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Situations of Vulnerability, Life Satisfaction, and Social Support of Older Women and Men: Results From the Canadian Longitudinal Study on Aging (CLSA)

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Abstract

Situations of vulnerability are associated with reduced life satisfaction. Although social support moderates the influence of situations of vulnerability, little is known about their associations. This study aimed to document situations of vulnerability and examine their association with life satisfaction among older adults, and the moderating effect of social support. Secondary analyses of cross-sectional data ($n = 21{,}491$; 73.4 ± 0.04) from the Canadian Longitudinal Study on Aging, stratified by sex. Confirmatory factor analysis identified a vulnerability variable from physiological, psychological, socioeconomic and social indicators. Regression models examined the associations. For both sexes, depressive symptoms, chronic conditions and insufficient income best explained vulnerability, followed by dependence in basic activities of daily living, less social participation and living with fewer people. Vulnerability was associated with lower life satisfaction, and social support acted as a

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buffer against vulnerability. The buffering effect of social support reinforces recommendations concerning policies and interventions designed to increase networks.

Keywords
composite indicator, frailty, quality of life, public health, CLSA

Resulting from low fertility rates and increasing life expectancy over the decades (United Nations, 2019), the aging of contemporary societies is associated with increased risk of situations of vulnerability for individuals and greater healthcare expenditures (Bloom et al., 2015). Globally, the proportion of people aged 65 and over is expected to rise significantly by 2050, with one in six people in this age group (United Nations, 2022). In Canada, this proportion is projected to rise from 18.5% to 25.5% (United Nations, 2022). Along with this demographic change, the steady decline in household size observed in North America over recent decades has increased the risk of social isolation (U.S. Surgeon General, 2023), which lead to the development of the Canadian Clinical Guidelines on Social Isolation and Loneliness in Older Adults (Canadian Coalition for Seniors' Mental Health, 2024). Although it is difficult to modify population aging, it is possible to reduce loneliness and social isolation and, more broadly, the risk of situations of vulnerability (Bazel & Mintz, 2014).

A situation of vulnerability has recently been defined as '*a set of circumstances in which one or more individuals experience, at a specific moment in time, one or multiple physiological, psychological, socioeconomic or social difficulties that may interact to increase their risk of being harmed or having coping challenges that have a negative impact on their life*' (Levasseur et al., 2022). In line with Schröder-Butterfill and Marianti's conceptual framework (Schröder-Butterfill & Marianti, 2006) and offering a new multidimensional perspective on this complex and dynamic concept that has commonly been seen as dichotomous or unidimensional, this definition needs further empirical validation. One study showed that social vulnerability should be measured on a multidimensional basis rather than broken down into individual factors (Andrew & Keefe, 2014). When multiple risk factors interact, for example, social isolation, financial insecurity and disabilities, older individuals may face an accumulation of adverse effects on their life, including reduced life satisfaction (Andrew & Keefe, 2014). Such interaction can be better understand with the Human Development Model-Disability Creation Process (HDM-DCP; Fougeyrollas, 2021), a comprehensive framework explaining that disability and vulnerability are shaped by the interaction between personal and environmental factors, notably social and economic aspects. The HDM-DCP captures the complexities of the experiences faced by aging adults. For example, decreased physical health can result in financial insecurity due to the increased medical expenses and reduced income, which demonstrates the

multidimensional nature of vulnerability. A recent scoping study of the definitions of vulnerability highlighted the dynamic and multidimensional nature of the concept (Levasseur et al., 2022). This scoping found that vulnerability is not a static but changes over time and is influenced by multiple intersecting factors aligning with the HDM-DCP, and emphasising the importance of holistically assessing vulnerability. In this context, resilience plays an important role in helping individuals adapt and recover from adversity, stress or trauma, by leveraging available strengths and resources, notably social support, emotional regulation and self-efficacy (Wister et al., 2022). In a study from Germany, resilience was associated with life satisfaction in both older women (Beutel et al., 2009) and men (Beutel et al., 2010). Although a meta-analysis found that resilience is unrelated to age (Górska et al., 2022), other studies have shown that life satisfaction decreases as adults age (Beutel et al., 2009, 2010). The identification of factors associated with vulnerability and interacting with resources that contribute to resilience is thus important to enhance the life satisfaction of older adults. Depressive symptoms were shown to accelerate the decline in cognitive functions (Hwang et al., 2021), which was associated with vulnerability in older adults (Pritchard-Jones, 2016). Among socioeconomic difficulties, when a person has difficulty satisfying basic needs such as affording food, clothes or shelter, this situation can exacerbate vulnerability by increasing stress and loneliness (Fokkema et al., 2012; Henke, 2020). In addition, older adults living alone might have fewer resources in case of an emergency or when ill (Grundy, 2006), face greater risks of depressive symptoms (Stahl et al., 2017) or loneliness (Hawkley et al., 2019), and have less saving capacity to satisfy their basic needs (Henke, 2020). Difficulty satisfying these needs was also shown to be associated with limited engagement in community activities, especially in older women (Green-LaPierre et al., 2012), which increases their risk of social isolation (Ejiri et al., 2019). The accumulation of multiple risk factors can affect social participation, as well as physical and mental health, and, in turn, reduce life satisfaction. According to a meta-analysis of 286 papers, life satisfaction is associated with indicators of vulnerability, including the socioeconomic status (notably income and education), size and quality of the social network, as well as independence in daily activities (Pinquart & Sörensen, 2000). Among British aged 50 and over, decreased life satisfaction, measured through the correlated concept of quality of life was associated with lower income, lack of trusting relationships with family and friends, as well as longstanding illnesses, functional or mobility limitations, and depressive symptoms (Netuveli et al., 2006). Compared to 1,058 less vulnerable counterparts, 181 older Americans in situations of vulnerability were found to have lower well-being (Shin et al., 2021). Associations of vulnerability with life satisfaction may, however, be moderated by individual and contextual factors. By enabling the proactive management of health, a positive attitude towards aging (Wu & Sheng, 2019), associated with self-efficacy (Fida et al., 2015), protects against vulnerability. Older women's living situation in Canada was also found to be more vulnerable than older men's: 31.5% lived alone in 2011 versus 16.0%, median income of $21,900 versus $32,300 in 2013, 34.2% versus 26.8% reported being in pain, and 35.3% versus 30.9% reported

