# Health and Emergency Department Transfers for Ontario Long-Term Care Home Residents Living with Schizophrenia

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# Preface

Samuel Tiukuvaara was the primary author of this thesis and was responsible for all aspects of its development including developing the thesis proposal, conducting the literature review, performing the analyses, interpreting the results, and writing. Samuel's supervisor, Dr. Jess Fiedorowicz, and his Thesis Advisory Committee, Drs. Colleen Webber and Steven Hawken, provided guidance and oversight throughout the process. Dr. Webber's support was substantial, providing detailed feedback and regular meetings that played a central role in the thesis's development.

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authors and do not reflect those of the funding or data sources; no endorsement is intended or should be inferred.

Parts of this material are based on data and information compiled and provided by the Ontario Ministry of Health. The analyses, conclusions, opinions and statements expressed herein are solely those of the authors and do not reflect those of the funding or data sources; no endorsement is intended or should be inferred.

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This project adapted the 2011, 2016, and 2021 CENSUS datasets from Statistics Canada. This does not constitute an endorsement by Statistics Canada of this product.

We thank IQVIA Solutions Canada Inc. for use of their Drug Information File. Parts of this material are based on data and information compiled and provided by the Ontario Ministry of Health. The analyses, conclusions, opinions and statements expressed herein are solely those of the authors and do not reflect those of the funding or data sources; no endorsement is intended or should be inferred.

We thank the Toronto Community Health Profiles Partnership for providing access to the Ontario Marginalization Index.

Parts of this report are based on Ontario Registrar General (ORG) information on deaths, the original source of which is ServiceOntario. The views expressed therein are those of the author and do not necessarily reflect those of ORG or the Ministry of Public and Business Service Delivery.

# Abstract

## Objective

Describe long-term care (LTC) residents living with and without schizophrenia and analyze the association of schizophrenia with emergency department (ED) transfers.

## Design

Cross-sectional study and cohort study.

## Settings and Participants

Individuals admitted to Ontario LTC between 2012 and 2023.

## Methods

Health administrative data were retrieved. Descriptive statistics were calculated for measures of health status and need upon admission. Negative binomial regression was used to analyze ED transfer rate overall and by ambulatory care sensitive conditions in the year following admission.

## Results

Residents living with schizophrenia were younger and had fewer comorbidities, more stable health, lower mortality risk, more intact functioning, and similar aggressive behaviour frequency. They received less nursing and personal care. Schizophrenia was not associated with ED transfers.

## Conclusion and Implications

Residents living with schizophrenia require less support for general health. LTC can support residents living with schizophrenia but access to mental health care may be improved.

# Acknowledgements

Embarking on my research journey and completing this thesis was made possible by the generous support I received throughout the last two years. There were many individuals invaluable to my journey, and I will mention some of them here.

I am deeply grateful to Dr. Jess Fiedorowicz for stepping up to take supervisory responsibility and providing clinical expertise. I extend my sincere thanks to my thesis advisory committee members, Drs. Colleen Webber and Steven Hawken, for their thoughtful guidance and constructive critiques. I am especially thankful to Dr. Webber for her extensive support during every step of my training and providing research opportunities that deepened my understanding of end-of-life care. She also spearheaded the CIHR grant application that funded this work.

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My heartfelt appreciation goes out to my family for their love, understanding, and persistent belief in me.

## Table of Contents

# Chapter 1: Introduction

## Aging Individuals Living with Schizophrenia

The number of Canadians aged ≥ 50 years living with schizophrenia now comprise half of Canadians living with schizophrenia.[1] As individuals living with schizophrenia age, they may experience improvements in certain psychiatric symptoms[2] but tend to accumulate medical conditions earlier than those not living with schizophrenia.[3] However, the understanding of this population is limited as older individuals living with schizophrenia are underrepresented in research. Additionally, studies often aggregate schizophrenia with other serious and persistent mental illnesses, which limits the ability to draw illness-specific conclusions.

Individuals living with schizophrenia tend to enter long-term care (LTC) homes at an earlier age than individuals living without schizophrenia.[4–7] However, the needs that lead to their admission are unclear and may not align with the traditional role of LTC homes, which is to provide 24-hour nursing and personal care for persons who require assistance with activities of daily living. Concerns have been raised that young and middle-aged individuals living with schizophrenia are inappropriately "warehoused" in LTC homes[8] as a substitute for community-based housing and psychiatric care.[9] Moreover, many LTC homes may lack the resources and expertise necessary to support residents with complex mental health needs.[9–12]

## Study Aim, Objectives, and Hypotheses

The aim of this thesis was to help describe the association between schizophrenia and the needs and outcomes of Ontario LTC home residents.

### Objective 1

To compare the health status and healthcare needs of Ontario LTC home residents living with and without schizophrenia upon admission. Residents were examined using measures of health (e.g., presence of comorbidities and health stability), functioning (e.g., Cognitive Performance Scale and Activities of Daily Living Self-Performance Hierarchy scale), and need for support (e.g., assistance with locomotion). It was hypothesized that LTC home residents living with schizophrenia would have fewer overall healthcare needs but more schizophrenia related healthcare needs.

### Objective 2

To compare the rate of emergency department (ED) transfers among Ontario LTC home residents living with and without schizophrenia during the first year after admission. A secondary analysis stratified ED transfers by ambulatory care sensitive conditions (ACSC). It was hypothesized that LTC home residents living with schizophrenia would have more ED transfers because of inadequate LTC resources and expertise to support their needs.

## Rationale for Thesis

LTC homes play a large role in the healthcare of older adults living with schizophrenia. However, knowledge gaps hinder the delivery of informed and targeted care to this growing and vulnerable population. Understanding the health status and healthcare needs of LTC residents with schizophrenia at the time of admission can help identify the services they require. The rate of ED transfers may indicate whether LTC homes are adequately equipped to manage the needs of these residents. Specifically, the rate of ACSC ED transfers can reflect the quality and timeliness of primary care and chronic disease management, while the rate of non-ACSC ED transfers may suggest the presence of acute medical issues beyond the scope of LTC homes.

## Thesis Organization

This is an article-based thesis comprised of two unpublished articles presented exactly as prepared for publication in the *Journal of American Medical Directors Association*. Chapter one is a detailed review of extant literature establishing key schizophrenia concepts, the state of knowledge about aging of individuals living with schizophrenia, and the challenges providing quality care to LTC home residents living with schizophrenia. Chapter two outlines the methodology employed in the component articles as sufficient detail needed to understand the large databases and sophisticated analyses exceeded what is allowed in publications. Chapter three is the first component article that describes the health status and healthcare needs of LTC home residents living with versus without schizophrenia. Chapter four is the second component article that analyzes the

association between schizophrenia and rate of ED transfers in the year following LTC home admission. Chapter five synthesizes the research presented in the component articles, situating them within the extant literature. It also discusses implications for further research and the delivery of care for LTC home residents living with schizophrenia.

# Chapter 2: Background

## Schizophrenia

The International Classification of Disease (ICD), the global standard for diagnostic classification now in its eleventh edition, describes schizophrenia as a mental illness characterized by disturbances in multiple mental modalities including thinking, perception, self-experience, cognition, volition, affect, and behavior.[13] ICD diagnostic requirements for schizophrenia are outlined in **Figure 1** and may be specified as currently symptomatic or in partial or complete remission. The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), a psychiatric diagnostic classification system used in North America, similarly characterizes schizophrenia but employs stricter diagnostic criteria such as continuous signs for more than six months and the exclusion of certain disorders with psychotic features.[14]

**Essential Features of Schizophrenia**

Two or more of the following symptoms must be present most of the time for a period of one or more months, with at least one qualifying symptom from the first four symptoms:

- Persistent delusions
- Persistent hallucinations
- Disorganized thinking

- Experience of influence, passivity, or control
- Negative symptoms (e.g., affective flattening, alogia or paucity of speech, avolition, asociality and anhedonia)
- Grossly disorganized behavior that impedes goal-directed activity
- Psychomotor disturbances

The symptoms must not be a manifestation of another medical condition or substance or medication on the central nervous system

**Figure 1.** Diagnostic requirements for schizophrenia as outlined by the ICD-11.

The etiology of schizophrenia is not fully known but is heterogenous and involves hundreds of genes, hypoxia related birth complications, cannabis use, neurochemical disturbances in dopamine and glutamine, structural and functional changes in the brain, and possibly childhood adversity.[15] Attenuated psychotic, negative, and cognitive symptoms typically begin between late adolescence and early adulthood but it is the first psychotic episode which typically attracts clinical attention and diagnosis.[16] Treatment includes first- and second-generation antipsychotic medications, which are similarly effective for positive symptoms, so medication choice is made accounting for differences in adverse effects (i.e., extrapyramidal symptoms versus weight gain and metabolic changes).[17] Unfortunately and importantly, antipsychotic medications have little benefit for negative and cognitive symptoms, and these symptoms contribute substantially to the long-term burden associated with the disorder.[16] A recent meta-analysis of long-term outcomes found 40.3% of individuals living with schizophrenia had severe or unstable symptoms and/or poor social function and only 24.2% were considered “recovered” (i.e.,

clinical and/or social remission lasting for at least two years).[18] This serious functional impairment that interferes with major life activities has led to schizophrenia being classified as a serious and persistent mental illness (SPMI).[19,20]

Individuals living with schizophrenia experience challenges in life beyond the symptoms of their mental Illness. First, they become marginalized in society as they are less likely to finish their education and gain employment,[21] more likely to be socially isolated,[22] and experience homelessness.[23] Second, many develop poor health behaviours, including dependence on tobacco or nicotine[24] and/or substances such illicit drugs, cannabis, or alcohol.[25] Smoking is a well-known risk factor for adverse health outcomes, including >50% increase in risk for laryngeal cancer, aortic aneurism, peripheral artery disease, lung cancer, other pharynx cancer, chronic obstructive pulmonary disorder, lower respiratory infection, and pancreatic cancer.[26] Third, many develop physical multimorbidity and psychiatric multimorbidity,[27] and they experience disparities in primary care[28] and frequent hospital admissions.[29–32] Specifically, schizophrenia has been associated with increased asthma, chronic obstructive pulmonary disease, pneumonia, breast cancer of female patients, cardiovascular disease, sexual dysfunction, fracture, and dementia.[33] Therefore, it is unsurprising that schizophrenia is associated with a 2.52 times greater risk of mortality[34,35] and this has persisted for decades.[36]

## Schizophrenia in Canada

The Canadian Chronic Disease Surveillance System has generated national estimates and trends for over 20 chronic diseases, conditions, and health outcomes since

2002.[1] These estimates are derived from diagnostic codes captured in hospital and physician billing records.[37] For schizophrenia, ICD-10 codes were used, except in provinces and territories that were still using ICD-9 codes prior to 2004. In 2022 – 2023, 364,340 (1.0%) Canadians were living with schizophrenia, with slightly higher prevalence among males (1.2%) compared to females (0.9%). This was an increase from 2002-2003, when 173,605 (0.6%) Canadians were living with schizophrenia. The 20-year period of increasing prevalence was marked by a decline in incidence from 61 to 51 cases per 100,000 persons, suggesting Canadians living with schizophrenia were living longer. This was reflected by increasing prevalence among those aged 35 to 79 years but no substantial change was observed in the ≥ 80 age group (see **Figure 2**). The steady prevalence among the oldest age group suggests they are not equally benefiting from improvements in living conditions and treatment. Nevertheless, Canadians aged ≥ 50 years now constitute half of Canadians living with schizophrenia. These national estimates and trends were similar in Ontario.[1]

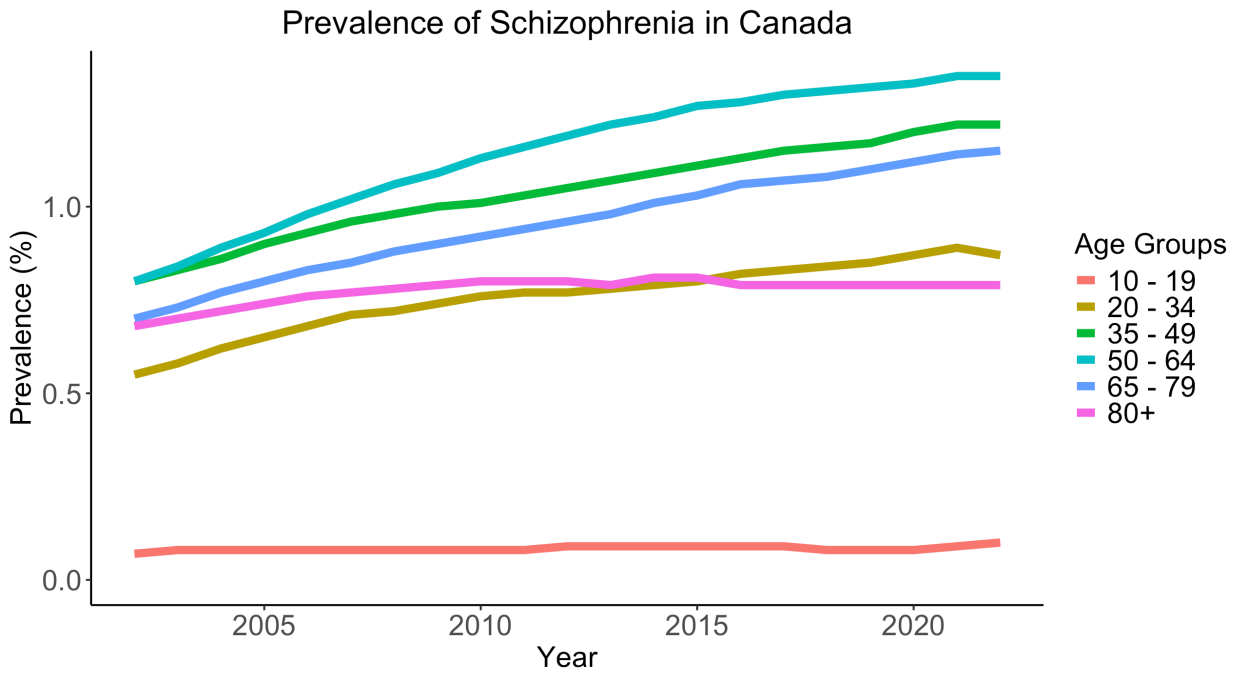


**Figure 2.** Prevalence of schizophrenia over time (2002 to 2022) by age group in Canada according to the Canadian Chronic Disease Surveillance System 2024.

## Schizophrenia and Aging

Less than 1% of literature on schizophrenia has been devoted to older individuals living with schizophrenia.[38] Most older individuals living with schizophrenia are diagnosed before age 40 but a minority, who tend to be female, are diagnosed at ≥ 40 years (i.e., late-onset schizophrenia).[39,40] Individuals with late-onset schizophrenia often have experienced greater premorbid opportunities for educational, occupational, and psychosocial attainment, and generally experience a more favorable prognosis.[41]

Individuals living with schizophrenia are nine times less likely than those living without schizophrenia to achieve successful aging as measured by the absence of comorbidities, cognitive and physical function, and engagement with life.[42] Long-term follow-up studies suggest they have fluctuating positive symptoms and relatively stable

negative symptoms and cognitive deficits, although findings are conflicting in late adulthood.[2] As they age, their health needs grow to include physical needs as the accumulation of poor health behaviours, antipsychotic medication side effects, and hypothesized accelerated aging[43] (i.e., physiological changes throughout the body that are associated with normal aging occur at an earlier age in people with schizophrenia than in the general population) manifest.[3,41]

The comparison of comorbidities between older individuals living with and without schizophrenia remains inconclusive. Systematic reviews have not specifically examined this demographic,[33] and individuals living with schizophrenia who survive into older age may represent a healthier subset. Individual studies have reported varying findings, with some showing decreased, similar, or increased prevalence of comorbidities such as dementia, cardiovascular disease, diabetes mellitus, and chronic obstructive pulmonary disease in older individuals living with versus without schizpohrenia.[7,44,45]

## Long-Term Care Homes

Long-term care (LTC) homes play an important role in the delivery of healthcare to older individuals. These facilities, also known as nursing homes, are inconsistently defined across jurisdictions. They are generally facilities with a domestic-styled environment that provide 24-hour nursing and personal care for persons who require assistance with activities of daily living and who often have complex health needs.[46]

In Ontario, LTC homes are regulated by the *Fixing Long-Term Care Act* (2021).[47] These homes are operated by municipalities, not-for-profit organizations, and private for-

profit organizations. Ontarians are generally eligible for admission if they are at least 18 years old and require frequent nursing care, assistance with activities of daily living (ADLs), or on-site monitoring that cannot be provided through arrangements in the community. Additionally, short-stay admissions can be made for respite care (up to 60 days) and convalescent care (up to 90 days). Upon admission, each resident has a plan of care created based on their needs and preferences. The plan of care covers all aspects of care, including medical, nursing, personal support, mental health, nutritional, dietary, recreational, social, palliative, restorative, religious and spiritual care. For example, a resident should receive an average of four hours of direct care each day by personal support workers and nurses. There are no charges to residents except for accommodations, which range from $66.95 per day for basic accommodations to $95.65 per day for private accommodations.[48] Financial help is available for residents who cannot afford the basic accommodation fee through the Long-Term Care Rate Reduction Program.

The latest available Quick Stats from the Canadian Institute for Health Information state there were 621 LTC homes in Ontario that cared for 101,397 residents in the 2023 – 2024 fiscal year.[49] The average age of a resident was 83 years, 64.9% were female, 62.2% had a dementia diagnosis, 63.5% required special rehabilitation (i.e., the most resource-intensive category based on clinical characteristics and resource needs). Four percent had a schizophrenia diagnosis identified on their admission assessment,[49] but comparisons across jurisdictions are challenging due to limited available data.[50,51] Of those who were newly admitted (n = 28,949), the most common sources of entry were from hospital

(49.3%), home (32.2%), or assisted living/board and care (13.0%). Most residents died in the LTC home (66.3%) or were transferred to a hospital (19.0%).

## Schizophrenia in LTC Homes

Compared to individuals living without schizophrenia, individuals living with schizophrenia are 2.6 times more likely to be admitted to a LTC home when assessed for social care (i.e., home care or residential care)[4] and enter LTC homes at an earlier age.[4–7] In the United States, the prevalence of LTC home residents with schizophrenia or bipolar disorder increased from 10.5% in 2007 to 18.6% in 2017 and exceeded the growth in the community and assisted-living communities (i.e., facilities that provide housing, personal care, at least two meals a day, and oversight 24 hours a day, but are not required to provide nursing services).[52] In Canada, historical data is more limited for the prevalence of schizophrenia in LTC homes but show it ranged from 2.7% to 3.5% between April 1st, 2019, to March 31st, 2024.[49,53–56]

There is growing recognition of the need to examine LTC delivery for individuals living with schizophrenia. While LTC homes provide essential support, they are not always equipped to offer the stimulating, supportive, and therapeutic environments that residents living with schizophrenia may benefit from.[9] For example, LTC home residents living with schizophrenia, and more broadly younger LTC home residents, have expressed a desire for greater autonomy and more meaningful engagement in daily life.[57,58] A key opportunity lies in enhancing staff training and awareness around SPMIs.[11,12] This would help staff distinguish schizophrenia signs and symptoms from other illnesses (e.g., dementia,

depression, or delirium), enhance communication, reduce stigma, and support the development of care plans. Additionally, increasing staffing capacity and flexibility can empower care teams to offer more personalized choices and support.[10] In Canada, workforce challenges (e.g., 42.5% decline in the number of registered psychiatric nurses over the past decade) highlight the importance of investing in mental health expertise within LTC homes.[59] By building on existing strengths and addressing these gaps, Ontario LTC homes can create more inclusive, supportive environments that better meet the needs of all LTC home residents.

Studies investigating the health reasons requiring LTC home admission among individuals living with schizophrenia are limited. Compared to individuals aged ≥ 60 years and living with schizophrenia or bipolar disorder residing in the community, those living in LTC homes have historically had more severe psychiatric symptoms, greater cognitive deficits, more functional and physical impairment, more aggressive behaviours, and a lack of social supports.[60] A more recent study comparing individuals aged ≥ 65 who were assessed for social care (i.e., home care or residential care) found those living with schizophrenia had higher rates of chronic obstructive pulmonary disorder and diabetes mellitus but lower rates of heart disease, congestive heart failure, and stroke than those living without schizophrenia.[4]

Some studies have examined differences in the quality of care and health outcomes for LTC home residents living with schizophrenia, but these studies often examined schizophrenia in a composite SPMI diagnosis group, combined with other diagnoses including bipolar disorder and depressive disorders. Multiple studies have found

schizophrenia to be associated with longer lengths of nursing home stay,[6,61–63] receipt of psychiatric interventions (e.g., assessment and treatment),[64–68] and decreased measures of pain but also decreased pain treatment in the presence of pain.[69–71] Additionally, isolated studies considered together raise concern schizophrenia is associated with decreased receipt of care such as receipt of medications.[67,68,72–74] Potentially preventable hospitalizations, a proxy for adequacy of primary care in a LTC home,[75] has been shown to be increased with SPMIs and decreased with schizophrenia. [76,77] Unfortunately, few health outcomes beyond pain have been investigated.[78–81]

## Conclusion

Schizophrenia is a chronic psychotic disorder often resulting in serious functional impairment. Similar to other jurisdictions in the world, the number of Ontarians aged ≥ 50 years and living with schizophrenia has grown and now constitute half Ontarians living with schizophrenia. Individuals living with schizophrenia have experienced challenging circumstances (e.g., fluctuating symptoms, marginalization, and comorbidities) and are entering LTC homes at an earlier age than those living without schizophrenia, but their health needs are unclear. Additionally, LTC homes may not be adequately equipped to provide high-quality care to support this population because of stigma and a lack of training. Further research in these areas will improve understanding of the health needs, use, and outcomes of LTC home residents living with schizophrenia, informing how to optimally deliver healthcare to support this vulnerable population.

# Chapter 3: Methodology

## Study Designs and Setting

I conducted two retrospective population-based studies in Ontario. The first was a cross-sectional study to examine the healthcare needs of newly admitted LTC home residents living with versus without schizophrenia, and the second was a cohort study to examine variation in the emergency department (ED) transfer rate between LTC residents with and without schizophrenia in the year following admission. Ontario is the largest Canadian province with a population of 16 million[82] and medically necessary care is paid for by a publicly funded health insurance plan.[83] ICES, an independent nonprofit research institute which collects health administrative data generated by healthcare service use, shared relevant data for these studies.[84]

This study is reported in accordance with the REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) reporting guideline.[85]

## Study Population

The study population consisted of all individuals newly admitted to Ontario LTC homes between April 1st, 2012, and March 31st, 2023. The accrual start date was the earliest date complete LTC home data could be used, and the accrual end date was the end of the most recent data. The index date was defined as the date of LTC home admission.

Newly admitted LTC home residents were identified via Resident Assessment Instrument Minimum Data Set (RAI-MDS) 2.0 admission assessments in Continuing Care Reporting System (see Data Sources, Access, and Linkage for detail). To eliminate persons with prior LTC home stays, those with a LTC home admission between April 1st, 2010, and March 31st, 2011, were excluded. If a person had more than one admission during the accrual window, only the first admission was used.

Individuals were excluded if they met any of the following:

1. **Invalid ICES Key Number (IKN):** this individual identifier is necessary for linking datasets together.
2. **Could not be linked to the registered person database (RPDB):** individuals not recorded in this dataset are missing basic demographic information.
3. **Had a death date before the index date:** this is a result of errors with administrative data.
4. **Were less than 18 years or greater than 105 years old at index:** individuals must be ≥ 18 years old to be eligible for LTC home admissions and an age of > 105 years is often a result of error in data entry.
5. **Were admitted for respite or convalescent care:** these types of LTC home admissions are uncommon and reflect a different population.

