The Influence of Psychosocial Factors on Hospital Length of Stay Among Aging Canadians

Kelly Ann Renwick, PhD1,2, Claudia Sanmartin, PhD3, Kaberi Dasgupta, MD1, Lea Berrang-Ford, PhD1,4, and Nancy Ross, PhD1,5

Abstract

Background: Hospital stays that are prolonged due to non-clinical factors are costly to health care systems and are likely suboptimal for patient well-being. We assessed the influence of psychosocial factors on hospital length of stay (LOS) for older Canadians in a retrospective cohort study. Data and Methods: Data from the Canadian Community Health Survey were linked with the Discharge Abstract Database. Analyses were stratified by age, 55–64 (n = 1,060) and 65 and older (n = 2,718). Main predictor variables of interest included four measures of social support, sense of belonging, and living alone. Multivariate models of LOS adjusted for age, sex, income, smoking, and frailty. Results: Among the younger respondents, low positive social interactions, low emotional/informational support, and living alone were associated with a longer LOS. Among respondents 65 and older, low affection, low positive social interactions, low emotional/informational support, and a weak sense of belonging were associated with a longer LOS. Discussion: Having low social support is associated with longer hospital stays in this Canadian cohort. Social support may influence LOS as risk factors for poor health and precarious care in the community. Mitigating these risk factors could reduce the economic burden that is played out through longer hospital stays.

Keywords
health care utilization, length of stay, living alone, sense of belonging, social support

Manuscript received: June 28, 2022; final revision received: September 8, 2022; accepted: October 26, 2022.

Introduction

A reduction in social resources among older adults (65 and older) has become a growing concern in recent years due in part to social changes that include the geographic dispersion of families, reductions in intergenerational living, declining fertility rates, and increasing divorce rates (Fakoya et al., 2020; Klinenberg, 2012; Moore & Rosenberg, 2001). These factors have contributed to an increasing number of older adults living alone and with fewer social resources than previous generations, presenting concerns for health outcomes and a burden of care for this population (Channer et al., 2020).

Previous social support and health studies, conducted over several decades, have found associations between low social support and mortality. Holt-Lunstad et al. (2010), in their meta-analysis of 148 studies, found a 50% increased odds of survival among participants with even adequate social relationships as compared to those with weak social connections. There has not been the same research attention paid to the connection between weak social support and hospitalization. Valtorta et al. (2018), following their systematic review, found little evidence supporting the influence of weak social relationships on general health care usage, but there is some evidence for an association between weak social relationships and a longer length of stay (LOS) in hospital. Following a review of fifteen articles referencing the influence of small social networks and perceived social support on LOS, five found a moderate association with a longer LOS and the remaining found no association (Valtorta et al., 2018). Given the inconclusive results of 

1McGill University, Montréal, QC, Canada
2Appalachian State University, Boone, NC, USA
3Statistics Canada, Ottawa, ON, Canada
4University of Leeds, Leeds, UK
5Queen’s University, Kingston, ON, Canada

Corresponding Author:
Kelly Ann Renwick, Department of Interdisciplinary Studies, Appalachian State University, 301 Bodenheimer Drive, Boone, NC 28608, USA.
Email: renwickka@appstate.edu

Creative Commons Non Commercial CC BY-NC. This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (https://creativecommons.org/licenses/by-nc/4.0/) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (https://us.sagepub.com/en-us/nam/open-access-at-sage).
social support on LOS, and the limited measures of social support, further research is warranted.

Considering the influence of low social support on mortality, a risk factor outside the scope of health care systems, we can speculate a priori that weak social resources will also pose a risk to greater, and longer, hospital usage, particularly in countries such as Canada with a growing aging population and one that is increasingly growing older (Statistics Canada, 2022). A better understanding of the social factors that contribute to a longer LOS may be one path to reducing hospital burden and increasing opportunities for care in the community.

We examined the association between weak social resources and LOS using a retrospective cohort formed from a linkage between the Canadian Community Health Survey (CCHS) and the Discharge Abstract Database (DAD) with the objective to better understand the influence of low social support, a weak sense of belonging, and living alone on LOS among older Canadians. This study expands on previous research with the inclusion of four dimensions of available social support and additional social resources for a better understanding of the types of psychosocial factors that influence LOS. To the knowledge of these authors, this is the first research to report on the social influences of LOS among aging Canadians, contributing to a better understanding of hospital burden in an aging Canada.

