defines obesity in adults as a BMI ≥ 30 kg/m²; however, given the issue of sarcopenic obesity, this study uses a cut-off of BMI ≥ 32 kg/m² for older adults, per Chile's Ministry of Health guidelines (Ministerio de Salud, 2008). Due to the exploratory nature of the study, all four nutritional categories—underweight (BMI < 23.0), normal weight (BMI 23.1 - 27.9), overweight (BMI 28.0 - 31.9), and obesity (BMI ≥ 32)—were included in the loneliness model, with the normal weight group as the reference group.

2.3.3. Individual Trait Factors

The study examines the psychological and sociological factors that affect human interactions. Key variables included in both models were: discrimination, general life satisfaction, family life satisfaction, personal relationship satisfaction, and caregiver activity. The social isolation model incorporates perceptions of living in a safe neighbourhood, smartphone use, and feelings of loneliness, whereas the loneliness model includes satisfaction with oneself, a sense of belonging to the neighbourhood, acceptance of one's physical appearance, pet ownership, and social isolation.

Discrimination was measured with the question, "Have you felt discriminated against in the last year?" Response options were yes or no. The no option was the reference group. General life satisfaction was measured with the question, "How do you feel about your life in general?" Responses ranged from 1 to 7, where 1 corresponded to "very bad" and 7 to "very good". Responses were grouped into three categories: "very unsatisfied/unsatisfied" (scores 1 - 3), "neither satisfied nor unsatisfied" (score 4), and "satisfied/very satisfied" (scores 5 - 7), with the last category as the reference group. Family life satisfaction was measured with the question, "How do you feel about your family life?" Responses ranged in a scale from 1 to 7, where 1 corresponding to "very bad" and 7 to "very good". Responses were grouped into three categories: "very unsatisfied/unsatisfied" (scores 1 - 3), "neither satisfied nor unsatisfied" (score 4), and "satisfied/very satisfied" (scores 5 - 7), with the last one category as the reference group.

Satisfaction with oneself was measured by the question: "In the last 2 weeks, how satisfied are you with yourself?" Responses ranged from 1 ("Very dissatisfied") to 5 ("Very satisfied") and were categorized as follows: "Very dissatisfied/Dissatisfied" (scores 1 - 2), "Neither satisfied nor dissatisfied" (score 3), and "Satisfied/Very satisfied" (scores 4 - 5), with the last group as the reference. Personal relationship satisfaction was measured with the question: "In the last 2 weeks, how satisfied are you with your personal relationships?" Responses ranged from 1 ("Very unsatisfied") to 5 ("Very satisfied"). They were grouped into three categories: "Very unsatisfied/unsatisfied" (scores 1 - 2), "Neither satisfied nor unsatisfied" (score 3), and "Satisfied/very satisfied" (scores 4 - 5), with the last group as the reference.

Acceptance of physical appearance was measured by the question: "In the last two weeks, have you been able to accept your physical appearance?" Responses

were scored from 1 to 5, with 1 indicating “Not at all” and 5 meaning “Totally.” The scores were categorised as “Not at all/little” (1 - 2), “Moderate” (3), and “Quite a bit/totally” (4 - 5), with the last category serving as the reference group.

Safety perception in the neighbourhood was assessed with the question: “How safe do you feel walking alone in your neighbourhood after dark?” The response options were: very unsafe, somewhat unsafe, moderately safe, and very safe. For analysis, these were grouped into a dichotomous variable: 0 for “very unsafe/somewhat unsafe”, and 1 for “moderately safe/very safe”. A sense of belonging to the neighbourhood was measured by the question: “How much do you agree with the statement that you feel like you belong in your neighbourhood?” Responses were scored on a 1 - 5 scale, where 1 = “Strongly agree” and 5 = “Strongly disagree”. The responses were categorised as follows: “Very agree/agree” (scores 1 - 2), “Neither agree nor disagree” (score 3), and “Disagree/strongly disagree” (scores 4 - 5). The first category serves as the reference group.

The study highlights that caregiving among older adults has notable psychological and social effects, particularly influencing mental health and overall well-being (Bongelli et al., 2024; Yu et al., 2025). Caregivers were identified with the question: “Apart from your usual activities, are you responsible for caring for children, elderly individuals with moderate to severe dependency, or chronically ill individuals?” Response options were: “Yes, as the sole caregiver”, “Yes, shared with another person”, and “No, I am not in charge of anyone”, with the last option as the reference category.

Research indicates that smartphone use can help older adults strengthen social connections and alleviate feelings of loneliness (Soundararajan et al., 2023; Loos et al., 2025). To measure usage, participants were asked, “In general, how many hours a day do you typically use your smartphone?” Responses varied from 0 to 24 hours. Due to the skewed nature of the data, usage was categorised based on the 90th percentile cut-off, resulting in two higher usage categories: moderate use (1 - 4 hours per day) and excessive use (5 or more hours per day). A “no use” category served as the reference group. Similarly, research indicates that pet ownership, particularly of dogs, is associated with lower loneliness among older adults, especially among women living alone (Ikeuchi et al., 2021; Marí-Klose et al., 2024). In this study, pet ownership was measured with the question, “Do you have pets?” Response options were yes or no. The no option was the reference group.

2.4. Statistical Analysis

Descriptive statistics were used to characterise the sample. The sample design was integrated into the analysis to ensure valid inferences about the population. Multicollinearity was assessed using a Spearman correlation matrix and variance inflation factors (VIFs). Multivariate logistic regression models were used to examine predictors of social isolation and loneliness. Additionally, separate models were developed for men and women to investigate gender differences. To improve understanding of the results, average marginal effects (AMEs) were calculated to estimate average adjusted probabilities (AAPs).

2.5. Model Specification

A univariate analysis was performed for each variable, focusing on those with p -values < 0.25 from the Wald test of logistic regression. A purposeful approach was used to refine covariate selection, including variables with significance levels of 0.1 or 0.15, and excluding non-significant covariates that were not considered confounders (Hosmer & Lemeshow, 2000). Multivariate logistic regression models for social isolation and loneliness were developed from survey data, utilising *svyset* and *svy* commands to adjust for sampling design. Odds ratios, standard errors, and 95% confidence intervals were estimated. Model goodness-of-fit was assessed using the Hosmer-Lemeshow test, and predictive ability was evaluated using the area under the receiver operating characteristic (ROC) curve (AUC). Average marginal effects (AMEs) were calculated using the *dx/dy* command and the delta method to standardise standard errors, showing changes in predicted probabilities as predictors moved from the reference category, while controlling for other variables (Williams, 2012). Statistical significance was assessed at the 10% level using Wald's chi-square test, with analyses performed in Stata 14.0.

3. Results

3.1. Descriptive

The NQoLHS-2023/2024 survey interviewed 6755 older adults, with an average age of 70.6 years (SD: 7.65). Among them, 30.4% reported social isolation (95% CI: 11.07 - 14.08), and 23.4% reported loneliness (95% CI: 21.55 - 25.26). These figures were slightly lower than the 32.9% and 26.5% reported in the raw data, respectively. Women accounted for 56.0% of those socially isolated, with an average age of 71.3 years (SD: 7.91) and a prevalence of 30.0% (95% CI: 27.69 - 32.34). In contrast, men with an average age of 71.5 years (SD: 7.51) reported 31.0% (95% CI: 27.90 - 34.37) of social isolation. The gender difference was not statistically significant. Prevalence varied by age: 29.1% in individuals aged 60 - 64, 30.5% in those aged 65 - 69, 27.1% in those aged 70 - 74, and 33.8% in those aged 75 and older.

