Scientific Research Publishing

Open Journal of Social Sciences, 2026, 14(4), 193-222
https://www.scirp.org/journal/jss
ISSN Online: 2327-5960
ISSN Print: 2327-5952

Loneliness Prevalence and Socioeconomic Inequalities in Older Adults in Chile: A Gender Perspective

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How to cite this paper: Olivares-Tirado, P. (2026). Loneliness Prevalence and Socioeconomic Inequalities in Older Adults in Chile: A Gender Perspective. *Open Journal of Social Sciences, 14,* 193-222.
https://doi.org/10.4236/jss.2026.144012

Received: March 16, 2026
Accepted: April 12, 2026
Published: April 15, 2026

Abstract

Aim: Socioeconomic disparities significantly influence the risk of loneliness among community-dwelling older adults. This study investigates the impact of inequalities in educational attainment and household income on the prevalence of loneliness among older adults in Chile. **Methods**: In this cross-sectional study, we included 6755 participants aged 60 and above from the 2023/2024 National Quality of Life and Health Survey. Loneliness was measured using the Three-Item Lonely Scale (TILS). Educational attainment was defined by the highest degree obtained or current enrollment, and household income was defined as total gross monthly income, grouped into quintiles. Separate Poisson regression models, adjusted for confounders, were used to assess gender and age group differences in the prevalence of loneliness across socioeconomic strata. **Results:** Overall, 23.4% of participants reported feeling lonely, with a higher prevalence among men than women. Disparities in household income had a greater impact on loneliness than educational attainment. Elevated adjusted inequality indices suggest that additional factors contribute to loneliness in this population. With the exception of women aged 60 - 69, substantial disparities in income and education across the social gradient—from worst-off to best-off—affected older men more than women in all age groups. However, these differences were not statistically significant. **Conclusions:** This study demonstrates that socioeconomic disparities in household income and educational attainment strongly influence loneliness among older adults in Chile, particularly among men. These findings can inform the development of structural interventions, such as reducing income inequality, strengthening social protection systems, and investing in community infrastructure. In addition, individual-level strategies—including targeted preventive programs and timely social and medical support for the most vulnerable groups—are also

recommended.

Keywords

Loneliness, Socioeconomic Inequalities, Inequality Index, Older Adults, Chile

1. Introduction

People worldwide are living longer, but evidence suggests that the additional years are spent in poor health (WHO, 2025a). As people age, they are more likely to experience declines in physical and mental capacity, and face age-related social and economic issues such as retirement, insufficient pensions, housing relocation and the death of friends and partners, worsening their health, quality of life and well-being (Pilehvari et al., 2023; Puyané et al., 2025; WHO, 2025a; WHO, 2020a; Kotwal et al., 2021; Sorinmade et al., 2025).

Globally, by 2050, the number of people aged 60 or older is projected to reach 2.1 billion, double the 2020 population. Two-thirds of the world's population aged 60 and over will live in low- and middle-income countries (LMICs), placing these countries at a disadvantage in addressing the challenges of an ageing population, given their limited financial resources and established health and social insurance systems (WHO, 2024; Sorinmade et al., 2025).

Moreover, it is essential to acknowledge that older adults are a highly heterogeneous population, and the current health, economic, and social challenges they face vary significantly by individuals' characteristics and by socioeconomic and cultural differences across their life course (Sorinmade et al., 2025). When a society has large social and economic differences between best-off and worst-off—the social gradient—inequalities and socioeconomic positions (SEP) represent this social gradient and are consistent and reliable predictors of a broad array of health outcomes, quality of life and well-being across the life span (Marmot, 2010, 2020; Tapia-Muñoz et al., 2022). The UNDP's 2014 Human Development Report shows how inequality in early life is linked to consequences in adulthood and, much later, in older age (UNDP, 2014).

Income is a primary measure of inequality, and it has been rising globally, driven by policies that lower wages and reduce tax revenues (Jolly, 2025). Within countries, income inequality leads to disparities in material conditions, heightens relative deprivation, and shapes population health outcomes. This phenomenon, known as the social gradient in health, reflects broader health inequalities. Countries with greater social and economic disparities also tend to experience pronounced health inequalities (Marmot, 2010, 2020). Relative deprivation describes the psychological impact of income inequality on individuals (Marmot, 2010, 2020; Tapia-Muñoz et al., 2022). Socioeconomic position (SEP) has been shown to influence the psychological and social health of older adults. Those with the lowest socioeconomic status are more likely to be diagnosed with depression, anxiety, other mental health

disorders, or experience problems related to social disconnection (Jolly, 2025).

Social disconnection refers to a lack of meaningful social relationships, resulting in reduced emotional support, limited information exchange, a diminished sense of belonging, and ultimately, social isolation and loneliness. These conditions can lead to inadequate support, lower social capital, and a range of negative experiences. Social isolation and loneliness are prevalent among older adults and have serious, yet often under-recognised, effects on their health, quality of life, and overall well-being (NASEM, 2020; Kim & Park, 2025; Olivares-Tirado, 2026).

Social isolation is defined as the objective absence of social roles, relationships, or interactions with others. It is characterised by a limited social support network and infrequent social contact, regardless of an individual's personal perception of their social life. Social isolation specifically reflects a deficit in the structural aspect of social connection, rather than other dimensions. It is typically assessed by evaluating the absence or weakness of a person's social support network (Institute of Medicine (US) et al., 1992; WHO, 2025a). In contrast, loneliness is a subjective, negative emotional state that arises when an individual's expectations of social connection are not met by their actual experiences (Russell et al., 1980). Loneliness may result from a lack of friends or support, or from unsatisfying social interactions. Unlike solitude, loneliness is generally involuntary and unwanted (Institute of Medicine (US) et al., 1992).

Social isolation and loneliness impact health through distinct yet overlapping mechanisms. Loneliness functions as a subjective, chronic psychological stressor, whereas isolation represents an objective, behavioural absence of social contact with physiological consequences. Both conditions are associated with negative mental and physical health outcomes, including increased mortality, particularly among older adults who are more likely to have reduced social interactions, live alone, and experience higher rates of loneliness (Hansen & Slagsvold, 2016; Rico-Uribe et al., 2016). Notably, social isolation and loneliness often serve as chronic stressors in adulthood. Research indicates that loneliness and social stress can disrupt the hypothalamic-pituitary-adrenal (HPA) axis and activate the sympathetic nervous system. Chronic social stress can therefore result in neuroendocrine alterations, immune dysfunction, oxidative stress, sleep disturbances, cognitive decline, emotional and cognitive dysregulation, and maladaptive thought patterns (McPherson et al., 2006; Uchino, 2006; Steptoe & Kivimäki, 2013; Cacioppo et al., 2015; Xia & Li, 2018; Cudjoe et al., 2022; Warren, 2025). In older adults, loneliness is particularly associated with adverse health effects, including elevated cardiovascular risk, cognitive impairments, and psychological disorders such as depression, anxiety, and insomnia, all contributing to diminished quality of life and increased morbidity and mortality (Niu et al., 2025).