Methods

Study Population

The cohort in this study was composed of 16,409 CCHS respondents 55 and older who completed the psychosocial variable modules (social support, sense of belonging, and living arrangement), covariate questions, and consented to share their data for data linkages. The CCHS is a cross-sectional annual health survey conducted by Statistics Canada with the objectives of health surveillance and population-level health research (Statistics Canada, 2018). Among selected households, the CCHS collects data from 136 health regions from each Canadian province and territory; eligible respondents include community dwellers 12 and older. Residents living in formal institutions, on Indian reserves, or in the armed forces are excluded from the CCHS (Statistics Canada, 2018).

Length of Stay

LOS was determined from the DAD, a national database providing administrative, clinical, and demographic information on hospital discharges (defined as deaths, sign-outs, or transfers) (CIHI, 2019). The DAD receives records directly from acute care facilities in each Canadian province except Quebec (CIHI, 2019). LOS in this research is cumulative; for respondents with multiple admissions, LOS refers to the total number of hospital days during the study period.

Data Linkage

Survey data from the CCHS Cycle 1.1 (2000/2001) were linked with hospital records from September 1, 2000 through March 31, 2004 from the DAD to form the dataset for analyses. CCHS respondents who provided written consent to share and link their data \( n = 117,837 \) represented 89.6% of all respondents. Adjustments were made for respondents who did not consent to share and link their data using special survey weights. Data were linked using G-Link at Statistics Canada. Data linkage used probabilistic methods with demographic information that included given and last name, sex, date of birth, and postal code. More information about the linkage is available elsewhere (Sanmartin et al., 2016). Analyses were conducted at the McGill University site of Statistics Canada’s Research Data Centre (Project Number 14-HAD-MCG-4064). This is a secure site that protects respondent confidentiality with strict protocols set by Statistics Canada.

Psychosocial Variables

The core predictors of interest included social support, sense of belonging to one’s community, and living arrangement. Social support measures on the CCHS had previously been developed for the Medical Outcomes Study (MOS), a 2-year study assessing patient care (Sherbourne & Stewart, 1991). These measures included 19 questions that captured functional dimensions of social support: the quality of social relationships in terms of their ability to provide emotional well-being and physical support (e.g., help during an illness, upkeep of the home, or the provision of information). Social support was self-reported on the CCHS as none of the time, little of the time, some of the time, most of the time, or all of the time. Functional measures of social support were aggregated into four dimensions: emotional/informational support (8 questions), affection (3 questions), positive social interactions (4 questions), and tangible support (4 questions). Social network size was included on the CCHS to capture structural support with one question asking about the number of respondent’s friends or relatives. In this research, functional measures of social support for each dimension were operationalized as low, moderate, or highest.

Sense of belonging was measured on the CCHS with one self-reported question: “How would you describe your sense of belonging to your local community?” Categories for response included “Very weak,” “Weak,” “Strong,” and “Very strong.” Sense of belonging in this research was operationalized as either weak or strong. Measurements of living arrangement on the CCHS included living alone or living with one or more of the following: children, parents, a spouse, siblings, or other. In this research, living arrangement was operationalized as either living alone or living with others.

Additional covariates in analyses included self-reported measures of age, sex, income, smoking, and...
frailty. Respondents were stratified by age, 55–64 and 65 and older. Stratifying by age provided an opportunity to assess the influence of psychosocial factors on two age groups with different hospitalization profiles. Additionally, these two age groups provided two very different employment life stages: within 10 years prior to retirement and post-retirement. Sense of belonging is often tied to our work and interactions with colleagues and community, this commonly weakens following retirement (Cloutier-Fisher et al., 2011). Understanding the influence of sense of belonging pre- and post-retirement provides better insight into the social changes that may occur as we age. Income was dichotomized into low versus middle/high but was originally reported as quintiles on the CCHS. Smoking status was dichotomized into smokers versus non-smokers. A frailty index was derived from 29 health deficits self-reported on the CCHS that included difficulties with activities inside and outside the home, confinement to bed, self-rated health, a change in health status, sensory impairment, and a myriad of chronic illnesses such as arthritis, cardiovascular and respiratory diseases, cancer, and dementia. Respondents with the lowest frailty received a score of 0 and those with the highest received a score of 1. The frailty index utilized 4 cut points: non-frail, pre-frail, more-frail, and most-frail; Statistics Canada validated these cut points using linkages between CCHS cycles 2.1 and 3.1 and the DAD (Hoover et al., 2013). In this research, frailty was operationalized as frail or not frail.