having at least one disability (Hudon & Milan, 2016). While there is abundant literature on sex differences in social support (Antonucci & Akiyama, 1987; Pinquart & Sörensen, 2000; Reevy & Maslach, 2001), few studies have explored its differential association with life satisfaction. In 99 older American facing adversity (e.g., financial hardships, illnesses, death of loved ones or interpersonal problems), a larger social network was associated with better life satisfaction in women and men but, overall, the latter were more satisfied with their lives (Fuller-Iglesias et al., 2008). The above meta-analysis also found that income and education were more strongly associated with life satisfaction in older men, whereas social support had a stronger association in women (Pinquart & Sörensen, 2000). In one Canadian study, satisfaction with relationships with friends, children, and family was associated with greater life satisfaction for older women but not men (Bourque et al., 2005). Increased frequency of contacts with children and family, and living alone, were also associated with quality of life in British women (Netuveli et al., 2006). These results indicate the importance of studying the association between vulnerability and life satisfaction separately for the two sexes. Among contextual factors, social support, that is, mobilising family members, friends or neighbours, can provide emotional, material and instrumental help or information that might act as a buffer against negative impacts, such as depressive symptoms (Adams et al., 2016).

To our knowledge, older Canadians' situations of vulnerability have not been measured multidimensionally and their associations with other outcomes have rarely been examined. Measuring frailty by aggregating physical, cognitive and mental health outcomes from the Canadian Longitudinal Study on Aging (CLSA), this concept related to vulnerability was found to be strongly correlated with life satisfaction in adults aged 45 + ($n = 20{,}874$) (Kanters et al., 2017). To our knowledge, only one study comprehensively measured situations of vulnerability by considering physiological, psychological, socioeconomic and social risk factors. That study found that older Germans ($n = 5{,}826$; surveyed in 2014-2015) in these situations had lower life satisfaction, controlling for age, gender and self-efficacy (Cihlar et al., 2023). The protective effect of social support was stronger with increasing vulnerability, suggesting that mobilising the network could be more beneficial for vulnerable older adults. To build comprehensive knowledge about situations of vulnerability and have more impact on decision-making (Nichols et al., 2021), these results need to be replicated and stratified according to sex.

It is essential to have comprehensive knowledge of situations of vulnerability and their associations with life satisfaction and social support in order to help develop public health interventions and welfare policies, as prioritised by the United Nations Decade of Healthy Ageing initiative (World Health Organization, 2020). By providing access to resources that ensure individuals have a good life (Greve, 2008, p. 58), welfare interventions were effective in improving health and decreasing older adults' risk of situations of vulnerability (Mah et al., 2022). Because demographic aging may increase dependence on the welfare state, results from the German study should be replicated to expand knowledge of situations of vulnerability among older

Canadians. This study thus aimed to document situations of vulnerability and examines their associations with life satisfaction and social support, and also the moderating effect of social support on the association between situations of vulnerability and satisfaction among older women and men. The sex stratification was warranted for understanding vulnerability among older women and men, as substantial evidence indicates systematic differences in health trajectories (Crimmins et al., 2011), social support (Levasseur et al., 2011), life satisfaction (Pinquart & Sörensen, 2000), as well as experiencing and accumulating vulnerability through distinct pathways (Grundy, 2006).

Methods

Design and Participants

Secondary analyses of cross-sectional data were carried out using the CLSA, a nationwide cohort study of adults living in private dwellings and aged 45 to 89 at baseline (2012–2015), and involving researchers from 26 universities across Canada (Raina et al., 2019). Although the CLSA is longitudinal, a data collection period and cross-sectional analysis similar to the German study (Cihlar et al., 2023) were used to replicate its results. The CLSA's respondents were recruited in two cohorts ($n = 51{,}338$), one comprehensive and the other tracking, using a stratified random sample of eligible households and an oversampling of certain underrepresented areas, based on age, gender and province, that make the sample representative of the Canadian aging population (Raina et al., 2019). Potential respondents were excluded if they could not communicate in English or French, lived in one of the three Canadian territories, were full-time members of the Canadian Armed Forces or lived on First Nations reserves or settlements. The **comprehensive cohort** ($n = 30{,}097$) was recruited among aging adults who lived within 50 km of one of the 11 data collection sites and participated in an in-depth physical assessment (Raina et al., 2019). Collected with the same core set of questionnaires but without the physical assessments, the **tracking cohort** ($n = 21{,}241$) recruited respondents from the 10 provinces. The two cohorts are complementary and may be studied separately or together. In the present study, only adults aged 65 and over in both cohorts were included ($n = 21{,}491$). The Research Ethics Committee of the Health and Social Services Centre, University Institute of Geriatrics of Sherbrooke, approved the study (MP-31-2017-656).