A growing body of evidence highlights the connection between income inequality and the prevalence of loneliness among older adults. Gierveld et al. (2018) suggest that inequality contributes to loneliness both directly—through limited socioeconomic resources and poor living conditions—and indirectly—via reduced so-

cial integration, diminished community trust, and heightened feelings of deprivation (Tapia-Muñoz et al., 2022). Across and within countries, higher income inequality consistently links to increased loneliness among older adults, especially those in lower socioeconomic groups (Niedzwiedz et al., 2016; Aartsen et al., 2020; Tapia-Muñoz et al., 2022; Beller, 2024; Niu et al., 2025). Loneliness prevalence estimates range from 12.0% to 33.0%, with notable gender differences (WHO, 2021; WHO, 2025b). Loneliness rates are highest in low-income (24.3%) and lower-middle-income countries (19.3%), compared to 10.6% in high-income countries (Akhter-Khan et al., 2024; WHO, 2025b). Cultural factors also influence loneliness; although collectivist societies traditionally provide stronger social support, this support is diminishing in post-modern contexts due to rising individualism, changing family structures, digital exclusion, and public insecurity. These trends deepen socioeconomic disparities and are associated with increased loneliness (Yildirimer, 2025; WHO, 2025b).

Chile is experiencing a rapid demographic transition, with adults aged 60 and over increasing from 16.2% of the population in 2017 to 19.8% according to the 2024 Census, and projected to reach 32% by 2050 (INE, 2023; INE, 2024). This shift is mainly driven by the Baby Boomer generation, which has undergone significant social, political, and economic changes. However, many baby boomers face challenges, including loss of identity after retirement, age-related discrimination, and weakened family ties due to geographic dispersal. High divorce rates contribute to more older adults living alone, increasing the risk of social disconnection (Leach et al., 2008; Lin & Brown, 2012; Lissitsa et al., 2021). Additional issues include gaps in social protection and leisure opportunities, reduced pensions, barriers to healthcare or reliable access to long-term care, and unsafe or inadequate public spaces. These challenges highlight the urgent need for targeted public policies to promote healthy ageing.

In April 2024, the average pension in Chile for individuals who contributed for more than 20 years was US$569.0—US$653.3 for men and US$440.2 for women. Among those with 35 to 40 years of contributions, representing a full working life, the average total pension reached US$735.2, with a median of US$598.7. Notably, 23.5% of pensioners had never contributed to the system and received only the non-contributory Guaranteed Universal Pension (PGU), averaging US$223.2 (Fernández et al., 2024). According to the World Inequality Database, Chile's average per capita national income in 2024 was approximately US$27,418 per year (PPP), or about US$2,285 per month (WID, 2026). Income inequality remains pronounced: the top 10% of earners receive 59.5% of total pre-tax national income, while the bottom 50% receive only 8.2% (WID, 2026).

Loneliness among older adults in Chile shows considerable variation across studies. A recent nationally representative study reported a loneliness prevalence of 23.4%, with higher rates observed among women and increasing with age (Olivares-Tirado, 2026). During the COVID-19 pandemic, Herrera et al. (2021) found that the prevalence of loneliness increased from 48% to 53%. In a post-pandemic

study in Santiago, 26% of self-sufficient older adults reported feeling lonely (Gierke et al., 2024). The 2023 Social Wellbeing Survey indicated a loneliness rate of 32% (Observatorio del Envejecimiento, 2025). Certain ethnic groups in rural areas experience especially high rates of loneliness, with prevalence exceeding 55%, except for the Rapa Nui (9.0%) and Diaguita (14.0%) populations (Gallardo-Peralta et al., 2023).

Despite increasing recognition of loneliness as a public health concern, research on socioeconomic disparities in loneliness remains limited (Barjaková et al., 2023; Beller, 2024). Gaining a comprehensive understanding of the links between socioeconomic inequality and loneliness risk —particularly from a gender perspective—is essential for developing policies that address avoidable and unjust health disparities among vulnerable populations. Such insight can inform strategies to enhance social engagement and improve health, quality of life, and well-being among disadvantaged groups, especially older adults. This study aims to investigate socioeconomic inequalities in loneliness among community-dwelling older adults in Chile, using education and income as key socioeconomic indicators. Specifically, it examines socioeconomic differences in the prevalence of loneliness through absolute and relative regression-based measures of health inequality, with a particular emphasis on gender disparities.

2. Method

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 probabilistic, geographically stratified, multistage design with four stages: commune, block, household, and person aged 15 or older. Personal interviews using an electronic device questionnaire were conducted between October 2023 and February 2024. Response rate of 100.5% and rejection rate 4.1% were registered. The present analysis focuses on a sample of 6755 individuals aged 60 years or older who could answer the questions independently. Because missing data was not relevant, missing-data handling was not utilised. (Ministry of Health, 2025).

Measures

Dependent variable

Loneliness was measured using the Three-Item Lonely Scale (TILS) from Hughes et al. (2004). It includes questions about lack of companionship, feeling left out, and feeling isolated. Responses are scored on a 1 - 3 scale, where 1 corresponds to "hardly ever", 2 to "sometimes", and 3 to "often". The total scores range from 3 to 9, with higher scores indicating greater loneliness. Because the score distribution was positively skewed, the cutoff score was set at the 75th percentile to better cap-

ture loneliness. The use of the 75th percentile as a cut-off is common because it effectively captures the "vast majority" of data points while remaining robust to extreme outliers in the long right tail, ensuring greater accuracy and performance for the variable (Ialongo, 2019). Conventionally, a score of 6+ indicates loneliness, but this criterion has faced criticism for creating a large gap between scores of 5 and 6. A score of 5 might come from an "often" answer, while a 6 could result from "some of the time" for each question (Ratcliffe et al., 2024). Then, those who scored 5 points were classified as lonely only if they answered "often" (score = 3) to the question "feel a lack of companionship," underscoring the item's role as a social component of loneliness, thereby improving the accuracy of loneliness measurement and building reliable models. This method identified 1785 individuals experiencing loneliness. Loneliness was categorised as a binary variable (1 = feeling alone; 0 = no feeling alone).

Independent variables

Socioeconomic position was assessed using two key independent variables: education and household income. Education level was defined as the highest degree obtained or current educational status, and classified into five categories: illiterate/elementary school, high school, technical high school, high-level technician, and graduate/postgraduate—the latter serving as the reference group. Household income encompassed the total gross monthly income of all working household members, along with any additional sources such as property rentals, retirement, or pension payments. Income was grouped into quintiles, with the fifth quintile acting as the reference category.

Confounder variables

The association between loneliness and either education level or household income may be shaped by a range of demographic, economic, health, and social variables. To reduce the influence of these potential confounders, models of loneliness will be adjusted for individual sociodemographic, health, and social characteristics. Even when social isolation, social participation, depression/anxiety, family and social life satisfaction, may lie on the pathway between socioeconomic positions and loneliness, they were included in the models to ensure the estimated effect is not biased.

Among the socio-demographic factors, age was treated as a categorical variable with three groups: 60 - 69 years, 70 - 79 years, and 80 years and older, with the 60 - 69 years group serving as the reference. Analysing changes across these ten-year age groups in older populations provides valuable demographic insights by revealing long-term trends in socioeconomic, behavioural, and health patterns. This approach helps to overcome short-term fluctuations and is essential for informing policies on retirement reform and strengthening the long-term care and health system infrastructure in aging societies (NRC-US & Gilford, 1988; NASEM, 2021; Storey et al., 2019).