Statistical Analysis
Hospital utilization data among general population samples often have a high prevalence of zeros and a strong positive skew because most people have infrequent hospital visits (Diehr et al., 1999). Therefore, a zero-truncated negative binomial regression was used to predict the level of use by hospital users. Variables were added to models incrementally to identify the progression of estimates from unadjusted to fully adjusted models. Model 1 was a univariate analysis of a core predictor (low social support, a weak sense of belonging, and living alone), model 2 included model 1 plus age and sex, model 3 included model 2 plus income, model 4 included model 3 plus smoking, and model 5 included model 4 plus frailty. Analyses were performed among stratified age groups for unadjusted through fully adjusted models.

Results
The sample population included 16,409 CCHS respondents from the study cohort involved in a larger research study (see Renwick et al., 2020). The mean age of respondents at baseline was 67.8 years with a higher overall percentage of women (58.22%) (Table 1). Most respondents reported the highest affection (50.79%) and moderate levels of tangible support (47.8%), positive social interactions (47.19%), and emotional/informational support (54.01%). More than half of respondents were married (53.93%) and lived with others (58.64%). At least three-quarters reported a middle to high income range (76.79%), were non-smokers (81.11%), and were not frail (81.05%). The majority of respondents reported a strong sense of belonging (66.48%) and were urban dwellers (70.03%).

Respondents from Québec did not have hospitalization records available for linkage, reducing the study population to 11,427. Among the sample of respondents available for analyses, 6,035 did not have a hospital admission and 5,392 had at least one admission (Table 2). Most respondents with an admission had one admission (39.82%) and the lowest proportion had five or more admissions (14.39%). Among respondents with at least one admission, 3,778 were admitted overnight for an acute hospitalization; it was among this sample that the LOS analyses were conducted. The highest proportion of those admitted overnight had a LOS between four and ten nights (30.32%).

A zero-truncated negative binomial regression among overnight hospital users only was performed to determine the influence of psychosocial factors on LOS. Among the 55–64 age group (n = 1,060), longer LOS was associated with low positive social interactions (Incidence Rate Ratio (IRR) 1.73, 95% CI: 1.21, 2.51) in models one through four and low emotional/informational support (IRR 1.45, 95% CI: 1.01, 2.05) and living alone (IRR 1.32, 95% CI: 1.06, 1.65) in models one through five (Table 3). In other words, respondents living alone had a 32% longer LOS as compared to respondents living with others in fully adjusted models. There were no associations between LOS and either tangible support or social network size in any models in either cohort; results are not reported.

Among the 65 and older age group (n = 2,718), longer LOS was associated with low affection (IRR 1.31, 95% CI: 1.08, 1.58), low positive social interactions (IRR 1.31, 95% CI: 1.09, 1.57), low emotional/informational support (IRR 1.34, 95% CI: 1.09, 1.61), and a weak sense of belonging (IRR 1.13, 95% CI: 1.01, 1.27) in models one through five (Table 3). In other words, respondents reporting a weak sense of belonging had a 13% longer LOS as compared to respondents reporting a strong sense of belonging. The association between a longer LOS and living alone in this cohort lost significance following the addition of income.

Discussion
We found a longer LOS to be associated with low positive social interactions, low emotional/informational support, and living alone in those aged 55–64, with the latter two predictors retaining statistical significance through models adjusting for frailty. Among older adults, low affection, low positive social interactions,
low emotional/informational support, and a weak sense of belonging were associated with a longer LOS, all of which retained statistical significance through models adjusting for frailty. The addition of a frailty index to the final models was expected to appreciably decrease the strength of the associations between predictor variables and LOS owing to the strong association between frailty and hospitalization (Chang et al., 2018).