Regarding loneliness, 60.4% of the participants were women, with an average age of 70.6 years (SD: 7.63) and a prevalence of 25.5% (95% CI: 23.3 - 27.8). In men, with an average age of 70.9 years (SD: 7.49), the prevalence was 20.7% (95% CI: 18.5 - 23.1). The gender difference was statistically significant. Prevalence also varied by age: 21.7% among individuals aged 60 - 64, 23.8% among those aged 65 - 69, 23.6% among those aged 70 - 74, and 24.3% among those aged 75 and older.

Additionally, the results indicate that 53.5% of women do not experience social isolation and loneliness, and 13.2% experience both. Among men, 54.4% did not experience social isolation and loneliness, and 13.3% experienced both. **Table 1** presents survey data on the sample characteristics related to social isolation and loneliness among older adults in Chile.

Table 1. Sample characteristics according to social isolation and loneliness in Chilean older adults. NQoLHS-2023/2024.

Characteristics	Social Isolation		Loneliness	
	isolated (n: 2222)	non-isolated (n: 4533)	feel alone (n: 1785)	non-alone (n: 4960)
Sociodemographic factors				
Age groups (%)				
60 - 64 years old (ref.)	26.9%*	28.7%	26.2% ^{ns}	28.7%
65 - 69 years old	24.5%*	24.4%	25.0% ^{ns}	24.3%
70 - 74 years old	16.5%*	19.4%	18.8% ^{ns}	18.4%
75 years old and over	32.2%*	27.5%	30.1% ^{ns}	28.5%
Gender (%)				
women (ref. in SI models)	-	-	60.4%**	53.8%
men (ref. in L models)	45.6% ^{ns}	44.3%	-	-
Education levels (%)				
Illiterate/elementary	54.8%***	42.0%	55.0%***	43.1%
high school	24.8%***	30.7%	27.5%***	29.3%
technical school	15.0%***	17.4%	12.9%***	17.8%
graduated (ref.)	5.5%***	9.9%	4.6%***	9.8%
Household income quintiles				
1st quintile	30.9%***	17.1%	32.4%***	17.9%
2nd quintile	34.3%***	33.2%	33.2%***	33.7%
3rd quintile	8.5%***	12.4%	8.5%***	12.1%
4th quintile	19.6%***	26.0%	20.1%***	25.3%
5th quintile (ref.)	6.7%***	11.2%	5.9%***	11.0%
Working				
	18.6% ^{ns}	20.2%	-	-
Retiree				
	-	-	54.8% ^{ns}	55.8%
Household size				
one person	16.7%***	8.4%	16.4%***	9.2%
two persons	31.3%***	31.3%	31.7%***	31.2%
three persons	21.4%***	24.6%	22.7%***	23.9%
four or more persons (ref.)	30.7%***	35.8%	29.2%***	35.8%
Health and Lifestyle factors				
Self-rated health status				
poor/very poor	23.8%***	12.8%	25.2%***	13.4%
fair	33.1%***	31.6%	37.4%***	30.5%

Continued

good/very good (ref.)	43.1%***	55.5%	37.3%***	56.1%
Sensory deficiency	33.4%**	27.9%	36.6%***	27.4%
Multimorbidity	73.2%***	65.2%	78.2%***	64.4%
Disability (moderate/severe)	77.3%***	67.3%	82.0%***	66.8%
Depression. anxiety	26.3%***	17.2%	36.6%***	14.9%
Physical activity	15.6%**	20.4%	15.1%**	20.1%
Nutritional status				
underweight	17.5%***	10.6%	14.4% ^{ns}	12.1%
normal weight (ref.)	40.0%***	43.1%	40.4% ^{ns}	42.7%
overweight	21.4%***	27.7%	23.5% ^{ns}	26.5%
obesity	21.2%***	18.6%	21.8% ^{ns}	18.7%
Physical mobility				
very bad/bad	17.0%***	9.4%	-	-
neither good nor bad	25.6%***	18.9%	-	-
good/very good (ref.)	57.4%***	71.7%	-	-
Individual factors				
Discrimination	9.1%***	4.8%	14.0%***	3.7%
General life satisfaction				
very unsatisfied/unsatisfied	10.3%***	2.3%	11.9%***	2.6%
neither satisfied nor unsatisfied	16.7%***	9.7%	20.5%***	9.1%
satisfied/very satisfied (ref.)	73.0%***	88.0%	67.7%***	88.3%
Family life satisfaction				
very unsatisfied/unsatisfied	9.3%***	2.3%	11.8%***	2.1%
neither satisfied nor unsatisfied	23.5%***	12.8%	28.8%***	12.1%
satisfied/very satisfied (ref.)	67.3%***	84.9%	59.4%***	85.7%
Personal relationship satisfaction				
very unsatisfied/unsatisfied	12.0%***	3.0%	13.6%***	3.4%
neither satisfied nor unsatisfied	14.0%***	8.1%	16.7%***	7.9%
satisfied/very satisfied (ref.)	73.9%***	88.9%	69.7%***	88.8%
Caregiver activity				
sole caregiver	17.0%***	12.1%	17.0%**	12.6%
shared care	7.1%***	13.2%	10.7%**	11.6%
he/she is not caregiver (ref.)	75.9%***	74.6%	72.3%**	75.8%
Live in unsafe neighborhood	53.9% ^{ns}	50.1%	-	-

Continued

Daily smartphone use				
no use (ref.)	18.2%**	11.4%	-	-
moderate use	70.1%**	75.9%	-	-
excessive use	11.7%**	12.7%	-	-
Feeling alone	37.2%***	17.3%	-	-
Socially isolated	-	-	24.9%***	8.7%
Satisfaction with oneself				
very dissatisfied/dissatisfied	-	-	17.5%***	6.2%
neither satisfied nor dissatisfied	-	-	18.6%***	9.1%
satisfied/very satisfied (ref.)	-	-	63.8%***	84.7%
Sense of belonging to the neighbourhood				
very agree/agree (ref.)	-	-	76.4%***	88.1%
neither agree nor disagree	-	-	10.6%***	5.5%
disagree/strongly disagree	-	-	13.0%***	6.4%
Acceptance of physical appearance				
not at all/little	-	-	16.3%***	6.7%
moderate	-	-	28.2%***	19.8%
quite a bit/totally (ref.)	-	-	55.5%***	73.5%
Pet ownership	-	-	7.9%*	68.0%

ref. = reference group; SI: Social Isolation; L: Loneliness. *: p -value < 0.10; **: p -value < 0.05; ***: p -value < 0.001; ns: no significant.

3.2. Model Goodness of Fit Statistics

The multicollinearity diagnostic showed that most variables had low correlations ($\rho < 0.30$), except for a few pairs with moderate correlations, including self-rated health and physical mobility, retirement status and age groups, retirement status and working status, personal relationship satisfaction and satisfaction with oneself, and general life satisfaction and family life satisfaction. The mean variance inflation factor (VIF) was low at 1.25 and 1.26 for the social isolation and loneliness models, respectively, indicating no multicollinearity. The goodness-of-fit tests confirmed the models' significance, and the ROC curve area demonstrated predictive powers of 72% and 77%. Alcohol consumption and smoking were examined but removed from the models. Alcohol consumption was excluded due to 50% missing data, and smoking was not significantly associated in either univariate or multivariate models, which affected the models' robustness and simplicity.