According to the 2024 Chilean Census, 11.5% of the population (2.1 million people) identify as belonging to an indigenous or native group. Of these, the Ma-

puche represent the largest proportion at 77.2%, followed by the Aymara at 8.5% and the Diaguita at 7.3% (INE, 2024). Indigeneity was coded as a binary variable, with non-indigenous individuals serving as the reference group. Given evidence that loneliness is higher among older adults in rural areas of Chile (Gallardo-Peralta et al., 2023), rural residence was also included as a binary variable, with urban residence as the reference group.

Large international surveys consistently show that having a partner is associated with lower levels of loneliness compared to living alone or being unpartnered. This protective effect is often stronger for men than for women (Stack, 1998; Wright & Brown, 2017; Hsiao et al., 2022; Vedder et al., 2024; Fernández-Fernández et al., 2025). Partnership status—defined as being married, cohabiting, or dating—was treated as a binary variable, with unpartnered individuals as the reference group.

A substantial body of research indicates that older adults living alone in the community are more likely to experience loneliness compared to those with other living arrangements. However, this relationship is influenced by factors such as personal preference, social support, health status, and cultural context (Taylor, 2019; Wei et al., 2022; Liu et al., 2025; Yu & Wu, 2025; Olivares-Tirado, 2026). Living alone was coded as a binary variable, with living with two or more people as the reference group. Employment status was also treated as a binary variable, with those not employed serving as the reference group. Caregiving activity was categorised into three groups: "sole caregivers," those who "share caregiving with others," and those who "do not care for anyone," with the latter as the reference category.

Social participation refers to active, regular involvement in one or more organisations, such as neighbourhood associations, sports clubs, religious groups, health self-help groups, civil society councils, parents' centres, and similar groups. Although social participation is a component of social isolation, the correlation between the two was weak (rho = .38); therefore, social participation was considered an important independent variable in the models. It was treated as a binary variable, with non-participants as the reference group.

Social isolation was assessed using a six-item instrument adapted from Zavaleta, Samuel, & Mills (2017), which evaluates both external and internal dimensions of isolation. The indicators include marital or civil status, social participation, social network support, emotional support, satisfaction with time spent with family, and sense of community belonging. Response options were "yes" (=1) and "no" (=0). Since social isolation is a negative construct, item scores were reversed before calculating the total score. The overall score ranges from 0 to 6, with higher scores reflecting greater social isolation. Due to the positive skew of the total score distribution and to prevent overrepresentation caused by unstructured isolation questions or potential bias from participants' educational and cognitive backgrounds, the cut-off was set at the 67th percentile. Scores of 3 or higher were classified as socially isolated. Social isolation was treated as a binary variable (1 = socially isolated; 0 = not socially isolated).

Family life satisfaction was assessed by asking, "How do you feel about your family life?" with responses ranging from 1 ("very bad") to 7 ("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 group serving as the reference. Social life satisfaction was measured using the question, "How satisfied do you feel with your social life (talking and/or sharing with family, partner, or friends during your free time)?" Responses ranged from 1 ("completely dissatisfied") to 5 ("completely satisfied"). These responses were similarly 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.

Mistreatment (abuse) was assessed by asking, "During the last year, has a known or unknown person insulted or offended you, controlled you, been jealous, or threatened you?" Responses were "yes" or "no," with "no" serving as the reference group. Discrimination was evaluated using the question, "Have you felt discriminated against in the last year?" Again, responses were "yes" or "no," with "no" as the reference category.

For health-related factors, self-rated health was categorised into three groups: very poor/poor, fair, and good/very good, with the latter serving as the reference group. Sensory deficiency—including blindness and/or deafness—was coded as a binary variable, with those without sensory deficits as the reference group. Multimorbidity was assessed by counting self-reported physician diagnoses across 14 chronic diseases: 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 three months), urinary incontinence, chronic kidney failure, and other chronic diseases. Multimorbidity was defined as having at least two of these 14 conditions and was treated as a binary variable (1 = multimorbidity; 0 = none or one chronic disease).

Disability status was coded as a binary variable, with individuals 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). Following WHO guidelines, older adults should participate in 150 - 300 minutes of moderate-intensity or 75 - 150 minutes of vigorous-intensity aerobic activity per week, or an equivalent combination (WHO, 2020b). Physical activity was classified as a binary variable: participants meeting the WHO recommendations were considered physically active, while those with less or no activity formed the control group.

Statistical analysis

Descriptive statistics were used to analyse participants' baseline characteristics by loneliness and gender. The chi-square test assessed the significance of associations between covariates and the dependent variable. The complex sample design

was accounted for in the analysis, enabling valid population inferences. The *svyset* and *svy* commands were used to specify the primary sampling unit, individual weights, and strata. Multicollinearity was evaluated using the Spearman correlation matrix and variance inflation factors (VIFs).

Given the high prevalence of loneliness, the binary outcome variable was modelled using Poisson regression with linearised standard errors, assuming a nonlinear relationship with socioeconomic position. The *estat gof* command was used to assess the goodness-of-fit of the Poisson models. Separate Poisson regression models were estimated to examine gender differences in the prevalence of loneliness across socioeconomic positions. Analyses by gender and age group were conducted separately using the *subpop* command to obtain estimates for these subpopulations (StataCorp, 2013). Both crude models (including only socioeconomic positions) and adjusted models (controlling for potential confounders) were utilised to isolate the association between socioeconomic position and loneliness.

Socioeconomic inequalities in loneliness were evaluated using regression-based measures: the Slope Index of Inequality (SII) and the Relative Index of Inequality (RII). The SII measures the absolute difference between the highest and lowest estimated values of the socioeconomic indicator, considering the entire socioeconomic distribution rather than just the extremes. The RII quantifies the ratio of estimated values between the highest and lowest socioeconomic groups, also accounting for the full distribution (Wagstaff et al., 1991; Schlotheuber & Hosseinpoor, 2022). As both SII and RII are multiplicative, their reciprocal values have equal magnitudes (Violán et al., 2016). In the analysis, the difference in loneliness prevalence between the lowest and highest socioeconomic positions was reversed to facilitate interpretation of the results.

Similarly, to estimate prevalence rates, Poisson regression models were performed for each subpopulation: a crude model including the "ridit" score for each socioeconomic position and an adjusted model controlling for potential confounders. The *"ridit"* score represents a relative position based on the midpoint of the cumulative distribution of participants within each socioeconomic category, ranging from 0 to 1. Participants were ranked in ascending order of socioeconomic position (Donaldson, 1998).

Because the outcome variable reflects prevalent cases of loneliness during 2023/2024, the incidence rate ratios (IRR) obtained from Poisson regression represent cumulative incidence or prevalence rate ratios (PRR) (Barros & Hirakata, 2003; Cummings, 2009; Schechter, 2014). To enhance understanding and communication of the association between loneliness and socioeconomic position, the margins command with *vce* (unconditional) was used to estimate prevalence rates (PR) for all education and household income quintiles within specific subpopulations (StataCorp, 2025). Due to the small sample sizes and the use of complex sampling designs in the regression analysis, significance thresholds and p-values may be directly affected. Therefore, a 10% significance threshold was adopted to reflect the exploratory nature of this study. All analyses were conducted using

Stata version 14.0.