**Table 1.** Characteristics of CCHS (Cycle 1.1) Respondents Available for Data Linkage with the DAD, Aged 55 and Older and Stratified by Age.

|                                | Total sample n = 16,409 | Aged 55–64 n = 6,918 (42.16%) | Aged 65 and older n = 9,491 (57.84%) |
|--------------------------------|-------------------------|---------------------------------|--------------------------------------|
|                                | Freq. %                 | Freq. %                         | Freq. %                              |
| **Age (mean)**                 |                         |                                 |                                      |
| 55–64                          | 6,918 42.16             | 3,741 54.07                     | 5,812 61.24                          |
| 65+                            | 9,491 57.84             | 3,177 45.92                     | 3,679 38.76                          |
| **Sex**                        |                         |                                 |                                      |
| Female                         | 9,553 58.22             | 3,741 54.07                     | 5,812 61.24                          |
| Male                           | 6,856 41.80             | 3,177 45.92                     | 3,679 38.76                          |
| **Tangible support**           |                         |                                 |                                      |
| Low                            | 1,851 11.28             | 682 9.86                        | 1,169 12.32                          |
| Moderate                       | 7,844 47.80             | 3,395 49.07                     | 4,449 46.88                          |
| Highest                        | 6,714 40.92             | 2,841 41.07                     | 3,873 40.81                          |
| **Affection**                  |                         |                                 |                                      |
| Low                            | 1,465 8.93              | 533 7.70                        | 932 9.82                             |
| Moderate                       | 6,610 40.28             | 2,660 38.45                     | 3,950 41.62                          |
| Highest                        | 8,334 50.79             | 3,725 53.85                     | 4,609 48.56                          |
| **Positive social interactions**|                        |                                 |                                      |
| Low                            | 1,476 9.00              | 488 7.05                        | 988 10.41                            |
| Moderate                       | 7,743 47.19             | 3,220 46.55                     | 4,523 47.66                          |
| Highest                        | 7,190 43.82             | 3,210 46.40                     | 3,980 41.93                          |
| **Emotional/informational support** |                     |                                 |                                      |
| Low                            | 1,592 9.70              | 584 8.44                        | 1,008 10.62                          |
| Moderate                       | 8,863 54.01             | 3,777 54.60                     | 5,086 53.59                          |
| Highest                        | 5,954 36.28             | 2,557 36.96                     | 3,397 35.79                          |
| **Marital status**             |                         |                                 |                                      |
| Married/common law             | 8,849 53.93             | 4,517 65.29                     | 4,332 45.64                          |
| Widowed                        | 4,432 27.01             | 668 9.66                        | 3,764 39.66                          |
| Divorced/Separated             | 2,013 12.27             | 1,192 17.23                     | 821 8.65                             |
| Never married                  | 1,115 6.80              | 541 7.82                        | 574 6.05                             |
| **Sense of belonging**         |                         |                                 |                                      |
| Weak                           | 5,501 33.52             | 2,498 36.11                     | 3,003 31.64                          |
| Strong                         | 10,908 66.48            | 4,420 63.89                     | 6,488 68.36                          |
| **Living arrangement**         |                         |                                 |                                      |
| Lives alone                    | 6,787 41.36             | 2,029 29.33                     | 4,758 50.13                          |
| Lives with others              | 9,622 58.64             | 4,889 70.67                     | 4,733 49.87                          |
| **Income**                     |                         |                                 |                                      |
| Low                            | 3,808 23.21             | 1,223 17.68                     | 2,585 27.24                          |
| Middle/high                    | 12,601 76.79            | 5,695 82.32                     | 6,906 72.76                          |
| **Smoking status**             |                         |                                 |                                      |
| Smoker                         | 3,099 18.89             | 1,767 25.54                     | 1,332 14.03                          |
| Non-smoker                     | 13,310 81.11            | 5,151 74.46                     | 8,159 85.97                          |
| **Frailty**                    |                         |                                 |                                      |
| Frail                          | 3,109 18.95             | 906 13.10                       | 2,203 23.21                          |
| Not frail                      | 13,300 81.05            | 6,012 86.90                     | 7,288 76.79                          |
| **Region**                     |                         |                                 |                                      |
| Urban                          | 11,492 70.03            | 4,690 67.79                     | 6,802 71.67                          |
| Rural                          | 4,917 29.97             | 2,228 32.21                     | 2,689 28.33                          |
Living alone was associated with LOS among the younger cohort only, with a 32% longer LOS compared to those living with others. Social support and mortality research has found that living with others has more protective benefits among those who are middle-aged than those over 65 (Agosti et al., 2018; Zueras et al., 2020). Birkeland and Natvig (2009) suggest that the independence older adults derive from living alone has a beneficial effect on their mental health that outweighs even a frail health status. Additionally, older adults who live alone may have a resilience and independence that strengthen their cognitive performances, activities for daily living, and instrumental activities for daily living, thus a lower comorbidity burden (Agosti et al., 2018). These positive influences of living alone may also serve to protect older adults from a longer LOS. It should be noted, however, that the survey respondents were primarily in the middle/high income range (76.79%) and likely had the resources for care in the home during times of illness or age-related disabilities. Low-income seniors often do not have the same opportunities for care in the community. Understanding the influence of psychosocial factors on LOS among less affluent Canadians will likely provide a better picture of hospital burden among this population.