Additionally, individuals whose recorded date of death was the same as their index date were excluded from the cohort study, as some had subsequent records of ED

transfers. These indicate errors in their follow-up data and their exclusion helped ensure the integrity of the dataset.

## Data Sources, Access, and Linkage

The ICES data repository is the most comprehensive array of individual, health-related data encompassing all people eligible for healthcare in Ontario since 1986.[84] Most of the data utilized for this thesis was captured from each individual's RAI-MDS 2.0 admission assessment. Additional data (e.g., discharge summaries of hospital stays and emergency department visits) was captured from other data sets and linked together at the individual level using IKNs, an encrypted form of an individual's health card number. The use of the data in this thesis was authorized under section 45 of Ontario's Personal Health Information Protection Act and did not require review by a Research Ethics Board.

### Resident Assessment Instrument Minimum Data Set (RAI-MD2) 2.0

RAI-MDS 2.0 (Canadian Version) assessment forms are standardized assessments of an LTC home resident's needs and functional status.[86] They are conducted by trained health professionals by communicating with and observing the resident, communicating with the resident's family and caregivers, and reviewing the resident's record. A RAI-MDS 2.0 assessment form is completed for every LTC home resident upon admission and subsequently every three months or sooner if there are major changes in a resident's health status.

## Continuing Care Reporting System (CCRS)

The CCRS contains clinical, demographic, and administrative information on residents in residential and hospital-based continuing care facilities (e.g., LTC homes) as well as information on facility characteristics.[87] Data is primarily collected using RAI-MDS 2.0 assessments. Most RAI-MDS 2.0 assessment variables are mandatory to report and the Canadian Institutes of Health Information utilizes several quality processes (e.g., software prompts at the time of documentation and audits) to ensure data quality.[88]

## Ontario Health Insurance Plan (OHIP) Claims Database

The OHIP claims database contains data on claims for services provided by health care providers (e.g., medical doctors) including date of service, patient served, diagnosis, and service provided.[89]

## Discharge Abstract Database (DAD)

The DAD data contains administrative, clinical and demographic information on acute inpatient hospital discharges.[90] Data on patients in adult designated inpatient mental health beds in Ontario were included in this database until October 1st, 2005, after which they were included in OMHRS.

## Ontario Mental Health Reporting System (OMHRS)

The OMHRS contains data on all individuals receiving adult mental health services in Ontario.[91] Data is collected using the Resident Assessment Instrument Mental Health version 2.0.

## National Ambulatory Care Reporting System (NACRS)

The NACRS contains demographic, administrative, clinical and service-specific data for hospital-based and community-based ambulatory care (e.g., emergency departments).[92]

## Ontario Drug Benefit (ODB) Database

The ODB database contains medical drug claims and pharmacy and practitioner information.[93] The ODB program provides drug benefits for Ontarians aged ≥ 65 years and certain individuals age < 65 years (e.g., LTC home residents).[94]

## CENSUS

The CENSUS database contains data about people and housing units in Canada by their demographic, social and economic characteristics.[95] The data is aggregated by geographic area, ranging from province (largest area) to dissemination area (smallest). A dissemination area is a "a small, relatively stable geographic unit composed of one or more adjacent dissemination blocks with an average population of 400 to 700 persons based on data from the previous Census of Population Program".[96]

## Registered Person Database (RPBD)

The RPDB contains basic demographic data on persons registered under the OHIP.[97]

### Ontario Marginalization Index (ONMARG)

The ONMARG contains data about the geographic distribution of marginalization in Ontario using census data according to four dimensions: households and dwellings, material resources, age and labor force, and racialized and newcomer populations.[98]

### Office of the Registrar General – Deaths (ORGD)

The ORGD contains data on all deaths in Ontario received from the Registrar General of Ontario, the original source of which is Service Ontario.

### Postal Code Conversion File (PCCF)

The PCCF links six-character postal codes to standard geographic areas such as dissemination areas, census tracts, and census subdivisions.[99]

## Study Variable Definitions

### Exposure: Schizophrenia

Residents' schizophrenia status at index was identified using a validated algorithm to detect chronic psychotic illness (i.e., schizophrenia and schizoaffective disorder) via health administrative data.[100] Schizophrenia was identified if any of the following were met prior to the index:

1. ≥ 3 outpatient physician billings for schizophrenia (i.e., OHIP code 295) in the OHIP claims database within a 3-year period

2. ≥ 1 hospital records in the DAD with a schizophrenia or schizoaffective disorder diagnosis (i.e., ICD-10-CM code F20 or F25)
3. ≥ 1 hospital records in the OMHRS with a schizophrenia or schizoaffective disorder diagnosis (i.e., DSM-IV code 295 prior to 2016, DSM-V code 295 between 2016 and March 31st, 2019, and ICD-10-CM code F20 and F25 from April 1st, 2019 and onward)

The algorithm has a sensitivity of 96.5%, specificity of 57.1%, positive predictive value of 49.4%, and negative predictive value of 97.4% in individuals with mental illness.[100] However, its specificity may be higher in LTC homes, where the ratio of true schizophrenia to other mental illnesses often misclassified as schizophrenia is higher (i.e., lower rate of false positives).

## Outcome: Health Status and Healthcare Needs

The selected clinical scales and comorbidities are widely used indicators of health status in the literature. The rationale for selected measures of potential healthcare need is detailed with their descriptions below.

### *Cognitive Performance Scale*

The Cognitive Performance Scale (CPS) is a clinical scale that summarized impairment in residents' cognitive performance on a scale from 0 (intact) to 6 (very severe impairment).[101] It combined the following RAI-MDS 2.0 assessment items: neurological diagnosis of coma or persistent vegetative state, capacity to remember recent events, performance in making everyday decisions about tasks or activities of daily living, ability to

express or communicate self, and self-performance in eating and drinking.[102] The logic that determined the CPS score is complex but is simplified in **Figure 1**.

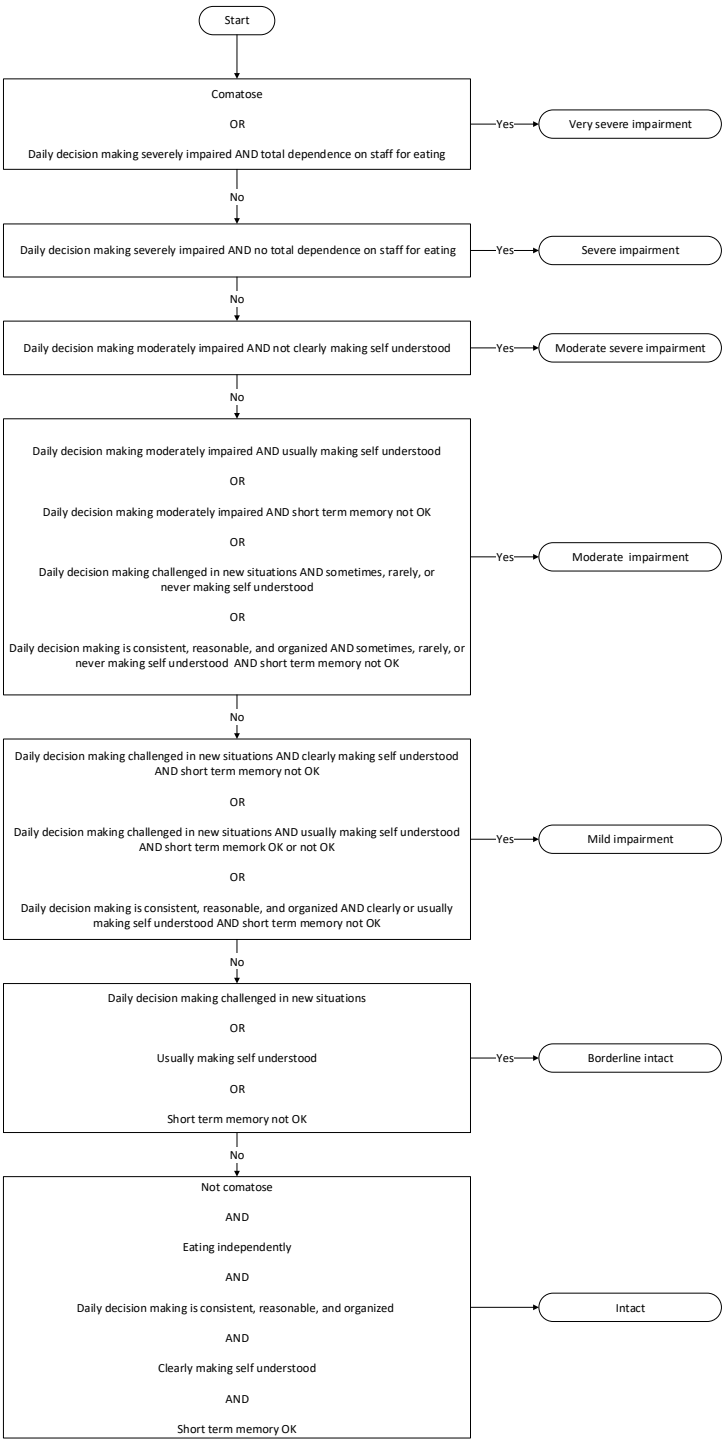

**Figure 1.** Simplified logic to assign a CPS score.[102]

### *Activities of Daily Living Self-Performance Hierarchy*

The Activities of Daily Living Self-Performance Hierarchy scale (ADL-H) is a clinical scale that summarized residents' individual ADLs from 0 (independent) to 6 (total dependence).[103] It combined the following RAI-MDS 2.0 assessment items: self-performance in moving between locations his or her room and adjacent corridor on the same floor, self-performance in eating and drinking, self-performance toileting, and self-performance in maintaining personal hygiene.[102] Each of these were scored as independent, supervision, limited assistance, extensive assistance, total dependence, or activity did not occur during the past seven days. The logic that determined the CPS score is detailed in **Figure 2**.

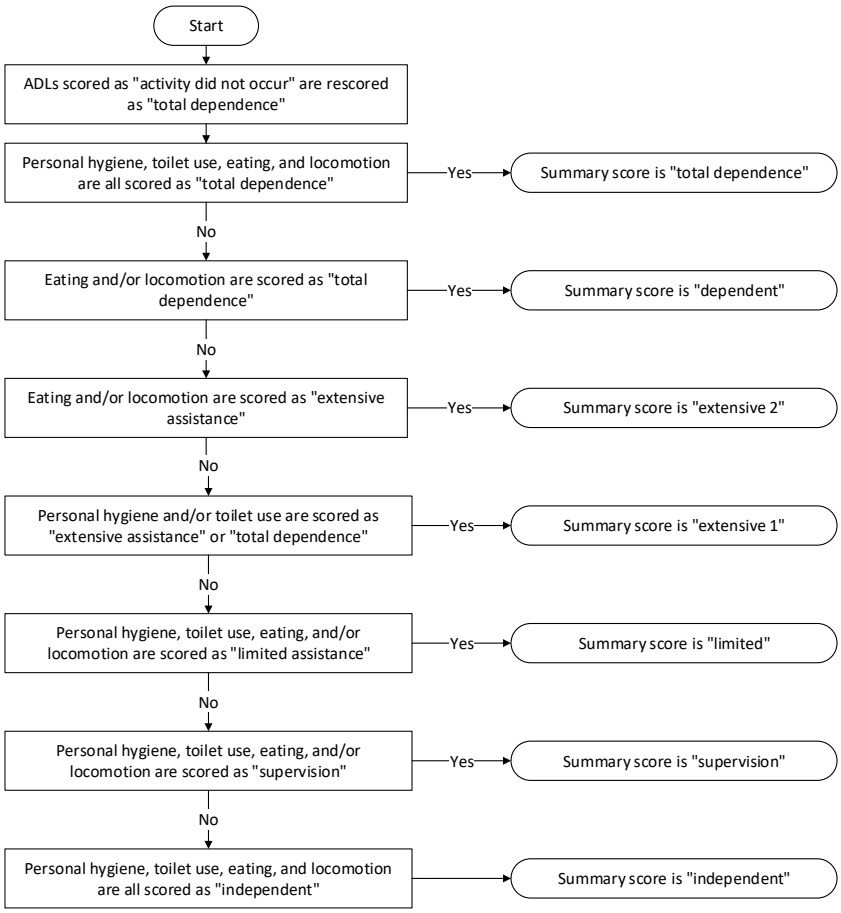


**Figure 2.** Logic to assign ADL-H score.[102]

### *Changes in Health, End-Stage Disease and Symptoms and Signs (CHESS) Scale*

The Changes in Health, End-Stage Disease and Symptoms and Signs (CHESS) is a clinical scale that summarized residents' health instability from 0 (no instability) to 6 (highest level of instability).[104] It combined the following RAI-MDS 2.0 assessment items grouped together: health symptoms (vomiting, dehydration, ≥ 25% of food uneaten at most meals, shortness of breath, edema, weight loss of 5% or more in last 30 days or 10% or more in last 180 days), presence of end-stage disease (i.e., predicted ≤ 6 months to live), and changes in health (deterioration in cognitive status or ADL function compared to his or

her status of 90 days ago).[102] The CHESS scale score summed the following: 0 to 2 points for count of health symptoms, 1 point for presence of end-stage disease, 1 point for decline in cognition, and 1 point for decline in ADLs.

### *Charlson Comorbidity Index*

The Charlson Comorbidity Index (CCI) score is a clinical scale that summarized residents' burden of select comorbidities which singly or in combination might alter the risk of mortality.[105] Residents' scores were calculated by identifying diagnoses from **Table 1** in the DAD using a two year lookback and summing the weights of each diagnosis present.[106] CCI scores ranged from 0 (no comorbidities present) to 29 (all comorbidities present).

**Table 1**

Diagnoses utilized by the Charlson Comorbidity Index

| Diagnosis | ICD-10-CA codes | Weight |
|---|---|---|
| Acute Myocardial Infarction | I21, I22, I252 | 1 |
| Congestive Heart Failure | I099, I255, I420, I425-I429, I43, I50, P290 | 1 |
| Peripheral Vascular Disease | I70, I71, I731, I738, I739, I771, I790, I792, K551, K558, K559, Z958, Z959 | 1 |
| Cerebrovascular Disease | G45, G46, H340, I60-I69 | 1 |
| Dementia | F00-F03, F051, G30, G311 | 1 |
| Chronic Obstructive Pulmonary Disease or other Respiratory Diseases | I278, I279, J40-J47, J60-J67, J684, J701, J703 | 1 |
| Rheumatic-like Diseases | M05, M06, M315, M32-M34, M351, M353, M360 | 1 |
| Ulcers of the Digestive System | K25-K28 | 1 |
| Liver Disease – Mild | B18, K700-K703, K709, K713-K715, K717, K73, K74, K760, K762-K764, K768, K769, Z944 | 1 |
| Diabetes – No Chronic Complications | E100, E101, E106, E108, E109, E110, E111, E116, E118, E119, E120, E121, E126, E128, E129, E130, E131, E136, E138, E139, E140, E141, E146, E148, E149 | 1 |
| Diabetes with Chronic Complications | E102-E105, E107, E112-E115, E117, E122-E125, E127, E132-E135, E137, E142-E145, E147 | 2 |
| Hemiplegia or Paraplegia | G041, G114, G801, G802, G81, G82, G830-G834, G839 | 2 |
| Renal (Kidney) Disease† | N032-N037, N052-N057, N18, N19, N250, Z490-Z492, Z940, Z992 | 2 |
| Cancer (No secondary found) | C00-C26, C30-C34, C37-C41, C43, C45-C58, C60-C76, C81-C85, C88, C90-C97 | 2 |
| Liver Disease – Moderate or Severe | I850, I859, I864, I982, K704, K711, K721, K729, K765, K766, K767 | 3 |
| Cancer (Metastatic – secondary) | C77-C80 | 6 |
| HIV / AIDS | B20-B22, B24 | 6 |

### *Aggressive Behaviour Scale*

The Aggressive Behaviour Scale (ABS) is a clinical scale that summarizes residents' aggressive behaviour from 0 to 12, with higher values indicating a higher degree of aggressive behaviour.[107] It combined the following RAI-MDS 2.0 assessment items: neurological diagnosis of coma or persistent vegetative state and frequency of verbal abuse, physical abuse, socially inappropriate or disruptive behaviour, and resistance to care.[102] The ABS score summed the points assigned to each behavioural symptom based on their frequency in the seven days prior to assessment: 0 if it did not occur, 1 if it occurred 1 to 3 days, 2 if it occurred 4 to 6 days, and 3 if it occurred daily. Residents who are comatose were assigned a missing ABS score.

### *Comorbidities*

Resident's comorbidities were captured from the RAI-MDS 2.0 admission assessment Section I – Disease Diagnoses. This section contained flags for the presence of diseases that have a relationship to their ADL status, cognitive status, mood or behavior status, medical treatments, nursing monitoring or risk of death.[86] Only prevalent comorbidities (i.e., ≥ 10% in study population) and clinically relevant comorbidities to schizophrenia were included: hypertension, dementia other than Alzheimer's, arthritis, diabetes mellitus, osteoporosis, depression, gastrointestinal disease, allergies, cerebrovascular accident, hypothyroidism, other cardiovascular disease, emphysema, arteriosclerotic heart disease, Alzheimer's disease, anemia, congestive heart failure, anxiety disorder, renal failure, cancer, cataracts, cardiac dysrhythmias, peripheral vascular disease.

### *Number of Medications*

Resident's number of medications were captured from both the RAI-MDS 2.0 admission assessment and from the ODB. Administering medication is a key component of staff responsibilities and the number of medications to be administered impacts healthcare system workload (e.g., medication review by pharmacist, ordering and storing medication, financial cost to the Ontario Drug Benefit, and time needed for administration). The RAI-MDS 2.0 admission assessment recorded the number of different medications administered during the seven days prior to assessment, including long-acting antipsychotic medication prior to the assessment period.[86] The ODB recorded all medications claims submitted during the first 14 days of admission, the period during which the RAI-MDS 2.0 admission assessment is to be completed, regardless whether they were administered.

### *Support Provided for Locomotion on Unit*

The highest level of support provided by staff for the how resident moved between locations in his or her room and adjacent corridor on the same floor was captured from the RAI-MDS 2.0 admission assessment. This task is also a key component of staff responsibilities and may require substantial resources (e.g., equipment and number of staff). The variable was categorized as no setup or physical help from staff, setup help only, one person physical assist, two+ persons physical assist, or ADL activity did not occur.[86] It was based on the seven days prior to assessment.

### *Resource Utilization Group Category*

Seven Resource Utilization Group (RUG) categories that rank residents' resource intensity need from reduced physical functions (lowest) to extensive services (highest) were captured from the CCRS.[108] Ontario's LTC sector uses the RUG version III methodology with based on resident medical conditions, ADLs, and nursing rehabilitation and therapy to adjust a LTC home's nursing and personal care funding.[109] Essentially, it may be interpreted as a net measure of the healthcare needs of a resident.

## Outcome: ED Transfer Rate

The number of ED transfers and ED diagnoses during the follow-up period were captured from the NACRS. ED diagnoses were identified using the ICD-10-CA code for the main problem, defined as the problem considered by ED health care providers to be the most clinically significant reason for the visit that requires evaluation, treatment, or management.[110] ED diagnoses were flagged as an ACSC based on the main diagnosis code and procedure codes, as identified in **Table 2**. The ACSC criteria were applied to transfers from LTC homes for the first time in 2003 and have since been utilized in Ontario at ICES.[75,111–113]

**Table 2**

ED diagnoses classified as ambulatory care sensitive conditions

| Condition | ICD-10-CA Codes | Exclude |
|---|---|---|
| Angina pectoris | I20, I2382, I240, I248, I249 | Cases with surgical procedure (CCI procedure: 1, 2, 5) |
| Asthma | J45 | |
| Cellulitis | L03 | Cases with surgical procedures (CCI: 1, 2, 5) |
| Chronic obstructive pulmonary disease | J41–J44, J47, J20 (only when "other diagnosis" of J41–J44, J47 is present), J12–J16, J18 (only when "other diagnosis" of J41–J44, J47 is present) | |
| Congestive heart failure | I50, J81 | Cases with surgical procedures (CCI: 1IJ50, 1HZ85, 1IH76, 1HB53, 1HD53, 1HZ53, 1HB55, 1HD55, 1HZ55, 1HB54, 1HD54) |
| Dehydration | E86 | |
| Diabetes mellitus | E101, E106, E107, E109, E110, E111, E116, E117, E119, E130, E131, E136, E137, E139, E140, E141, E146, E147, E149 | |
| Gastroenteritis | K52 | |
| Grand mal seizure disorders | G40, G41 | |
| Hypertension | I100, I101, I11 | Cases with surgical procedures (CCI: 1IJ50, 1HZ85, 1IJ76, 1HB53, 1HD53, 1HZ53, 1HB55, 1HD55, 1HZ55, 1HB54, 1HD54) |
| Hypoglycemia | E162 | |
| Kidney or urinary tract infection | N10, N151, N11, N136, N390 | |
| Pneumonia | J12–J16, J18 | |
| Severe ear, nose, or throat infection | J02, J03, J312 | |

## Other Variables

The following sociodemographic and economic variables were used to describe the study population at baseline. Some variables (i.e., age, sex, fiscal year of LTC home admission, and number of beds in LTC home) were identified as confounders for the analysis between schizophrenia and rate of transfer to an ED using VanderWeele's principles of confounder selection.[114] The other sociodemographic variables and the health variables were identified as mediators because they occurred after the onset of schizophrenia and likely on the causal pathway between schizophrenia and ED transfers.

### *Age*

Residents' age at index was captured using the RPDB. This continuous variable was categorized as 18 – 64 years, 54 – 79 years, 80 – 84 years, or 85 – 105 years when necessary for interpretability during analysis.

### *Sex*

Residents' sex at index was captured using the RPDB. This dichotomous variable was categorized as male or female.

### *Marital Status*

Resident's marital status at index was captured using the CCRS. This categorical variable was recategorized as unknown (missing or unknown), not married (never married, widowed, separated, or divorced), or married to simplify interpretability during analysis.

### *Absence of Personal Contact with Family or Friends*

Absence of visitors or telephone calls from others in the last seven days was captured from the RAI-MDS 2.0 admission assessment. This dichotomous variable was categorized as yes or no.[86]

### *Education*

Residents' highest level of education attained at index was captured using the CCRS. This categorical variable was recategorized as unknown, ≤ high school (8$^{th}$ grade or less, 9$^{th}$ to 11$^{th}$ grade, or high school), or > high school (technical or trade school, some college, bachelor's degree, or graduate degree) to simplify interpretability during analysis.

### *Prior Neighborhood Income Quintile*

Residents' neighborhood median household income quintile (1 to 5, from low to high) from their place of residence prior to LTC admission was captured by linking their postal code from the RPDB to CENSUS records using the PCCF.[95,99]

### *Prior Neighborhood Marginalization Quintiles*

Resident's neighborhood marginalization according to quintiles (1 to 5, from low to high) for households and dwellings, material resources, age and labor force, and racialized and newcomer populations prior to index were captured from ONMARG using postal codes from the RPDB and the PCCF.[115] The households and dwellings dimension of marginalization related to family and neighborhood stability and cohesiveness. The material resources dimension of marginalization related to the inability for individuals and communities to access and attain basic material needs relating to housing, food, clothing,

and education. The age and labor force dimension of marginalization related to impacts of disability and dependence. The racialized and newcomers populations index related to the impacts of racialization and xenophobia.