Measures

The usual sociodemographic data were collected to describe the respondents (Table 1). Based on a recent scoping study that content-analysed the definitions and measurements of this concept using the DCP Model (Fougeyrollas, 2021; Levasseur et al., 2022) situations of vulnerability were synthesised in four dimensions: physiological, psychological, socioeconomic and social. To ensure large-scale reproducibility of

Table 1. Respondents' Characteristics.

Characteristic	Women ($n = 10,749$) Mean (s.d.)	Men ($n = 10,742$) Mean (s.d.)	Total ($n = 21,491$) Mean (s.d.)	p-Value[†]
Age (years)	73.3 (5.8)	73.4 (5.7)	73.4 (0.04)	.37
Positive attitude towards own aging[1] (/5)	3.7 (0.9)	3.7 (0.9)	3.7 (0.9)	.83
Independence in instrumental activities of daily living[2] (/7)	6.8 (0.6)	6.9 (0.5)	6.9 (0.6)	<.001
Network size[3] (/198)	23.1 (17.4)	23.5 (19.1)	23.3 (18.3)	.11
	***n* (%)**	***n* (%)**	***n* (%)**	
Education level				<.001
<Secondary school	1,346 (12.6)	1,107 (10.4)	2,453 (11.5)	<.001
Secondary school	1,458 (13.6)	1,142 (10.7)	2,600 (12.1)	<.001
>Secondary school	7,911 (73.8)	8,444 (79.0)	16,355 (76.4)	<.001
Owner (vs. renter)	8,466 (79.0)	9,219 (86.0)	17,685 (82.5)	<.001
Born in Canada	8,842 (82.3)	8,395 (78.2)	17,237 (80.2)	<.001
In a couple	5,049 (47.0)	8,238 (76.7)	13,287 (61.8)	<.001
Household income				<.001
- < $20,000	1,098 (11.6)	438 (4.3)	1,536 (7.8)	<.001
$20,000–$49,999	4,286 (45.3)	3,154 (31.2)	7,440 (38.0)	<.001
$50,000–$99,999	3,075 (32.5)	4,311 (42.6)	7,386 (37.7)	<.001
$100,000–$149,999	712 (7.5)	1,436 (14.2)	2,148 (11.0)	<.001
>$150,000	294 (3.1)	770 (7.6)	1,064 (5.4)	<.001
Retirement status				<.001
Fully retired	8,915 (83.5)	8,084 (75.3)	16,999 (79.4)	<.001
Partly retired	935 (8.8)	1,677 (15.6)	2,612 (12.2)	<.001
Not retired	829 (7.8)	971 (9.0)	1,800 (8.4)	<.001

[†]*t*-Test (continuous) and chi[2] test (categorical) comparing women and men; S.D.: standard deviation; [1] assessed by asking respondents the following question: '*In terms of your own healthy aging, would you say it is: 1) poor, 2) fair, 3) good, 4) very good, or 5) excellent?*';[2] can do the following activities without or with some help (vs. unable): use the phone, get to places outside walking distance, go shopping, prepare meals, do housework, take medicine, handle money;[3] sum of reported living children, siblings, friends and neighbours.

the results, indicators were kept to a minimum (Casadevall & Fang, 2010) and chosen among questionnaires presenting the best psychometric properties that were available in most major national surveys. Physiological vulnerability was the sum of two items: (i) respondents indicated their disability from dependence in basic activities of daily living (ADL), and (ii) the number of reported chronic conditions (excluding the category 'other long-term physical or mental condition'). These two items were selected since: (i) reporting a disability from dependence in ADL was associated with poor self-

rated health and matched the person's actual ability to function in daily life better than their self-rated health (Bardage et al., 2005; Cambois et al., 2015), and (ii) the number of chronic conditions was found to be correlated with poor self-rated health in older Canadians, when controlling for age and gender (Wister et al., 2015). Psychological vulnerability utilised the 10-item Center for Epidemiologic Studies Depression scale (CES-D-10) (Andresen et al., 1994). The CES-D-10 is a widely used instrument that estimates the weekly frequency of 10 depressive symptoms; it has shown good internal consistency ($\alpha = .72$) in older adults without cardiovascular disease, dementia or physical disability (Mohebbi et al., 2018). Socioeconomic vulnerability was assessed by asking respondents '*How well do you think your income currently meets your basic needs?*' The choice of answers was as follows: (a) very well, (b) adequately, (c) with some difficulty, (d) not very well, (e) totally inadequately. Social vulnerability was measured using two variables: (i) the number of people living in the household as reported by the respondent, and (ii) social participation assessed by the reported frequency of engaging in eight types of activities with others. Since one item of the CES-D-10 considers loneliness, another measure of this concept was not included in this dimension of vulnerability to avoid redundancy. Internal consistency of the social participation scale was satisfactory ($\alpha = .72$) (Levasseur et al., 2015). Measures used to estimate vulnerability were normalised and, when necessary, inverted to represent risk factors.

Life satisfaction, the dependent variable, was assessed with the Satisfaction with Life Scale (SWLS); a 5-item questionnaire with answers ranging from 0 (strongly disagree) to 6 (strongly agree) (Diener et al., 1985). These items were: (a) In most ways my life is close to my ideal; (b) The conditions of my life are excellent; (c) I am satisfied with my life; (d) So far I have gotten the important things I want in life; and (e) If I could live my life over, I would change almost nothing. The sum of these answers is the final score, which ranges between 0 and 30, with scores $\geq$20 indicating average or better satisfaction (Diener, 2023). The scale has shown good internal consistency ($\alpha = .74$) among adults aged 50 and over (López-Ortega et al., 2016).