A weak sense of belonging was associated with LOS among the older cohort only, with a 13% longer LOS compared to those reporting a strong sense of belonging. The lack of a significant association among the younger cohort supports the idea that a sense of belonging is often tied to our work and interactions with colleagues, and can weaken following retirement (Cloutier-Fisher et al., 2011). A sense of belonging integrates people into their community and serves as a connection between social networks and the environment (McLaren et al., 2007). This can only occur if an individual has put the time in to develop relationships with others and with their community, as a result of this energy they feel valued and accepted (McLaren et al., 2007). Losing touch with the community following retirement, functional decline, or the loss of close connections, all common circumstances among older adults, can weaken a sense of belonging (Cloutier-Fisher et al., 2011). This loss can have detrimental effects, including associations with poor health (Ross et al., 2002), mortality (Renwick et al., 2020), anxiety, and depression (McLaren et al., 2007).

Low positive social interactions were associated with an increased LOS in both the younger and older cohorts, with a predicted LOS 73% and 13% longer, respectively, than those reporting the highest positive social interactions. Positive social interactions are closely related to social integration, a commonly used measure of participation in social support-health research. Social integration and participation have been associated with a wide variety of health outcomes and have been theorized to confer protection by influencing positive health behaviors (Berkman et al., 2004). Additionally, those who are unable to participate due to poor health, functional decline, or disability may already be at an increased risk of poor health outcomes that lead to longer hospital stays.

Low emotional/informational support was associated with LOS in both the younger and older groups, with a predicted LOS 73% and 13% longer, respectively, than those reporting the highest positive social interactions. Positive social interactions are closely related to social integration, a commonly used measure of participation in social support-health research. Social integration and participation have been associated with a wide variety of health outcomes and have been theorized to confer protection by influencing positive health behaviors (Berkman et al., 2004). Additionally, those who are unable to participate due to poor health, functional decline, or disability may already be at an increased risk of poor health outcomes that lead to longer hospital stays.

| Table 2. Acute and Non-Acute Hospital Utilization Outcomes Among CCHS (Cycle 1.1) Respondents Linked with the DAD, Aged 55 and Older and Stratified by Age. |
|---------------------------------------------------------------|
| **Outcomes** | **Total sample** | **Aged 55–64** | **Aged 65 and older** |
|---------------------------------------------------------------|
| **Hospital admission** | **Freq.** | **n** | **%** | **Freq.** | **n** | **%** | **Freq.** | **n** | **%** |
| No admissions | 6,035 | 4,769 | 63.12 | 3,010 | 2,009 | 66.90 |
| 1 or more admissions | 5,392 | 1,759 | 36.88 | 1,759 | 1,653 | 93.78 |
| **Number of admissions** | **Freq.** | **n** | **%** | **Freq.** | **n** | **%** | **Freq.** | **n** | **%** |
| 1 admission | 2,147 | 39.82 | 2,041 | 39.82 | 106 | 5.62 |
| 2 admissions | 1,328 | 24.63 | 1,258 | 24.63 | 70 | 3.73 |
| 3–4 admissions | 1,141 | 21.16 | 1,054 | 21.16 | 87 | 4.67 |
| 5 admissions or more | 776 | 14.39 | 740 | 14.39 | 36 | 1.93 |
| **Length of stay** | **Freq.** | **n** | **%** | **Freq.** | **n** | **%** | **Freq.** | **n** | **%** |
| 3 nights or fewer | 892 | 23.56 | 836 | 23.56 | 56 | 3.04 |
| 4–10 nights | 1,148 | 30.32 | 1,052 | 30.32 | 96 | 5.24 |
| 11–29 nights | 940 | 24.83 | 876 | 24.83 | 64 | 3.52 |
| 30 nights or more | 806 | 21.29 | 752 | 21.29 | 54 | 3.01 |

Data include hospital utilization from September 1, 2000 to March 31, 2004. Data do not include respondents from Québec.
literature as an important variable conferring protection against mortality. Findings here suggest that informational support as well as measures commonly associated with affection and emotional support may also confer protection against longer hospital stays.