3.3. Social Isolation Models

The analysis of the overall survey data model identified several key factors con-

tributing to social isolation among older adults in Chile. These include being men, lower educational levels, living alone, work status, being underweight, experiencing loneliness, having sole caregiving activity, dissatisfaction with overall life, family life and personal relationships, and moderate use of smartphone. Conversely, excessive smartphone use and shared caregiving activities, were protective factors significantly associated with social isolation. It must be noted that age groups, household incomes, self-rated status, sensory deficiencies, depression, disability, multimorbidity, physical inactivity, physical mobility, discrimination and live in an unsafe neighbourhood did not show a significant association with social isolation in the survey model. Details on logistic regression and average marginal effects (AMEs) from survey data on overall social isolation among older adults in Chile are provided in the supplementary materials (Table S1).

In the following tables, only the significant factors are presented. Table 2 presents the odds ratios (ORs) and average marginal effects (AMEs) with 95% confidence intervals from the logistic regression model using survey data to examine social isolation in the overall sample of older women in Chile.

Table 2. Predictors and marginal effects of social isolation from the older women’s survey data.

Covariates	Logistic Regression			Average Marginal Effects		
	OR	Std. Error	[95% C. I.]	dy/dx	Std. Error	[95% C. I.]
Education levels						
Illiterate/elementary	2.053**	0.6793	(1.070 - 3.939)	0.104**	0.0418	(0.022 - 0.186)
high school	2.032**	0.6985	(1.032 - 3.999)	0.103**	0.0444	(0.016 - 0.189)
technical school	2.941**	1.0475	(1.458 - 5.931)	0.169***	0.0483	(0.074 - 0.264)
Household income quintiles						
1st quintile	1.994**	0.7094	(0.989 - 4.018)	0.122**	0.0571	(0.010 - 0.234)
2nd quintile	1.300^{ns}	0.4722	(0.636 - 2.658)	0.043^{ns}	0.0570	(-0.069 - 0.155)
3rd quintile	1.055^{ns}	0.4394	(0.465 - 2.395)	0.008^{ns}	0.0647	(-0.119 - 0.135)
4th quintile	0.984^{ns}	0.4152	(0.429 - 2.259)	-0.002^{ns}	0.0649	(-0.130 - 0.125)
Working	1.507*	0.3288	(0.980 - 2.316)	0.072*	0.0402	(-0.007 - 0.151)
The number of people living in the home						
one person	1.610**	0.3862	(1.004 - 2.582)	0.085**	0.0428	(0.002 - 0.169)
two persons	1.096^{ns}	0.2230	(0.734 - 1.636)	0.015^{ns}	0.0340	(-0.051 - 0.082)
three persons	0.944^{ns}	0.2481	(0.562 - 1.584)	-0.009^{ns}	0.0429	(-0.093 - 0.075)
Caregiver activity						
sole caregiver	1.420^{ns}	0.4174	(0.796 - 2.533)	0.062^{ns}	0.0542	(-0.044 - 0.169)
shared caregiving	0.654**	0.1379	(0.431 - 0.990)	-0.065**	0.0307	(-0.125 - -0.005)

Continued

Nutritional status						
underweight	1.084^{ns}	0.2537	(0.684 - 1.719)	0.014^{ns}	0.0414	(-0.067 - 0.095)
overweight	0.701^{**}	0.1182	(0.503 - 0.977)	-0.058^{**}	0.0270	(-0.111 - -0.005)
obesity	1.009^{ns}	0.2091	(0.671 - 1.517)	0.002^{ns}	0.0360	(-0.069 - 0.072)
Physical mobility						
very bad/bad	1.148^{ns}	0.4332	(0.546 - 2.413)	0.023^{ns}	0.0646	(-0.103 - 0.150)
neither good nor bad	1.414^{**}	0.2165	(1.045 - 1.911)	0.060^{**}	0.0275	(-0.006 - 0.114)
Feeling alone	1.693^{***}	0.2387	(1.283 - 2.235)	0.095^{***}	0.0267	(0.042 - 0.147)
General life satisfaction						
very unsatisfied/unsatisfied	2.250^{**}	0.8057	(1.111 - 4.554)	0.155^{**}	0.0754	(-0.007 - 0.303)
neither satisfied nor unsatisfied	1.285^{ns}	0.2711	(0.848 - 1.947)	0.044[*]	0.0384	(-0.031 - 0.119)
Family life satisfaction						
very unsatisfied/unsatisfied	1.492^{ns}	0.5000	(0.772 - 2.887)	0.071^{ns}	0.0637	(-0.053 - 0.196)
neither satisfied nor unsatisfied	1.398[*]	0.2832	(0.938 - 2.083)	0.059^{ns}	0.0373	(-0.014 - 0.132)
Personal relationship satisfaction						
very unsatisfied/unsatisfied	2.229^{**}	0.5600	(1.359 - 3.656)	0.152^{**}	0.0515	(0.051 - 0.253)
neither satisfied nor unsatisfied	1.578^{**}	0.3288	(1.046 - 2.379)	0.082^{**}	0.0403	(0.003 - 0.161)
Daily smartphone use						
moderate use	0.608^{**}	0.1234	(0.408 - 0.907)	-0.090^{**}	0.0386	(-0.165 - -0.013)
excessive use	0.650^{ns}	0.1794	(0.377 - 1.120)	-0.078^{ns}	0.0495	(-0.175 - 0.019)

dy/dx: the marginal change of the outcome (dy) concerning the change from the ref. group of the factors (dx). *: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.0001$; ^{ns}: no significant.

Key predictors of social isolation in the women's survey data include lower educational attainment, membership in the first household income quintile, living alone, dissatisfaction with general life and personal relationships, neutral satisfaction with family life, neutral physical mobility, and feeling lonely. Conversely, protective factors against social isolation in older women included sharing caregiving, being overweight and moderate smartphone use.

Analysis of AMEs shows that women with technical school education are 16.9% more likely to experience social isolation than university graduates. Individuals who are illiterate or have only completed elementary school are 10.4% more likely, while attendees of high school face an 10.3% higher risk than university graduates. Belonging to the first household income quintile increases the likelihood of social isolation by 12.2% compared to those in the fifth quintile. Living alone increases the likelihood of social isolation by 8.5% compared to those living with four or more people. Women who report being highly dissatisfied and neutral with their overall life have a 15.5% and 4.4% higher risk of social isolation, respectively, com-

pared with those who are satisfied. Furthermore, those who report being highly dissatisfied or neutral with their personal relationships have a 15.2% and 8.2% higher risk of social isolation, respectively, compared with those who are satisfied. Women who experience feelings of loneliness are 9.5% more likely to be isolated. Additionally, women with neutral physical mobility have a 6.0% higher risk of social isolation than the reference group. Conversely, women with moderate smartphone use, sharing caregiving and being overweight, are 9.0%, 6.5% and 5.8% less likely to feel socially isolated compared to their reference groups, respectively.

Table 3 presents the odds ratios (ORs) and average marginal effects (AMEs) with 95% confidence intervals from a logistic regression examining social isolation among older Chilean men.

Table 3. Predictors and marginal effects of social isolation from the older men’s survey data.