### *Prior Municipality Urbanicity*

Residents' census subdivision (also known as a municipality) urbanicity prior to index was captured from the CCRS. This categorical variable was categorized as missing, urban (located in a census metropolitan area, census agglomeration, or census metropolitan zone strongly influenced by a census metropolitan area or census agglomeration based on commuting flows), or rural (located in a census metropolitan zone weakly influenced or not influenced by a census metropolitan area or census agglomeration based on commuting flows).[116]

### *Homelessness*

Homelessness in the five years prior to index was identified using a validated algorithm on emergency department records from the National Ambulatory Care Reporting System and hospital discharge records from the Discharge Abstract Database and Ontario Mental Health Reporting System.[117,118] This binary variable categorized as yes versus no if homelessness was recorded in any diagnosis field (i.e., ICD codes Z59.0 and/or Z59.1) or in select demographic fields in the Ontario Mental Health Reporting System (i.e., living arrangement at discharge, setting from which admitted, prior residential status, and/or usual residence). The algorithm's sensitivity was 24.8% until 2018, when a change in

coding practice was implemented, resulting in an increased sensitivity of 52.9%. Its specificity remained constant at 99%.

### *LTC Home Entry Source*

Resident's entry source into their LTC home was captured from the CCRS. This categorical variable was recategorized as inpatient acute care service, inpatient psychiatry service, home with no home care, home with home care, and other (ambulatory health service, general inpatient rehabilitation service, inpatient continuing care service, 24-hour nursing care residential care service, other/unclassified service, specialized inpatient rehabilitation service, board and care residential care service). The "other" category encompassed other entry sources, many of which were broadly defined and perceived to be at high risk of misclassification. For example, entry from an ambulatory health service (e.g., emergency department) would be unusual and retirement homes could be classified as either type of residential care service (24-hour nursing care or board and care) without detailed knowledge of the entry source and variable definition.

### *LTC Home Urbanicity*

The census subdivision urbanicity of the LTC home a resident was admitted to was captured from the CCRS. This categorical variable was categorized as missing, urban (located in a census metropolitan area, census agglomeration, or census metropolitan zone strongly influenced by a census metropolitan area or census agglomeration based on commuting flows), or rural (located in a census metropolitan zone weakly influenced or not

influenced by a census metropolitan area or census agglomeration based on commuting flows).[116]

### *LTC Home Number of Beds*

The number of beds in the LTC home a resident was admitted to was captured from the CCRS. This continuous variable was categorized as < 50, 50 – 99, 100 – 149, and ≥ 150 to simplify interpretability during analysis.

### *Fiscal Year Admitted to LTC Home*

Resident's fiscal year of admission was extracted from the index date. A fiscal year was defined as April 1st of one year to March 31st of the following year.

### *Length of Follow-Up*

Resident's length of follow-up was captured for the purpose of measuring ED transfer rates in the year following LTC admission. It was calculated as the number of days from the index date to the last date of follow-up, minus the sum of days hospitalized as captured in the DAD and OMHRS. The last date of follow-up was defined by the first of the following: 365 days after the index date, date of LTC home discharge from the CCRS, or date of death from ORGD (or if not available, then RPDB). The date of LTC discharge was defined as the first LTC home discharge record in the CCRS without a record of LTC home re-entry within 30 days in the CCRS.

## Data Processing and Statistical Analyses

ICES provided individual-level data for the requested variables in several data sets, which I linked and recoded as necessary. These datasets were linked using unique encoded identifiers and analyzed at ICES. Data preparation and analyses were performed using SAS, version 9.4 (SAS Institute, Cary NC). Smalls cells (< 6 observations) were suppressed in accordance with ICES policy to reduce the risk of individual identification.

### Analyses for Objective 1

The number of LTC home admissions and prevalence of schizophrenia were calculated for each fiscal year.

The study population's socioeconomic, demographic, and healthcare needs upon LTC home admission were described using measuring of central tendency and dispersion for continuous variables (i.e., means and standard deviations for normally distributed data and medians and interquartile ranges for skewed data) and counts and proportions for categorical variables. Descriptive statistics were calculated overall and by schizophrenia status with standardized differences. To assess the magnitude of differences between groups, standardized differences (std diffs) were calculated for each comparison and a threshold of ≥ 0.1 was utilized to indicate a meaningful difference.[119]

A sensitivity analyses for healthcare needs was conducted by stratifying the study population by dementia status (i.e., Alzheimer's disease or dementia other than Alzheimer's flagged on the RAI-MDS 2.0 admission assessment Section I – Disease Diagnoses) and age groups (i.e., 18 to 49 years, 50 to 64 years, 65 to 69 years, 70 to 74

years, 75 to 79 years, 80 to 84 years, 85 to 89 years, and 90 years to 105). These analyses were conducted because dementia may obscure the symptoms of schizophrenia and residents living with schizophrenia are often admitted at a younger age .

## Analyses for Objective 2

The association between schizophrenia and the number of overall, ACSC, and non-ACSC ED transfers in the year following LTC home admission were analyzed with Poisson regression and negative binomial regression. These modeled the number of ED transfers ($\lambda$) as a function of schizophrenia ($x_1$) with adjustment for the confounders age ($x_2$), sex ($x_3$), fiscal year of admission ($x_4$), and LTC home number of beds ($x_5$), and length of follow-up as an offset term: $\log(\lambda) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \log(time)$. Schizophrenia's association with ED transfer rate was interpreted as a multiplicative effect by exponentiating $\beta_1$ to a rate ratio (i.e., $e^{\beta_1} = \frac{Mean\ rate\ for\ schizophrenia}{Mean\ rate\ for\ no\ schizophrenia}$).

Negative binomial regression was utilized in addition to Poisson regression to account for the possibility of greater variation (i.e., overdispersion) in ED transfers than what Poisson regression assumes (i.e., variation equal to mean). While both models produce similar estimates, negative binomial regression calculates appropriately larger confidence intervals for model coefficients in the presence of overdispersion and avoids artificially complex models.[120] The best fitting model was selected using two metrics: the ratio of the deviance to degrees of freedom (deviance/DF) and Akaike's Information Criterion (AIC). A deviance/DF should be equal to one, with larger values indicating potential overdispersion and smaller values indicating potential underdispersion.[121] AIC

balances model fit with complexity, with smaller values indicating a more parsimonious and better-fitting model.[122]

Zero inflated regression models were not used because we did not have rationale for the presence of structural zeros. For example, LTC home residents with a do-not-hospitalize still experience ED transfers, although at a reduced rate.[123–125]

The ten most frequent ED transfer reasons identified by three-character main problem ICD-10-CA codes were tabulated by schizophrenia status using counts and proportions.

## Handling of Missing Data

Missing data for each variable were reported in the descriptive analyses. None of the variables used in the regression modelling had missing data.

# Chapter 4: Health Status and Healthcare Needs

## Preface

This chapter contains component article one addressing objective one, titled "Health Status and Healthcare Needs of Long-Term Care Home Residents Living with Schizophrenia in Ontario, Canada". It was prepared for submission in the Journal of the American Medical Directors Association (JAMDA).

Samuel Tiukuvaara was the primary author was responsible for all aspects of its development including conceptualization, methodology, statistical analysis, interpretation of results, and manuscript writing. Drs. Jess Fiedorowicz, Colleen Webber, and Steven Hawken provided guidance and oversight throughout the process.

The research presented in this chapter was approved as part of the thesis proposal submitted to the School of Epidemiology and Public Health at the University of Ottawa in June 2024. An ICES privacy impact assessment was approved as a prerequisite for accessing the required data. The use of the data in this project is authorized under section 45 of Ontario's Personal Health Information Protection Act (PHIPA) and did not require review by a Research Ethics Board.

# JAMDA Title Page

## Title

Health Status and Healthcare Needs of Long-Term Care Home Residents Living with Schizophrenia in Ontario, Canada

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## Brief Summary

Ontario long-term care home residents living with schizophrenia have similar or fewer comorbidities and functional impairments upon admission. They require more

medications to be administered but less assistance for locomotion and more are assigned a lower resource intensity status.

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Parts of this material are based on data and information compiled and provided by the Ontario Ministry of Health. The analyses, conclusions, opinions and statements

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This project adapted the 2011, 2016, and 2021 CENSUS datasets from Statistics Canada. This does not constitute an endorsement by Statistics Canada of this product.

We thank IQVIA Solutions Canada Inc. for use of their Drug Information File. Parts of this material are based on data and information compiled and provided by the Ontario Ministry of Health. The analyses, conclusions, opinions and statements expressed herein are solely those of the authors and do not reflect those of the funding or data sources; no endorsement is intended or should be inferred.

We thank the Toronto Community Health Profiles Partnership for providing access to the Ontario Marginalization Index.

Parts of this report are based on Ontario Registrar General (ORG) information on deaths, the original source of which is ServiceOntario. The views expressed therein are those of the author and do not necessarily reflect those of ORG or the Ministry of Public and Business Service Delivery.

# Abstract

## Objective

We compared the health status and healthcare needs of Ontario long-term care (LTC) residents living with versus without schizophrenia upon admission.

## Design

Retrospective cross-sectional study.

## Settings and Participants

Individuals admitted to LTC between April 1st, 2012, and March 31st, 2023.

## Methods

Resident Assessment Instrument-Minimum Data Set 2.0 admission assessments were linked to health administrative datasets. Schizophrenia was identified using hospitalization and physician service claims. Descriptive statistics were calculated for measures of health status and healthcare need.

## Results

Among 231,384 residents, 8,776 (3.8%) were living with schizophrenia. Residents living with schizophrenia had fewer comorbidities, more stable general health, and a greater proportion with Charlson Comorbidity Index scores of zero (18.7% vs. 13.3%). They also showed less impairment by a greater proportion with “borderline intact” Cognitive Performance Scale scores (15.4% vs. 10.3%) and “supervision” Activities of Daily Living

Self-Performance Scale scores (8.4% vs. 5.5%). Aggressive Behavior Scale scores were similar. Residents living with schizophrenia had a higher median number of medications administered (interquartile range 7 – 14 vs. 7 – 13), required less locomotion support, and were more often categorized in the lower intensity "behavioral problems" Resource Utilization Group (3.6% vs. 1.4%).

## Conclusion and Implications

Residents living with schizophrenia have distinct health statuses and healthcare needs, sometimes requiring less support for general health and functioning. Future research is needed to describe their non-health needs and reasons for admission.

## Introduction

Schizophrenia is characterized by positive symptoms (e.g., delusions and hallucinations), negative symptoms (e.g., avolition and affective flattening), and cognitive impairment.[1] Approximately 1% of Canadians live with schizophrenia, half of whom are ≥ 50 years of age.[2] As they age, their healthcare needs expand beyond mental health as a result of health behaviours, antipsychotic medication side effects, and manifestation of other medical conditions associated with aging which are highly co-morbid.[3] However, their specific healthcare needs remain understudied, as less than 1% of schizophrenia literature has been devoted to older individuals.[4]

Individuals living with serious and persistent mental illnesses (SPMI) are admitted to long-term care (LTC) homes, also known as nursing homes, at a younger age than individuals living without SPMIs.[5–8] Residents living with schizophrenia have been found to have longer lengths of stay[7,9–11] and increased receipt of psychiatric interventions,[12–16] but quality of care and health outcomes are understudied. There is recognition that LTC may benefit from adapting their services to better support residents living with schizophrenia as they are not always equipped to offer the stimulating, supportive, and therapeutic environments that these residents may benefit from.[17,18] Key opportunities lie in enhancing staff training and awareness around SPMIs[19,20] and offering more personalized choices and support.[21]

In this study, we measured schizophrenia prevalence among newly admitted Ontario LTC residents over time and compared the health status and healthcare needs of

residents living with versus without schizophrenia upon admission. We hypothesized residents living with schizophrenia may have more intact general health and fewer overall needs, but more schizophrenia-related comorbidities (e.g., cardiovascular comorbidities and diabetes mellitus) and needs. This research will inform strategies for delivering more effective healthcare to this vulnerable population.

## Methods

This study is reported in accordance with the REporting of studies Conducted using Observational Routinely-collected health Data reporting guideline.[22]

### Study Design and Population

We conducted a retrospective cross-sectional study of all individuals newly admitted to LTC in Ontario between April 1st, 2012, and March 31st, 2023. Ontario provides medically necessary care through a publicly funded health insurance plan and adults are eligible for LTC admission if they require frequent nursing care, assistance with activities of daily living (ADLs), or monitoring that cannot be provided in the community. We excluded individuals if they had could not be linked to the Registered Persons Database, had a recorded death date before recorded admission date, were aged < 18 years or ≥ 105 years on their admission date, or were admitted for respite or convalescent care.

### Data Sources

We used health administrative data from ICES, an independent, non-profit research institute whose legal status under Ontario's health information privacy law allows it to

collect and analyze health care and demographic data, without consent, for health system evaluation and improvement. Most data were captured from the Continuing Care Reporting System, which derives data from Resident Assessment Instrument Minimum Data Set (RAI-MDS) version 2.0 assessments. RAI-MDS 2.0 assessments are mandated for residents within 14 days of admission, quarterly, and following significant changes in resident status.[23] Additional data were captured CENSUS, Discharge Abstract Database, National Ambulatory Care Reporting System, Ontario Drug Benefit Database, Ontario Health Insurance Plan Claims Database, Ontario Marginalization Index, Ontario Mental Health Reporting System, and Postal Code Conversion File (datasets are described in **Supplementary Table 1**). These datasets were linked using unique encoded identifiers and analyzed at ICES.

## Study Variables

Residents were identified as living with schizophrenia if ≥ 3 outpatient physician billings for schizophrenia to the Ontario Health Insurance Plan occurred within a three-year period or ≥ 1 hospital records in the Discharge Abstract Database or Ontario Mental Health Reporting System documented a schizophrenia diagnosis (see **Supplementary Table 2** for codes). This algorithm had a sensitivity of 96.5% and a specificity of 57.1% in a hospital-derived validation sample.[24] However, its specificity may be higher in LTC where the prevalence of other mental illnesses which may be misidentified with schizophrenia is lower. The diagnosis date was defined as the earliest health care encounter that fulfilled the algorithm's criteria.

Marital status, absence of personal contact with family or friends in the past seven days, level of education, urbanicity of prior residence, and entry source were captured from RAI-MDS 2.0 admission assessments. Entry source was categorized as inpatient acute care service, inpatient psychiatry service, home with no home care, home with home care, and other. Age, sex, and postal code of prior residence were captured from the Registered Persons Database. Age was categorized as 18 to 49 years, 50 to 64 years, 65 to 69 years, 70 to 74 years, 75 to 79 years, 80 to 84 years, 85 to 89 years, and 90 years to 105 years. Postal codes were used to capture prior neighborhood income quintile using Statistics Canada census data and prior neighborhood marginalization quintiles using the Ontario Marginalization Index.[25] Neighborhood marginalization was captured using census data to measure material resources, households and dwellings, age and labor force, and racialized and newcomers.[26] Homelessness in the prior five years was identified using emergency department records from the National Ambulatory Care Reporting System and hospital records from the Discharge Abstract Database and the Ontario Mental Health Reporting System.[27] LTC home urbanicity and number of beds were captured from the Continuing Care Reporting System. Codes used to classify cohort characteristics are detailed in **Supplementary Table 3**.

The Cognitive Performance Scale (scores range from 0-6), ALD Self-Performance Hierarchy Scale (scores range from 0-6), Changes in Health, End-Stage Disease and Symptoms and Signs scale (CHESS; scores range from 0-5), and Aggressive Behavior Scale (scores range from 0-12), were captured from RAI-MDS 2.0 admission assessments. A higher score on these scales represented higher levels of impairment, instability, or

aggressive behaviour. The Charlson Comorbidity Index was calculated using a two-year lookback using the Discharge Abstract Database.[28] The number of medications was captured from both the RAI-MDS 2.0 admission assessment (i.e., administered in the seven days prior to assessment) and from the Ontario Drug Benefit (i.e., billed in the 14 days following admission). Diseases and infections flagged on the RAI-MDS 2.0 admission assessment that had ≥ 10 % prevalence among total study population or were clinically relevant to schizophrenia were captured. Resource Utilization Group category (from low to high intensity: reduced physical functions, behavior problems, impaired cognition, clinically complex, special care, special rehabilitation, and extensive services) was captured from the Continuing Care Reporting System. Support provided for locomotion on unit was captured from the RAI-MDS 2.0 admission assessment. Codes used to classify outcomes are detailed in **Supplementary Table 4 and 5**.

## Analysis

Schizophrenia prevalence among newly admitted residents per year was calculated overall and by age category and sex. Descriptive statistics were used to describe the study population (e.g., sociodemographic characteristics) and main findings (e.g., health status and healthcare needs). All descriptive statistics were reported overall and stratified by schizophrenia status. Standardized differences were calculated, with values ≥ 0.1 considered a meaningful difference between groups.[29]

Sensitivity analyses were conducted by dementia status and age category. Dementia status (Alzheimer's disease or dementia other than Alzheimer's flagged on the

RAI-MDS 2.0 admission assessment) was included because of its high prevalence in LTC and its potential to obscure schizophrenia symptoms. Age category was included because residents living with schizophrenia are often admitted at a younger age and age is associated with general health.

Data preparation and analyses were performed using SAS, version 9.4 (SAS Institute, Cary NC). Smalls cells (i.e., < 6 observations) were suppressed in accordance to reduce the risk of individual identification.

## Results

The final study population included 231,384 residents, of which 8,776 (3.8%) were identified as living with schizophrenia (see **Figure 1**). The median time lived with schizophrenia was 12.7 years (IQR 3.7 years to 22.0 years).

### Schizophrenia Prevalence

**Figure 2** presents schizophrenia prevalence among residents over time. Schizophrenia prevalence increased from 3.5% in 2012 to 4.4% in 2022, with a bump in prevalence following the COVID-19 pandemic onset. Across the age groups, schizophrenia was more prevalent in younger residents and reached 20% in those aged 18 to 64 years. Within age groups, female residents had slightly higher prevalence of schizophrenia than male residents.

## Cohort Characteristics

**Table 1** presents sociodemographic characteristics of residents and their LTC home characteristics. Residents living with schizophrenia had a similar sex distribution and admission pattern to LTC homes based on number of beds compared to residents living without schizophrenia. However, all other characteristics differed. The largest difference was the younger age of residents living with schizophrenia (median age 72 years versus 85 years). Fewer residents living with schizophrenia were married (15.6% versus 31.5%) or had personal contact with family or friends upon admission (93% vs 97%). More residents living with schizophrenia lived in areas prior to admission that were urban (88.4% versus 85.0%), in the lowest income quintile (35.3% versus 27.9%), and more marginalized as measured by material resources, households and dwellings, and racialized and newcomer populations but less marginalized as measured by age and labor force. More residents living with schizophrenia were homeless in the prior five years (7.7% versus 0.8%). More residents living with schizophrenia were admitted from an inpatient psychiatry service (7.0% versus 0.4%) and fewer were admitted from home with homecare (7.1% versus 10.5%) or without homecare (19.3% versus 27.5%). Finally, more residents living with schizophrenia were admitted to urban LTC homes (88.9% versus 85.7%).

## Health Status and Healthcare Needs

**Table 2** presents resident health status and healthcare needs. Residents living with schizophrenia had similar or better general health compared to those without schizophrenia. They had fewer comorbidities except for diabetes mellitus (33.1% vs.

26.6%), anxiety disorders (16.7% vs. 11.8%), depression (31.1% vs. 23.6%), and emphysema (19.9% vs. 15.0%). More residents living with schizophrenia had a Charlson Comorbidity Index score of zero (18.7% vs. 13.3%) and a CHESS score of zero (58.5% vs. 46.9%). Residents living with schizophrenia had similar or better functioning: more were borderline intact on the Cognitive Performance Scale (15.4% vs 10.3%), more required only supervision on the ADL Self-Performance Hierarchy Scale (8.4% vs 5.5%), and they had no differences according to the Aggressive Behavior Scale.

The types of support from staff differed by schizophrenia status. Residents living with schizophrenia had a greater median number of medications both billed to ODB (24 vs 20) and documented on their RAI-MDS 2.0 admission assessment (IQR 7 – 14 vs. 7 – 13). More required no help for locomotion from staff (23.0% versus 15.8%) or only set-up help only (20.2% versus 16.1%). More also were categorized in the lower intensity "behavioral problems" RUG category (3.6% vs 1.4%).

## Sensitivity Analysis

Stratification by dementia status (**Supplementary Table 6 and 7**) showed that differences between residents living with versus without schizophrenia tended to occur in those without dementia and that additional differences emerged within this non-dementia group. Specifically, residents living with schizophrenia in the non-dementia group had greater impairment on the Cognitive Performance Scale and more aggressive symptoms on the Aggressive Behavior Scale.

Stratification by age (**Supplementary Tables 8 and 9**) showed that differences between residents living with versus schizophrenia tended to occur in those younger than 80 years of age. However, several notable exceptions emerged. First, residents living with schizophrenia aged 90 years and older had less intact cognition on the Cognitive Performance Scale and more aggressive symptoms on the Aggressive Behavior Scale. Aggressive symptoms were also more frequent in residents living with schizophrenia aged 18 to 64 years. Second, although the number of medications documented as administered on the RAI-MDS 2.0 admission assessment was similar between groups among residents aged 75 years and older, those living with schizophrenia continued to have more medications billed to ODB. Third, several age-related comorbidities (e.g., arthritis, osteoporosis, and congestive heart failure) were no longer less prevalent among residents living with schizophrenia, and comorbidities that were more prevalent among residents living with schizophrenia were found to be age specific. Specifically, diabetes mellitus and emphysema were more prevalent only in younger age groups, depression in older age groups, and anxiety disorders in both the youngest and oldest age groups. Additionally, hypothyroidism became more prevalent among residents living with schizophrenia aged 65 to 84 years.

## Discussion

Schizophrenia prevalence among newly admitted Ontario LTC residents increased from 3.5% in 2012 to 4.4% in 2022. Schizophrenia was substantially more prevalent in younger residents and slightly more prevalent in females than males. Residents living with

schizophrenia had similar or better general health status as measured by fewer comorbidities, lower risk of mortality on the Charlson Comorbidity Index, more stable health on the CHESS, and less impairment on the Cognitive Performance Scale and ADL Self-Performance Hierarchy Scale. Behavioral symptoms, measured by the Aggressive Behaviour Scale, were similar between the two groups. The types of support from staff differed by schizophrenia status, including more medications billed and administered but less help required for locomotion and lower RUG categorization. Sensitivity analyses showed differences tended to occur in residents without dementia and residents under 80 years of age.

Health status related to age-related comorbidities, cognitive functioning, and ADLs was similar or more intact in residents living with schizophrenia, as expected because of their younger age and as noted by our sensitivity analysis. Also consistent with expectations was the increased prevalence of some schizophrenia-related comorbidities (i.e., diabetes mellitus, depression, emphysema, and anxiety). Similar patterns of comorbidity and functioning for schizophrenia and SPMIs have been observed in New Zealand[5] and the US[7]. Our finding of fewer cardiovascular comorbidities in residents living with schizophrenia, also found in other studies, was surprising as these comorbidities are expected complications of antipsychotic medication. It is possible that cardiovascular comorbidities were underdetected in residents living with schizophrenia[30,31] or individuals living with schizophrenia and cardiovascular comorbidities receive care in other settings (e.g., acute care or complex continuing care). Comorbidity findings in residents living with schizophrenia partially contradict the perception of LTC directors that they tend to be

admitted for reasons including heart disease, stroke, and trauma.[37] We were also surprised to find most residents living with and without schizophrenia had similar frequency of behavioural symptoms despite the association of behavioural symptoms with mental illnesses.[34,37] Recognizing that such symptoms are similarly infrequent among residents living with schizophrenia is crucial to dismantling stigma.