**Strengths and Weaknesses**

The CCHS is a comprehensive national health survey providing a rich source of data from across Canada. Likewise, the DAD is a comprehensive administrative database providing information about hospital discharges in each province and territory except Québec. The data linkage between the CCHS and the DAD provided a new opportunity to better understand the relationship between health behaviors and hospital utilization among Canadians just prior to retirement and post retirement.

Data were linked using probabilistic linkages due to a lack of unique identifiers between datasets. Probabilistic linkages use common identifiers, relying on the likelihood that linked records belong to the same person; it is anticipated that errors will occur. Linkage conflicts were resolved by mapping one-to-one record relationships. Despite resolving conflicts, most linkages can be expected to have false positive (an incorrect link) or false negative (a missed link) errors. Among respondents eligible for CCHS linkages, errors were quite low, 0.04% were found to have false positive and 2.43% were found to have false negative linkages.

Previous LOS and social support research has produced mixed findings, with five out of fifteen studies in

### Table 3

| Core predictors                                    | Total sample | Aged 55–64 | Aged 65 and older |
|----------------------------------------------------|--------------|------------|-------------------|
|                                                    | n=3,778      | n=1,060    | n=2,718           |
| **Low affection**                                  |              |            |                   |
| **Model 1**                                        | 1.54 (1.28, 1.82)* | 1.72 (1.20, 2.44)* | 1.46 (1.21, 1.79)* |
| **Model 2**                                        | 1.51 (1.28, 1.79)* | 1.77 (1.23, 2.52)* | 1.43 (1.19, 1.73)* |
| **Model 3**                                        | 1.35 (1.14, 1.60)* | 1.40 (0.98, 2.03) | 1.32 (1.09, 1.60)* |
| **Model 4**                                        | 1.31 (1.12, 1.55)* | 1.39 (0.97, 1.97) | 1.30 (1.07, 1.57)* |
| **Model 5**                                        | 1.30 (1.11, 1.52)* | 1.22 (0.87, 1.72) | 1.31 (1.08, 1.58)* |
| **Low positive social interactions**               |              |            |                   |
| **Model 1**                                        | 1.73 (1.46, 2.01)* | 2.12 (1.48, 3.03)* | 1.57 (1.31, 1.90)* |
| **Model 2**                                        | 1.68 (1.43, 1.97)* | 2.18 (1.52, 3.13)* | 1.52 (1.27, 1.82)* |
| **Model 3**                                        | 1.51 (1.28, 1.79)* | 1.79 (1.23, 2.56)* | 1.40 (1.17, 1.68)* |
| **Model 4**                                        | 1.48 (1.25, 1.73)* | 1.73 (1.21, 2.51)* | 1.38 (1.15, 1.67)* |
| **Model 5**                                        | 1.35 (1.15, 1.58)* | 1.38 (0.97, 1.95) | 1.31 (1.09, 1.57)* |
| **Low emotional/informational support**            |              |            |                   |
| **Model 1**                                        | 1.60 (1.34, 1.92)* | 1.92 (1.32, 2.77)* | 1.51 (1.23, 1.84)* |
| **Model 2**                                        | 1.63 (1.38, 1.93)* | 2.01 (1.40, 2.97)* | 1.51 (1.25, 1.84)* |
| **Model 3**                                        | 1.45 (1.21, 1.72)* | 1.62 (1.11, 2.36)* | 1.38 (1.13, 1.68)* |
| **Model 4**                                        | 1.40 (1.17, 1.67)* | 1.58 (1.08, 2.32)* | 1.35 (1.11, 1.65)* |
| **Model 5**                                        | 1.36 (1.15, 1.62)* | 1.45 (1.01, 2.05)* | 1.34 (1.09, 1.61)* |
| **Weak sense of belonging**                        |              |            |                   |
| **Model 1**                                        | 1.17 (1.06, 1.31)* | 1.01 (0.81, 1.26) | 1.23 (1.09, 1.39)* |
| **Model 2**                                        | 1.17 (1.05, 1.30)* | 1.01 (0.81, 1.26) | 1.23 (1.09, 1.39)* |
| **Model 3**                                        | 1.11 (1.00, 1.23)  | 0.91 (0.74, 1.14) | 1.19 (1.05, 1.34)* |
| **Model 4**                                        | 1.08 (0.98, 1.21)  | 0.86 (0.69, 1.06) | 1.19 (1.05, 1.34)* |
| **Model 5**                                        | 1.03 (0.93, 1.14)  | 0.79 (0.64, 0.96)* | 1.13 (1.01, 1.27)* |
| **Living alone**                                   |              |            |                   |
| **Model 1**                                        | 1.46 (1.32, 1.62)* | 1.61 (1.31, 2.01)* | 1.30 (1.16, 1.45)* |
| **Model 2**                                        | 1.32 (1.19, 1.46)* | 1.61 (1.30, 1.99)* | 1.23 (1.11, 1.39)* |
| **Model 3**                                        | 1.15 (1.03, 1.28)* | 1.32 (1.04, 1.67)* | 1.11 (0.97, 1.25) |
| **Model 4**                                        | 1.14 (1.02, 1.27)* | 1.31 (1.04, 1.67)* | 1.09 (0.96, 1.25) |
| **Model 5**                                        | 1.16 (1.05, 1.30)* | 1.32 (1.06, 1.65)* | 1.12 (0.99, 1.26) |