Covariates	Logistic Regression			Average Marginal Effects		
	OR	Std. Error	[95% C. I.]	dy/dx	Std. Error	[95% C. I.]
Education levels						
Illiterate/elementary	2.979**	0.9870	(1.465 - 5.656)	0.186**	0.0548	(0.078 - 0.293)
high school	1.490^{ns}	0.4488	(0.823 - 2.696)	0.061^{ns}	0.0431	(-0.023 - 0.146)
technical school	1.728^{ns}	0.6955	(0.782 - 3.818)	0.087^{ns}	0.0631	(-0.037 - 0.210)
Working	1.394*	0.2494	(0.980 - 1.983)	0.061*	0.0335	(-0.004 - 0.127)
The number of people living in the home						
one person	2.113**	0.5506	(1.264 - 3.530)	0.144**	0.0516	(0.043 - 0.246)
two persons	1.256^{ns}	0.2543	(0.843 - 1.872)	0.041^{ns}	0.0361	(-0.030 - 0.112)
three persons	1.223^{ns}	0.3245	(0.725 - 2.063)	0.036^{ns}	0.0472	(-0.057 - 0.128)
Caregiver activity						
sole caregiver	1.933**	0.5437	(1.111 - 3.364)	0.132**	0.0591	(0.016 - 0.248)
shared caregiving	0.641^{ns}	0.2508	(0.297 - 1.385)	-0.075^{ns}	0.0619	(-0.196 - 0.046)
Nutritional status						
underweight	2.172**	0.6221	(1.236 - 3.818)	0.154**	0.0615	(0.034 - 0.275)
overweight	0.910^{ns}	0.1615	(0.641 - 1.290)	-0.017^{ns}	0.0308	(-0.077 - 0.044)
obesity	1.151^{ns}	0.2400	(0.763 - 1.735)	0.026^{ns}	0.0389	(-0.051 - 0.102)
Moderate/severe disability	1.414*	0.2845	(0.952 - 2.102)	0.063*	0.0353	(-0.007 - 0.132)
Feeling alone	1.819**	0.4138	(1.162 - 2.847)	0.117**	0.0465	(0.026 - 0.209)
Family life satisfaction						
Unsatisfied	1.915*	0.7404	(0.894 - 4.101)	0.129^{ns}	0.0823	(-0.033 - 0.290)
Neutral satisfaction	1.579*	0.3739	(0.991 - 2.518)	0.088*	0.0487	(-0.007 - 0.184)

dy/dx: the marginal change of the outcome (dy) concerning the change from the ref. group of the factors (dx). *: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.0001$; ^{ns}: no significant.

The analysis of men's survey data identified several factors associated with social isolation. Key predictors include the lowest educational attainment, working status, living alone, sole caregiving, feeling loneliness, being underweight, moderate/severe disability and dissatisfaction with family life. No significant protective factors against social isolation were observed in older men.

Older men who are illiterate or have only completed elementary school are 18.6% more likely to be socially isolated than university graduates. Being underweight increases the likelihood of social isolation by 15.4% compared to those in normal weight. Living alone raises the likelihood of isolation by 14.4% compared to living with four or more people. Sole caregiver men are 13.2% more likely to feel socially isolated compared to those without caregiving activities. Men who experience feelings of loneliness are 11.7% more likely to be isolated. Furthermore, men who report being neutral regarding family life satisfaction have a 8.8% higher risk of social isolation, compared with those who are satisfied. Additionally, men with moderate/severe disability and working status have about a 6.0% higher risk of isolation compared to their reference group peers.

3.4. Loneliness Models

The analysis of the overall survey data model identified several key factors contributing to loneliness among older adults in Chile. These predictors include younger age groups, lower educational levels, retiree status, the number of people living in the household, moderate to severe disabilities, depression or other mental health issues, experiences of discrimination, social isolation, caregiving responsibilities, dissatisfaction with oneself, lack of acceptance of one's physical appearance, dissatisfaction with family life, feelings of not belonging to the neighborhood, and pet ownership. Details on logistic regression and average marginal effects (AMEs) from survey data on loneliness among older adults in Chile are provided in the supplementary materials (Table S2). Table 4 presents the odds ratios (ORs) and average marginal effects (AMEs) with 95% confidence intervals from a logistic regression model using survey data to examine loneliness in a sample of older Chilean women.

Table 4. Predictors and marginal effects of loneliness from older women's survey data.

Covariates	Logistic Regression			Average Marginal Effects		
	OR	Std. Error	[95% C. I.]	dy/dx	Std. Error	[95% C. I.]
Age groups						
65 - 69 years old	1.392*	0.2786	(0.943 - 2.057)	0.044*	0.0261	(-0.007 - 0.095)
70 - 74 years old	1.741**	0.4282	(1.073 - 2.826)	0.078**	0.0354	(-0.008 - 0.147)
75 and more	1.607*	0.4200	(0.960 - 2.688)	0.065*	0.0370	(-0.007 - 0.138)
Education levels						
Illiterate/elementary	2.379**	0.8499	(1.177 - 4.808)	0.110**	0.0391	(0.033 - 0.187)

Continued

high school	2.396**	0.8956	(1.148 - 5.002)	0.111**	0.0428	(0.027 - 0.195)
technical school	1.644^{ns}	1.6436	(0.801 - 3.371)	0.058^{ns}	0.0393	(-0.019 - 0.135)
Retiree	0.750*	0.1203	(0.547 - 1.029)	-0.041*	0.0241	(-0.086 - 0.004)
Household size						
one person	1.565*	0.3718	(0.980 - 2.499)	0.064*	0.0343	(-0.003 - 0.132)
two persons	1.267^{ns}	0.2191	(0.901 - 1.781)	0.033^{ns}	0.0233	(-0.013 - 0.078)
three persons	1.397*	0.2403	(0.995 - 1.960)	0.047**	0.0241	(-0.0002 - 0.094)
Fair self-rated health	1.293*	0.1890	(0.970 - 1.725)	-0.038*	0.0217	(-0.005 - 0.080)
Disability (mod./severe)	1.496*	0.3615	(0.929 - 2.407)	0.055*	0.0313	(-0.006 - 0.117)
Depression, anxiety	2.643***	0.5359	(1.773 - 3.940)	0.157***	0.0370	(0.085 - 0.229)
Nutritional status						
underweight	1.650**	0.4057	(1.017 - 2.678)	0.072*	0.0382	(-0.003 - 0.147)
overweight	1.484**	0.2710	(1.035 - 2.126)	0.056**	0.0268	(0.003 - 0.108)
obesity	1.191^{ns}	0.2000	(0.855 - 1.658)	0.024^{ns}	0.0236	(-0.021 - 0.069)
Discrimination	2.734***	0.6456	(1.718 - 4.353)	0.168***	0.0449	(0.080 - 0.256)
Social isolated	1.628**	0.2975	(1.136 - 2.333)	0.075**	0.0298	(0.017 - 0.133)
Satisfaction with oneself						
very dissatisfied/dissatisfied	1.501*	0.3463	(0.952 - 2.364)	0.061*	0.0372	(-0.115 - 0.134)
neither satisfied nor dissatisfied	1.704**	0.3476	(1.140 - 2.546)	0.082**	0.0339	(0.016 - 0.149)
Acceptance of physical appearance						
not at all/little	1.999**	0.4238	(1.317 - 3.035)	0.107**	0.0366	(0.035 - 0.179)
moderate	1.677**	0.2965	(1.184 - 2.376)	0.078**	0.0281	(0.022 - 0.133)
Family life satisfaction						
very unsatisfied/unsatisfied	3.653***	1.2647	(1.847 - 7.224)	0.222**	0.0698	(0.085 - 0.358)
neither satisfied nor unsatisfied	2.404***	0.4529	(1.888 - 3.706)	0.159***	0.0300	(0.100 - 0.218)
Caregiver activity						
sole caregiver	1.266^{ns}	0.2020	(0.925 - 1.734)	0.034^{ns}	0.0235	(-0.012 - 0.080)
Shared caregiving	1.625*	0.4153	(0.983 - 2.688)	0.073*	0.0410	(-0.008 - 0.153)
Sense of belonging to the neighborhood						
neutral	1.604*	0.4121	(0.967 - 2.660)	0.073*	0.0425	(-0.011 - 0.156)
disagree/strongly disagree	1.070^{ns}	0.2685	(0.652 - 1.754)	0.010^{ns}	0.0363	(-0.061 - 0.081)
Pet ownership	1.586**	0.2460	(1.169 - 2.153)	0.064**	0.0216	(0.021 - 0.106)

dy/dx: the marginal change of the outcome variable (dy) concerning the change from the reference group of the factors (dx). ^{ns}: no significant; *: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.0001$.