3. Results

Table 1 summarises the sample characteristics by the relationship between loneliness and participants' gender. A sample of 6755 individuals aged 60 and over corresponds to 3,718,439 individuals after integrating the sample design into the analysis. The average participant age was 70.6 years (SD = 7.65), with 60% being women and 50% aged 70 or older. In the raw data, 26.5% of participants experienced loneliness, with a higher rate among women (27.4%). In the expanded adjusted data, the overall loneliness prevalence decreases to 23.4%, with a higher rate among men (24.4%) than among women (22.6%). The gender difference was not statistically significant.

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

Characteristics	Women		Men	
	Loneliness	Non-loneliness	Loneliness	Non-loneliness
	(n:1249)	(n:3309)	(n:539)	(n:1658)
Age groups				
60 - 69 year-olds (ref.)	49.1%^{ns}	52.1%	47.9%^{ns}	47.6%
70 - 79 year-olds	36.6%	34.0%	37.4%	37.1%
80 or more year-olds	14.3%	13.9%	14.7%	15.3%
Native peoples	9.7%**	7.9%	10.0%^{ns}	8.6%
Education levels				
illiterate/elementary school	58.4%***	47.4%	49.6%***	38.4%
high school	28.0%	32.1%	31.4%	34.3%
technical high school	5.4%	7.6%	7.8%	9.2%
high-level technician	4.6%	6.3%	7.1%	8.4%
graduated/post-degree (ref.)	3.6%	6.6%	4.1%	9.7%
Household income quintiles				
1st quintile	42.2%***	29.7%	34.8%***	18.1%
2nd quintile	34.0%	36.8%	33.3%	32.5%
3rd quintile	8.1%	10.1%	7.7%	12.4%
4th quintile	12.9%	17.3%	18.4%	27.4%
5th quintile (ref.)	2.8%	6.1%	5.8%	9.6%
Rural area residence	8.7%^{ns}	8.3%	6.9%^{ns}	8.8%

Continued

Having a partner	42.6%***	50.3%	44.8%***	73.6%
Living alone	32.0%***	22.9%	41.1%***	21.0%
Working	34.8%**	38.4%	27.7%^{ns}	31.2%
Caregiver activity				
sole caregiver	15.6%**	12.9%	10.5%**	6.6%
shared caregiving	7.8%	10.2%	5.8%	7.6%
does not care (ref.)	76.6%	76.9%	83.7%	85.8%
Social participation	52.6%**	57.7%	42.2%**	49.7%
Family life satisfaction				
very dissatisfied/dissatisfied	12.7%***	2.7%	12.5%***	2.7%
neither satisfied nor unsatisfied	29.7%	12.7%	25.9%	12.7%
satisfied/very satisfied (ref.)	57.6%	84.6%	61.6%	84.6%
Social life satisfaction				
very dissatisfied/dissatisfied	21.8%***	7.9%	16.7%***	6.6%
neither satisfied nor unsatisfied	17.3%	8.3%	18.0%	9.5%
satisfied/very satisfied (ref.)	60.9%	83.8%	65.3%	83.9%
Social isolation	48.2%***	26.2%	54.3%***	27.7%
Self-rated health status				
very bad/bad	27.4%***	14.9%	22.0%***	12.5%
fair	53.4%	45.5%	48.0%	42.3%
good/very good (ref.)	19.2%	39.6%	30.0%	45.1%
Multimorbidity	84.1%***	72.0%	66.7%***	56.2%
Depression/anxiety	44.2%***	19.9%	22.4%***	9.3%
Sensory deficiency	36.6%***	28.0%	36.8%**	27.9%
Physically active	11.9%**	15.6%	22.1%^{ns}	25.3%
Disability				
none/mild (ref.)	12.1%***	27.7%	26.1%***	39.9%
moderate	42.0%	46.4%	38.9%	41.1%
severe	45.9%	25.9%	35.0%	19.0%
Mistreatment (abuse)	19.6%	8.7%	19.5%***	8.4%
Discrimination	13.7%***	3.6%	14.9%***	4.0%

ref.: reference group**; *****: p-value < .0001; ******: p-value < .05; **ns**: no significant. The significance symbols at the top of categorical variables apply to the entire variable.

Regarding indicators of socioeconomic position in the survey data, 45.9% of the participants were illiterate or had elementary education, 28.9% had a current high school diploma, 7.1% had a technical high school diploma, 9.6% had a high technical level or incomplete graduation, and 8.6% had a graduate or postgraduate diploma. On the other hand, 21.3%, 33.6%, 11.2%, 24.1% and 9.8% of the participants belonged to the 1st, 2nd, 3rd, 4th and 5th quintiles, respectively. Additionally, the average monthly household income by quintile was: CL$228,791 (Q1), CL$436,187 (Q2), CL$591,972 (Q3), CL$824,515 (Q4), and CL$1,791,254 (Q5).

Survey Loneliness Models

The multicollinearity diagnostic showed that most variables had weak correlations (rho < .40), except for two pairs with a negative moderate correlation, including having a partner with living alone (rho: −.43), and self-rated health with disability (rho: −.41). The mean variance inflation factor (VIF) was 1.25, indicating no multicollinearity issues. Deviance and Pearson goodness-of-fit, as well as the ratios deviance/df and Pearson/df, were close to 1, suggesting no overdispersion. Table 2 presents the Incidence rate ratios (IRR), standard errors, with 95% confidence intervals from the Poisson regression models for loneliness among older adults in both genders.

Table 2. Predictors of Loneliness among older adults from survey data in both genders.

	Men		Women	
	IRR (St. err.)	95% C.I.	IRR (St. err.)	95% C.I.
Age groups				
70 - 79 y-old	**.885** (.1159)^{ns}	(.684 - 1.145)	**1.272** (.1082)**	(.684 - 1.145)
80+ y-old	**.651** (.1165)**	(.457 - .926)	**1.150** (.1746)^{ns}	(.852 - 1.550)
Education level				
illiterate/elementary school	**1.717** (.5634)^{ns}	(.900 - 3.277)	**2.125** (.5403)**	(1.288 - 3.506)
high school	**1.397** (.4894)^{ns}	(.701 - 2.785)	**2.022** (.5119)**	(1.228 - 3.328)
technical high school	**1.640** (.5597)^{ns}	(.838 - 3.211)	**1.710** (.4973)*	(.965 - 3.032)
high-level technician	**1.335** (.4893)^{ns}	(.648 - 2.748)	**1.727** (.5247)*	(.949 - 3.141)
Household income quintiles				
1st quintile	**1.378** (.3836)^{ns}	(.796 - 2.384)	**1.289** (.3347)^{ns}	(.773 - 2.150)
2nd quintile	**1.046** (.2846)^{ns}	(.612 - 1.788)	**1.105** (.2739)^{ns}	(.678 - 1.800)
3rd quintile	**.839** (.2652)^{ns}	(.450 - 1.564)	**1.015** (.2651)^{ns}	(.606 - 1.697)
4th quintile	**1.001** (.0302)^{ns}	(.552 - 1.815)	**1.257** (.3818)^{ns}	(.691 - 2.287)
Resident in rural area	**.856** (.1932)^{ns}	(.549 - 1.335)	**1.149** (.1866)^{ns}	(.834 - 1.582)
Native peoples	**.960** (.1723)^{ns}	(.675 - 1.367)	**1.024** (.1209)^{ns}	(.811 - 1.292)
Having a partner	**.508** (.0629)***	(.398 - .648)	**1.120** (.0871)^{ns}	(.961 - 1.305)
Living alone	**1.141**(.1443)^{ns}	(.889 - 1.463)	**1.117**(.1070)^{ns}	(.925 - 1.349)
Working	**1.111** (.1561)^{ns}	(.843 - 1.466)	**1.155** (.9445)*	(.983 - 1.357)