Our finding that staff needed to manage slightly more medications for residents was inconsistent with previous LTC studies that found schizophrenia to be associated decreased receipt of medications such as antidepressants,[33] analgesics,[34,35] and antiretroviral medications. It may be because we examined the total number of medications rather than select medications, and the administration of antipsychotic medications to residents living with schizophrenia. [36] [37,38] However, residents living with schizophrenia required less support for locomotion and were categorized into lower resource intensity RUG categories based on medical conditions, ADLs, and receipt of nursing care. RUGs are used by Ontario Health to adjust nursing and personal care payments to LTC homes, with RUGs in the "behavioral problems" category reducing these payments by 6.1% to 36.7%.[39] While RUGs may adequately predict the resources required to provide nursing and personal care,[39] perhaps program and support service funding need to be adjusted as residents living with schizophrenia have expressed frustration with the monotony of daily life and a lack of interest in traditional activity programs (e.g., bingo, arts and crafts, and other activities within versus outside the LTC).[18,40,41]

The fourfold greater prevalence of schizophrenia in Ontario LTC residents compared to community dwelling individuals, combined with their seemingly lower general

health needs than other residents, suggests other factors are influencing their admissions. Unfortunately, the reason for admission was not captured in our data. It may be that residents living with schizophrenia were lacking a social network capable of supporting them pre-admission, as reflected by a greater proportion of them previously living in marginalized neighborhoods, being unmarried, and not having personal contact with family and friends in the LTC home. When responding to isolated patients, staff may feel the need to provide care beyond their scope for residents' day-to-day needs (e.g., purchasing items and emotional support).[42] In addition, this suggests LTC is sometimes serving as a substitute for community-based housing and psychiatric care.[17] The Government of Ontario is integrating community-based services into upcoming quality standards for schizophrenia care.[43] However, the health statuses of some individuals living with schizophrenia may exceed what can be cared for in community settings but not align with the traditional reasons for LTC admission. This highlights the need for investment in mental health expertise within LTC and for addressing existing workforce shortages, notably the 42.5% decline in the number of registered psychiatric nurses over the last decade.[44]

## Limitations

This study has notable limitations. First, some residents may have been misclassified as living with schizophrenia, causing the findings for that group to partially reflect characteristics of residents living without schizophrenia and potentially obscuring true differences between the two groups. Second, the reason for LTC admission was not captured. Knowledge of this detail would have permitted better understanding of resident healthcare needs rather than relying on inference alone. Third, the comorbidities may not

have captured all existing comorbidities because the RAI-MDS 2.0 captures comorbidities affecting the plan of care. Furthermore, comorbidities may be underdetected and undertreated in residents living with schizophrenia, making their health appear more intact than is true.[45]

## Conclusions and Implications

Ontario LTC home residents living with schizophrenia have distinct health statuses and healthcare needs, sometimes requiring less support for general health and functioning. This health administrative data from the entire LTC population in Ontario suggests factors beyond general health needs influence admission but is unable to fully describe any such needs or other underlying drivers of admission. Future research to explore these dimensions would deepen our understanding and improve care planning for this population. Such insights could also inform the development of schizophrenia care quality standards specific to LTC beyond those for community and hospital settings. Despite these limitations, our findings offer valuable perspectives for LTC home operators, clinicians, and healthcare policymakers on the healthcare needs of residents living with schizophrenia.

## Conflicts of Interest

No conflicts of interest.

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## Tables and Figures

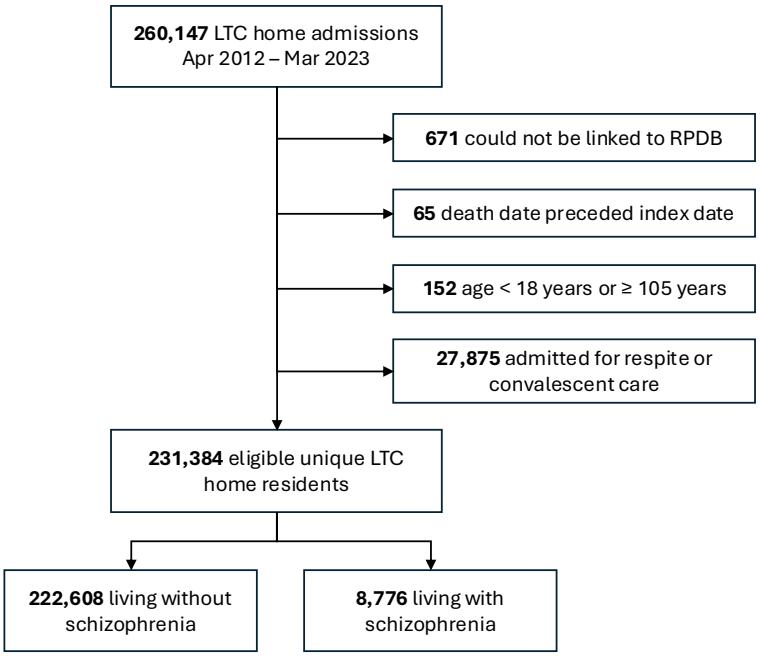
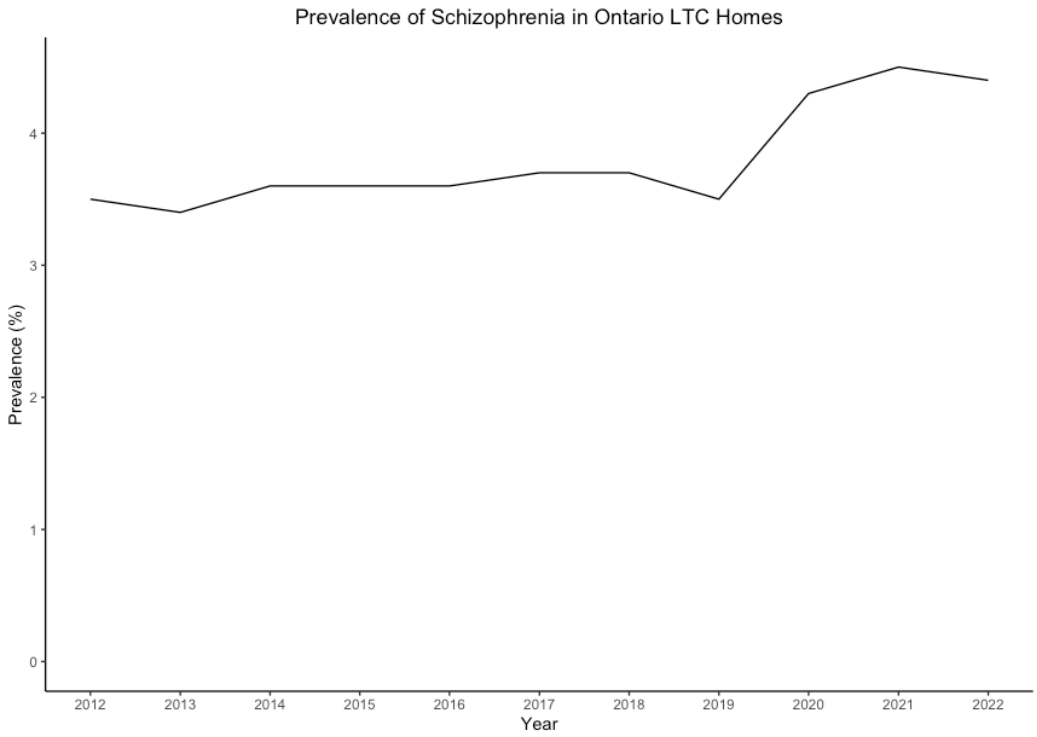



**Figure 1.** Flow diagram of cohort selection.



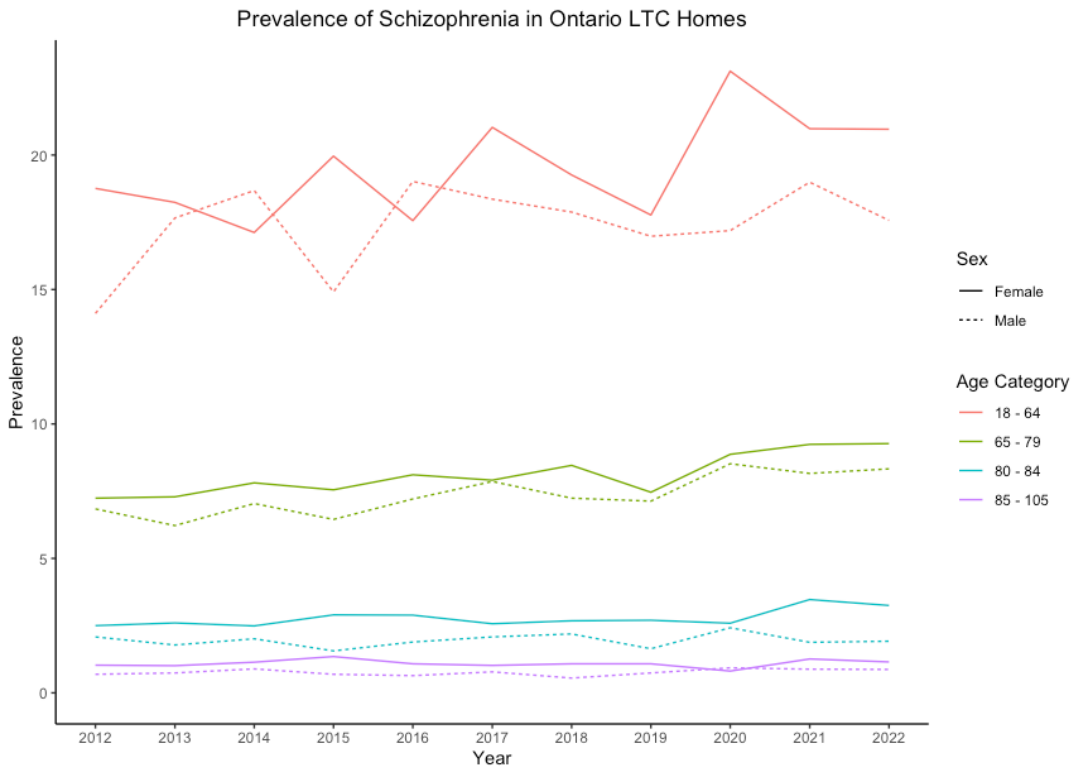




**Figure 2**

Prevalence of schizophrenia among newly admitted Ontario LTC home residents over time

**Table 1**

Sociodemographic characteristics upon LTC admission

| Characteristic | Total | No Schizophrenia | Schizophrenia | Standardized Difference |
|---|---|---|---|---|
| Age | 85 (78-90) | 85 (79-90) | 72 (64-80) | 1.15 |
| Female sex | 145,086 (62.7%) | 139,860 (62.8%) | 5,226 (59.5%) | 0.07 |
| Marital status | | | | |
| Never married | 17,053 (7.4%) | 14,201 (6.4%) | 2,852 (32.5%) | 0.70 |
| Married | 71,422 (30.9%) | 70,055 (31.5%) | 1,367 (15.6%) | 0.38 |
| Previously married | 135,530 (58.6%) | 131,513 (59.1%) | 4,017 (35.8%) | 0.27 |
| Missing | 7,379 (3.2%) | 6,839 (3.1%) | 540 (6.2%) | 0.15 |
| Education | | | | |
| None | 2,382 (1.0%) | 2,255 (1.0%) | 127 (1.4%) | 0.04 |
| ≤ High school | 87,202 (37.7%) | 84,139 (37.8%) | 3,063 (34.9%) | 0.06 |
| > High school | 40,169 (17.4%) | 38,878 (17.5%) | 1,291 (14.7%) | 0.08 |
| Missing | 101,631 (43.9%) | 97,336 (43.7%) | 4,295 (48.9%) | 0.11 |
| Income quintile | | | | |
| 1 | 65,290 (28.2%) | 62,193 (27.9%) | 3,097 (35.3%) | 0.16 |
| 2 | 50,893 (22.0%) | 49,048 (22.0%) | 1,845 (21.0%) | 0.03 |
| 3 | 42,326 (18.3%) | 40,898 (18.4%) | 1,428 (16.3%) | 0.06 |
| 4 | 38,631 (16.7%) | 37,368 (16.8%) | 1,263 (14.4%) | 0.07 |
| 5 | 31,821 (13.8%) | 30,852 (13.9%) | 969 (11.0%) | 0.09 |
| Missing | 2,423 (1.0%) | 2,249 (1.0%) | 174 (2.0%) | 0.08 |
| Material resources quintile | | | | |
| 1 | 36,991 (16.0%) | 35,761 (16.1%) | 1,230 (14.0%) | 0.06 |
| 2 | 43,498 (18.8%) | 42,133 (18.9%) | 1,365 (15.6%) | 0.09 |
| 3 | 45,161 (19.5%) | 43,608 (19.6%) | 1,553 (17.7%) | 0.05 |
| 4 | 45,918 (19.8%) | 44,219 (19.9%) | 1,699 (19.4%) | 0.01 |
| 5 | 55,996 (24.2%) | 53,305 (23.9%) | 2,691 (30.7%) | 0.15 |
| Missing | 3,820 (1.7%) | 3,582 (1.6%) | 238 (2.7%) | 0.08 |
| Household and dwellings quintile | | | | |
| 1 | 18,983 (8.2%) | 18,459 (8.3%) | 524 (6.0%) | 0.09 |
| 2 | 28,656 (12.4%) | 27,774 (12.5%) | 882 (10.1%) | 0.08 |
| 3 | 39,259 (17.0%) | 37,993 (17.1%) | 1,266 (14.4%) | 0.07 |

| | | | | |
|---|---|---|---|---|
| 4 | 56,982 (24.6%) | 55,009 (24.7%) | 1,973 (22.5%) | 0.05 |
| 5 | 83,684 (36.2%) | 79,791 (35.8%) | 3,893 (44.4%) | 0.17 |
| Missing | 3,820 (1.7%) | 3,582 (1.6%) | 238 (2.7%) | 0.08 |
| Age and labor force quintile | | | | |
| 1 | 20,290 (8.8%) | 19,304 (8.7%) | 986 (11.2%) | 0.09 |
| 2 | 26,582 (11.5%) | 25,410 (11.4%) | 1,172 (13.4%) | 0.06 |
| 3 | 30,786 (13.3%) | 29,434 (13.2%) | 1,352 (15.4%) | 0.06 |
| 4 | 39,860 (17.2%) | 38,404 (17.3%) | 1,456 (16.6%) | 0.02 |
| 5 | 110,046 (47.6%) | 106,474 (47.8%) | 3,572 (40.7%) | 0.14 |
| Missing | 3,820 (1.7%) | 3,582 (1.6%) | 238 (2.7%) | 0.08 |
| Racialized and newcomer populations quintile | | | | |
| 1 | 51,153 (22.1%) | 49,568 (22.3%) | 1,585 (18.1%) | 0.11 |
| 2 | 52,739 (22.8%) | 50,995 (22.9%) | 1,744 (19.9%) | 0.07 |
| 3 | 45,237 (19.6%) | 43,492 (19.5%) | 1,745 (19.9%) | 0.01 |
| 4 | 41,567 (18.0%) | 39,740 (17.9%) | 1,827 (20.8%) | 0.08 |
| 5 | 36,868 (15.9%) | 35,231 (15.8%) | 1,637 (18.7%) | 0.08 |
| Missing | 3,820 (1.7%) | 3,582 (1.6%) | 238 (2.7%) | 0.08 |
| Prior urbanicity | | | | |
| Urban | 196,910 (85.1%) | 189,154 (85.0%) | 7,756 (88.4%) | 0.10 |
| Rural | 30,267 (13.1%) | 29,418 (13.2%) | 849 (9.7%) | 0.11 |
| Missing | 4,207 (1.8%) | 4,036 (1.8%) | 171 (1.9%) | 0.01 |
| Homeless in last 5 years | 2,457 (1.1%) | 1,783 (0.8%) | 674 (7.7%) | 0.35 |
| Entry source | | | | |
| Inpatient acute care service | 66,296 (28.7%) | 63,460 (28.5%) | 2,836 (32.3%) | 0.08 |
| Inpatient psychiatry service | 1,427 (0.6%) | 814 (0.4%) | 613 (7.0%) | 0.36 |
| Home with no home care | 62,908 (27.2%) | 61,215 (27.5%) | 1,693 (19.3%) | 0.20 |
| Home with home care | 24,061 (10.4%) | 23,436 (10.5%) | 625 (7.1%) | 0.12 |
| Other | 76,692 (33.1%) | 73,683 (33.1%) | 3,009 (34.3%) | 0.03 |
| LTC home urbanicity | | | | |

| | | | | |
|---|---|---|---|---|
| Urban | 198,490 (85.8%) | 190,685 (85.7%) | 7,805 (88.9%) | 0.10 |
| Rural | 32,755 (14.2%) | *31785-31789 | *966-970 | < 0.1 |
| Missing | 139 (0.1%) | *134-138 | *1-5 | < 0.1 |
| LTC home number of Beds | | | | |
| < 50 | 6,586 (2.8%) | 6,368 (2.9%) | 218 (2.5%) | 0.02 |
| 50 - 99 | 47,339 (20.5%) | 45,645 (20.5%) | 1,694 (19.3%) | 0.03 |
| 100 - 149 | 57,155 (24.7%) | 55,081 (24.7%) | 2,074 (23.6%) | 0.03 |
| ≥ 150 | 120,304 (52.0%) | 115,514 (51.9%) | 4,790 (54.6%) | 0.05 |
| Absence of personal contact with family or friends | | | | |
| No | 224,751 (97.1%) | 97% | 93% | ≥ 0.1 |
| Yes | 6,578 (2.8%) | *5980-5984 | *594-598 | ≥ 0.1 |
| Missing | 55 (0.0%) | *50-54 | *1-5 | < 0.1 |

Data are median (IQR) or No. (%).

LTC, long-term care.

**Table 2**

Health status and healthcare needs upon LTC home admission

| Characteristic | Total | No Schizophrenia | Schizophrenia | Standardized Difference |
|---|---|---|---|---|
| Cognitive Performance Scale | | | | |
| Intact | 20,415 (8.8%) | 19,628 (8.8%) | 787 (9.0%) | 0.01 |
| Borderline intact | 24,193 (10.5%) | 22,843 (10.3%) | 1,350 (15.4%) | 0.15 |
| Mild impairment | 52,689 (22.8%) | 50,724 (22.8%) | 1,965 (22.4%) | 0.01 |
| Moderate impairment | 88,254 (38.1%) | 85,019 (38.2%) | 3,235 (36.9%) | 0.03 |
| Moderate severe impairment | 21,459 (9.3%) | 20,747 (9.3%) | 712 (8.1%) | 0.04 |
| Severe impairment | 18,455 (8.0%) | 17,922 (8.1%) | 533 (6.1%) | 0.08 |
| Very severe impairment | 5,919 (2.6%) | 5,725 (2.6%) | 194 (2.2%) | 0.02 |
| ADL Self-Performance Hierarchy Scale | | | | |
| Independent | 5,542 (2.4%) | 5,229 (2.3%) | 313 (3.6%) | 0.07 |
| Supervision | 13,044 (5.6%) | 12,307 (5.5%) | 737 (8.4%) | 0.11 |
| Limited | 32,649 (14.1%) | 31,184 (14.0%) | 1,465 (16.7%) | 0.08 |
| Extensive 1 | 68,749 (29.7%) | 65,946 (29.6%) | 2,803 (31.9%) | 0.05 |
| Extensive 2 | 54,914 (23.7%) | 53,345 (24.0%) | 1,569 (17.9%) | 0.15 |
| Dependent | 47,859 (20.7%) | 46,249 (20.8%) | 1,610 (18.3%) | 0.06 |
| Total Dependence | 8,627 (3.7%) | 8,348 (3.8%) | 279 (3.2%) | 0.03 |
| CHESS | | | | |
| 0 (stable) | 109,483 (47.3%) | 104,353 (46.9%) | 5,130 (58.5%) | 0.23 |
| 1 | 79,656 (34.4%) | 77,046 (34.6%) | 2,610 (29.7%) | 0.10 |
| 2 | 31,335 (13.5%) | 30,516 (13.7%) | 819 (9.3%) | 0.14 |
| 3 | 8,331 (3.6%) | 8,170 (3.7%) | 161 (1.8%) | 0.11 |
| 4 | 2,186 (0.9%) | 2,136 (1.0%) | 50 (0.6%) | 0.05 |
| 5 (unstable) | 393 (0.2%) | 387 (0.2%) | 6 (0.1%) | 0.03 |
| Charlson Comorbidity Index | | | | |
| 0 | 31,311 (13.5%) | 29,672 (13.3%) | 1,639 (18.7%) | 0.15 |
| 1 | 52,296 (22.6%) | 50,495 (22.7%) | 1,801 (20.5%) | 0.05 |

| | | | | |
|---|---|---|---|---|
| 2 | 30,120 (13.0%) | 28,900 (13.0%) | 1,220 (13.9%) | 0.03 |
| 3 | 24,594 (10.6%) | 23,806 (10.7%) | 788 (9.0%) | 0.06 |
| 4+ | 28,132 (12.2%) | 27,242 (12.2%) | 890 (10.1%) | 0.07 |
| Missing | 64,931 (28.1%) | 62,493 (28.1%) | 2,438 (27.8%) | 0.01 |
| Aggressive Behavior Scale | | | | |
| None (0) | 135,592 (58.6%) | 130,642 (58.7%) | 4,950 (56.4%) | 0.05 |
| Mild (1 – 2) | 54,449 (23.5%) | 52,293 (23.5%) | 2,156 (24.6%) | 0.03 |
| Moderate (3 – 5) | 29,990 (13.0%) | 28,736 (12.9%) | 1,254 (14.3%) | 0.04 |
| Severe (6 – 12) | 11,298 (4.9%) | *10883-10887 | *411-415 | < 0.1 |
| Missing | 55 (0.0%) | *50-54 | *1-5 | < 0.1 |
| RUG Category | | | | |
| Special rehabilitation | 4,904 (2.1%) | 4,726 (2.1%) | 178 (2.0%) | 0.01 |
| Extensive services | 3,676 (1.6%) | 3,573 (1.6%) | 103 (1.2%) | 0.04 |
| Special care | 25,896 (11.2%) | 25,090 (11.3%) | 806 (9.2%) | 0.07 |
| Clinically complex | 81,529 (35.2%) | 78,321 (35.2%) | 3,208 (36.6%) | 0.03 |
| Impaired cognition | 28,781 (12.4%) | 27,592 (12.4%) | 1,189 (13.5%) | 0.03 |
| Behavioral problems | 3,535 (1.5%) | 3,222 (1.4%) | 313 (3.6%) | 0.14 |
| Physical functions reduced | 83,063 (35.9%) | 80,084 (36.0%) | 2,979 (33.9%) | 0.04 |
| Support provided for locomotion on unit | | | | |
| No set-up or physical help from staff | 37,194 (16.1%) | 35,173 (15.8%) | 2,021 (23.0%) | 0.18 |
| Set-up help only | 37,512 (16.2%) | 35,742 (16.1%) | 1,770 (20.2%) | 0.11 |
| 1 person physical assist | 139,423 (60.3%) | 135,077 (60.7%) | 4,346 (49.5%) | 0.23 |
| 2+ person physical assist | 7,314 (3.2%) | 7,118 (3.2%) | 196 (2.2%) | 0.06 |
| Activity did not occur | 9,941 (4.3%) | 9,498 (4.3%) | 443 (5.0%) | 0.04 |
| Number of medications | | | | |
| RAI-MDS 2.0 | 10 (7-13) | 10 (7-13) | 10 (7-14) | 0.14 |
| ODB | 21 (14-29) | 20 (13-29) | 24 (16-33) | 0.27 |
| Comorbidities | | | | |

| | | | | |
|---|---|---|---|---|
| Hypertension | 149,706 (64.7%) | 145,214 (65.2%) | 4,492 (51.2%) | 0.29 |
| Dementia other than Alzheimer's | 116,485 (50.3%) | 113,261 (50.9%) | 3,224 (36.7%) | 0.29 |
| Arthritis | 90,384 (39.1%) | 87,921 (39.5%) | 2,463 (28.1%) | 0.24 |
| Diabetes mellitus | 62,085 (26.8%) | 59,177 (26.6%) | 2,908 (33.1%) | 0.14 |
| Osteoporosis | 57,473 (24.8%) | 56,085 (25.2%) | 1,388 (15.8%) | 0.23 |
| Depression | 55,218 (23.9%) | 52,490 (23.6%) | 2,728 (31.1%) | 0.17 |
| Gastrointestinal disease | 53,738 (23.2%) | 51,813 (23.3%) | 1,925 (21.9%) | 0.03 |
| Allergies | 49,330 (21.3%) | 47,544 (21.4%) | 1,786 (20.4%) | 0.03 |
| Cerebrovascular accident | 42,650 (18.4%) | 41,513 (18.6%) | 1,137 (13.0%) | 0.16 |
| Hypothyroidism | 41,658 (18.0%) | 40,060 (18.0%) | 1,598 (18.2%) | 0.01 |
| Other cardiovascular disease | 40,678 (17.6%) | 39,787 (17.9%) | 891 (10.2%) | 0.22 |
| Emphysema | 35,236 (15.2%) | 33,490 (15.0%) | 1,746 (19.9%) | 0.13 |
| Arteriosclerotic heart disease | 34,942 (15.1%) | 34,121 (15.3%) | 821 (9.4%) | 0.18 |
| Alzheimer's disease | 32,725 (14.1%) | 32,119 (14.4%) | 606 (6.9%) | 0.25 |
| Anemia | 32,426 (14.0%) | 31,192 (14.0%) | 1,234 (14.1%) | 0.00 |
| Congestive heart failure | 31,970 (13.8%) | 31,257 (14.0%) | 713 (8.1%) | 0.19 |
| Anxiety disorder | 27,658 (12.0%) | 26,193 (11.8%) | 1,465 (16.7%) | 0.14 |
| Renal failure | 26,947 (11.6%) | 26,200 (11.8%) | 747 (8.5%) | 0.11 |
| Cancer | 25,216 (10.9%) | 24,556 (11.0%) | 660 (7.5%) | 0.12 |
| Cataracts | 24,083 (10.4%) | 23,392 (10.5%) | 691 (7.9%) | 0.09 |
| Cardiac dysrhythmias | 14,543 (6.3%) | 14,299 (6.4%) | 244 (2.8%) | 0.18 |
| Peripheral vascular disease | 13,073 (5.6%) | 12,765 (5.7%) | 308 (3.5%) | 0.11 |

Data are median (IQR) or No. (%).