Key factors linked to loneliness among women include dissatisfaction with family life, difficulty accepting their physical appearance, dissatisfaction with themselves, experiences of discrimination, mental health issues like depression, living arrangement, malnutrition status, low educational attainment, age groups, ambivalence about belonging to their neighborhood, sole caregiving responsibilities, and pet ownership. In contrast, being a retiree and rating one's health as fair are protective factors against loneliness.

The AMEs indicate that older women who are very dissatisfied or neutral about their family life are 22.2% and 15.9% more likely to feel lonely, respectively, compared to those who are satisfied. Women who have difficulty with accepting their physical appearance, whether they feel not at all or a little satisfied or moderately satisfied, are 10.7% and 7.8% more likely to experience loneliness. Additionally, older women who are dissatisfied with themselves are more likely to feel lonely, with rates of 6.1% among dissatisfied women and 8.2% among neutral women, compared to those who are satisfied. Women facing discrimination are 16.8% more likely to feel lonely, while those with depression or social isolation are 15.7% and 7.5% more likely compared to their reference groups, respectively.

Individuals who are illiterate or have only an elementary school education, and those with a high school education, are 11.0% and 11.1% more likely to feel lonely compared to university graduates. Among age groups, those aged 65 - 69, 70 - 74, and 75 or older are 4.4%, 7.8%, and 6.5% more likely to feel lonely than those aged 60 - 64. Women living alone are 6.4% more likely to feel lonely, while those living with two or three others are 3.3% and 4.7% more likely, respectively, than those living with four or more people. Underweight and overweight individuals are 7.2% and 5.6% more likely to feel lonely, respectively. Women who share caregiving responsibilities, have moderate to severe disabilities, or are pet owners are 7.3%, 5.5%, and 6.4% more likely to feel lonely compared to their peers. Conversely, retiree women and those rating their health as fair are 4.1% and 3.8% less likely to feel lonely, respectively, than their respective reference groups. **Table 5** presents the odds ratios (ORs) and average marginal effects (AMEs) with 95% confidence intervals from the logistic regression model using survey data to examine loneliness in a sample of Chilean older men.

Table 5. Predictors and marginal effects of loneliness from older men's survey data.

Covariates	Logistic Regression			Average Marginal Effects		
	OR	Std. Error	[95% C. I.]	dy/dx	Std. Error	[95% C. I.]
Education levels						
Illiterate/elementary	2.797**	1.1597	(1.236 - 6.329)	0.121**	0.0411	(0.040 - 0.201)
high school	1.990^{ns}	0.9063	(0.811 - 4.879)	0.074*	0.0445	(-0.014 - 0.161)
technical school	2.005*	0.8394	(0.879 - 4.573)	0.075*	0.0428	(-0.009 - 0.158)

Continued

Household size						
one person	3.011***	0.3718	(1.827 - 4.966)	0.158***	0.0372	(0.085 - 0.230)
two persons	1.534*	0.2191	(0.957 - 2.461)	0.052*	0.0289	(-0.004 - 0.109)
three persons	1.737**	0.2403	(1.093 - 2.762)	0.070**	0.0299	(0.011 - 0.128)
Depression, anxiety	1.573**	0.3513	(1.014 - 2.443)	0.065*	0.0338	(-0.002 - 0.131)
Nutritional status						
underweight	0.636*	0.1664	(0.380 - 1.065)	-0.058*	0.0319	(-0.121 - 0.004)
overweight	0.640**	0.1415	(0.414 - 0.989)	-0.058**	0.0276	(-0.112 - -0.004)
obesity	0.899^{ns}	0.2485	(0.521 - 1.549)	-0.015^{ns}	0.0380	(-0.089 - 0.060)
Discrimination	3.267**	1.1466	(1.637 - 6.522)	0.195**	0.0664	(0.065 - 0.325)
Social isolated	1.759**	0.3886	(1.138 - 2.717)	0.083**	0.0350	(0.014 - 0.151)
Satisfaction with oneself						
very dissatisfied/dissatisfied	1.630^{ns}	0.5779	(0.811 - 3.276)	0.069^{ns}	0.0548	(-0.038 - 0.176)
neither satisfied nor dissatisfied	2.021**	0.5253	(1.211 - 3.372)	0.104**	0.0424	(0.021 - 0.187)
Family life satisfaction						
very unsatisfied/unsatisfied	1.942^{ns}	0.9890	(0.712 - 5.295)	0.098^{ns}	0.0863	(-0.071 - 0.268)
neither satisfied nor unsatisfied	1.621**	0.3643	(1.041 - 2.523)	0.069**	0.0348	(0.0008 - 0.137)
Caregiver activity						
sole caregiver	2.061**	0.5618	(1.206 - 3.526)	0.106**	0.0453	(0.171 - 0.195)
Shared caregiving	1.704^{ns}	0.6502	(0.804 - 3.613)	0.075^{ns}	0.0586	(-0.040 - 0.190)
Sense of belonging to the neighborhood						
neutral	2.754**	0.8688	(1.479 - 5.126)	0.158**	0.0563	(0.048 - 0.269)
disagree/strongly disagree	2.158**	0.6910	(1.148 - 4.054)	0.115**	0.0545	(0.008 - 0.222)

dy/dx: the marginal change of the outcome variable (dy) concerning the change from the reference group of the factors (dx). ^{ns}: no significant; *: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.0001$.

Key factors associated with loneliness among older men, according to survey data, include experiences of discrimination, living arrangements, lower educational attainment, feelings of not belonging to their neighbourhood, caregiving responsibilities, social isolation, depression or other mental health issues, and dissatisfaction with themselves or their family life. Interestingly, being underweight or overweight serves as a protective factor against loneliness in older men.

The AMEs show that older men facing discrimination are 19.5% more likely to feel lonely. Those who feel neutral or lack a sense of belonging in their neighbourhood are 15.8% and 11.9% more likely to experience loneliness, respectively. Education also impacts loneliness; individuals with illiterate/elementary education and those with high school or technical school attainments are 12.1%, 7.4%, and

7.5% more likely to feel lonely compared to university graduates. Men who are dissatisfied with themselves or their family life are 10.4% and 6.9% more likely to feel lonely, respectively. Men with sole caregiving responsibilities are 10.6% more likely to feel lonely compared to those who are not involved in caregiving. Additionally, socially isolated men are 8.3% more likely to feel lonely, and those dealing with depression or mental health issues are 6.5% more likely compared to their reference groups. Conversely, both underweight and overweight older men are 5.8% less likely to feel lonely compared to those of normal weight.

4. Discussion

Population ageing poses significant challenges globally, including challenges for social connections and community engagement among older adults. As the baby boomer generation ages, social isolation and loneliness are significant and increasing public health concerns that challenge health and welfare systems in postmodern societies (Pavlidis, 2025). These issues play a crucial role in maintaining health, improving quality of life and ensuring the well-being of this population, especially in low- and middle-income countries. Furthermore, social disconnection is a potential risk of physical and mental chronic diseases, including cardiovascular diseases, cancer, dementia and premature death (Naito et al., 2021; Lenartsson et al., 2022; Wang et al., 2023a).