Model 1 = univariate analysis; Model 2 = model 1 plus age and sex; Model 3 = model 2 plus income; Model 4 = model 3 plus smoking status; Model 5 = model 4 plus frailty.

*Results significant at the \( p < .05 \) level.
a recent systematic review reporting a significant association between longer LOS and weak social relationships; the remaining studies found no association (Valtorta et al., 2018). Among these studies, social network and perceived support were the only social support variables under study. The results of the research reported here expand on the types of psychosocial factors that influence LOS, thus providing a better understanding of the influence of different dimensions of support.

Conclusion

Low social support and a weak sense of belonging are social factors outside the realm of what we tend to think of as medical or clinical determinants that we found to be associated with longer hospital stays among older Canadians and need to be considered as we look to the future of healthy aging and a reduced burden of care. Providing social resources and a sense of belonging from a policy perspective will likely present challenges, particularly emotional support and affection. Social support and a sense of belonging require time and effort; these relationships are often constructed over a lifetime and cannot be easily conferred.

The use of community outreach, such as day programs and adult day services (ADSs), may provide older adults opportunities for social resources. ADSs provide supervised care for ADLs, meals, exercise, and activities (Fields et al., 2014), but they also provide opportunities for socialization (Gaugler, 2014; Iecovich & Biderman, 2013). Additionally, hospital utilization has been found to be relatively low among participants despite a large percentage experiencing poor health and disabilities (Dwyer et al., 2014). Providing opportunities for positive social interactions and informational support through ADSs could afford older adults with opportunities to make close connections and bolster more intimate support systems such as affection, emotional support, and a sense of belonging, and may have the added benefit of improved health, reduced hospital stays, and a reduced hospital burden.

Declaration of Conflicting Interests

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

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Funding for this project was provided by the Canadian Institute for Health Research, the Fonds de Recherche du Québec - Santé, and the Institute for Health and Social Policy of McGill University.

ORCID iD

Dr. Kelly Ann Renwick https://orcid.org/0000-0001-9833-7792

References

Agosti, P., Tettamanti, M., Vella, F., Suppressa, P., Pasina, L., Franchi, C., Nobili, A., Mannucci, P., & Sabbà, C., & REPOSI Investigators. (2018). Living alone as an independent predictor of prolonged length of hospital stay and non-home discharge in older patients. *European Journal of Internal Medicine*, 57, 25–31.

Berkman, L. F., Melchior, M., Chastang, J.-F., Niedhammer, I., Leclere, A., & Goldberg, M. (2004). Social integration and mortality: A prospective study of French employees of electricity of France-gas of France the GAZEL cohort. *American Journal of Epidemiology*, 159(2), 167–174.

Birkeland, A., & Natvig, G. K. (2009). Coping with ageing and failing health: A qualitative study among elderly living alone. *International Journal of Nursing Practice*, 15(4), 257–264.

Chang, S. F., Lin, H. C., & Cheng, C. L. (2018). The relationship of frailty and hospitalization among older people: Evidence from a meta-analysis. *Journal of Nursing Scholarship, 50*(4), 383–391.