Social support was measured with the Medical Outcomes Study (MOS) Social Support Survey, which includes four subscales and 18 items evaluating the availability of emotional and informational (8 items), tangible (4 items) and affectionate (3 items) support, as well as positive social interaction (3 items). The answers were: (a) none, (b) a little, (c) some, (d) most and (e) all of the time, and the scales showed good reliability ($\alpha = .78$) (Robitaille et al., 2011). The final score was calculated by averaging the 18 answers (range = 1.0–5.0), with higher scores indicating greater social support.

Finally, three other categorical variables were also considered: age, sex (male; female), and a positive attitude towards one's own aging.

Analyses

All analyses were performed for the whole sample and separately for women and men. Participants were described using means and standard deviations for continuous

variables, and frequencies and percentages for categorical variables. Similarly to the German study (Cihlar et al., 2023), a principal components analysis was performed to verify that the six variables indicating vulnerability had a correlated structure and, subsequently, a latent variable was identified using confirmatory factor analysis (CFA) (Tabachnick & Fidell, 2007). CFA was based on structural equation modelling (SEM), with linear link functions and including missing values. The model was assessed with fit indicators, that is, comparative fit index (CFI) and root mean square error of approximation (RMSEA), with the same variables based on maximum likelihood with missing values (MLMV).

A continuous vulnerability variable was estimated based on the factor score obtained from the latent structure identified with CFA, with higher scores indicating greater vulnerability. Generation of the latent variable similar to the German study (Cihlar et al., 2023), makes it possible to compare the situations of vulnerability in the two studies. Thus, on the one hand, the results from Germany can be verified and, on the other hand, extended operationalisation can be carried out. To estimate the association between situations of vulnerability and life satisfaction, linear regression models were used in four steps to: (a) test the main effect of multidimensional vulnerability; (b) test the main effect of social support; (c) test the moderating effect of social support by adding an interaction term; and (d) control for potential confounding effects (age, sex and healthy aging). No collinearity problem between the variables' main effects was observed and residual analyses were performed to verify the regression assumptions. The analyses were performed with Stata 17.0 (StataCorp, 2021).

Results

Equally distributed between both sexes, respondents were aged between 65 and 89, and the majority reported a positive attitude towards their own aging (Table 1). Most performed their instrumental activities of daily living (IADL) alone or with some help and reported an average of 23 people in their network. Over three out of four respondents had some post-secondary education, owned their home, and were born in Canada, and almost two thirds lived in a couple. Less than one in ten, including more women than men, had a yearly household income under $20,000, and about four out of five were fully retired. More men than women had some post-secondary education, owned their home, lived in a couple and were partly retired.

On average, respondents reported good life satisfaction and highly available social support (Table 2). Most respondents were independent in ADL and had about five chronic conditions. The majority did not report depressive symptoms and considered their income more than sufficient to meet their basic needs. One third lived alone and engaged in social activities at least once a day. Compared to men, women lived with fewer people, had more chronic conditions and depressive symptoms, but greater social participation.

The excellent fit of the six variables confirmed vulnerability as multidimensional (Table 3); having depressive symptoms, chronic conditions and income not meeting

Table 2. Description of the Main Variables.

Characteristic	Women ($n = 10,749$) Mean (s.d.)	Men ($n = 10,742$) Mean (s.d.)	Total ($n = 21,491$) Mean (s.d.)	p-Value[†]
Life satisfaction[1] (/30)	22.9 (6.1)	23.8 (5.7)	23.4 (0.04)	<.001
Social support (/5)	4.2 (0.7)	4.2 (0.8)	4.2 (0.7)	<.001
Situations of vulnerability (standardised final score)	**0.0 (0.5)**	**0.0 (0.5)**	**0.0 (0.5)**	**1.00**
Physiological				
Independence in ADL[2] (/12)	11.9 (0.4)	12.0 (0.3)	11.9 (0.4)	<.001
# of chronic conditions (/30)	5.3 (3.1)	4.2 (2.7)	4.7 (2.9)	<.001
Psychological				
Depressive symptoms[3] (/30)	5.8 (4.7)	4.6 (4.1)	5.2 (4.4)	<.001
Socioeconomic				
Income meets basic needs (/5)	4.5 (0.1)	4.5 (0.1)	4.5 (0.9)	.8
Social				
Persons living with respondent (#)	1.7 (0.8)	2.0 (0.7)	1.8 (0.8)	<.001
Social participation[4] (# of activities/months)	22.5 (13.2)	20.6 (13.2)	21.5 (13.3)	<.001

[†]z-Test comparing women and men; S.D.: standard deviation; [1] The questions assessed if life was close to ideal, living conditions, life satisfaction, the important things respondents have got in life and if they would change almost nothing if they could live their life over; [2] Can perform basic activities of daily living, with or without help: (a) dressing, feeding, grooming, walking, getting out of bed and taking a bath (range 0–12, with higher scores indicating independence); [3] Weekly frequency of depressive symptoms (e.g., being bothered, feeling fearful) answered as follows: (0) rarely or none of the time; (1) some or a little of the time; (2) occasionally or a moderate amount of time; (3) all of the time (scores ≥8 indicate depressive mood); [4] family or friends outside the household; church or religious; sports or physical; educational and cultural; service club or fraternal organisation; neighbourhood, community or professional association; volunteer or charity work; and other recreational (e.g., hobbies, bingo and other games); responses were converted into monthly frequencies of participation in each activity, i.e., respectively: 'at least once a day' = 20, 'at least once a week' = 6, 'at least once a month' = 2, 'at least once a year' = 1, and 'never' = 0, and then summed into a continuous estimate of the total number of community activities per month.