The study found that 30.4% reported social isolation and 23.4% experienced loneliness, with both rates increasing with age and being higher among women. These figures are lower than those reported in previous Chilean studies (Gierke et al., 2024; Observatorio del Envejecimiento, 2025; Carrasco et al., 2021; Herrera et al., 2021), possibly due to differences in sample characteristics and operational definitions. In contrast, global research suggests that social isolation in older adults in the community ranges from 25% to 34%, while loneliness ranges from 12% to 33%. Both also tend to increase with age and show significant gender differences (Hajek et al., 2023; Teo et al., 2023; WHO, 2021; WHO, 2025).

From a gender perspective, a statistically significant difference is observed only for loneliness. Women are more affected by feelings of loneliness, whereas men are slightly more likely to experience social isolation; however, this difference was not significant. These findings align with previous research indicating that men and women experience social isolation and loneliness differently in older age. This difference can be attributed to their varying social network types, the differing value they place on social ties, and their unique personal experiences of social disconnection (Takagi et al., 2020; Compernelle et al., 2021; Kim & Lee, 2022; Zhao et al., 2025; Puyané et al., 2025).

For both genders, lower educational attainment, working status, living alone, experiencing loneliness, and dissatisfaction with family life were significant predictors of social isolation. Men living alone and dissatisfied with their family life have a higher risk of social isolation than women. In contrast, older women who use smartphones moderately are at lower risk of isolation. This result aligns with

previous research indicating that smartphones enhance connectivity for older adults, helping them stay in touch with family and friends (Soundararajan et al., 2023; Loos et al., 2025; Umoh et al., 2023); however, increased smartphone addiction among older adults may threaten their ability to maintain a balanced, healthy lifestyle (Bharamagoudar & Komala, 2025).

A significant link was found between lower educational attainment and social isolation among women. Factors such as dissatisfaction with overall life and personal relationships, feelings of loneliness, and limited physical mobility were also associated with social isolation among women. These findings align with previous research, emphasising the complex interactions among demographic variables, health, psychological factors, and behavioural aspects that contribute to social isolation among older women. Women tend to be more affected by the quality of their close relationships and social support than by the quantity of those connections (Kim & Lee, 2022; Kim & Park, 2024; Wang et al., 2023b; Wen et al., 2022; Miao et al., 2025).

Being overweight may act as a protective factor against social isolation in women. The relationship between overweight and social isolation in older women is complex, showing both positive and negative associations. Some studies suggest that older overweight women may feel more accepted in social circles and have better self-perception as they age (Hajek et al., 2021). However, other research indicates that feelings of embarrassment and shame among those who are overweight and obese can lead to reduced social participation and increased isolation (von Humboldt et al., 2024; Ghosh et al., 2025).

In older men, there is a significant association between the lowest educational attainment, being underweight, living alone, having sole caregiving activity, experiencing loneliness, neutral dissatisfaction with family life, having moderate /severe disability and working status, and social isolation. Notably, this study found that older men have no significant protective factor against social isolation. These findings align with previous studies demonstrating that men who live alone, feel lonely, or lack family support face an increased risk of social isolation (Pavlidis, 2025; Takagi et al., 2020; Kim & Lee, 2022; Miao et al., 2025). Moreover, research shows that loneliness can exacerbate social isolation, and vice versa: some men may feel isolated without being lonely, or feel lonely despite being socially connected (Taylor, 2019; Pan, 2024; Sandy et al., 2025). Evidence also suggests that retirement adjustment can alter social relationships, increasing the risk of loneliness and isolation during the early retirement phase, particularly among men (Guthmuller et al., 2024; Fu & Zhang, 2025). Previous studies also show that caregiving can limit social interactions, as men may be reluctant to leave their partner alone or decline offers of help. This behaviour can lead to smaller social networks and increased isolation (Fee et al., 2021; Akhter-Khan et al., 2022). Additionally, there is evidence of a bidirectional relationship between functional disability and social isolation in older men (Pan et al., 2024; Shimada et al., 2025).

The study found several risk factors for loneliness in both men and women, including educational attainment, living alone, depression, discrimination, social

isolation, caregiving responsibilities, and dissatisfaction with oneself or family life. A sense of not belonging to the neighbourhood also contributes to loneliness. Older men generally experience a higher risk magnitude of loneliness, except in cases of family dissatisfaction and depression, which are more common in women. Furthermore, while being underweight or overweight impacts both genders, it increases the risk of loneliness in women but decreases it in men. These results align with previous research indicating that older men and women have distinct social networks and value their social connections differently. Men are more vulnerable to social isolation and benefit from strong family ties, while women prioritise the quality of their social connections, emotional engagement and overall social participation (Takagi et al., 2020; Compernelle et al., 2021; Kim & Lee, 2022).

A significant association exists between dissatisfaction with family life, depression, experiences of discrimination, a lack of acceptance of one's physical appearance, lower educational attainment, and loneliness among older women. Furthermore, women over 65 who are underweight or overweight, live alone, are socially isolated, have disabilities, consider their health as fair, share caregiving responsibilities, and own pets are more likely to feel lonely. These findings support previous research highlighting how psychological, mental health, social, and demographic factors contribute to loneliness in older women, particularly through the quality of their relationships, social networks, and experiences of discrimination (Savage et al., 2020; Srivastava et al., 2020; Kim & Lee, 2022; Wen et al., 2022).

Retirement seems to help protect older women from loneliness. In the study, 56% of participants were retirees with an average age of 73, and 12% had achieved professional success. The rate of loneliness among women with professional accomplishments was 20%, compared with 29% among those with lower educational attainment. These findings support previous research suggesting that long-term retirement can reduce loneliness in women. Factors such as social context, relationship status, education level, and cultural influences all contribute to this effect (Guthmuller et al., 2024; Chiao et al., 2022).

Fewer factors contribute to loneliness in men than in women. The study shows a strong connection between loneliness in older men and experiences of discrimination, living alone or in a three-person household, low educational attainment, and a feeling of not belonging to their neighbourhood. Additionally, factors such as dissatisfaction with oneself or family life, being a sole caregiver, social isolation, and depression also play a role. Psychological resilience may influence the impact of these factors. These findings align with previous research emphasising the importance of psychological, social, and demographic factors in the aetiology of loneliness among older men (Savage et al., 2020; Srivastava et al., 2020; Kim & Lee, 2022; Wen et al., 2024).

Being overweight or underweight may protect older men from loneliness. In the study, 25% of men were overweight, and 12% were underweight. Loneliness rates were 16% for overweight men and 24% for underweight men, compared to

22% for those with a normal weight. While previous research suggests a link between higher body mass index (BMI) and loneliness, the direction of causality remains unclear. The association with underweight individuals is less consistent, particularly given factors such as depression and social isolation (Hajek et al., 2021; Ahola et al., 2024; Bae & Pachucki, 2024).

This study had several limitations. First, self-reported measures may introduce recall bias, particularly among older adults and individuals with lower educational attainment. Second, the operational definition of social isolation, although theoretically well-founded, has not been psychometrically validated, which could affect estimates of the construct. Additionally, the cross-sectional design limits our ability to establish causality, even though reverse causality is possible. Finally, as an observational study, the findings may be influenced by unmeasured confounding variables; therefore, caution is advised when interpreting them in light of these limitations.