Continued

Caregiver activity				
sole caregiver	**1.676** (.2650)***	(1.227 - 2.288)	**1.067** (.1009)^{ns}	(.886 - 1.285)
shared caregiving	**1.370** (.3577)^{ns}	(.819 - 2.291)	**1.186** (.1581)^{ns}	(.912 - 1.542)
Social participation	**1.054** (.1283)^{ns}	(.829 - 1.339)	**1.180** (.1105)*	(.981 - 1.419)
Family life satisfaction				
very dissatisfied/dissatisfied	**1.388** (.2802)^{ns}	(.933 - 2.066)	**1.767** (.2156)***	(1.390 - 2.247)
neither satisfied nor unsatisfied	**1.353** (.1962)**	(1.017 - 1.800)	**1.729** (.1692)***	(1.017 - 1.800)
Social life satisfaction				
very dissatisfied/dissatisfied	**1.422** (.2042)**	(1.071 - 1.886)	**1.349** (.1325)**	(1.112 - 1.637)
neither satisfied nor unsatisfied	**1.627** (.2098)***	(1.262 - 2.097)	**1.438** (.2056)**	(1.085 - 1.906)
Social isolation	**1.280** (.1836)*	(.965 - 1.698)	**1.482** (.1218)***	(1.260 - 1.742)
Self-rated health status				
very bad / bad	**1.119** (.1971)^{ns}	(.791 - 1.584)	**1.029** (.1195)^{ns}	(.818 - 1.293)
fair	**1.237** (.1783)^{ns}	(.932 - 1.643)	**1.347** (.1505)**	(1.081 - 1.678)
Multimorbidity	**1.140** (.1391)^{ns}	(.896 - 1.449)	**1.042** (.1555)^{ns}	(.776 - 1.397)
Depression/anxiety	**1.369** (.2039)**	(1.021 - 1.835)	**1.673** (.1761)***	(1.360 - 2.059)
Sensory deficiency	**.993** (.1290)^{ns}	(.769 - 1.283)	**1.000** (.0894)^{ns}	(.839 - 1.193)
Physically active	**.835** (.1207)^{ns}	(.628 - 1.110)	**.955** (.1196)^{ns}	(.746 - 1.222)
Disability				
moderate	**1.134** (.1595)^{ns}	(.860- 1.496)	**1.252** (.2251)^{ns}	(.879- 1.784)
severe	**1.513** (.2421)**	(1.104 - 2.073)	**1.506** (.2493)**	(1.087 - 2.087)
Mistreatment (abuse)	**1.363** (.1779)**	(1.054 - 1.763)	**1.183** (.1419)^{ns}	(.934 - 1.498)
Discrimination	**1.273** (.2253)^{ns}	(.898 - 1.804)	**1.347** (.1841)**	(1.028 - 1.763)
constant	**.090** (.0351)***	(.042 - .194)	**.026** (.0084)***	(.014 - .049)

IRR: Incident Rate Ratios; **St. err.**: Standard error. ***p*-values**: *: $p < .10$; **: $p < .05$; ***$p < .0001$; **ns**: no significant.

Key significant predictors of loneliness from the men's survey data include sole caregiving activity, indifferent family life satisfaction, dissatisfaction with social life, depression/anxiety, severe disability, social isolation and mistreatment. Oldest-old age and having a partner were protective factors against loneliness in men. In turn, significant predictors of loneliness among older women were: aged 70 - 79 y-olds, lower educational attainments, working status, dissatisfaction with family life, dissatisfaction with social life, fair self-rated health, depression/anxiety, severe disability, discrimination and social participation. No significant protective factors against loneliness were observed among older women.

Just to exemplify the interpretation of the IRRs: the likelihood of experiencing loneliness in an older man acting as a sole caregiver is 1.7 times that of a non-caregiver. On the contrary, a man who has a partner has almost half the likelihood of experiencing loneliness than one who does not have a partner.