ADL, activities of daily living; CHESS, Changes in Health, End-stage disease, Signs, and Symptoms; ODB, Ontario Drug Benefit; RAI-MDS, Resident Assessment Instrument Minimum Data Set; RUG, Resource Utilization Category.

# Supplementary Materials

**Supplementary Table 1**

Description of health administrative data sets used

| Data Set | Description |
|---|---|
| CENSUS | Contains data about people and housing units in Canada by their demographic, social and economic characteristics. |
| Continuing Care Reporting System | Contains clinical, demographic, and administrative information on residents in residential and hospital-based continuing care facilities (e.g., LTC homes) as well as information on facility characteristics. Data is primarily collected using RAI-MDS 2.0 assessments. |
| Discharge Abstract Database | Contains administrative, clinical and demographic information on acute inpatient facility discharges. Data on patients in adult designated inpatient mental health beds in Ontario were included in this database until October 1st, 2005, after which they were included in OMHRS. |
| National Ambulatory Care Reporting System | Contains demographic, administrative, clinical and service-specific data for hospital-based and community-based ambulatory care (e.g., emergency departments). |
| Ontario Drug Benefit Database | Contains medical drug claims and pharmacy and practitioner information. The ODB program provides drug benefits for Ontarians aged ≥ 65 years and certain individuals age < 65 years (e.g., LTC home residents). |
| Ontario Health Insurance Plan Claims Database | Contains data on claims for services provided by health care providers (e.g., medical doctors) including date of service, patient served, diagnosis, and service provided. |
| Ontario Marginalization Index | Contains data about the geographic distribution of marginalization in Ontario according to four dimensions: households and dwellings, material resources, age and labor force, and racialized and newcomer populations. |
| Ontario Mental Health Reporting System | contains data on all individuals receiving adult mental health services in Ontario. Data is collected using the Resident Assessment Instrument Mental Health version 2.0. |
| Postal Code Conversion File | Links six-character postal codes to standard geographic areas such as dissemination areas, census tracts, and census subdivisions |

**Supplementary Table 2**

Diagnostic or billing codes used to identify schizophrenia

| Criterion | Code | Dataset |
|---|---|---|
| Outpatient physician billings | 295 | OHIP |
| Hospitalization records | ICD-10-CM codes F20 or F25 | DAD |
| Mental health hospitalization records | Prior to 2016: DSM-IV code 295<br>Between 2016 and March 31st, 2019: DSM-V code 295<br>From April 1st, 2019: ICD-10-CM code F20 and F25 | OMHRS |

DAD, Discharge Abstract Database; OHIP, Ontario Health Insurance Program; OMHRS, Ontario Mental Health Reporting System.

**Supplementary Table 3**

Codes used to describe sociodemographic characteristics of LTC residents and characteristics of their LTC homes

| Variable | Code | Dataset | Note |
|---|---|---|---|
| Age | BDATE | RPDB | |
| Sex | SEX | RPDB | |
| Marital status | A5 | CCRS | Categorized as missing, never married, married, and previously married (widowed, separated, or divorced) |
| Education | AB7 | CCRS | Categorized as missing, none, ≤ high school (≤ 8$^{th}$ grade, 9$^{th}$ – 11$^{th}$ grade, or high school), and > high school (technical or trade school, some college, bachelor's degree, or graduate degree) |
| Income quintile | incquint | Census | ICES macro function GETDEMO used |
| Material resources quintile | MATERIAL_RESOURCES_Q_DA | ONMARG | ICES macro function GETONMARG used. Relates to the inability for individuals and communities to access and attain basic material needs. Indicators used included proportion without high-school diploma, lone parent families, measures of low income, dwellings that need major repair. |
| Household and dwellings quintile | HOUSEHOLDS_DWELLINGS_Q_DA | ONMARG | ICES macro function GETONMARG used. Relates to family and neighborhood stability and cohesiveness. Indicators used included types and density of residential accommodations, as well as certain characteristics of family structure. |
| Age and labor force quintile | AGE_LABOURFORCE_Q_DA | ONMARG | ICES macro function GETONMARG used. Relates to impacts of disability and dependence. Indicators used included proportion of |

| | | | |
|---|---|---|---|
| | | | proportion of population aged ≥ 65, dependency ratio, and proportion not participating in labor force. |
| Racialized and newcomer populations quintile | RACIALIZED_NC_POP_Q_DA | ONMARG | ICES macro function GETONMARG used. Relates to the impacts of racialization and xenophobia. Indicators used included proportion of the population who were recent immigrants and proportion who self-identify as a visible minority. |
| Urbanicity | RES_URBAN_RURAL_CODE | CCRS | |
| Homeless in last 5 years | DAD: (DX10CODE1-25=Z590 or Z591) or (CMGDIAG=Z590 or Z591)<br>NACRS: (DX10CODE1-10=Z590 or Z591) or (RESTYPE=3 or 4)<br>OMHRS: (PREDX10CODE1-12=Z590 or Z591) or (POSTDX10CODE1-32=Z590 or Z591) or (PRIOR_RESIDENCE=6) or (USUAL_RESIDENCE=8) or (ADMITFROM=8) or (DISCHLIVING=8) | DAD, NACRS, OMHRS | |
| Entry source | ADMISSION_FROM_FACILITY_TYPE | NACRS | Categorized as inpatient acute care service, inpatient psychiatry service, home with no home care (private home – no home care), home with home care (home care service), and other (ambulatory health service, inpatient rehabilitation service - general, inpatient continuing care service, residential care service – 24-h nursing care, other/unclassified service, or inpatient rehabilitation service - specialized, residential care service – board and care) |
| Number of beds | DESIGNATED_MOH_BEDS | CCRS | |
| Urbanicity | FAC_URBAN_RURAL_CODE | CCRS | |

CCRS, Continuing Care Reporting System; DAD, Discharge Abstract Database; NACRS, National Ambulatory Care Reporting System; ONMARG, Ontario Marginalization Index; OMHRS, Ontario Mental Health Reporting System; RPDB, Registered Person Database.

**Supplementary Table 4**

Codes from the Continuing Care Reporting System used to measure health status and healthcare needs

| Variable | Code |
|---|---|
| Cognitive Performance Scale | CPS |
| Activities of Daily Living Self-Performance Scale | ADL_HIERARCHY |
| CHESS | CHESS |
| Aggressive Behavior Scale | ABS |
| RUG Category | RUG_34_HIER_CATEGORY |
| Support provided for locomotion on unit | G1EB |
| Number of medications (RAI-MDS 2.0) | O1 |
| Absence of personal contact with family or friends | F2E |
| Hypertension | I1H |
| Dementia other than Alzheimer's | I1V |
| Arthritis | I1L |
| Diabetes mellitus | I1A |
| Osteoporosis | I1O |
| Depression | I1GG |
| Gastrointestinal disease | I1SS |
| Allergies | I1PP |
| Cerebrovascular accident | I1U |
| Hypothyroidism | I1C |
| Other cardiovascular disease | I1K |
| Emphysema | I1KK |
| Arteriosclerotic heart disease | I1D |
| Alzheimer's disease | I1R |
| Anemia | I1QQ |
| Congestive heart failure | I1F |
| Anxiety disorder | I1FF |
| Renal failure | I1UU |
| Cancer | I1RR |
| Cataracts | I1LL |
| Cardiac dysrhythmias | I1E |
| Peripheral vascular disease | I1J |

CHESS, Changes in Health, End-stage disease, Signs, and Symptoms; RAI-MDS, Resident Assessment Instrument-Minimum Data Set; RUG, Resource Utilization Group.

**Supplementary Table 5**

Charlson Comorbidity Index diagnoses and weighting. Moderate to severe liver disease trumps mild liver disease, diabetes with chronic complications trumps diabetes with no chronic complications, and metastatic cancer trumps non-metastatic cancer. A two-year lookback window was used in the Discharge Abstract Database.

| Diagnosis | ICD-10-CA Codes | Weight |
|---|---|---|
| Acute myocardial infarction | I21, I22, I252 | 1 |
| Congestive heart failure | I099, I255, I420, I425-I429, I43, I50, P290 | 1 |
| Peripheral vascular disease | I70, I71, I731, I738, I739, I771, I790, I792, K551, K558, K559, Z958, Z959 | 1 |
| Cerebrovascular disease | G45, G46, H340, I60-I69 | 1 |
| Dementia | F00-F03, F051, G30, G311 | 1 |
| Chronic obstructive pulmonary disease or other respiratory diseases | I278, I279, J40-J47, J60-J67, J684, J701, J703 | 1 |
| Rheumatic-like diseases | M05, M06, M315, M32-M34, M351, M353, M360 | 1 |
| Ulcers of the digestive system | K25-K28 | 1 |
| Liver disease (mild) | B18, K700-K703, K709, K713-K715, K717, K73, K74, K760, K762-K764, K768, K769, Z944 | 1 |
| Diabetes without chronic complications | E100, E101, E106, E108, E109, E110, E111, E116, E118, E119, E120, E121, E126, E128, E129, E130, E131, E136, E138, E139, E140, E141, E146, E148, E149 | 1 |
| Diabetes with chronic complications | E102-E105, E107, E112-E115, E117, E122-E125, E127, E132-E135, E137, E142-E145, E147 | 2 |
| Hemiplegia or paraplegia | G041, G114, G801, G802, G81, G82, G830-G834, G839 | 2 |
| Renal (kidney) disease† | N032-N037, N052-N057, N18, N19, N250, Z490-Z492, Z940, Z992 | 2 |
| Cancer (no secondary found) | C00-C26, C30-C34, C37-C41, C43, C45-C58, C60-C76, C81-C85, C88, C90-C97 | 2 |
| Liver disease (moderate or severe) | I850, I859, I864, I982, K704, K711, K721, K729, K765, K766, K767 | 3 |
| Cancer (metastatic – secondary) | C77-C80 | 6 |
| HIV / AIDS | B20-B22, B24 | 6 |

HIV / AIDS, human immunodeficiency virus / acquired immunodeficiency syndrome.

**Supplementary Table 6**

Sociodemographic characteristics of LTC residents and characteristics of their LTC homes stratified by dementia status

| | Dementia | | | No Dementia | | |
|---|---|---|---|---|---|---|
| Characteristic | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff |
| Age | 86 (80-90) | 77 (70-84) | 0.86 | 85 (76-90) | 68 (61-76) | 1.32 |
| Female sex | 88,208 (63.7%) | 2,328 (63.2%) | 0.01 | 88,208 (63.7%) | 2,328 (63.2%) | 0.01 |
| Marital status | | | | | | |
| Never married | 6,395 (4.6%) | 777 (21.1%) | 0.51 | 7,806 (9.3%) | 2,075 (40.7%) | 0.78 |
| Married | 47,192 (34.1%) | 795 (21.6%) | 0.28 | 22,863 (27.2%) | 572 (11.2%) | 0.41 |
| Previously married | 81,012 (58.5%) | 1,919 (52.1%) | 0.13 | 50,501 (60.0%) | 2,098 (41.2%) | 0.38 |
| Missing | 3,862 (2.8%) | 192 (5.2%) | 0.12 | 2,977 (3.5%) | 348 (6.8%) | 0.15 |
| Education | | | | | | |
| None | 1,274 (0.9%) | 42 (1.1%) | 0.02 | 981 (1.2%) | 85 (1.7%) | 0.04 |
| ≤ High school | 52,460 (37.9%) | 1,303 (35.4%) | 0.05 | 31,679 (37.6%) | 1,760 (34.6%) | 0.06 |
| > High school | 24,760 (17.9%) | 537 (14.6%) | 0.09 | 14,118 (16.8%) | 754 (14.8%) | 0.05 |
| Missing | 59,967 (43.3%) | 1,801 (48.9%) | 0.11 | 37,369 (44.4%) | 2,494 (49.0%) | 0.09 |
| Income 1uintile | | | | | | |
| 1 | 36,776 (26.6%) | 1,203 (32.7%) | 0.13 | 25,417 (30.2%) | 1,894 (37.2%) | 0.15 |
| 2 | 30,540 (22.1%) | 752 (20.4%) | 0.04 | 18,508 (22.0%) | 1,093 (21.5%) | 0.01 |
| 3 | 25,788 (18.6%) | 624 (16.9%) | 0.04 | 15,110 (18.0%) | 804 (15.8%) | 0.06 |
| 4 | 23,933 (17.3%) | 568 (15.4%) | 0.05 | 13,435 (16.0%) | 695 (13.6%) | 0.07 |
| 5 | 20,033 (14.5%) | 461 (12.5%) | 0.06 | 10,819 (12.9%) | 508 (10.0%) | 0.09 |
| Missing | 1,391 (1.0%) | 75 (2.0%) | 0.08 | 858 (1.0%) | 99 (1.9%) | 0.08 |
| Material resources quintile | | | | | | |
| 1 | 23,499 (17.0%) | 554 (15.0%) | 0.05 | 12,262 (14.6%) | 676 (13.3%) | 0.04 |
| 2 | 27,171 (19.6%) | 648 (17.6%) | 0.05 | 14,962 (17.8%) | 717 (14.1%) | 0.10 |
| 3 | 27,301 (19.7%) | 664 (18.0%) | 0.04 | 16,307 (19.4%) | 889 (17.5%) | 0.05 |
| 4 | 27,012 (19.5%) | 691 (18.8%) | 0.02 | 17,207 (20.4%) | 1,008 (19.8%) | 0.02 |
| 5 | 31,364 (22.7%) | 1,030 (28.0%) | 0.12 | 21,941 (26.1%) | 1,661 (32.6%) | 0.14 |
| Missing | 2,114 (1.5%) | 96 (2.6%) | 0.08 | 1,468 (1.7%) | 142 (2.8%) | 0.07 |
| Household & dwellings quintile | | | | | | |
| 1 | 2,114 (1.5%) | 96 (2.6%) | 0.08 | 1,468 (1.7%) | 142 (2.8%) | 0.07 |
| 2 | 11,541 (8.3%) | 262 (7.1%) | 0.05 | 6,918 (8.2%) | 262 (5.1%) | 0.12 |
| 3 | 17,700 (12.8%) | 407 (11.1%) | 0.05 | 10,074 (12.0%) | 475 (9.3%) | 0.09 |
| 4 | 23,990 (17.3%) | 557 (15.1%) | 0.06 | 14,003 (16.6%) | 709 (13.9%) | 0.08 |
| 5 | 34,536 (24.9%) | 838 (22.8%) | 0.05 | 20,473 (24.3%) | 1,135 (22.3%) | 0.05 |
| Missing | 2,114 (1.5%) | 96 (2.6%) | 0.08 | 1,468 (1.7%) | 142 (2.8%) | 0.070 |
| Age & labor force quintile | | | | | | |
| 1 | 12,056 (8.7%) | 416 (11.3%) | 0.09 | 7,248 (8.6%) | 570 (11.2%) | 0.09 |
| 2 | 15,717 (11.4%) | 477 (13.0%) | 0.05 | 9,693 (11.5%) | 695 (13.6%) | 0.06 |
| 3 | 18,223 (13.2%) | 576 (15.6%) | 0.07 | 11,211 (13.3%) | 776 (15.2%) | 0.06 |
| 4 | 23,943 (17.3%) | 631 (17.1%) | 0.00 | 14,461 (17.2%) | 825 (16.2%) | 0.03 |
| 5 | 66,408 (48.0%) | 1,487 (40.4%) | 0.15 | 40,066 (47.6%) | 2,085 (40.9%) | 0.14 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Missing | 2,114 (1.5%) | 96 (2.6%) | 0.08 | 1,468 (1.7%) | 142 (2.8%) | 0.07 |
| Racialized & newcomer populations quintile | | | | | | |
| 1 | 30,500 (22.0%) | 658 (17.9%) | 0.10 | 19,068 (22.7%) | 927 (18.2%) | 0.11 |
| 2 | 31,971 (23.1%) | 683 (18.5%) | 0.11 | 19,024 (22.6%) | 1,061 (20.8%) | 0.04 |
| 3 | 27,450 (19.8%) | 735 (20.0%) | 0.00 | 16,042 (19.1%) | 1,010 (19.8%) | 0.02 |
| 4 | 24,987 (18.0%) | 780 (21.2%) | 0.08 | 14,753 (17.5%) | 1,047 (20.6%) | 0.08 |
| 5 | 21,439 (15.5%) | 731 (19.8%) | 0.12 | 13,792 (16.4%) | 906 (17.8%) | 0.04 |
| Missing | 2,114 (1.5%) | 96 (2.6%) | 0.08 | 1,468 (1.7%) | 142 (2.8%) | 0.07 |
| Urbanicity | | | | | | |
| Urban | 118,576 (85.6%) | 3,243 (88.1%) | 0.07 | 70,578 (83.9%) | 4,513 (88.6%) | 0.14 |
| Rural | 17,537 (12.7%) | 366 (9.9%) | 0.09 | 11,881 (14.1%) | 483 (9.5%) | 0.14 |
| Missing | 2,348 (1.7%) | 74 (2.0%) | 0.02 | 1,688 (2.0%) | 97 (1.9%) | 0.01 |
| Homeless in last 5 years | 767 (0.6%) | 228 (6.2%) | 0.32 | 1,016 (1.2%) | 446 (8.8%) | 0.35 |
| Entry source | | | | | | |
| Inpatient acute care service | 36,582 (26.4%) | 1,175 (31.9%) | 0.12 | 26,878 (31.9%) | 1,661 (32.6%) | 0.01 |
| Inpatient psychiatry service | 699 (0.5%) | 240 (6.5%) | 0.33 | 115 (0.1%) | 373 (7.3%) | 0.39 |
| Home with no home care | 40,162 (29.0%) | 731 (19.8%) | 0.21 | 21,053 (25.0%) | 962 (18.9%) | 0.15 |
| Home with home care | 14,974 (10.8%) | 273 (7.4%) | 0.12 | 8,489 (10.1%) | 352 (6.9%) | 0.11 |
| Other | 46,071 (33.3%) | 1,264 (34.3%) | 0.02 | 27,612 (32.8%) | 1,745 (34.3%) | 0.03 |
| LTC home urbanicity | | | | | | |
| Urban | 86% | 89% | ≥ 0.1 | 85% | 88% | ≥ 0.1 |
| Rural | *18883-18887 | *371-375 | ≥ 0.1 | *12903-12907 | *590-594 | ≥ 0.1 |
| Missing | *81-85 | *1-5 | < 0.1 | *48-52 | *1-5 | < 0.1 |
| LTC home number of beds | | | | | | |
| < 50 | 3,596 (2.6%) | 86 (2.3%) | 0.02 | 2,772 (3.3%) | 132 (2.6%) | 0.04 |
| 50 - 99 | 27,321 (19.7%) | 623 (16.9%) | 0.07 | 18,324 (21.8%) | 1,071 (21.0%) | 0.02 |
| 100 - 149 | 35,056 (25.3%) | 899 (24.4%) | 0.02 | 20,025 (23.8%) | 1,175 (23.1%) | 0.02 |
| ≥ 150 | 72,488 (52.4%) | 2,075 (56.3%) | 0.08 | 43,026 (51.1%) | 2,715 (53.3%) | 0.04 |

Data are median (IQR) or No. (%).

SCZ, schizophrenia; Std Diff, standardized difference.