Despite its limitations, the study has several strengths. The use of nationally representative data enables generalisation of findings, and a larger sample size enhances the accuracy of the results. By employing parsimonious models that account for relevant confounding variables, the study provides reliable estimates, while the AMEs approach facilitates interpretation. Furthermore, conducting separate analyses by gender provides deeper insight into the relationships between social disconnection and potential predictors in Chilean older adults.

Future research should focus on longitudinal surveys that examine how personality traits, socioeconomic and cultural disparities, and gender interact with social isolation and loneliness among older adults. It is also important to investigate how subjective loneliness mediates the effects of social isolation on health and quality of life. Additionally, a deeper understanding of the psychosocial mechanisms underlying gender differences in these issues will help guide effective prevention and intervention strategies to address social disconnection among older adults.

In conclusion, this study reveals significant gender differences in social isolation and loneliness among older adults in Chile. Social disconnection increases with age, and women experience higher rates of social isolation and loneliness. Moderate smartphone use and being overweight may act as protective factors among women, whereas men have no significant protective factors against social isolation. The findings can guide public policies and interventions to address the mental health, quality of life, and well-being of this population. The research also underscores the greater impact of psychosocial factors than of socioeconomic and health concerns, such as multimorbidity, sensory impairment, or physical inactivity, among older adults. This profile of social disconnection among older adults may be shaped by specific historical and sociocultural factors affecting the baby-boomer generation in Chile. Notably, this generation has demonstrated remarkable resilience in the face of adverse circumstances, particularly during the COVID-19 pandemic.

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Data Availability

Data supporting this research is available at <https://datos.gob.cl/dataset/encavi-2023-24>.

Conflicts of Interest

The author declares that he has no conflicts of interest.

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Supplementary

Table S1. Predictors and marginal effects of social isolation from the overall survey data.

Covariates	Logistic Regression			Average Marginal Effects		
	OR	Std. Error	[95% C. I.]	dy/dx	Std. Error	[95% C. I.]
Men	1.367**	0.1784	(1.058 - 1.768)	0.056**	0.0240	(0.008 - 0.103)
Age groups						
65 - 69 years old	1.129^{ns}	0.1727	(0.835 - 1.526)	0.022^{ns}	0.0168	(-0.007 - 0.059)
70 - 74 years old	0.928^{ns}	0.1566	(0.665 - 1.293)	-0.013^{ns}	0.0292	(-0.070 - 0.044)
75 and more	1.073^{ns}	0.1752	(0.778 - 1.480)	0.013^{ns}	0.0291	(-0.045 - 0.070)
Education levels						
Illiterate/elementary	2.378**	0.6218	(1.421 - 3.978)	0.141***	0.0368	(0.068 - 0.213)
high school	1.755**	0.4276	(1.086 - 2.835)	0.085**	0.0211	(0.021 - 0.150)
technical school	2.224**	0.6853	(1.212 - 4.080)	0.128**	0.0459	(0.038 - 0.218)
Household income quintiles						
1st quintile	1.461^{ns}	0.3855	(0.869 - 2.457)	0.071^{ns}	0.0474	(-0.022 - 0.163)
2nd quintile	1.109^{ns}	0.2664	(0.691 - 1.780)	0.018^{ns}	0.0420	(-0.064 - 0.101)
3rd quintile	0.848^{ns}	0.2279	(0.500 - 1.440)	-0.028^{ns}	0.0456	(-0.117 - 0.062)
4th quintile	1.039^{ns}	0.2974	(0.591 - 1.825)	0.007^{ns}	0.0500	(-0.091 - 0.105)
Working	1.505**	0.2063	(1.148 - 1.971)	0.075**	0.0258	(0.025 - 0.126)
Household size						
one person	1.860**	0.3463	(1.289 - 2.683)	0.118**	0.0359	(0.048 - 0.189)
two persons	1.170^{ns}	0.1641	(0.888 - 1.542)	0.028^{ns}	0.0247	(-0.021 - 0.076)
three persons	1.059^{ns}	0.2042	(0.724 - 1.548)	0.010^{ns}	0.0335	(-0.056 - 0.076)
Self-rated health status						
bad/very bad	1.164^{ns}	0.2328	(0.785 - 1.726)	0.028^{ns}	0.0377	(-0.046 - 0.102)
fair	0.902^{ns}	0.1116	(0.707 - 1.151)	-0.018^{ns}	0.0216	(-0.061 - 0.024)
Sensory deficiency	1.017^{ns}	0.1194	(0.807 - 1.282)	0.003^{ns}	0.0210	(-0.038 - 0.044)
Multimorbidity	1.092^{ns}	0.1237	(0.874 - 1.365)	0.016^{ns}	0.0200	(-0.024 - 0.055)
Disability (mod./severe)	1.130^{ns}	0.1610	(0.854 - 1.496)	0.022^{ns}	0.0250	(-0.027 - 0.071)
Depression, anxiety	1.020^{ns}	0.1385	(0.781 - 1.333)	0.004^{ns}	0.0243	(-0.044 - 0.051)
Physically inactive	1.191^{ns}	0.1387	(0.947 - 1.498)	0.031^{ns}	0.0199	(-0.008 - 0.070)
Nutritional status						
underweight	1.520**	0.2297	(1.128 - 2.046)	0.080**	0.0302	(-0.021 - 0.139)
overweight	0.822^{ns}	0.1022	(0.644 - 1.050)	-0.034^{ns}	0.0210	(-0.075 - -0.007)
obesity	1.088^{ns}	0.1474	(0.834 - 1.421)	0.015^{ns}	0.0247	(-0.033 - 0.064)

Continued

Physical mobility						
very bad/bad	1.130^{ns}	0.2596	(0.719 - 1.777)	0.022^{ns}	0.0419	(-0.060 - 0.104)
neither good nor bad	1.237^{ns}	0.1838	(0.923 - 1.658)	0.039^{ns}	0.0279	(-0.016 - 0.093)
Discrimination	1.110^{ns}	0.2078	(0.767 - 1.604)	0.019^{ns}	0.0344	(-0.049 - 0.086)
Feeling alone	1.695^{***}	0.2328	(1.293 - 2.221)	0.101^{***}	0.0269	(0.048 - 0.154)
General life satisfaction						
very unsatisfied/unsatisfied	2.215^{**}	0.6434	(1.249 - 3.924)	0.159^{**}	0.0629	(0.036 - 0.283)
neither satisfied nor unsatisfied	1.190^{ns}	0.2023	(0.852 - 1.664)	0.032^{ns}	0.0318	(-0.030 - 0.094)
Family life satisfaction						
very unsatisfied/unsatisfied	1.605[*]	0.4144	(0.965 - 2.269)	0.090[*]	0.0530	(-0.014 - 0.194)
neither satisfied nor unsatisfied	1.501^{**}	0.2160	(1.130 - 1.993)	0.077^{**}	0.0287	(0.020 - 0.133)
Personal relationship satisfaction						
very unsatisfied/unsatisfied	1.916^{**}	0.4484	(1.209 - 3.038)	0.128^{**}	0.0489	(0.032 - 0.224)
neither satisfied nor unsatisfied	1.205^{ns}	0.2183	(0.843 - 1.721)	0.034^{ns}	0.0339	(-0.032 - 0.101)
Caregiver activity						
sole caregiver	1.654^{**}	0.3527	(1.087 - 2.517)	0.097^{**}	0.0434	(0.012 - 0.182)
shared care	0.693[*]	0.1518	(0.450 - 1.067)	-0.060[*]	0.0344	(-0.128 - -0.007)
Unsafe neighborhood	1.213^{ns}	0.1472	(0.955 - 1.541)	0.035^{ns}	0.0216	(-0.008 - 0.077)
Daily smartphone use						
moderate use	0.690^{**}	0.1132	(0.490 - 0.953)	-0.069^{**}	0.0317	(-0.132 - -0.007)
excessive use	0.759^{ns}	0.1661	(0.494 - 1.168)	-0.052^{ns}	0.0413	(-0.133 - 0.029)

dy/dx: the marginal change of the outcome (dy) concerning the change from the ref. group of the factors (dx). *: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.0001$; ns: no significant.