basic needs best explained the construct (Table 4). Dependence in ADL, less social participation and living with fewer people were found to make a significant but weaker contribution to vulnerability. Ranging between −0.63 and 1.62 (women: −0.66 to 1.52; men: −0.54 to 1.70), vulnerability had an almost normal distribution with a positive skew towards the most vulnerable (Figure 1). Women were more vulnerable than men (means = 0.08 vs. −0.08, respectively; $p < .001$) when compared on the overall vulnerability score.

Less vulnerability (Model 1; Table 5) and highly available social support were associated with greater satisfaction with life (Model 2). A moderating effect of support on

Table 3. Indicators of fit for Model of Multidimensional Vulnerability.

Total ($n = 21,330$)						
χ^2	df	CFI	RMSEA	AIC	BIC	Log likelihood
249.5	9	0.95	0.04	355834.4	355978.0	−177899.2
Women ($n = 10,668$)						
χ^2	**df**	**CFI**	**RMSEA**	**AIC**	**BIC**	**Log likelihood**
121.4	9	0.96	0.03	177765.6	177896.7	−88864.8
Men ($n = 10,662$)						
χ^2	**df**	**CFI**	**RMSEA**	**AIC**	**BIC**	**Log likelihood**
152.5	9	0.92	0.04	178477.0	178608.1	−89220.5

df: degrees of freedom; CFI: comparative fit index; RMSEA: root mean square error of approximation; AIC: Akaike information criterion; BIC: Bayesian information criterion.

Table 4. Standardised Coefficients for Confirmatory Factor Analysis of Multidimensional Vulnerability.

Indicator	Women ($n = 10,668$) Coefficient (S.E.)	Men ($n = 10,662$) Coefficient (S.E.)	Total ($n = 21,330$) Coefficient (S.E.)
Depressive symptoms	0.54 (0.01)	0.57 (0.02)	0.56 (0.01)
Chronic conditions	0.54 (0.01)	0.42 (0.02)	0.51 (0.01)
Income not meeting basic needs	0.38 (0.01)	0.32 (0.01)	0.35 (0.01)
Dependence in ADL	0.30 (0.01)	0.26 (0.02)	0.29 (0.01)
Less social participation	0.23 (0.01)	0.22 (0.01)	0.20 (0.01)
Living with fewer people	0.10 (0.01)	0.09 (0.01)	0.13 (0.01)

S.E.: standard error; ADL: activities of daily living; $p < .001$ for all coefficients.

the association between vulnerability and life satisfaction was observed (Model 3; Figure 2). In other words, when support was not considered available, greater vulnerability was associated with less life satisfaction. However, when social support was considered readily available, the association between vulnerability and satisfaction was weaker because satisfaction was systematically higher. In other words, support was associated with higher life satisfaction in all older adults in situations of vulnerability, but less in those who were not vulnerable; the latter appeared to be satisfied with their lives, independently of their perception of the availability of their social support. No interactions were found between vulnerability and support subscales (results not presented). Associations remained when controlling for co-variables (Model 4). When controlling for additional co-variables (i.e., independence in IADL, network size, education, being in a couple, household income and retirement status), non-

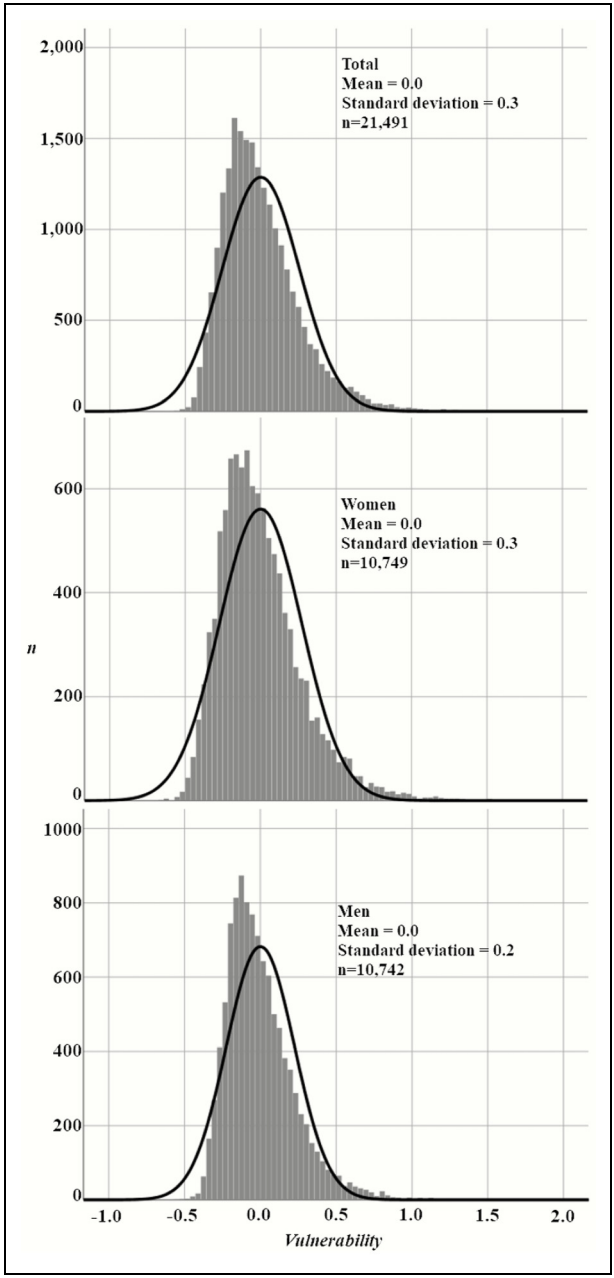

Figure 1. Frequency distribution of multidimensional vulnerability ($n = 21{,}491$).