## Supplementary Table 7

Health status and healthcare needs upon admission stratified by dementia status

| | Dementia | | | No Dementia | | |
|---|---|---|---|---|---|---|
| Characteristic | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff |
| Cognitive Performance Scale | | | | | | |
| Intact | 2,168 (1.6%) | 98 (2.7%) | 0.08 | 17,460 (20.7%) | 689 (13.5%) | 0.19 |
| Borderline intact | 6,038 (4.4%) | 267 (7.2%) | 0.12 | 16,805 (20.0%) | 1,083 (21.3%) | 0.03 |
| Mild impairment | 26,922 (19.4%) | 725 (19.7%) | 0.01 | 23,802 (28.3%) | 1,240 (24.3%) | 0.09 |
| Moderate impairment | 66,035 (47.7%) | 1,657 (45.0%) | 0.05 | 18,984 (22.6%) | 1,578 (31.0%) | 0.19 |
| Moderate severe impairment | 16,841 (12.2%) | 440 (11.9%) | 0.01 | 3,906 (4.6%) | 272 (5.3%) | 0.03 |
| Severe impairment | 16,007 (11.6%) | 370 (10.0%) | 0.05 | 1,915 (2.3%) | 163 (3.2%) | 0.06 |
| Very severe impairment | 4,450 (3.2%) | 126 (3.4%) | 0.01 | 1,275 (1.5%) | 68 (1.3%) | 0.02 |
| Activities of Daily Living Self-Performance Hierarchy Scale | | | | | | |
| Independent | 2,501 (1.8%) | 87 (2.4%) | 0.04 | 2,728 (3.2%) | 226 (4.4%) | 0.06 |
| Supervision | 7,544 (5.4%) | 255 (6.9%) | 0.06 | 4,763 (5.7%) | 482 (9.5%) | 0.14 |
| Limited | 20,726 (15.0%) | 588 (16.0%) | 0.03 | 10,458 (12.4%) | 877 (17.2%) | 0.14 |
| Extensive 1 | 46,149 (33.3%) | 1,230 (33.4%) | 0.00 | 19,797 (23.5%) | 1,573 (30.9%) | 0.17 |
| Extensive 2 | 30,918 (22.3%) | 697 (18.9%) | 0.08 | 22,427 (26.7%) | 872 (17.1%) | 0.23 |
| Dependent | 25,203 (18.2%) | 667 (18.1%) | 0.00 | 21,046 (25.0%) | 943 (18.5%) | 0.16 |
| Total Dependence | 5,420 (3.9%) | 159 (4.3%) | 0.02 | 2,928 (3.5%) | 120 (2.4%) | 0.07 |
| CHESS | | | | | | |
| 0 (stable) | 66,076 (47.7%) | 2,056 (55.8%) | 0.16 | 38,277 (45.5%) | 3,074 (60.4%) | 0.30 |
| 1 | 48,122 (34.8%) | 1,172 (31.8%) | 0.06 | 28,924 (34.4%) | 1,438 (28.2%) | 0.13 |
| 2 | 17,923 (12.9%) | 351 (9.5%) | 0.11 | 12,593 (15.0%) | 468 (9.2%) | 0.18 |
| 3 | 4,843 (3.5%) | 75 (2.0%) | 0.09 | 3,327 (4.0%) | 86 (1.7%) | 0.14 |
| 4 | *1289-1293 | *24-28 | < 0.1 | *843-847 | *22-26 | < 0.1 |
| 5 (unstable) | *204-208 | *1-5 | < 0.1 | *179-183 | *1-5 | < 0.1 |
| Charlson Comorbidity Index | | | | | | |
| 0 | 13,349 (9.6%) | 482 (13.1%) | 0.11 | 16,323 (19.4%) | 1,157 (22.7%) | 0.08 |
| 1 | 35,649 (25.7%) | 895 (24.3%) | 0.03 | 14,846 (17.6%) | 906 (17.8%) | 0.00 |
| 2 | 17,382 (12.6%) | 507 (13.8%) | 0.04 | 11,518 (13.7%) | 713 (14.0%) | 0.01 |
| 3 | 13,088 (9.5%) | 354 (9.6%) | 0.01 | 10,718 (12.7%) | 434 (8.5%) | 0.14 |
| 4+ | 12,969 (9.4%) | 337 (9.2%) | 0.07 | 14,273 (17.0%) | 553 (10.9%) | 0.18 |
| Missing | 46,024 (33.2%) | 1,108 (30.1%) | 0.07 | 16,469 (19.6%) | 1,330 (26.1%) | 0.16 |
| Aggressive Behavior Scale | | | | | | |
| None (0) | 67,954 (49.1%) | 1,825 (49.6%) | 0.01 | 62,688 (74.5%) | 3,125 (61.4%) | 0.28 |
| Mild (1 – 20) | 37,653 (27.2%) | 947 (25.7%) | 0.03 | 14,640 (17.4%) | 1,209 (23.7%) | 0.16 |
| Moderate (3 – 5) | 23,255 (16.8%) | 656 (17.8%) | 0.03 | 5,481 (6.5%) | 598 (11.7%) | 0.18 |
| Severe (6 – 12) | 9,579 (6.9%) | 255 (6.9%) | 0.00 | *1304-1308 | *156-160 | ≥ 0.1 |
| Missing | 20 (0.0%) | 0 (0.0%) | 0.02 | *30-34 | *1-5 | < 0.1 |
| Resource Utilization Group Category | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Special rehabilitation | 2,164 (1.6%) | 69 (1.9%) | 0.02 | 2,562 (3.0%) | 109 (2.1%) | 0.06 |
| Extensive services | 1,583 (1.1%) | 47 (1.3%) | 0.01 | 1,990 (2.4%) | 56 (1.1%) | 0.10 |
| Special care | 11,869 (8.6%) | 261 (7.1%) | 0.06 | 13,221 (15.7%) | 545 (10.7%) | 0.15 |
| Clinically complex | 46,227 (33.4%) | 1,276 (34.6%) | 0.03 | 32,094 (38.1%) | 1,932 (37.9%) | 0.00 |
| Impaired cognition | 24,323 (17.6%) | 629 (17.1%) | 0.01 | 3,269 (3.9%) | 560 (11.0%) | 0.27 |
| Behavioral problems | 2,474 (1.8%) | 110 (3.0%) | 0.08 | 748 (0.9%) | 203 (4.0%) | 0.20 |
| Physical functions reduced | 49,821 (36.0%) | 1,291 (35.1%) | 0.02 | 30,263 (36.0%) | 1,688 (33.1%) | 0.06 |
| Absence of personal contact with family or friends | | | | | | |
| No | 134,392 (97.1%) | 3,443 (93.5%) | 0.17 | 98% | 93% | ≥ 0.1 |
| Yes | 4,049 (2.9%) | 240 (6.5%) | 0.17 | *1931-1935 | *354-358 | ≥ 0.1 |
| Missing | 20 (0.0%) | 0 (0.0%) | 0.02 | *30-34 | *1-5 | < 0.1 |
| Number of medications | | | | | | |
| RAI-MDS | 9 (6-12) | 10 (7-13) | 0.13 | 11 (8-14) | 11 (8-14) | 0.04 |
| ODB | 19 (12-27) | 22 (14-30) | 0.23 | 23 (16-31) | 25 (17-35) | 0.18 |
| Support provided for locomotion on unit | | | | | | |
| No set-up or physical help from staff | 23,366 (16.9%) | 777 (21.1%) | 0.11 | 11,807 (14.0%) | 1,244 (24.4%) | 0.27 |
| Set-up help only | 23,901 (17.3%) | 697 (18.9%) | 0.04 | 11,841 (14.1%) | 1,073 (21.1%) | 0.19 |
| 1 person physical assist | 81,918 (59.2%) | 1,976 (53.7%) | 0.11 | 53,159 (63.2%) | 2,370 (46.5%) | 0.34 |
| 2+ person physical assist | 4,328 (3.1%) | 80 (2.2%) | 0.06 | 2,790 (3.3%) | 116 (2.3%) | 0.06 |
| Activity did not occur | 4,948 (3.6%) | 153 (4.2%) | 0.03 | 4,550 (5.4%) | 290 (5.7%) | 0.01 |
| Comorbidities | | | | | | |
| Hypertension | 89,003 (64.3%) | 2,015 (54.7%) | 0.29 | 56,211 (66.8%) | 2,477 (48.6%) | 0.37 |
| Dementia not Alzheimer's | 113,261 (81.8%) | 3,224 (87.5%) | 0.16 | 0.0% | 0.0% | NA |
| Arthritis | 53,652 (38.7%) | 1,102 (29.9%) | 0.19 | 34,269 (40.7%) | 1,361 (26.7%) | 0.30 |
| Diabetes mellitus | 33,431 (24.1%) | 1,080 (29.3%) | 0.12 | 25,746 (30.6%) | 1,828 (35.9%) | 0.11 |
| Osteoporosis | 36,429 (26.3%) | 716 (19.4%) | 0.16 | 19,656 (23.4%) | 672 (13.2%) | 0.27 |
| Depression | 33,489 (24.2%) | 1,186 (32.2%) | 0.18 | 19,001 (22.6%) | 1,542 (30.3%) | 0.18 |
| Gastrointestinal disease | 30,907 (22.3%) | 789 (21.4%) | 0.02 | 20,906 (24.8%) | 1,136 (22.3%) | 0.06 |
| Allergies | 28,501 (20.6%) | 710 (19.3%) | 0.03 | 19,043 (22.6%) | 1,076 (21.1%) | 0.04 |
| Cerebrovascular accident | 22,555 (16.3%) | 513 (13.9%) | 0.07 | 18,958 (22.5%) | 624 (12.3%) | 0.27 |
| Hypothyroidism | 24,791 (17.9%) | 688 (18.7%) | 0.02 | 15,269 (18.1%) | 910 (17.9%) | 0.01 |
| Other cardiovascular disease | 23,202 (16.8%) | 435 (11.8%) | 0.14 | 16,585 (19.7%) | 456 (9.0%) | 0.31 |
| Emphysema | 18,005 (13.0%) | 574 (15.6%) | 0.07 | 15,485 (18.4%) | 1,172 (23.0%) | 0.11 |
| Arteriosclerotic heart disease | 20,614 (14.9%) | 415 (11.3%) | 0.11 | 13,507 (16.1%) | 406 (8.0%) | 0.25 |
| Alzheimer's | 32,119 (23.2%) | 606 (16.5%) | 0.17 | 0.0% | 0.0% | NA |
| Anemia | 18,646 (13.5%) | 535 (14.5%) | 0.03 | 12,546 (14.9%) | 699 (13.7%) | 0.03 |
| Congestive heart failure | 15,630 (11.3%) | 313 (8.5%) | 0.09 | 15,627 (18.6%) | 400 (7.9%) | 0.32 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Anxiety disorder | 16,587 (12.0%) | 571 (15.5%) | 0.10 | 9,606 (11.4%) | 894 (17.6%) | 0.18 |
| Renal failure | 14,391 (10.4%) | 291 (7.9%) | 0.09 | 11,809 (14.0%) | 456 (9.0%) | 0.16 |
| Cancer | 14,240 (10.3%) | 275 (7.5%) | 0.10 | 10,316 (12.3%) | 385 (7.6%) | 0.16 |
| Cataracts | 14,761 (10.7%) | 315 (8.6%) | 0.07 | 8,631 (10.3%) | 376 (7.4%) | 0.10 |
| Cardiac dysrhythmias | 8,664 (6.3%) | 136 (3.7%) | 0.12 | 5,635 (6.7%) | 108 (2.1%) | 0.22 |
| Peripheral vascular disease | 6,503 (4.7%) | 110 (3.0%) | 0.09 | 6,262 (7.4%) | 198 (3.9%) | 0.15 |

Data are median (IQR) or No. (%).

CHESS, Changes in Health, End-Stage Disease and Symptoms and Signs; SCZ, schizophrenia; Std Diff, standardized difference.

## Supplementary Table 8

Sociodemographic characteristics of LTC residents and characteristics of their LTC homes stratified by age