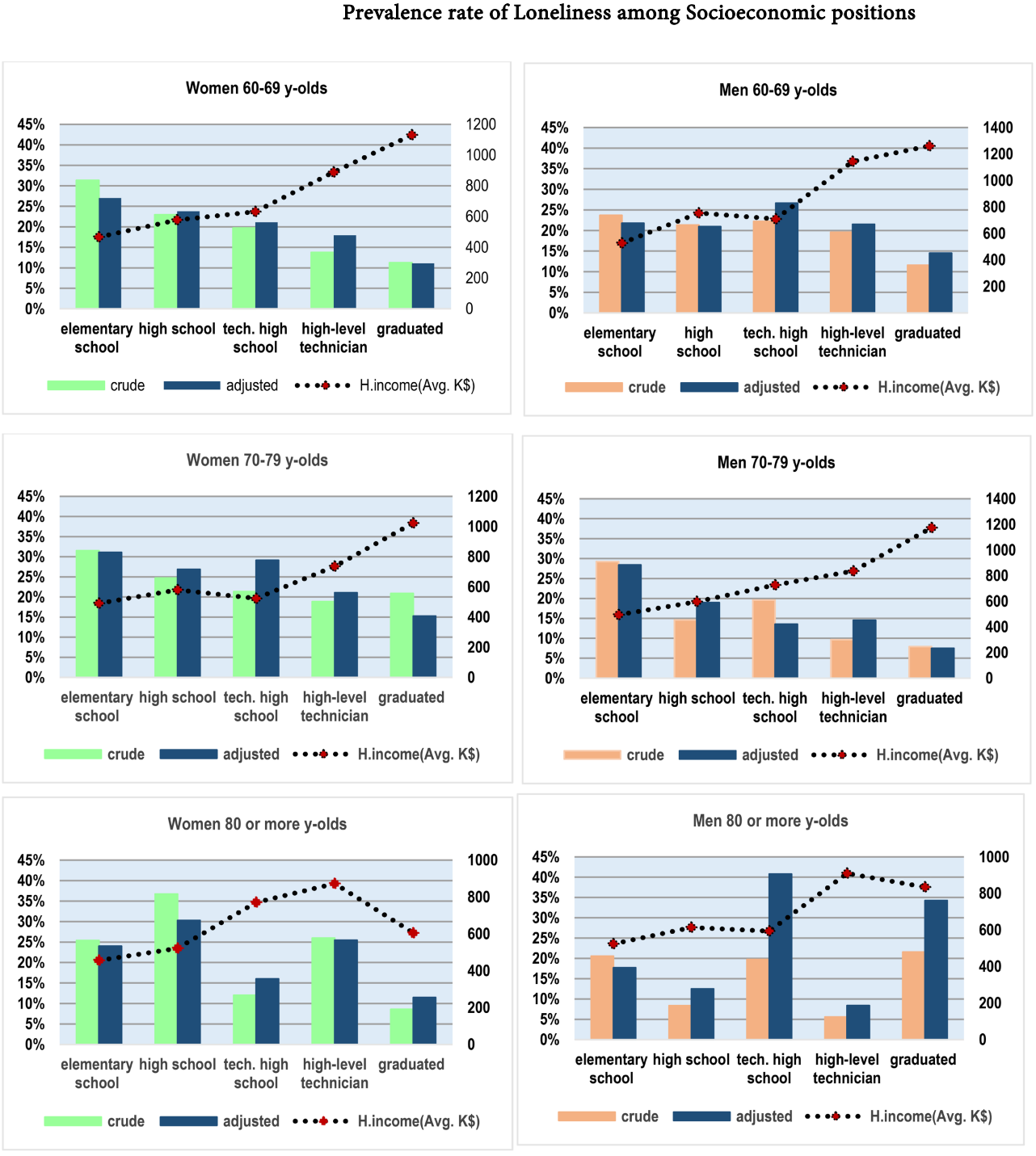

Figure 1. The prevalence rates of loneliness by sex and age groups for education levels. NQoLHS-2023/2024.

Figure 1 and Figure 2 display loneliness rates by gender and age group, respectively, categorised by education level and household income quintile. Prevalence rates (PRs) indicate the crude and adjusted probabilities of loneliness within each subpopulation. Average monthly household income is included to underscore economic differences among socioeconomic positions.

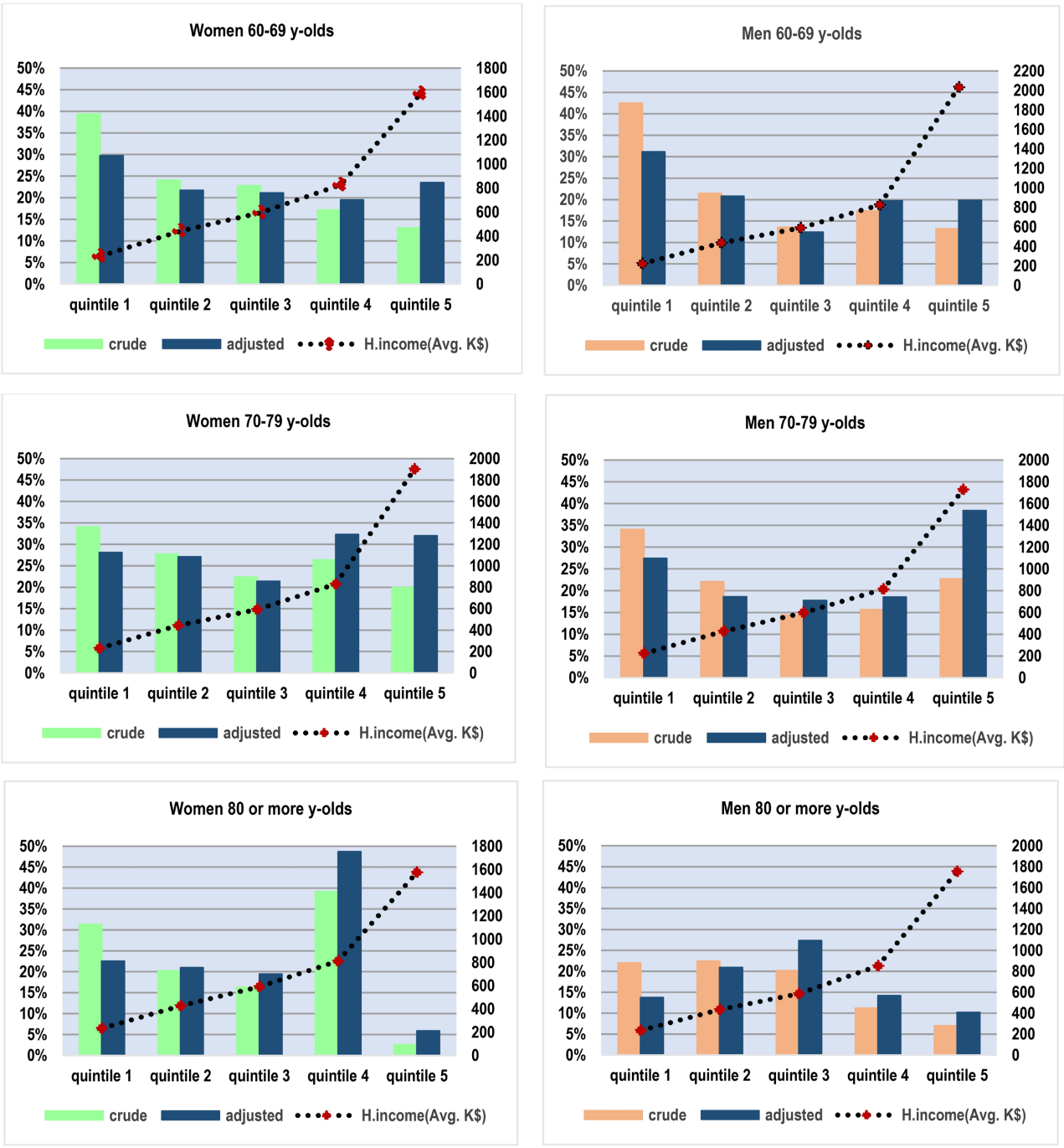

Figure 2. The prevalence rates of loneliness by sex and age groups for income quintiles. NQoLHS-2023/2024.

Overall, Figure 1 shows a decreasing trend in the prevalence rates of loneliness among both genders across more young-old age groups, from the illiterate/elementary school to the graduated educational attainment. On the other hand, the oldest-old individuals deviate from the trend in prevalence across educational levels in both genders. Moreover, differences between crude and adjusted loneliness prevalence rates are likely due to the effects of other covariates, along with educational attainment.

Overall, Figure 2, except for the adjusted prevalence rate of loneliness among the oldest-old men, shows that the crude and adjusted prevalence rates of loneliness across the three age groups of both sexes tend to decrease from the 1st to the 3rd income quintile. In older age groups (70 - 79), particularly among women, adjusted prevalence rates are higher in the 4th and 5th quintiles. It must be noted that the oldest-old women in the 4th quintile have the highest prevalence of loneliness, and those in the 5th quintile, both men and women aged 80 or older, have the lowest prevalence of loneliness.

Inequalities Index

The Slope Index of Inequality (SII) and the Relative Index of Inequality (RII) were used to quantify, across the study sub-populations, the absolute and relative inequality gap between the least-advantaged and most-advantaged groups in the analysed socioeconomic positions. Table 3 shows the SlI and RII of loneliness by education Levels and income quintiles by gender and age groups among older adults in Chile.

Table 3. SlI and RII of loneliness by sex and age groups for education level and income quintiles in older adults.