Table 5. Standardised Regression Coefficients in the Multivariate Model Estimating Main and Moderating Effects of Social Support on the Association Between Situations of Vulnerability and Life Satisfaction.

Total ($n = 21,491$)

	Model 1		Model 2		Model 3		Model 4	
	β (95%CI)	*p*-Value	β (95%CI)	*p*-Value	β (95%CI)	*p*-Value	β (95%CI)	*p*-Value
Constant	3.9 (3.9,4.0)	<.001	2.5 (2.4,2.6)	<.001	2.5 (2.5,2.6)	<.001	1.0 (0.8,1.2)	<.001
Vulnerability	−0.5 (−0.5,−0.4)	<.001	−0.4 (−0.4, −0.4)	<.001	−0.6 (−0.6, −0.5)	<.001	−0.5 (−0.6,−0.5)	<.001
Social support			0.2 (0.2,0.3)	<.001	0.2 (0.2,0.3)	<.001	0.2 (0.2,0.2)	<.001
Age							0.07 (0.6,0.9)	<.001
Female (vs. male)							-0.002 (-0.01, 0.01)	.70
Positive attitude towards aging							0.2 (0.1,0.2)	<.001
Vulnerability * Social support					0.2 (0.1,0.2)	<.001	0.2 (0.1,0.2)	<.001
				Model fit				
Log likelihood	-67,125.2		-88,589.2		-86,050.1		-194,44.5	
AIC	134,256.4		177,196.4		172,128.3		388,957.0	
BIC	134,280.3		177,268.2		172,239.9		388,236.2	
R^2	0.230		0.285		0.286		0.311	
Women (n = 10,749)								
Constant	3.7 (3.6,3.7)	<.001	2.2 (2.1,2.3)	<.001	2.2 (2.1,2.3)	<.001	0.6 (0.4,0.9)	<.001
Vulnerability	−0.5 (−0.5,−0.5)	<.001		<.001		<.001	−0.5 (−0.5,-0.4)	<.001

(Continued)

Table 5. Continued

Total ($n = 21,491$)

	Model 1		Model 2		Model 3		Model 4	
	β (95%CI)	*p*-Value	β (95%CI)	*p*-Value	β (95%CI)	*p*-Value	β (95%CI)	*p*-Value
			−0.4 (−0.4,-0.4)		−0.5 (−0.6,-0.5)			
Social support			0.3 (0.2,0.3)	<.001	0.3 (0.2,0.3)	<.001	0.3 (0.2,0.3)	<.001
Age							0.1 (0.1,0.1)	<.001
Healthy aging							0.2 (0.1,0.2)	<.001
Vulnerability * Social support					0.2 (0.1,0.2)	<.001	0.1 (0.1,0.2)	<.001
				Model fit				
Log likelihood	−34,631.8		−44,963.4		−44,100.3		−90,499.7	
AIC	69,269.5		89,944.7		88,228.6		181,053.5	
BIC	69,291.3		90,010.2		88,330.5		181,250.1	
R^2	0.220		0.282		0.283		0.309	
Men (n = 10,742)								
Constant	4.1 (4.1,4.2)	<.001	2.8 (2.7,3.0)	<.001	2.9 (2.8,3.0)	<.001	1.5 (1.2,1.7)	<.001
Vulnerability	−0.5 (−0.5,−0.5)	<.001	−0.4 (−0.4, −0.4)	<.001	−0.6 (−0.7, −0.5)	<.001	−0.6 (−0.6,−0.5)	<.001
Social support			0.2 (0.2,0.2)	<.001	0.2 (0.2,0.2)	<.001	0.2 (0.2,0.2)	<.001
Age							0.1 (0.1,0.1)	<.001

(Continued)

Table 5. Continued

Total ($n = 21{,}491$)

	Model 1		Model 2		Model 3		Model 4	
	β (95%CI)	p-Value	β (95%CI)	p-Value	β (95%CI)	p-Value	β (95%CI)	p-Value
Healthy aging							0.1 (0.1,0.2)	<.001
Vulnerability * Social support					0.2 (0.1,0.3)	<.001	0.2 (0,1,0.3)	<.001
				Model fit				
Log likelihood	−31,677.1		−42,765.7		−40,489.9		−87,303.3	
AIC	63,360.3		85,531.4		81,007.8		176,660.6	
BIC	63,382.1		85,596.9		81,109.7		174,857.2	
R^2	0.236		0.283		0.285		0.307	