| | 18 – 49 | | | 50 – 64 | | | 65 – 69 | | | 70 – 74 | | | 75 – 79 | | | 80 – 84 | | | 85 – 89 | | | ≥ 90 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Characteristic | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff |
| Female sex | 643 (50.1%) | 124 (53.0%) | 0.06 | 4,107 (46.4%) | 1,023 (49.8%) | 0.07 | 4,088 (50.3%) | 725 (52.3%) | 0.04 | 7,884 (52.9%) | 827 (56.1%) | 0.06 | 15,155 (57.7%) | 856 (64.5%) | 0.14 | 26,373 (60.5%) | 759 (69.1%) | 0.18 | 36,418 (64.2%) | 526 (71.5%) | 0.16 | 45,192 (71.9%) | 386 (82.5%) | 0.26 |
| Marital status | | | | | | | | | | | | | | | | | | | | | | | | |
| Never married | 758 (59.1%) | 169 (72.2%) | 0.28 | 2,851 (32.2%) | 1,051 (51.2%) | 0.39 | 1,451 (17.9%) | 599 (43.2%) | 0.57 | 1,584 (10.6%) | 447 (30.3%) | 0.50 | 1,672 (6.4%) | 288 (21.7%) | 0.45 | 1,895 (4.3%) | 162 (14.8%) | 0.36 | 1,976 (3.5%) | 91 (12.4%) | 0.33 | 2,014 (3.2%) | 45 (9.6%) | 0.26 |
| Married | 205 (16.0%) | 12 (5.1%) | 0.36 | 2,302 (26.0%) | 186 (9.1%) | 0.46 | 2,842 (35.0%) | 165 (11.9%) | 0.57 | 6,094 (40.9%) | 249 (16.9%) | 0.55 | 11,308 (43.0%) | 273 (20.6%) | 0.50 | 17,307 (39.7%) | 238 (21.7%) | 0.40 | 18,285 (32.2%) | 166 (22.6%) | 0.22 | 11,712 (18.6%) | 78 (16.7%) | 0.05 |
| Previously married | 262 (20.4%) | 38 (16.2%) | 0.11 | 3,180 (35.9%) | 665 (32.4%) | 0.07 | 3,405 (41.9%) | 523 (37.7%) | 0.09 | 6,575 (44.2%) | 675 (45.8%) | 0.03 | 12,445 (47.3%) | 680 (51.2%) | 0.08 | 23,138 (53.1%) | 648 (59.0%) | 0.12 | 34,957 (61.6%) | 457 (62.1%) | 0.01 | 47,551 (75.6%) | 331 (70.7%) | 0.11 |
| Missing | 58 (4.5%) | 15 (6.4%) | 0.08 | 521 (5.9%) | 151 (7.4%) | 0.06 | 423 (5.2%) | 99 (7.1%) | 0.08 | 639 (4.3%) | 102 (6.9%) | 0.12 | 861 (3.3%) | 87 (6.6%) | 0.15 | 1,226 (2.8%) | 50 (4.6%) | 0.09 | 1,498 (2.6%) | 22 (3.0%) | 0.02 | 1,613 (2.6%) | 14 (3.0%) | 0.03 |
| Education | | | | | | | | | | | | | | | | | | | | | | | | |
| None | *40-44 | *1-5 | * | 149-153 | 38-42 | < 0.05 | 84 (1.0%) | 14 (1.0%) | 0.00 | 107 (0.7%) | 15 (1.0%) | 0.03 | 206 (0.8%) | 14 (1.1%) | 0.03 | 433 (1.0%) | 14 (1.3%) | 0.03 | 572 (1.0%) | 16 (2.2%) | 0.09 | 660 (1.0%) | 11 (2.4%) | 0.10 |
| ≤ High School | 463 (36.1%) | 82 (35.0%) | 0.02 | 2,784 (31.4%) | 724 (35.3%) | 0.08 | 2,532 (31.2%) | 459 (33.1%) | 0.04 | 4,975 (33.4%) | 471 (32.0%) | 0.03 | 9,354 (35.6%) | 472 (35.5%) | 0.00 | 16,406 (37.7%) | 397 (36.2%) | 0.03 | 22,471 (39.6%) | 267 (36.3%) | 0.07 | 25,154 (40.0%) | 191 (40.8%) | 0.02 |
| > High School | *245-249 | *33-37 | * | 1765 - 1769 | 303-307 | > 0.1 | 1,786 (22.0%) | 201 (14.5%) | 0.20 | 3,208 (21.5%) | 248 (16.8%) | 0.12 | 5,152 (19.6%) | 198 (14.9%) | 0.12 | 7,839 (18.0%) | 158 (14.4%) | 0.10 | 9,094 (16.0%) | 96 (13.0%) | 0.09 | 9,785 (15.6%) | 50 (10.7%) | 0.15 |
| Missing | 531 (41.4%) | 114 (48.7%) | 0.15 | 4,152 (46.9%) | 984 (47.9%) | 0.02 | 3,719 (45.8%) | 712 (51.4%) | 0.11 | 6,602 (44.3%) | 739 (50.2%) | 0.12 | 11,574 (44.0%) | 644 (48.5%) | 0.09 | 18,888 (43.4%) | 529 (48.2%) | 0.10 | 24,579 (43.3%) | 357 (48.5%) | 0.10 | 27,291 (43.4%) | 216 (46.2%) | 0.06 |
| Income quintile | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 402 (31.3%) | 81 (34.6%) | 0.07 | 2,883 (32.6%) | 768 (37.4%) | 0.10 | 2,561 (31.5%) | 545 (39.3%) | 0.16 | 4,499 (30.2%) | 541 (36.7%) | 0.14 | 7,478 (28.4%) | 428 (32.2%) | 0.08 | 11,902 (27.3%) | 361 (32.9%) | 0.12 | 15,420 (27.2%) | 236 (32.1%) | 0.11 | 17,048 (27.1%) | 137 (29.3%) | 0.05 |
| 2 | 313 (24.4%) | 56 (23.9%) | 0.01 | 2,046 (23.1%) | 462 (22.5%) | 0.01 | 1,777 (21.9%) | 266 (19.2%) | 0.07 | 3,268 (21.9%) | 318 (21.6%) | 0.01 | 5,689 (21.6%) | 276 (20.8%) | 0.02 | 9,732 (22.3%) | 212 (19.3%) | 0.08 | 12,480 (22.0%) | 146 (19.8%) | 0.05 | 13,743 (21.9%) | 109 (23.3%) | 0.03 |
| 3 | 223 (17.4%) | 40 (17.1%) | 0.01 | 1,502 (17.0%) | 311 (15.1%) | 0.05 | 1,438 (17.7%) | 209 (15.1%) | 0.07 | 2,675 (18.0%) | 241 (16.4%) | 0.04 | 4,798 (18.3%) | 221 (16.6%) | 0.04 | 8,087 (18.6%) | 199 (18.1%) | 0.01 | 10,458 (18.4%) | 125 (17.0%) | 0.04 | 11,717 (18.6%) | 82 (17.5%) | 0.03 |
| 4 | 172 (13.4%) | 27 (11.5%) | 0.06 | 1,250 (14.1%) | 252 (12.3%) | 0.05 | 1,241 (15.3%) | 196 (14.1%) | 0.03 | 2,389 (16.0%) | 197 (13.4%) | 0.08 | 4,465 (17.0%) | 214 (16.1%) | 0.02 | 7,390 (17.0%) | 187 (17.0%) | 0.00 | 9,756 (17.2%) | 116 (15.8%) | 0.04 | 10,705 (17.0%) | 74 (15.8%) | 0.03 |
| 5 | 150 (11.7%) | 22 (9.4%) | 0.08 | 1,048 (11.8%) | 204 (9.9%) | 0.06 | 1,009 (12.4%) | 144 (10.4%) | 0.06 | 1,906 (12.8%) | 144 (9.8%) | 0.10 | 3,589 (13.7%) | 164 (12.3%) | 0.04 | 6,063 (13.9%) | 128 (11.7%) | 0.07 | 8,073 (14.2%) | 103 (14.0%) | 0.01 | 9,014 (14.3%) | 60 (12.8%) | 0.04 |
| Missing | 23 (1.8%) | 8 (3.4%) | 0.10 | 125 (1.4%) | 56 (2.7%) | 0.09 | 95 (1.2%) | 26 (1.9%) | 0.06 | 155 (1.0%) | 32 (2.2%) | 0.09 | 267 (1.0%) | 25 (1.9%) | 0.07 | 392 (0.9%) | 11 (1.0%) | 0.01 | 529 (0.9%) | 10 (1.4%) | 0.04 | 663 (1.1%) | 6 (1.3%) | 0.02 |
| Material resources quintile | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 165 (12.9%) | 33 (14.1%) | 0.04 | 1,182 (13.3%) | 254 (12.4%) | 0.03 | 1,161 (14.3%) | 178 (12.8%) | 0.04 | 2,174 (14.6%) | 180 (12.2%) | 0.07 | 4,141 (15.8%) | 209 (15.7%) | 0.00 | 6,824 (15.7%) | 173 (15.8%) | 0.00 | 9,400 (16.6%) | 130 (17.7%) | 0.03 | 10,714 (17.0%) | 73 (15.6%) | 0.04 |
| 2 | 204 (15.9%) | 31 (13.2%) | 0.08 | 1,337 (15.1%) | 264 (12.9%) | 0.07 | 1,363 (16.8%) | 205 (14.8%) | 0.06 | 2,681 (18.0%) | 209 (14.2%) | 0.10 | 4,885 (18.6%) | 242 (18.2%) | 0.01 | 8,292 (19.0%) | 191 (17.4%) | 0.04 | 10,924 (19.3%) | 132 (17.9%) | 0.03 | 12,447 (19.8%) | 91 (19.4%) | 0.01 |
| 3 | 216 (16.8%) | 41 (17.5%) | 0.02 | 1,623 (18.3%) | 341 (16.6%) | 0.05 | 1,562 (19.2%) | 243 (17.5%) | 0.04 | 2,872 (19.3%) | 284 (19.3%) | 0.00 | 5,061 (19.3%) | 225 (16.9%) | 0.06 | 8,624 (19.8%) | 206 (18.8%) | 0.03 | 11,195 (19.7%) | 129 (17.5%) | 0.06 | 12,455 (19.8%) | 84 (17.9%) | 0.05 |
| 4 | 269 (21.0%) | 48 (20.5%) | 0.01 | 1,831 (20.7%) | 388 (18.9%) | 0.05 | 1,585 (19.5%) | 258 (18.6%) | 0.02 | 2,954 (19.8%) | 294 (20.0%) | 0.00 | 5,305 (20.2%) | 247 (18.6%) | 0.04 | 8,856 (20.3%) | 212 (19.3%) | 0.03 | 11,213 (19.8%) | 158 (21.5%) | 0.04 | 12,206 (19.4%) | 94 (20.1%) | 0.02 |
| 5 | 389 (30.3%) | 69 (29.5%) | 0.02 | 2,664 (30.1%) | 730 (35.6%) | 0.12 | 2,276 (28.0%) | 465 (33.5%) | 0.12 | 3,925 (26.4%) | 464 (31.5%) | 0.11 | 6,452 (24.5%) | 372 (28.0%) | 0.08 | 10,343 (23.7%) | 296 (27.0%) | 0.07 | 13,160 (23.2%) | 177 (24.0%) | 0.02 | 14,096 (22.4%) | 118 (25.2%) | 0.07 |
| Missing | 40 (3.1%) | 12 (5.1%) | 0.10 | 217 (2.5%) | 76 (3.7%) | 0.07 | 174 (2.1%) | 37 (2.7%) | 0.03 | 286 (1.9%) | 42 (2.9%) | 0.06 | 442 (1.7%) | 33 (2.5%) | 0.06 | 627 (1.4%) | 20 (1.8%) | 0.03 | 824 (1.5%) | 10 (1.4%) | 0.01 | 972 (1.5%) | 8 (1.7%) | 0.01 |
| Household & dwellings quintile | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 113 (8.8%) | 19 (8.1%) | 0.03 | 694 (7.8%) | 104 (5.1%) | 0.11 | 676 (8.3%) | 77 (5.6%) | 0.11 | 1,300 (8.7%) | 71 (4.8%) | 0.16 | 2,240 (8.5%) | 96 (7.2%) | 0.05 | 3,718 (8.5%) | 71 (6.5%) | 0.08 | 4,778 (8.4%) | 62 (8.4%) | 0.00 | 4,940 (7.9%) | 24 (5.1%) | 0.11 |
| 2 | 147 (11.5%) | 22 (9.4%) | 0.07 | 1,050 (11.9%) | 198 (9.6%) | 0.07 | 1,008 (12.4%) | 128 (9.2%) | 0.10 | 1,939 (13.0%) | 127 (8.6%) | 0.14 | 3,531 (13.4%) | 156 (11.7%) | 0.05 | 5,650 (13.0%) | 112 (10.2%) | 0.09 | 7,083 (12.5%) | 92 (12.5%) | 0.00 | 7,366 (11.7%) | 47 (10.0%) | 0.05 |
| 3 | 215 (16.8%) | 28 (12.0%) | 0.14 | 1,456 (16.4%) | 288 (14.0%) | 0.07 | 1,355 (16.7%) | 183 (13.2%) | 0.10 | 2,464 (16.5%) | 203 (13.8%) | 0.08 | 4,516 (17.2%) | 203 (15.3%) | 0.05 | 7,618 (17.5%) | 172 (15.7%) | 0.05 | 9,791 (17.3%) | 112 (15.2%) | 0.06 | 10,578 (16.8%) | 77 (16.5%) | 0.01 |
| 4 | 297 (23.1%) | 51 (21.8%) | 0.03 | 2,124 (24.0%) | 443 (21.6%) | 0.06 | 1,978 (24.4%) | 312 (22.5%) | 0.04 | 3,545 (23.8%) | 339 (23.0%) | 0.02 | 6,436 (24.5%) | 272 (20.5%) | 0.10 | 10,874 (25.0%) | 258 (23.5%) | 0.03 | 13,879 (24.5%) | 175 (23.8%) | 0.02 | 15,876 (25.2%) | 123 (26.3%) | 0.02 |
| 5 | 471 (36.7%) | 102 (43.6%) | 0.14 | 3,313 (37.4%) | 944 (46.0%) | 0.17 | 2,930 (36.1%) | 649 (46.8%) | 0.22 | 5,358 (36.0%) | 691 (46.9%) | 0.22 | 9,121 (34.7%) | 568 (42.8%) | 0.17 | 15,079 (34.6%) | 465 (42.3%) | 0.16 | 20,361 (35.9%) | 285 (38.7%) | 0.06 | 23,158 (36.8%) | 189 (40.4%) | 0.07 |
| Missing | 40 (3.1%) | 12 (5.1%) | 0.10 | 217 (2.5%) | 76 (3.7%) | 0.07 | 174 (2.1%) | 37 (2.7%) | 0.03 | 286 (1.9%) | 42 (2.9%) | 0.06 | 442 (1.7%) | 33 (2.5%) | 0.06 | 627 (1.4%) | 20 (1.8%) | 0.03 | 824 (1.5%) | 10 (1.4%) | 0.01 | 972 (1.5%) | 8 (1.7%) | 0.01 |
| Age & labor force quintile | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 173 (13.5%) | 33 (14.1%) | 0.02 | 1,128 (12.7%) | 263 (12.8%) | 0.00 | 905 (11.1%) | 157 (11.3%) | 0.01 | 1,523 (10.2%) | 147 (10.0%) | 0.01 | 2,579 (9.8%) | 145 (10.9%) | 0.04 | 3,849 (8.8%) | 130 (11.8%) | 0.10 | 4,602 (8.1%) | 74 (10.1%) | 0.07 | 4,545 (7.2%) | 37 (7.9%) | 0.03 |
| 2 | 188 (14.7%) | 35 (15.0%) | 0.01 | 1,263 (14.3%) | 315 (15.3%) | 0.03 | 1,068 (13.2%) | 206 (14.9%) | 0.05 | 1,987 (13.3%) | 177 (12.0%) | 0.04 | 3,203 (12.2%) | 183 (13.8%) | 0.05 | 4,978 (11.4%) | 118 (10.7%) | 0.02 | 6,150 (10.8%) | 80 (10.9%) | 0.00 | 6,573 (10.5%) | 58 (12.4%) | 0.06 |
| 3 | 164 (12.8%) | 27 (11.5%) | 0.04 | 1,327 (15.0%) | 334 (16.3%) | 0.04 | 1,193 (14.7%) | 230 (16.6%) | 0.05 | 2,092 (14.0%) | 235 (16.0%) | 0.05 | 3,662 (13.9%) | 207 (15.6%) | 0.05 | 5,883 (13.5%) | 152 (13.8%) | 0.01 | 7,283 (12.8%) | 106 (14.4%) | 0.05 | 7,830 (12.5%) | 61 (13.0%) | 0.02 |
| 4 | 218 (17.0%) | 45 (19.2%) | 0.06 | 1,483 (16.7%) | 335 (16.3%) | 0.01 | 1,373 (16.9%) | 225 (16.2%) | 0.02 | 2,581 (17.3%) | 240 (16.3%) | 0.03 | 4,414 (16.8%) | 207 (15.6%) | 0.03 | 7,573 (17.4%) | 195 (17.8%) | 0.01 | 9,848 (17.4%) | 134 (18.2%) | 0.02 | 10,914 (17.4%) | 75 (16.0%) | 0.04 |
| 5 | 500 (39.0%) | 82 (35.0%) | 0.08 | 3,436 (38.8%) | 730 (35.6%) | 0.07 | 3,408 (42.0%) | 531 (38.3%) | 0.08 | 6,423 (43.1%) | 632 (42.9%) | 0.01 | 11,986 (45.6%) | 553 (41.6%) | 0.08 | 20,656 (47.4%) | 483 (44.0%) | 0.07 | 28,009 (49.4%) | 332 (45.1%) | 0.09 | 32,056 (51.0%) | 229 (48.9%) | 0.04 |
| Missing | 40 (3.1%) | 12 (5.1%) | 0.10 | 217 (2.5%) | 76 (3.7%) | 0.07 | 174 (2.1%) | 37 (2.7%) | 0.03 | 286 (1.9%) | 42 (2.9%) | 0.06 | 442 (1.7%) | 33 (2.5%) | 0.06 | 627 (1.4%) | 20 (1.8%) | 0.03 | 824 (1.5%) | 10 (1.4%) | 0.01 | 972 (1.5%) | 8 (1.7%) | 0.01 |
| Racialized & newcomer populations quintile | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 259 (20.2%) | 33 (14.1%) | 0.16 | 1,850 (20.9%) | 368 (17.9%) | 0.08 | 1,845 (22.7%) | 252 (18.2%) | 0.11 | 3,445 (23.1%) | 282 (19.1%) | 0.10 | 6,040 (23.0%) | 272 (20.5%) | 0.06 | 10,065 (23.1%) | 177 (16.1%) | 0.18 | 12,464 (22.0%) | 117 (15.9%) | 0.16 | 13,600 (21.6%) | 84 (17.9%) | 0.09 |
| 2 | 261 (20.3%) | 43 (18.4%) | 0.05 | 1,885 (21.3%) | 406 (19.8%) | 0.04 | 1,836 (22.6%) | 303 (21.9%) | 0.02 | 3,289 (22.1%) | 296 (20.1%) | 0.05 | 5,977 (22.7%) | 252 (19.0%) | 0.09 | 9,984 (22.9%) | 232 (21.1%) | 0.04 | 13,135 (23.2%) | 128 (17.4%) | 0.14 | 14,628 (23.3%) | 84 (17.9%) | 0.13 |
| 3 | 252 (19.6%) | 35 (15.0%) | 0.12 | 1,723 (19.5%) | 417 (20.3%) | 0.02 | 1,548 (19.1%) | 256 (18.5%) | 0.02 | 2,882 (19.4%) | 285 (19.3%) | 0.00 | 5,006 (19.0%) | 261 (19.7%) | 0.02 | 8,314 (19.1%) | 230 (20.9%) | 0.05 | 11,186 (19.7%) | 165 (22.4%) | 0.07 | 12,581 (20.0%) | 96 (20.5%) | 0.01 |
| 4 | 228 (17.8%) | 60 (25.6%) | 0.19 | 1,599 (18.1%) | 385 (18.8%) | 0.02 | 1,381 (17.0%) | 300 (21.6%) | 0.12 | 2,582 (17.3%) | 312 (21.2%) | 0.10 | 4,584 (17.4%) | 285 (21.5%) | 0.10 | 7,622 (17.5%) | 238 (21.7%) | 0.11 | 10,260 (18.1%) | 150 (20.4%) | 0.06 | 11,484 (18.3%) | 97 (20.7%) | 0.06 |
| 5 | 243 (18.9%) | 51 (21.8%) | 0.07 | 1,580 (17.8%) | 401 (19.5%) | 0.04 | 1,337 (16.5%) | 238 (17.2%) | 0.02 | 2,408 (16.2%) | 256 (17.4%) | 0.03 | 4,237 (16.1%) | 225 (16.9%) | 0.02 | 6,954 (16.0%) | 201 (18.3%) | 0.06 | 8,847 (15.6%) | 166 (22.6%) | 0.18 | 9,625 (15.3%) | 99 (21.2%) | 0.15 |
| Missing | 40 (3.1%) | 12 (5.1%) | 0.10 | 217 (2.5%) | 76 (3.7%) | 0.07 | 174 (2.1%) | 37 (2.7%) | 0.03 | 286 (1.9%) | 42 (2.9%) | 0.06 | 442 (1.7%) | 33 (2.5%) | 0.06 | 627 (1.4%) | 20 (1.8%) | 0.03 | 824 (1.5%) | 10 (1.4%) | 0.01 | 972 (1.5%) | 8 (1.7%) | 0.01 |
| Prior urbanicity | | | | | | | | | | | | | | | | | | | | | | | | |
| Urban | 1,095 (85.3%) | 206 (88.0%) | 0.08 | 7,485 (84.5%) | 1,800 (87.7%) | 0.09 | 6,796 (83.7%) | 1,224 (88.3%) | 0.13 | 12,542 (84.2%) | 1,294 (87.8%) | 0.11 | 22,078 (84.0%) | 1,172 (88.3%) | 0.12 | 36,670 (84.2%) | 985 (89.7%) | 0.17 | 48,443 (85.4%) | 654 (88.9%) | 0.10 | 54,045 (85.9%) | 421 (90.0%) | 0.12 |
| Rural | 163 (12.7%) | 20 (8.5%) | 0.14 | 1,142 (12.9%) | 200 (9.7%) | 0.10 | 1,169 (14.4%) | 137 (9.9%) | 0.14 | 2,100 (14.1%) | 157 (10.7%) | 0.11 | 3,725 (14.2%) | 133 (10.0%) | 0.13 | 6,038 (13.9%) | 96 (8.7%) | 0.16 | 7,260 (12.8%) | 68 (9.2%) | 0.11 | 7,821 (12.4%) | 38 (8.1%) | 0.14 |
| Missing | 25 (1.9%) | 8 (3.4%) | 0.09 | 227 (2.6%) | 53 (2.6%) | 0.00 | 156 (1.9%) | 25 (1.8%) | 0.01 | 250 (1.7%) | 22 (1.5%) | 0.02 | 483 (1.8%) | 23 (1.7%) | 0.01 | 858 (2.0%) | 17 (1.5%) | 0.03 | 1,013 (1.8%) | 14 (1.9%) | 0.01 | 1,024 (1.6%) | 9 (1.9%) | 0.02 |
| Homeless in last 5 years | 81 (6.3%) | 49 (20.9%) | 0.44 | 464 (5.2%) | 284 (13.8%) | 0.30 | 254 (3.1%) | 121 (8.7%) | 0.24 | 298 (2.0%) | 115 (7.8%) | 0.27 | 229 (0.9%) | 55 (4.1%) | 0.21 | 200 (0.5%) | 29 (2.6%) | 0.18 | 154 - 158 | 13 - 17 | > 0.1 | *102-106 | *1-5 | * |
| Entry source | | | | | | | | | | | | | | | | | | | | | | | | |
| Inpatient acute care service | 422 (32.9%) | 75 (32.1%) | 0.02 | 3,234 (36.5%) | 706 (34.4%) | 0.05 | 2,844 (35.0%) | 462 (33.3%) | 0.04 | 4,783 (32.1%) | 482 (32.7%) | 0.01 | 8,050 (30.6%) | 420 (31.6%) | 0.02 | 12,568 (28.8%) | 341 (31.1%) | 0.05 | 15,373 (27.1%) | 215 (29.2%) | 0.05 | 16,186 (25.7%) | 135 (28.8%) | 0.07 |
| Inpatient psychiatry service | 7 (0.5%) | 22 (9.4%) | 0.42 | 87 (1.0%) | 200 (9.7%) | 0.40 | 91 (1.1%) | 128 (9.2%) | 0.37 | 120 (0.8%) | 110 (7.5%) | 0.34 | 155 (0.6%) | 82 (6.2%) | 0.31 | 171 (0.4%) | 42 (3.8%) | 0.24 | 124 (0.2%) | 21 (2.9%) | 0.22 | 59 (0.1%) | 8 (1.7%) | 0.17 |
| Home with no home care | 382 (29.8%) | 47 (20.1%) | 0.23 | 2,287 (25.8%) | 354 (17.2%) | 0.21 | 2,213 (27.3%) | 257 (18.5%) | 0.21 | 4,369 (29.3%) | 260 (17.7%) | 0.28 | 8,072 (30.7%) | 252 (19.0%) | 0.27 | 12,915 (29.6%) | 252 (23.0%) | 0.15 | 15,754 (27.8%) | 171 (23.2%) | 0.10 | 15,223 (24.2%) | 100 (21.4%) | 0.07 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Home with home care | 152 (11.8%) | 16 (6.8%) | 0.17 | 868 (9.8%) | 137 (6.7%) | 0.11 | 793 (9.8%) | 88 (6.3%) | 0.13 | 1,666 (11.2%) | 95 (6.4%) | 0.17 | 2,874 (10.9%) | 103 (7.8%) | 0.11 | 4,856 (11.1%) | 88 (8.0%) | 0.11 | 6,053 (10.7%) | 67 (9.1%) | 0.05 | 6,174 (9.8%) | 31 (6.6%) | 0.12 |
| Other | 320 (24.9%) | 74 (31.6%) | 0.15 | 2,378 (26.9%) | 656 (32.0%) | 0.11 | 2,180 (26.8%) | 451 (32.5%) | 0.13 | 3,954 (26.6%) | 526 (35.7%) | 0.20 | 7,135 (27.1%) | 471 (35.5%) | 0.18 | 13,056 (30.0%) | 375 (34.2%) | 0.09 | 19,412 (34.2%) | 262 (35.6%) | 0.03 | 25,248 (40.1%) | 194 (41.5%) | 0.03 |
| LTC home urbanicity | | | | | | | | | | | | | | | | | | | | | | | | |
| Urban | 1118 - 1126 | 198 - 206 | <0.1 | 7,594 (85.8%) | 1,810 (88.2%) | 0.07 | 6,892 (84.9%) | 1,212 (87.4%) | 0.08 | 12,720 (85.4%) | 1,306 (88.7%) | 0.10 | 22317 - 22321 | 1188 - 1192 | >0.1 | 37,107 (85.2%) | 993 (90.4%) | 0.16 | 48,776 (86.0%) | 661 (89.8%) | 0.12 | 54,155 (86.1%) | 431 (92.1%) | 0.19 |
| Rural | *156-160 | 28 - 36 | <0.1 | 1,253 (14.2%) | 243 (11.8%) | 0.07 | 1,223 (15.1%) | 174 (12.6%) | 0.07 | 2,157 (14.5%) | 167 (11.3%) | 0.09 | *3956-3960 | *133-137 | >0.1 | 6,432 (14.8%) | 105 (9.6%) | 0.16 | 7,905 (13.9%) | 75 (10.2%) | 0.12 | 8,699 (13.8%) | 37 (7.9%) | 0.19 |
| Missing | *1-5 | 0 (0.0%) | <0.1 | 7 (0.1%) | 0 (0.0%) | 0.04 | 6 (0.1%) | 0 (0.0%) | 0.04 | 15 (0.1%) | 0 (0.0%) | 0.05 | *7-11 | *1-5 | <0.1 | 27 (0.1%) | 0 (0.0%) | 0.04 | 35 (0.1%) | 0 (0.0%) | 0.04 | 36 (0.1%) | 0 (0.0%) | 0.03 |
| LTC home number of beds | | | | | | | | | | | | | | | | | | | | | | | | |
| < 50 | 34 (2.7%) | 7 (3.0%) | 0.02 | 262 (3.0%) | 54 (2.6%) | 0.02 | 234 (2.9%) | 38 (2.7%) | 0.01 | 418 (2.8%) | 28 (1.9%) | 0.06 | 766 (2.9%) | 33 (2.5%) | 0.03 | 1,210 (2.8%) | 23 (2.1%) | 0.04 | 1,626 (2.9%) | 19 (2.6%) | 0.02 | 1,818 (2.9%) | 16 (3.4%) | 0.03 |
| 50 - 99 | 260 (20.3%) | 53 (22.6%) | 0.06 | 1,937 (21.9%) | 423 (20.6%) | 0.03 | 1,775 (21.9%) | 287 (20.7%) | 0.03 | 3,109 (20.9%) | 258 (17.5%) | 0.09 | 5,334 (20.3%) | 263 (19.8%) | 0.01 | 9,141 (21.0%) | 199 (18.1%) | 0.07 | 11,431 (20.2%) | 125 (17.0%) | 0.08 | 12,658 (20.1%) | 86 (18.4%) | 0.04 |
| 100 - 149 | 292 (22.8%) | 44 (18.8%) | 0.10 | 2,055 (23.2%) | 504 (24.5%) | 0.03 | 1,992 (24.5%) | 302 (21.8%) | 0.07 | 3,644 (24.5%) | 360 (24.4%) | 0.00 | 6,560 (25.0%) | 319 (24.0%) | 0.02 | 10,954 (25.1%) | 266 (24.2%) | 0.02 | 14,168 (25.0%) | 186 (25.3%) | 0.01 | 15,416 (24.5%) | 93 (19.9%) | 0.11 |
| ≥ 150 | 697 (54.3%) | 130 (55.6%) | 0.03 | 4,600 (52.0%) | 1,072 (52.2%) | 0.01 | 4,120 (50.7%) | 759 (54.8%) | 0.08 | 7,721 (51.8%) | 827 (56.1%) | 0.09 | 13,626 (51.8%) | 713 (53.7%) | 0.04 | 22,261 (51.1%) | 610 (55.6%) | 0.09 | 29,491 (52.0%) | 406 (55.2%) | 0.06 | 32,998 (52.5%) | 273 (58.3%) | 0.12 |
| Absence of personal contact with family or friends | | | | | | | | | | | | | | | | | | | | | | | | |
| No | 1,215 (94.7%) | 215 (91.9%) | 0.11 | 8,423 (95.1%) | 1,908 (92.9%) | 0.09 | 7,777 (95.8%) | 1,260 (90.9%) | 0.20 | 14,361 (96.4%) | 1,370 (93.0%) | 0.16 | 25,480 (96.9%) | 1,235 (93.0%) | 0.18 | 42,371 (97.3%) | 1,040 (94.7%) | 0.13 | 55,392 (97.7%) | 702 (95.4%) | 0.13 | 61,555 (97.9%) | 447 (95.5%) | 0.13 |
| Yes | *62-66 | *14-18 | * | *424-428 | *140-144 | <0.1 | 344 (4.2%) | 126 (9.1%) | 0.20 | *526-531 | 98 - 103 | >0.1 | 798 (3.0%) | 93 (7.0%) | 0.18 | *1190-1195 | 53 - 58 | >0.1 | 1,311 (2.3%) | 34 (4.6%) | 0.13 | 1,324 (2.1%) | 21 (4.5%) | 0.13 |
| Missing | *2-6 | *1-5 | * | *3-7 | *1-5 | <0.1 | 0 (0%) | 0 (0%) | 0.00 | 0 - 5 | 0 - 5 | <0.1 | 8 (0.0%) | 0 (0.0%) | 0.03 | 0 - 5 | 0 - 5 | <0.1 | 13 (0.0%) | 0 (0.0%) | 0.02 | 11 (0.0%) | 0 (0.0%) | 0.02 |

Data are median (IQR) or No. (%).

SCZ, schizophrenia; Std Diff, standardized difference.