	60 - 69 y-olds		70 - 79 y-olds		80 or more y-olds	
	SII (95% CI)	RII	SII (95% CI)	RII	SII (95% CI)	RII
Men						
Education Levels						
Crude model	**.068** (.068 - .069)	**1.393**	**.191** (.190 - .193)	**2.987**	**.092** (.092 - .092)	**1.851**
Adjusted model	**.106** (.058 - .154)	**1.570**	**.248** (.210 - .287)	**3.566**	**.117** (.022 - .211)	**1.745**
Household Income Quintiles						
Crude model	**.239** (.238 - .239)	**3.049**	**.156** (.156 - .157)	**2.050**	**.137** (.137 - .137)	**2.087**
Adjusted model	**.306** (.249 - .363)	**3.539**	**.238** (.180 - .295)	**2.974**	**.201** (.003 - .398)	**2.069**
Women						
Education Levels						
Crude model	**.176** (.166 - .185)	**2.217**	**.112** (.112 - .112)	**1.552**	**.015** (.015 - .015)	**1.059**
Adjusted model	**.198** (.169 - .227)	**2.547**	**.140** (.101 - .178)	**1.730**	**.032** (-.061 - .124)	**1.135**
Household Income Quintiles						
Crude model	**.243** (.242 - .243)	**2.722**	**.111** (.111 - .111)	**1.491**	**.052** (.052 - .052)	**1.223**
Adjusted model	**.249** (.217 - .280)	**3.161**	**.141** (.100 - .181)	**1.779**	**.162** (.113 - .212)	**2.356**

* Comparison groups: **Education levels**: illiterate/elementary school vs graduated; **Household income**: 1st vs 5th quintile. *** Crude Model**: Crude model including only loneliness and "ridit" of education levels and of the income quintiles, respectively. *** Adjusted Model**: corresponds to the Crude model adjusted by demographics, socioeconomic, and health factors.

Overall, the absolute differences between the least and most advantaged groups in both socioeconomic positions are greater in the adjusted models for both genders. Similarly, the relative differences—expressed as ratios of the estimated indi-

cators—are also larger in the adjusted models for both genders, except among men aged 80 or over in both socioeconomic positions.

For educational attainment, men aged 70 - 79 exhibit the highest adjusted SII and RII values among all age groups in both genders. In this group, the difference in loneliness prevalence between illiterate/elementary and graduate groups is 19.1 percentage points in the crude model and 24.8 percentage points in the adjusted model. Additionally, the RII for men aged 70 - 79 indicates that the prevalence of loneliness is 3.0 times higher in the crude model and 3.6 times higher in the adjusted model for illiterate/elementary school graduates compared to graduates. In contrast, women aged 80 and over have the lowest adjusted SII and RII for educational attainment across all age groups. Among these women, the SII shows a difference of 1.5 percentage points in the crude model and 3.2 percentage points in the adjusted model in the prevalence of loneliness. The RII indicates the prevalence of loneliness is 1.06 times higher in the crude model and 1.1 times higher in the adjusted model among illiterate/elementary school graduates compared to graduates.

Across household income quintiles, individuals aged 60 - 69 have the highest adjusted SII and RII values among all age groups, with men showing higher values than women. Among men in this age group, the difference in loneliness prevalence between the first and fifth quintiles is 23.9 percentage points in the crude model and 30.9 percentage points in the adjusted model. For women aged 60 - 69, these differences are 24.3 and 24.9 percentage points in the crude and adjusted models, respectively. The RII for men aged 60 - 69 indicates that the prevalence of loneliness is 3.1 times higher in the crude model and 3.5 times higher in the adjusted model in the lowest versus the highest income quintile. For women, the RII is 2.7 times higher in the crude model and 3.2 times higher in the adjusted model. In contrast, women aged 70 - 79 have the lowest adjusted SII and RII values across income quintiles. In this group, the difference in loneliness prevalence between the first and fifth quintiles is 11.1 percentage points in the crude model and 14.1 percentage points in the adjusted model. The crude RII is 1.5, and the adjusted RII is 1.8 times higher among women in this age group.

4. Discussion

"*Economic growth without reducing income inequalities will not reduce health inequalities*" (Marmot, 2010)

Socioeconomic inequalities are closely associated with a higher prevalence of loneliness among older adults, especially in societies with significant income disparities. Loneliness is more common in disadvantaged groups, contributes to poorer health outcomes and reduced quality of life, and represents a growing public health concern. Moreover, loneliness may serve as an independent pathway linking socioeconomic disparities to adverse health outcomes (Meisters et al., 2021).

Overall, the prevalence of loneliness among older adults in Chile is inversely

related to both educational level and household income quintile, when not stratified by age or sex. The slope of the trend curve for household income quintiles (m = −0.047) is steeper than that for educational levels (m = −0.037), suggesting that household income has a stronger impact on loneliness prevalence in this population. These results align with previous studies showing positive associations between lower education, lower income, and increased loneliness (Kung et al., 2022; Kino et al., 2023; Taylor et al., 2024; Hajek et al., 2024; Beller, 2024).

The study found that the adjusted prevalence of loneliness among older adults was 23.4%, with men reporting higher rates than women, although this difference was not statistically significant. This prevalence is consistent with previous research, although it contrasts with findings regarding which gender is more affected (Kim & Lee, 2022; Chang et al., 2023; Ratcliffe et al., 2024; Salari et al., 2025). Some studies suggest that men experience greater loneliness due to shifting sociocultural contexts and differing attitudes toward social connections (Dahlberg & McKee, 2014; Kim et al., 2021; Ratcliffe et al., 2024; Salari et al., 2025; Takagi et al., 2020; Compernolle et al., 2021; Kim & Lee, 2022; Zhao et al., 2025; Puyané et al., 2025). Remarkably, the men in this study belong to the "baby boom" generation, which is facing significant family, sociocultural, and economic changes typical of postmodern societies. As a result, men may lack close social network support, experiencing more "social" loneliness than "emotional" loneliness, a pattern more commonly observed in women (Nicolaisen & Thorsen, 2014; de Jong Gierveld et al., 2009; Stevens & Westerhof, 2006). Furthermore, the operational definition of loneliness used in this study, which emphasizes social disconnection, may also influence these outcomes.

Gender differences in loneliness are shaped by distinct predictor and protective factors. For men, key predictors include caregiving responsibilities, severe disabilities, dissatisfaction with social life, depression, mistreatment, neutral family life satisfaction, and social isolation. Sole men caregivers are 32.6% more likely to feel lonely, while dissatisfaction or indifference toward social life increases their likelihood by 26.4% and 30.2%, respectively. Depression, abuse, and severe disabilities further elevate the likelihood for men. These findings are consistent with previous studies showing that older men often experience heightened loneliness due to smaller social networks and a greater reliance on partners for emotional support (Chang et al., 2023; Kim & Lee, 2022; Ratcliffe et al., 2024; Salari et al., 2025). In contrast, men aged 80 or older, and those with partners, are less likely to experience loneliness. Psychological resilience and higher socioeconomic status may help explain these protective effects, enabling older men to better cope with stress, maintain mental health, and manage feelings of loneliness (Fontes & Neri, 2015; Taylor & Carr, 2020; Zapater-Fajarí et al., 2021; Trică et al., 2024).