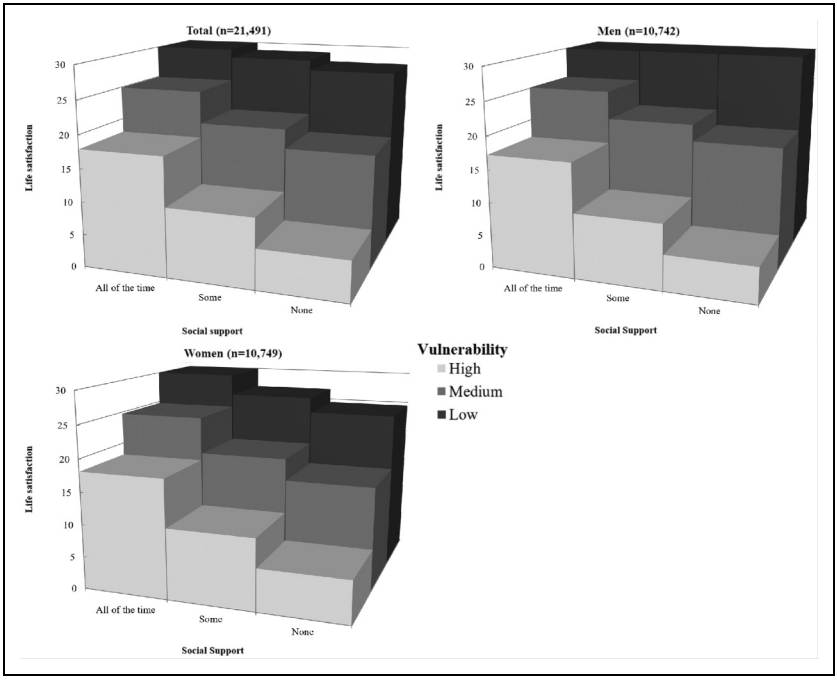

Figure 2. Moderating effect of social support on the association between vulnerability and life satisfaction.

significant differences were found but were not retained as they added collinearity issues and increased the number of missing values. All variables explained about one third (31.1%; 30.9% for women and 30.7% for men) of the variance in life satisfaction (Table 5).

Discussion

This study documented situations of vulnerability and examined their associations with life satisfaction and social support, as well as the moderating effect of social support on the association between situations of vulnerability and life satisfaction among older women and men. Four domains were found to document situations of vulnerability: (a) physiological (dependence in ADL and chronic conditions), (b) psychological (depressive symptoms), (c) socioeconomic (income not meeting basic needs) and (d) social (number of people living with respondent and social participation). Psychological, physiological and socioeconomic vulnerability indicators best explained overall vulnerability. The association of vulnerability appeared slightly stronger in older men compared to women, despite women having higher

odds of reporting physical decline and depressive symptoms (Crimmins et al., 2011). In the present study, the weaker association of vulnerability on women's life satisfaction may reflect greater emotional regulation and coping mechanisms (Grundy, 2006), in addition to social support. Greater availability of social support was associated with higher satisfaction in older men and women in situations of vulnerability, with the association being marginally stronger for women. However, life satisfaction decreased more rapidly with vulnerability when social support was low.

In line with the definition of situations of vulnerability developed by our team (Levasseur et al., 2022) and previous work on its social dimension (Andrew & Keefe, 2014), the present study emphasised the relevance of multidimensionality. The results support the importance of avoiding stigmatising older adults with a single criterion, such as chronological age, and recognising the heterogeneity of life trajectories. Moreover, the multidimensional concept of vulnerability contributes to a better understanding of the development of these situations, evolution of risks over time, and how individuals use resources to prevent negative outcomes. According to the present study, the importance of all the domains of vulnerability was not the same for older adults. Similarly to a recent meta-analysis of 38 studies depressive symptoms and chronic conditions mainly contributed to the variance of vulnerability. Income not meeting basic needs and dependence in daily activities contributed moderately to the variance of vulnerability, but more pronounced in women than men. Despite contributing less to this variance, infrequent social participation and living alone also contributed to vulnerability. Consistent with a comprehensive review of domains predicting frailty (Boucham et al., 2024), the present findings suggest that mitigating vulnerability requires a multidimensional approach addressing psychological, medical, socio-economic and social indicators, in addition to highlighting greater risk in women compared to men. Overall, the results are consistent with the German study (Cihlar et al., 2023), including the proportion of the variance in life satisfaction, and the finding that greater social support may protect older men and women in situations of vulnerability to a point where their assessment of satisfaction is on a par with that of non-vulnerable peers. This cross-cultural consistency in different welfare states strengthens the finding that social support can generally make an important difference for older men and women in situations of vulnerability.

The present study presented evidence of the moderating effect of social support on the association between life satisfaction and vulnerability in Canadian older adults. As older adults can effectively leverage their social network to gain the support they need, thereby improving their life satisfaction, these finding supports the importance of fostering resources associated with resilience (Wister et al., 2022). Differential protective effects of social factors for older women and men were nevertheless observed in another study (Levasseur et al., 2011). For example, social roles (e.g., family and occupation) can help women mobilise their social ties (Bukov et al., 2002). Recognising that social support is both directly associated with life satisfaction and also modifies its association with vulnerability highlights its role as a protective factor in these situations (Levasseur et al., 2022). The social support received by women and men

who are not in a situation of vulnerability may have a weaker effect on satisfaction. However, even if older women are more likely than men to keep in touch with family and friends (Cornwell, 2011), support should be maintained as it may become relevant in the event of increased vulnerability. Although the pathways by which social support contributes to health were explored, its association with situations of vulnerability warrants further study.