Channer, N. S., Hartt, M., & Biglieri, S. (2020). Aging-in-place and the spatial distribution of older adult vulnerability in Canada. *Applied Geography*, 125, 102357.

CIHI. (2019). Discharge Abstract Database metadata (DAD). Retrieved August 10, from https://www.cihi.ca/en/discharge-abstract-database-metadata

Cloutier-Fisher, D., Kobayashi, K., & Smith, A. (2011). The subjective dimension of social isolation: A qualitative investigation of older adults’ experiences in small social support networks. *Journal of Aging Studies*, 25(4), 407–414.

Diehr, P., Yanez, D., Ash, A., Hornbrook, M., & Lin, D. (1999). Methods for analyzing health care utilization and costs. *Annual Review of Public Health*, 20(1), 125–144.

Dwyer, L. L., Harris-Kojetin, L. D., & Valverde, R. H. (2014). Differences in adult day services center participant characteristics by center ownership: United States, 2012. *NCHS Data Brief*, 164, 1–8.

Fakoya, O. A., McCorry, N. K., & Donnelly, M. (2020). Loneliness and social isolation interventions for older adults: A scoping review of reviews. *BMC Public Health*, 20(1), 129.

Fields, N. L., Anderson, K. A., & Dabelko-Schoeny, H. (2014). The effectiveness of adult day services for older adults a review of the literature from 2000 to 2011. *Journal of Applied Gerontology*, 33(2), 130–163.

Gaugler, J. E. (2014). The process of adult day service use. *Geriatric Nursing*, 35(1), 47–54.

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine*, 7(7), e1000316.

Hoover, M., Rotermann, M., Sannmartin, C., & Bernier, J. (2013). Validation of an index to estimate the prevalence of frailty among community-dwelling seniors. *Health Reports*, 24(9), 10–17.

Iecovich, E., & Biderman, A. (2013). Attendance in adult day care centers of cognitively intact older persons reasons for use and nonuse. *Journal of Applied Gerontology*, 32(5), 561–585.

Klindenberg, E. (2012). *Going solo: The extraordinary rise and surprising appeal of living alone*. Penguin Press.

McLaren, S., Gomez, R., Bailey, M., & Van Der Horst, R. K. (2007). The association of depression and sense of
belonging with suicidal ideation among older adults: Applicability of resiliency models. *Suicide and Life-Threatening Behavior, 37*(1), 89–102.

Moore, E., & Rosenberg, M. (2001). Canada’s elderly population: The challenges of diversity. *The Canadian Geographer/Le Géographe canadien, 45*(1), 145–150.

Renwick, K. A., Sammartin, C., Dasgupta, K., Berrang-Ford, L., & Ross, N. (2020). The influence of low social support and living alone on premature mortality among aging Canadians. *Canadian Journal of Public Health, 111*(4), 594–605.

Ross, N. A., Berthelot, J.-M., & Tremblay, S. (2002). Regional socioeconomic context and health [Canadian Community Health Survey-2002 Annual Report]. *Health Reports, 13*, 33–44.

Sammartin, C., Decady, Y., Trudeau, R., Dasylva, A., Tjepkema, M., Finès, P., Burnett, R., Ross, N., & Manuel, D. G. (2016). Linking the Canadian Community Health Survey and the Canadian Mortality Database: An enhanced data source for the study of mortality. *Health Reports, 27*(12), 10–18.

Sherbourne, C. D., & Stewart, A. L. (1991). The MOS social support survey. *Social Science & Medicine, 32*(6), 705–714.

Statistics Canada. (2018). *Canadian Community Health Survey - Annual Component (CCHS)*. Retrieved April 21, from http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3226

Statistics Canada. (2022). A portrait of Canada’s growing population aged 85 and older from the 2021 Census. Retrieved June 30, from https://www12.statcan.gc.ca/census-recensement/2021/as-sa/98-200-X/2021004/98-200-X2021004-eng.cfm

Valtorta, N. K., Moore, D. C., Barron, L., Stow, D., & Hanratty, B. (2018). Older adults’ social relationships and health care utilization: A systematic review. *American Journal of Public Health, 108*(4), e1–e10.

Zueras, P., Rutigliano, R., & Trias-Llimós, S. (2020). Marital status, living arrangements, and mortality in middle and older age in Europe. *International Journal of Public Health, 65*(5), 627–636.