Among women, no protective factors against loneliness were identified, and more predictor factors were observed compared to men. Educational level emerged as a major risk factor: women who were illiterate or had only elementary or high school education are 27% more likely of loneliness—double that of graduates.

While this finding aligns with prior research, it is important to note that the effect of lower education in older women is often indirect, moderated by partner or parental history and broader social context, rather than acting as a simple, independent predictor (Fierloos et al., 2021; Fernández-Carro & Gumà Lao, 2022; Hajek et al., 2024). Dissatisfaction with family life also increased loneliness likelihood, with rates of 35.8% and 36.6% for women reporting neutral or dissatisfied family relationships, respectively. This supports previous findings that dissatisfaction with family life—including being unpartnered, childless or widowed, or having low satisfaction with family communication or relationship quality—is consistently linked to higher loneliness in older women (Dahlberg et al., 2021; Fernández-Carro & Gumà Lao, 2022; Fernández-Dávila et al., 2025).

Before discussing the findings on socioeconomic inequalities, it is important to consider several contextual facts about Chile. According to the 2024 National Socioeconomic Characterisation Survey (CASEN, 2024), among people aged 60 and over, 44.5% were illiterate or had only elementary education, 30.7% had completed high school, and just 10.2% were graduates or postgraduates. Income poverty and multidimensional poverty rates among older adults were 13.5% and 14.9%, respectively, compared to national averages of 17.3% and 17.7%. Notably, both socioeconomic indicators show worse outcomes for women (Observatorio Social & Subsecretaría de Evaluación Social del Ministerio de Desarrollo Social y Familia, 2026).

Distinct patterns emerge across age groups and genders. While notable differences in loneliness prevalence were observed across income quintiles, these were not statistically significant for either gender. In contrast, significant differences in loneliness by education level were found only among women. This finding contrasts with previous studies, which often report that the impact of education diminishes or disappears once household income is considered (Beller, 2024; Dahlberg et al., 2021; Hajek et al., 2024). One possible explanation is that, especially for women, education strongly shapes family trajectories and enhances social skills that lead to higher-quality social connections, influencing both the size and quality of social networks (Bishop & Martin, 2007; Kung et al., 2022; Fernández-Carro & Gumà Lao, 2022; Balki et al., 2023).

The adjusted inequality indices for both socioeconomic indicators were higher than in the crude analysis, suggesting that the effects of education and household income on loneliness prevalence among older adults are mediated or moderated by other relevant variables. Notably, aside from depression and disability, most physical health factors were not significantly associated with loneliness. In contrast, social factors—including social isolation, discrimination, and mistreatment—were significant, indicating that loneliness in older adults is a multidimensional phenomenon primarily related to psychosocial issues affecting health and well-being.

The study found significant disparities in the prevalence of loneliness by education level, gender, and age group. Older adults with lower educational attain-

ment were more likely to experience loneliness than those who had completed higher education. Among older women, those with only an elementary education or who were illiterate had a higher prevalence of loneliness compared to graduates, although this difference diminished in older age groups. Except for women aged 60 - 69, men with lower educational attainment also faced higher loneliness prevalence than their more educated peers. These patterns may reflect the impact of losing structural and social roles within the family, retirement and its effects on socialisation, weaker friendship networks, less willingness to engage in social activities, and changes in partner status. Notably, this cohort includes the "baby boomer" generation, whose men were often socialised to be stoic rather than emotionally expressive, making meaningful interactions—including with intimate partners—more challenging. These findings are consistent with previous evidence suggesting that changes in family structure, reduced work-related social ties, partner status, social isolation, and limited social participation heighten vulnerability to loneliness among older men (Pinquart & Sorensen, 2001; Santini et al., 2016; Botterill et al., 2016; Schwartz & Litwin, 2018; Cudjoe et al., 2020; Lee et al., 2020; Boehlen et al., 2021; Kim & Lee, 2022; Chang et al., 2023; Ratcliffe et al., 2024).

Men exhibit greater absolute and relative disparities in loneliness likelihood related to household income than women across age groups. Except among the oldest-old women, these disparities diminish with increasing age in both genders. Household income reflects material resources, granting access to health insurance, health-related services, and healthier environments and lifestyles (Marmot, 2010). Conversely, higher income inequality among older adults is linked to poorer physical and mental health outcomes, including greater loneliness and reduced access to healthcare—particularly preventive services (Frazier et al., 2023; Chi et al., 2024). These results align with existing literature, which shows that economically disadvantaged individuals are more susceptible to loneliness than those who are better off, indicating that income inequality exacerbates the social gradient in loneliness (Cheung et al., 2019; McCain et al., 2021; Tapia-Muñoz et al., 2022; Sánchez-Moreno et al., 2024; Beller, 2024).

This study offers several notable strengths. Utilising nationally representative data supports the generalizability of the findings, while a large sample size enhances the precision of the results. The use of a structured, multi-item questionnaire (TILS) to measure loneliness ensures data reliability. Parsimonious models that adjust for relevant confounders provide robust estimates, and the use of Average Marginal Effects (AMEs) facilitates clear interpretation. Additionally, conducting separate analyses by gender and age group, together with the use of a specific inequalities index, yields a more nuanced understanding of how socioeconomic position relates to the likelihood of loneliness among older adults in Chile.

Nonetheless, this study has important limitations. Self-reported measures may introduce recall bias, particularly among older adults, those with cognitive issues, and those with lower educational attainment. The cross-sectional design precludes establishing causality and leaves open the possibility of reverse causation.

Dividing the sample by gender and age group reduces the number of participants in each stratum, potentially affecting the precision of estimates, especially for adults aged 80 or older. Finally, as with any observational study, unmeasured factors may introduce endogeneity or confounding; thus, these findings should be interpreted with caution.

Future research should prioritise longitudinal studies with large sample sizes, employing structured and validated instruments to assess both the social and emotional dimensions of loneliness in greater depth and to clarify their relevance across genders among older adults. It would also be valuable to investigate how socioeconomic position throughout the life course influences social connections and community engagement, and how these factors, in turn, impact health, quality of life, and well-being in later life. Additionally, incorporating personality traits into future analyses could help elucidate underlying mechanisms and clarify the role of resilience as a moderating factor in the relationship between social disconnection and socioeconomic disparities among older adults of both genders.

5. Conclusion

In Chile, almost one in four older adults reports experiencing loneliness—a condition that significantly undermines mental health and quality of life, particularly among disadvantaged groups. This underscores the importance of the social gradient in health. Unlike trends observed in much of the literature, older men in Chile are slightly more likely than women to report loneliness, though the difference is not statistically significant. Notably, except for women aged 60 - 69, substantial disparities in income and education affect older men across all age groups. The experiences of the baby-boom generation contribute to these patterns, as many older men face family disconnection, decreased income after retirement, and diminishing social networks. These findings highlight the critical need to address socioeconomic inequalities when exploring their impact on health outcomes. Effectively combating loneliness requires a dual approach: implementing structural interventions—such as reducing income inequality, enhancing social protection systems, and investing in community infrastructure—alongside individualised strategies, including targeted preventive programs and timely social and medical support for those in the most vulnerable groups.

Acknowledgements

The author utilised AI Grammarly to enhance the manuscript's grammar, clarity and academic conciseness.

Funding

No external funding supported this work.

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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