The findings of the present study have implications for clinical practice and policy research, notably regarding the multidimensional nature of vulnerability, the protective effect of social support and the differences according to sex. For practice, the varying importance of factors associated with vulnerability highlights the need for a comprehensive tool evaluating older women and men at risk of vulnerability, who may be in need of multidisciplinary interventions (Decoster et al., 2015). The integration of a multidimensional measure of vulnerability in public health monitoring is also essential, including to identify and address geographic disparities (Horev et al., 2004). This monitoring can guide more effective allocation of resources as well as design and implementation of interventions for high-risk populations, for example, in areas with superior financial insecurity or functional dependence, who may benefit from financial assistance or rehabilitation services. Considering the protective effect of social support, fostering strong social networks is also potentially important to reduce vulnerability and increase life satisfaction in older adults. Policymakers targeting community-based programs that enhance social connection and enable emotional and instrumental support, such as in senior centres, social clubs and volunteer opportunities, present a great potential to mitigate the negative impact of vulnerability.

Building on other work (Cihlar et al., 2023; Levasseur et al., 2022) advancing conceptualisation and measuring situations of vulnerability, this article argues for further exploration of the contextual factors that influence situations of vulnerability. Social and material deprivation increases vulnerability (Blair et al., 2015), but this situation can be improved by a welfare state that combats ageism, communicates concerning community resources, and provides accessible and affordable transportation and housing (National Seniors Council, 2014). Differing welfare regimes can influence vulnerability differently, depending on how much they intervene on socioeconomic factors (Esping-Andersen, 1990). For example, the liberal Canadian welfare state provides income-dependent benefits and relies heavily on the market while conservative Germany provides more generous benefits but adheres to a traditional model centred around the male primary provider (Pfau-Effinger, 2004). Increasing life satisfaction in Quebec, Canada, between 1985 and 2008 tended to support the premise that welfare improvement, that is, reduced income inequality and greater family and social support provided by the government, has more effect on well-being than income increases alone (Barrington-Leigh, 2013). Although Canada has not yet adopted a national action framework, the National Seniors Strategy for Canada (National Institute on Ageing, 2020) and the expert commission for the German Government Reports on Older People (German Centre of Gerontology (Deutsches

Zentrum für Altersfragen), 2023) can guide interventions and welfare policies in improving situations of vulnerability for older adults.

Strengths and Limitations

The present study is based on the CLSA, a nationwide survey with a large sample of respondents. The selected variables are commonly considered in other population surveys, which facilitates cross-validation and comparison. Grounded in theoretical work, this study empirically supports a comprehensive, practical definition of situations of vulnerability. Among limitations, since all measures were self-reported, they could be subject to a desirability bias, such as dependence in ADL, chronic condition, and income satisfying basic needs. Regarding income, respondents might have been embarrassed to report that they could not meet their basic needs. As a limited number of indicators was selected to facilitate replication using data from other surveys, the vulnerability variable may not fully reflect the complexity of this construct, especially for socioeconomic and social indicators. Since only sex, and not age, was considered in the confirmatory factor analysis, the construction of the vulnerability variable may lack age-related differences. The variability in social support was small; together with the large sample size, this may have led to statistical differences that were not clinically significant. Although expected the collinearity between the main effect of the vulnerability variable and its interaction term may have inflate the standard errors. Finally, more data on environmental variables, such as material and social deprivation, would enrich the study.

Conclusion

This study documented situations of vulnerability among older Canadians and examined their associations with life satisfaction and social support, as well as the moderating effect of social support. These situations were explained by physiological, psychological, socioeconomic and social indicators, supporting the multidimensionality of the concept. Although similar results were observed for women and men, interventions countering vulnerability might differ. For example, social support acts as a buffer against the potential negative effect of vulnerability on satisfaction, suggesting that interventions designed to increase social networks could be effective. For women and men in situations of vulnerability, greater support enhanced satisfaction. Given the potential of understanding associations between social support, vulnerability and satisfaction, and the complex pattern of results observed in this study, future research is warranted to replicate and extend the findings. A more comprehensive measure of vulnerability could be assessed in future clinical studies, notably by developing a formative measurement model, including indicators of functional capacities, cognitive impairment, anxiety, loneliness, wealth, education, financial strain, social isolation, and quality of relationships. Interactions of specific sources of social support (relationships with friends,

children and family) with vulnerability in its association with life satisfaction could improve interventions. Longitudinal studies targeting older adults at high risk of vulnerability are necessary to better understand how their situations evolve over late adulthood and improve the needed social skills to effectively maintain and develop their social network and use social support. Quantitative, multilevel and longitudinal studies could provide insights regarding the contextual and changing life conditions of older adults.

Impact Statement

The authors certify that this work is confirmatory of recent clinical research. The work confirms the following research: Cihlar, V., Micheel, F., & Mergenthaler, A. (2022). Multidimensional vulnerability among older adults in Germany. *Zeitschrift Für Gerontologie Und Geriatrie*. https://doi.org/10.1007/s00391-022-02142-3. The current work is a cross-cultural replication of Cihlar's research and we stratified the analyses according to sex. Results were similar but we found differential protective effects for older women and men, suggesting that interventions for countering vulnerability might differ by sex.

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Author Contributions

Conceptualisation by ML, VC and DN; Data curation by DN and LT; Formal analysis by ML, DN and LT; Funding acquisition by ML; Investigation by ML, DN, VC, FM and AM; Methodology by ML, DN, VC, AM & LT; Project administration by ML and DN; Supervision by ML; Visualisation by ML, DN and LT; Writing the original draft by ML, DN and FM; and Writing the review and editing by ML, DN, VC, FM, AM and LT.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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