Table S2. Predictors and marginal effects of loneliness from the overall survey data.

Covariates	Logistic Regression			Average Marginal Effects		
	OR	Std. Error	[95% C. I.]	dy/dx	Std. Error	[95% C. I.]
Women	0.967^{ns}	0.1380	(0.730 - 1.280)	-0.005^{ns}	0.0200	(-0.044 - 0.035)
Age groups						
65 - 69 years old	1.388^{**}	0.2052	(1.038 - 1.858)	0.045^{**}	0.0203	(0.005 - 0.085)
70 - 74 years old	1.349[*]	0.2165	(0.983 - 1.850)	0.041[*]	0.0171	(-0.020 - 0.048)
75 and more	1.377^{ns}	0.2806	(0.922 - 2.057)	0.044^{ns}	0.0285	(-0.012 - 0.100)
Education levels						
Illiterate/elementary	2.532^{**}	0.7882	(1.371 - 4.674)	0.116^{***}	0.0330	(0.051 - 0.181)
high school	2.187^{**}	0.7320	(1.131 - 4.228)	0.094^{**}	0.0363	(0.023 - 0.165)
technical school	1.807[*]	0.5635	(0.978 - 3.339)	0.068^{**}	0.0328	(0.004 - 0.132)

Continued

Household income quintiles						
1st quintile	1.354^{ns}	0.3818	(0.777 - 2.359)	0.046^{ns}	0.0418	(-0.036 - 0.128)
2nd quintile	0.821^{ns}	0.2246	(0.479 - 1.407)	-0.027^{ns}	0.0385	(-0.103 - 0.049)
3rd quintile	0.737^{ns}	0.2165	(0.413 - 1.314)	-0.041^{ns}	0.0399	(-0.119 - 0.037)
4th quintile	1.076^{ns}	0.3432	(0.575 - 2.017)	0.011^{ns}	0.0461	(-0.080 - 0.101)
Retiree	0.784^{**}	0.0954	(0.617 - 0.996)	0.035^{**}	0.0173	(-0.068 - -0.0005)
Household size						
one person	2.165^{***}	0.3564	(1.566 - 2.994)	0.114^{***}	0.0244	(0.067 - 0.162)
two persons	1.385^{**}	0.1972	(1.046 - 1.833)	0.044^{**}	0.0189	(0.007 - 0.081)
three persons	1.483^{**}	0.2265	(1.098 - 2.003)	0.054^{**}	0.0206	(0.013 - 0.094)
Self-rated health status						
bad/very bad	0.858^{ns}	0.1610	(0.593 - 1.242)	-0.021^{ns}	0.0249	(-0.069 - 0.028)
fair	1.134^{ns}	0.1520	(0.872 - 1.477)	0.018^{ns}	0.0193	(-0.020 - 0.056)
Sensory deficiency	1.090^{ns}	0.1685	(0.804 - 1.478)	0.002^{ns}	0.0165	(-0.030 - 0.035)
Multimorbidity	1.094^{ns}	0.1527	(0.831 - 1.440)	0.013^{ns}	0.0194	(-0.025 - 0.051)
Disability (mod./severe)	1.392^{**}	0.2142	(1.028 - 1.885)	0.046^{**}	0.0204	(0.005 - 0.086)
Depression, anxiety	2.067^{***}	0.3286	(1.511 - 2.827)	0.115^{***}	0.0280	(0.060 - 0.169)
Physically inactive	1.068^{ns}	0.1491	(0.811 - 1.406)	0.009^{ns}	0.0193	(-0.029 - 0.047)
Nutritional status						
underweight	1.047^{ns}	0.2020	(0.716 - 1.531)	0.007^{ns}	0.0277	(-0.048 - 0.061)
overweight	0.956^{ns}	0.1354	(0.723 - 1.264)	-0.006^{ns}	0.0197	(-0.045 - 0.032)
obesity	0.999^{ns}	0.1418	(0.755 - 1.321)	-0.0002^{ns}	0.0200	(-0.039 - 0.039)
Discrimination	2.788^{***}	0.6292	(1.788 - 4.348)	0.174^{***}	0.0438	(0.088 - 0.260)
Social isolated	1.626^{**}	0.2390	(1.217 - 2.172)	0.075^{**}	0.0240	(0.028 - 0.122)
Satisfaction with oneself						
very dissatisfied/dissatisfied	1.492[*]	0.3221	(0.975 - 2.283)	0.060[*]	0.0348	(-0.008 - 0.128)
neither satisfied nor dissatisfied	1.789^{***}	0.2942	(1.294 - 2.473)	0.090^{**}	0.0280	(0.035 - 0.145)
Acceptance of physical appearance						
not at all/little	1.609^{**}	0.2853	(1.135 - 2.282)	0.072^{**}	0.0289	(0.015 - 0.129)
moderate	1.302^{**}	0.1675	(1.010 - 1.677)	0.038^{**}	0.0191	(0.0005 - 0.076)
General life satisfaction						
very unsatisfied/unsatisfied	1.005^{ns}	0.2869	(0.572 - 1.763)	0.0006^{ns}	0.0402	(-0.078 - 0.079)
neither satisfied nor unsatisfied	1.064^{ns}	0.2155	(0.714 - 1.585)	0.009^{ns}	0.0291	(-0.048 - 0.066)

Continued

Family life satisfaction						
very unsatisfied/unsatisfied	2.678**	0.7732	(1.517 - 4.729)	0.164**	0.0568	(0.052 - 0.275)
neither satisfied nor unsatisfied	2.085***	0.2677	(1.620 - 2.686)	0.117***	0.0223	(0.073 - 0.160)
Personal relationship satisfaction						
very unsatisfied/unsatisfied	1.089^{ns}	0.2665	(0.673 - 1.764)	0.012^{ns}	0.0355	(-0.057 - 0.082)
neither satisfied nor unsatisfied	1.268^{ns}	0.2133	(0.910 - 1.766)	0.035^{ns}	0.0257	(-0.015 - 0.085)
Caregiver activity						
sole caregiver	1.460**	0.2052	(1.107 - 1.926)	0.055**	0.0218	(0.012 - 0.098)
shared care	1.616**	0.3554	(1.048 - 2.492)	0.071**	0.0352	(0.002 - 0.141)
Sense of belonging to the neighborhood						
neutral	2.044**	0.4176	(1.367 - 3.056)	0.114**	0.0366	(0.042 - 0.185)
disagree/strongly disagree	1.546**	0.2895	(1.070 - 2.236)	0.066**	0.0302	(0.007 - 0.125)
Pet ownership						
	1.337**	0.1500	(1.072 - 1.668)	0.040**	0.0154	(0.010 - 0.070)

dy/dx: the marginal change of the outcome variable (dy) concerning the change from the reference group of the factors (dx). ^{ns}: no significant; *, $p < 0.1$; **, $p < 0.05$; ***, $p < 0.0001$.