## Supplementary Table 9

Health status and healthcare needs upon admission stratified by age

| | 18 – 49 | | | 50 – 64 | | | 65 – 69 | | | 70 – 74 | | | 75 – 79 | | | 80 – 84 | | | 85 – 89 | | | ≥ 90 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Characteristic | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff | No SCZ | SCZ | Std Diff |
| Cognitive Performance Scale | | | | | | | | | | | | | | | | | | | | | | | | |
| Intact | 285 (22.2%) | 41 (17.5%) | 0.12 | 1,638 (18.5%) | 233 (11.3%) | 0.20 | 1,251 (15.4%) | 146 (10.5%) | 0.15 | 1,787 (12.0%) | 140 (9.5%) | 0.08 | 2,424 (9.2%) | 99 (7.5%) | 0.06 | 3,453 (7.9%) | 69 (6.3%) | 0.06 | 4,136 (7.3%) | 42 (5.7%) | 0.06 | 4,654 (7.4%) | 17 (3.6%) | 0.17 |
| Borderline intact | 209 (16.3%) | 47 (20.1%) | 0.10 | 1,389 (15.7%) | 403 (19.6%) | 0.10 | 1,192 (14.7%) | 265 (19.1%) | 0.12 | 1,747 (11.7%) | 238 (16.2%) | 0.13 | 2,627 (10.0%) | 152 (11.4%) | 0.05 | 4,052 (9.3%) | 134 (12.2%) | 0.09 | 5,312 (9.4%) | 75 (10.2%) | 0.03 | 6,315 (10.0%) | 36 (7.7%) | 0.08 |
| Mild impairment | 209 (16.3%) | 53 (22.6%) | 0.16 | 1,679 (19.0%) | 428 (20.8%) | 0.05 | 1,624 (20.0%) | 319 (23.0%) | 0.07 | 3,065 (20.6%) | 350 (23.8%) | 0.08 | 5,355 (20.4%) | 301 (22.7%) | 0.06 | 9,570 (22.0%) | 263 (24.0%) | 0.05 | 13,358 (23.6%) | 155 (21.1%) | 0.06 | 15,864 (25.2%) | 96 (20.5%) | 0.11 |
| Moderate impairment | 245 (19.1%) | 60 (25.6%) | 0.16 | 2,245 (25.4%) | 712 (34.7%) | 0.21 | 2,356 (29.0%) | 472 (34.1%) | 0.11 | 4,959 (33.3%) | 539 (36.6%) | 0.07 | 9,822 (37.4%) | 535 (40.3%) | 0.06 | 17,299 (39.7%) | 410 (37.3%) | 0.05 | 23,047 (40.6%) | 312 (42.4%) | 0.04 | 25,046 (39.8%) | 195 (41.7%) | 0.04 |
| Moderate severe impairment | 104 (8.1%) | 17 (7.3%) | 0.03 | 802 (9.1%) | 129 (6.3%) | 0.10 | 735 (9.1%) | 94 (6.8%) | 0.08 | 1,429 (9.6%) | 110 (7.5%) | 0.08 | 2,621 (10.0%) | 116 (8.7%) | 0.04 | 4,304 (9.9%) | 105 (9.6%) | 0.01 | 5,295 (9.3%) | 77 (10.5%) | 0.04 | 5,457 (8.7%) | 64 (13.7%) | 0.16 |
| Severe impairment | 99 (7.7%) | 9 (3.8%) | 0.17 | 719 (8.1%) | 98 (4.8%) | 0.14 | 672 (8.3%) | 67 (4.8%) | 0.14 | 1,449 (9.7%) | 78 (5.3%) | 0.17 | 2,678 (10.2%) | 99 (7.5%) | 0.10 | 3,826 (8.8%) | 84 (7.7%) | 0.04 | 4,245 (7.5%) | 54 (7.3%) | 0.01 | 4,234 (6.7%) | 44 (9.4%) | 0.10 |
| Very severe impairment | 132 (10.3%) | 7 (3.0%) | 0.30 | 382 (4.3%) | 50 (2.4%) | 0.10 | 291 (3.6%) | 23 (1.7%) | 0.12 | 456 (3.1%) | 18 (1.2%) | 0.13 | 759 (2.9%) | 26 (2.0%) | 0.06 | 1,062 (2.4%) | 33 (3.0%) | 0.04 | 1,323 (2.3%) | 21 (2.9%) | 0.03 | 1,320 (2.1%) | 16 (3.4%) | 0.08 |
| Activities of Daily Living Self-Performance Hierarchy Scale | | | | | | | | | | | | | | | | | | | | | | | | |
| Independent | 36 (2.8%) | 10 (4.3%) | 0.08 | 347 (3.9%) | 92 (4.5%) | 0.03 | 249 (3.1%) | 64 (4.6%) | 0.08 | 377 (2.5%) | 52 (3.5%) | 0.06 | 644 (2.4%) | 42 (3.2%) | 0.04 | 1,086 (2.5%) | 30 (2.7%) | 0.02 | 1,321 (2.3%) | 17 (2.3%) | 0.00 | 1,169 (1.9%) | 6 (1.3%) | 0.05 |
| Supervision | 85 (6.6%) | 25 (10.7%) | 0.15 | 697 (7.9%) | 242 (11.8%) | 0.13 | 559 (6.9%) | 146 (10.5%) | 0.13 | 1,033 (6.9%) | 132 (9.0%) | 0.08 | 1,608 (6.1%) | 77 (5.8%) | 0.01 | 2,709 (6.2%) | 66 (6.0%) | 0.01 | 3,045 (5.4%) | 33 (4.5%) | 0.04 | 2,571 (4.1%) | 16 (3.4%) | 0.04 |
| Limited | 117 (9.1%) | 41 (17.5%) | 0.25 | 1,163 (13.1%) | 409 (19.9%) | 0.18 | 1,119 (13.8%) | 263 (19.0%) | 0.14 | 2,069 (13.9%) | 254 (17.2%) | 0.09 | 3,881 (14.8%) | 203 (15.3%) | 0.02 | 6,471 (14.9%) | 150 (13.7%) | 0.03 | 8,387 (14.8%) | 102 (13.9%) | 0.03 | 7,977 (12.7%) | 43 (9.2%) | 0.11 |
| Extensive 1 | 329 (25.6%) | 82 (35.0%) | 0.21 | 2,521 (28.5%) | 674 (32.8%) | 0.10 | 2,417 (29.8%) | 429 (31.0%) | 0.03 | 4,588 (30.8%) | 485 (32.9%) | 0.05 | 8,175 (31.1%) | 443 (33.4%) | 0.05 | 13,380 (30.7%) | 341 (31.1%) | 0.01 | 17,141 (30.2%) | 214 (29.1%) | 0.03 | 17,395 (27.7%) | 135 (28.8%) | 0.03 |
| Extensive 2 | 244 (19.0%) | 29 (12.4%) | 0.18 | 1,805 (20.4%) | 267 (13.0%) | 0.20 | 1,728 (21.3%) | 234 (16.9%) | 0.11 | 3,196 (21.5%) | 254 (17.2%) | 0.11 | 5,686 (21.6%) | 263 (19.8%) | 0.05 | 9,831 (22.6%) | 216 (19.7%) | 0.07 | 13,566 (23.9%) | 178 (24.2%) | 0.01 | 17,289 (27.5%) | 128 (27.4%) | 0.00 |
| Dependent | 278 (21.7%) | 32 (13.7%) | 0.21 | 1,791 (20.2%) | 316 (15.4%) | 0.13 | 1,649 (20.3%) | 210 (15.2%) | 0.14 | 2,973 (20.0%) | 267 (18.1%) | 0.05 | 5,218 (19.9%) | 257 (19.4%) | 0.01 | 8,589 (19.7%) | 249 (22.7%) | 0.07 | 11,350 (20.0%) | 160 (21.7%) | 0.04 | 14,401 (22.9%) | 119 (25.4%) | 0.06 |
| Total Dependence | 194 (15.1%) | 15 (6.4%) | 0.28 | 530 (6.0%) | 53 (2.6%) | 0.17 | 400 (4.9%) | 40 (2.9%) | 0.11 | 656 (4.4%) | 29 (2.0%) | 0.14 | 1,074 (4.1%) | 43 (3.2%) | 0.05 | 1,500 (3.4%) | 46 (4.2%) | 0.04 | 1,906 (3.4%) | 32 (4.3%) | 0.05 | 2,088 (3.3%) | 21 (4.5%) | 0.06 |
| CHESS | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 (stable) | 758 (59.1%) | 157 (67.1%) | 0.17 | 5,154 (58.2%) | 1,329 (64.7%) | 0.13 | 4,478 (55.1%) | 878 (63.3%) | 0.17 | 7,941 (53.3%) | 876 (59.5%) | 0.12 | 13,376 (50.9%) | 735 (55.3%) | 0.09 | 21,183 (48.6%) | 593 (54.0%) | 0.11 | 26,027 (45.9%) | 362 (49.2%) | 0.07 | 25,436 (40.4%) | 200 (42.7%) | 0.05 |
| 1 | 379 (29.5%) | 56 (23.9%) | 0.13 | 2,559 (28.9%) | 527 (25.7%) | 0.07 | 2,442 (30.1%) | 373 (26.9%) | 0.07 | 4,638 (31.1%) | 437 (29.7%) | 0.03 | 8,645 (32.9%) | 439 (33.1%) | 0.00 | 14,655 (33.6%) | 349 (31.8%) | 0.04 | 20,069 (35.4%) | 262 (35.6%) | 0.00 | 23,659 (37.6%) | 167 (35.7%) | 0.04 |
| 2 | *118-122 | *16-20 | < 0.1 | 894 - 898 | 155 - 159 | <0.1 | 903 (11.1%) | 107 (7.7%) | 0.12 | 1,773 (11.9%) | 138 (9.4%) | 0.08 | 3,126 (11.9%) | 118 (8.9%) | 0.10 | 5,790 (13.3%) | 119 (10.8%) | 0.08 | 7,805 (13.8%) | 86 (11.7%) | 0.06 | 10,102 (16.1%) | 77 (16.5%) | 0.01 |
| 3 | *20-24 | *1-5 | * | 184 - 188 | 29 - 33 | <0.1 | 240 (3.0%) | 20 (1.4%) | 0.10 | 431 (2.9%) | 15 (1.0%) | 0.14 | 899 (3.4%) | 23 (1.7%) | 0.11 | 1,477 (3.4%) | 31 (2.8%) | 0.03 | 2,128 (3.8%) | 19 (2.6%) | 0.07 | 2,787 (4.4%) | 18 (3.8%) | 0.03 |
| 4 | *1-5 | 0 (0.0%) | <0.1 | *45-49 | *4-8 | <0.1 | 50 (0.6%) | 8 (0.6%) | 0.01 | 99 (0.7%) | 7 (0.5%) | 0.03 | *197-201 | *8-12 | <0.1 | 398 (0.9%) | 6 (0.5%) | 0.04 | *595-599 | *2-6 | <0.1 | *746-750 | *2-6 | <0.1 |
| 5 (unstable) | 0 (0.0%) | 0 (0.0%) | 0.00 | *10-14 | *1-5 | <0.1 | 8 (0.1%) | 0 (0.0%) | 0.04 | 10 (0.1%) | 0 (0.0%) | 0.04 | *39-43 | *1-5 | <0.1 | 63 (0.1%) | 0 (0.0%) | 0.05 | *88-92 | *1-5 | <0.1 | *155-159 | *1-5 | * |
| Charlson Comorbidity Index | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 363 (28.3%) | 70 (29.9%) | 0.04 | 1,558 (17.6%) | 444 (21.6%) | 0.10 | 1,055 (13.0%) | 297 (21.4%) | 0.23 | 1,588 (10.7%) | 252 (17.1%) | 0.19 | 2,565 (9.8%) | 212 (16.0%) | 0.19 | 4,566 (10.5%) | 194 (17.7%) | 0.21 | 6,989 (12.3%) | 93 (12.6%) | 0.01 | 10,988 (17.5%) | 77 (16.5%) | 0.03 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 144 (11.2%) | 29 (12.4%) | 0.04 | 1,476 (16.7%) | 350 (17.0%) | 0.01 | 1,531 (18.9%) | 267 (19.3%) | 0.01 | 3,046 (20.5%) | 313 (21.2%) | 0.02 | 5,764 (21.9%) | 292 (22.0%) | 0.00 | 9,916 (22.8%) | 236 (21.5%) | 0.03 | 13,392 (23.6%) | 195 (26.5%) | 0.07 | 15,226 (24.2%) | 119 (25.4%) | 0.03 |
| 2 | 131 (10.2%) | 23 (9.8%) | 0.01 | 917 (10.4%) | 292 (14.2%) | 0.12 | 968 (11.9%) | 195 (14.1%) | 0.06 | 1,946 (13.1%) | 218 (14.8%) | 0.05 | 3,419 (13.0%) | 176 (13.3%) | 0.01 | 5,780 (13.3%) | 159 (14.5%) | 0.04 | 7,662 (13.5%) | 96 (13.0%) | 0.01 | 8,077 (12.8%) | 61 (13.0%) | 0.01 |
| 3 | 86 (6.7%) | 14 (6.0%) | 0.03 | 1,053 (11.9%) | 161 (7.8%) | 0.14 | 1,037 (12.8%) | 94 (6.8%) | 0.20 | 1,746 (11.7%) | 142 (9.6%) | 0.07 | 3,093 (11.8%) | 143 (10.8%) | 0.03 | 4,843 (11.1%) | 121 (11.0%) | 0.00 | 6,070 (10.7%) | 71 (9.6%) | 0.04 | 5,878 (9.3%) | 42 (9.0%) | 0.01 |
| 4+ | 149 (11.6%) | 17 (7.3%) | 0.15 | 1,600 (18.1%) | 207 (10.1%) | 0.23 | 1,508 (18.6%) | 136 (9.8%) | 0.25 | 2,485 (16.7%) | 157 (10.7%) | 0.18 | 3,905 (14.9%) | 146 (11.0%) | 0.12 | 5,777 (13.3%) | 116 (10.6%) | 0.08 | 6,490 (11.4%) | 79 (10.7%) | 0.02 | 5,328 (8.5%) | 32 (6.8%) | 0.06 |
| Missing | 410 (32.0%) | 81 (34.6%) | 0.06 | 2,250 (25.4%) | 599 (29.2%) | 0.09 | 2,022 (24.9%) | 397 (28.6%) | 0.09 | 4,081 (27.4%) | 391 (26.5%) | 0.02 | 7,540 (28.7%) | 359 (27.0%) | 0.04 | 12,684 (29.1%) | 272 (24.8%) | 0.10 | 16,113 (28.4%) | 202 (27.4%) | 0.02 | 17,393 (27.7%) | 137 (29.3%) | 0.04 |
| Aggressive Behavior Scale | | | | | | | | | | | | | | | | | | | | | | | | |
| None (0) | 814 (63.4%) | 128 (54.7%) | 0.18 | 5,387 (60.8%) | 1,144 (55.7%) | 0.10 | 4,755 (58.6%) | 778 (56.1%) | 0.05 | 8,429 (56.6%) | 827 (56.1%) | 0.01 | 14,329 (54.5%) | 762 (57.4%) | 0.06 | 24,435 (56.1%) | 642 (58.5%) | 0.05 | 33,318 (58.7%) | 432 (58.7%) | 0.00 | 39,175 (62.3%) | 237 (50.6%) | 0.24 |
| Mild (1 – 20) | 285 (22.2%) | 58 (24.8%) | 0.06 | 2,002 (22.6%) | 535 (26.1%) | 0.08 | 1,901 (23.4%) | 364 (26.3%) | 0.07 | 3,502 (23.5%) | 375 (25.5%) | 0.05 | 6,363 (24.2%) | 295 (22.2%) | 0.05 | 10,566 (24.3%) | 237 (21.6%) | 0.06 | 13,454 (23.7%) | 164 (22.3%) | 0.03 | 14,220 (22.6%) | 128 (27.4%) | 0.11 |
| Moderate (3 – 5) | 130 (10.1%) | 30 (12.8%) | 0.08 | 1,082 (12.2%) | 273 (13.3%) | 0.03 | 1,059 (13.0%) | 190 (13.7%) | 0.02 | 2,081 (14.0%) | 215 (14.6%) | 0.02 | 3,868 (14.7%) | 200 (15.1%) | 0.01 | 6,166 (14.2%) | 166 (15.1%) | 0.03 | 7,188 (12.7%) | 103 (14.0%) | 0.04 | 7,162 (11.4%) | 77 (16.5%) | 0.15 |
| Severe (6 – 12) | *48-52 | *13-17 | * | *376-380 | *96-100 | <0.1 | 406 (5.0%) | 54 (3.9%) | 0.05 | *875-880 | 51 - 56 | * | 1,718 (6.5%) | 71 (5.3%) | 0.05 | *2394-2399 | 48 - 53 | <0.1 | 2,743 (4.8%) | 37 (5.0%) | 0.01 | 2,322 (3.7%) | 26 (5.6%) | 0.09 |
| Missing | *2-6 | *1-5 | * | *3-7 | *1-5 | <0.1 | 0 (0%) | 0 (0%) | 0.00 | *0-5 | 0 - 5 | < 0.1 | 8 (0.0%) | 0 (0.0%) | 0.03 | 0 - 5 | 0 - 5 | <0.1 | 13 (0.0%) | 0 (0.0%) | 0.02 | 11 (0.0%) | 0 (0.0%) | 0.02 |
| Resource Utilization Group Category | | | | | | | | | | | | | | | | | | | | | | | | |
| Special rehabilitation | *57-61 | *3-7 | * | 311 - 315 | 40 - 44 | <0.1 | 231 (2.8%) | 24 (1.7%) | 0.07 | 386 (2.6%) | 28 (1.9%) | 0.05 | 612 (2.3%) | 26 (2.0%) | 0.03 | 847 (1.9%) | 25 (2.3%) | 0.02 | 1,111 (2.0%) | 16 (2.2%) | 0.02 | 1,166 (1.9%) | 13 (2.8%) | 0.06 |
| Extensive services | *33-37 | *1-5 | * | 182 - 186 | 19 - 23 | <0.1 | 163 (2.0%) | 11 (0.8%) | 0.10 | 228 (1.5%) | 17 (1.2%) | 0.03 | 421 (1.6%) | 14 (1.1%) | 0.05 | 741 (1.7%) | 16 (1.5%) | 0.02 | 908 (1.6%) | 12 (1.6%) | 0.00 | 894 (1.4%) | 8 (1.7%) | 0.02 |
| Special care | 402 (31.3%) | 42 (17.9%) | 0.31 | 1,609 (18.2%) | 214 (10.4%) | 0.22 | 1,197 (14.7%) | 124 (8.9%) | 0.18 | 1,789 (12.0%) | 141 (9.6%) | 0.08 | 2,726 (10.4%) | 87 (6.6%) | 0.14 | 4,201 (9.6%) | 85 (7.7%) | 0.07 | 5,840 (10.3%) | 68 (9.2%) | 0.04 | 7,326 (11.6%) | 45 (9.6%) | 0.07 |
| Clinically complex | 369 (28.8%) | 74 (31.6%) | 0.06 | 3,220 (36.4%) | 790 (38.5%) | 0.04 | 3,115 (38.4%) | 511 (36.9%) | 0.03 | 5,671 (38.1%) | 548 (37.2%) | 0.02 | 9,559 (36.4%) | 497 (37.4%) | 0.02 | 15,362 (35.3%) | 395 (36.0%) | 0.02 | 19,685 (34.7%) | 243 (33.0%) | 0.04 | 21,340 (33.9%) | 150 (32.1%) | 0.04 |
| Impaired cognition | 101 (7.9%) | 33 (14.1%) | 0.20 | 1,005 (11.4%) | 301 (14.7%) | 0.10 | 1,041 (12.8%) | 196 (14.1%) | 0.04 | 2,121 (14.2%) | 206 (14.0%) | 0.01 | 4,030 (15.3%) | 194 (14.6%) | 0.02 | 6,324 (14.5%) | 135 (12.3%) | 0.07 | 7,236 (12.8%) | 83 (11.3%) | 0.05 | 5,734 (9.1%) | 41 (8.8%) | 0.01 |
| Behavioral problems | 16 (1.2%) | 11 (4.7%) | 0.20 | 145 (1.6%) | 92 (4.5%) | 0.17 | 107 (1.3%) | 58 (4.2%) | 0.18 | 221 (1.5%) | 62 (4.2%) | 0.16 | 421 (1.6%) | 33 (2.5%) | 0.06 | 718 (1.6%) | 26 (2.4%) | 0.05 | 887 (1.6%) | 21 (2.9%) | 0.09 | 707 (1.1%) | 10 (2.1%) | 0.08 |
| Physical functions reduced | 301 (23.5%) | 66 (28.2%) | 0.11 | 2,378 (26.9%) | 593 (28.9%) | 0.05 | 2,267 (27.9%) | 462 (33.3%) | 0.12 | 4,476 (30.1%) | 471 (32.0%) | 0.04 | 8,517 (32.4%) | 477 (35.9%) | 0.07 | 15,373 (35.3%) | 416 (37.9%) | 0.05 | 21,049 (37.1%) | 293 (39.8%) | 0.06 | 25,723 (40.9%) | 201 (42.9%) | 0.04 |
| Number of medications | | | | | | | | | | | | | | | | | | | | | | | | |
| RAI-MDS | 9 (5-12) | 9 (6-13) | 0.16 | 10 (6-13) | 11 (7-14) | 0.18 | 10 (7-14) | 11 (8-14) | 0.18 | 10 (7-13) | 11 (7-14) | 0.11 | 10 (7-13) | 10 (7-14) | 0.08 | 10 (7-13) | 10 (7-13) | 0.08 | 10 (7-13) | 10 (7-13) | 0.02 | 9 (7-12) | 9 (7-12) | 0.01 |
| ODB | 17 (10-28) | 22 (13-32) | 0.32 | 21 (13-31) | 25 (17-35) | 0.30 | 22 (14-32) | 26 (17-35) | 0.23 | 22 (14-31) | 25 (16-34) | 0.18 | 22 (14-30) | 24 (16-32) | 0.15 | 21 (14-29) | 23 (15-31) | 0.14 | 21 (14-28) | 21 (14-29) | 0.04 | 19 (13-26) | 20 (14-28) | 0.11 |
| Support provided for locomotion on unit | | | | | | | | | | | | | | | | | | | | | | | | |
| No set-up or physical help from staff | 274 (21.4%) | 79 (33.8%) | 0.28 | 1,989 (22.5%) | 620 (30.2%) | 0.18 | 1,702 (21.0%) | 371 (26.8%) | 0.14 | 3,003 (20.2%) | 343 (23.3%) | 0.08 | 4,925 (18.7%) | 258 (19.4%) | 0.02 | 7,662 (17.6%) | 207 (18.9%) | 0.03 | 8,596 (15.2%) | 93 (12.6%) | 0.07 | 7,022 (11.2%) | 50 (10.7%) | 0.02 |
| Set-up help only | 198 (15.4%) | 51 (21.8%) | 0.16 | 1,525 (17.2%) | 489 (23.8%) | 0.16 | 1,376 (16.9%) | 296 (21.4%) | 0.11 | 2,496 (16.8%) | 316 (21.5%) | 0.12 | 4,418 (16.8%) | 250 (18.8%) | 0.05 | 7,281 (16.7%) | 168 (15.3%) | 0.04 | 9,465 (16.7%) | 140 (19.0%) | 0.06 | 8,983 (14.3%) | 60 (12.8%) | 0.04 |
| 1 person physical assist | 677 (52.8%) | 82 (35.0%) | 0.36 | 4,513 (51.0%) | 796 (38.8%) | 0.25 | 4,329 (53.3%) | 625 (45.1%) | 0.17 | 8,125 (54.6%) | 690 (46.8%) | 0.16 | 14,932 (56.8%) | 727 (54.7%) | 0.04 | 25,600 (58.8%) | 648 (59.0%) | 0.01 | 34,776 (61.3%) | 456 (62.0%) | 0.01 | 42,125 (67.0%) | 322 (68.8%) | 0.04 |
| 2+ person physical assist | 52 (4.1%) | 9 (3.8%) | 0.01 | 313 (3.5%) | 40 (1.9%) | 0.10 | 256 (3.2%) | 27 (1.9%) | 0.08 | 521 (3.5%) | 41 (2.8%) | 0.04 | 861 (3.3%) | 26 (2.0%) | 0.08 | 1,356 (3.1%) | 22 (2.0%) | 0.07 | 1,699 (3.0%) | 16 (2.2%) | 0.05 | 2,060 (3.3%) | 15 (3.2%) | 0.00 |
| Activity did not occur | 82 (6.4%) | 13 (5.6%) | 0.04 | 514 (5.8%) | 108 (5.3%) | 0.02 | 458 (5.6%) | 67 (4.8%) | 0.04 | 747 (5.0%) | 83 (5.6%) | 0.03 | 1,150 (4.4%) | 67 (5.0%) | 0.03 | 1,667 (3.8%) | 53 (4.8%) | 0.05 | 2,180 (3.8%) | 31 (4.2%) | 0.02 | 2,700 (4.3%) | 21 (4.5%) | 0.01 |
| Comorbidities | | | | | | | | | | | | | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hypertension | 282 (22.0%) | 46 (19.7%) | 0.06 | 3,837 (43.3%) | 876 (42.7%) | 0.01 | 4,393 (54.1%) | 645 (46.5%) | 0.15 | 8,887 (59.7%) | 776 (52.7%) | 0.14 | 16,507 (62.8%) | 738 (55.6%) | 0.15 | 28,651 (65.8%) | 656 (59.7%) | 0.13 | 38,546 (68.0%) | 454 (61.7%) | 0.13 | 44,111 (70.1%) | 301 (64.3%) | 0.12 |
| Dementia not Alzheimer's | 125 (9.7%) | 20 (8.5%) | 0.04 | 2,184 (24.7%) | 381 (18.6%) | 0.15 | 2,869 (35.3%) | 383 (27.6%) | 0.17 | 6,635 (44.6%) | 565 (38.4%) | 0.13 | 13,518 (51.4%) | 617 (46.5%) | 0.10 | 23,701 (54.4%) | 557 (50.7%) | 0.07 | 31,474 (55.5%) | 422 (57.3%) | 0.04 | 32,755 (52.1%) | 279 (59.6%) | 0.15 |
| Arthritis | 112 (8.7%) | 23 (9.8%) | 0.04 | 1,654 (18.7%) | 416 (20.3%) | 0.04 | 2,048 (25.2%) | 329 (23.7%) | 0.03 | 4,455 (29.9%) | 406 (27.6%) | 0.05 | 9,122 (34.7%) | 407 (30.6%) | 0.09 | 16,900 (38.8%) | 395 (36.0%) | 0.06 | 24,121 (42.5%) | 281 (38.2%) | 0.09 | 29,509 (46.9%) | 206 (44.0%) | 0.06 |
| Diabetes mellitus | 236 (18.4%) | 65 (27.8%) | 0.22 | 2,750 (31.1%) | 747 (36.4%) | 0.11 | 2,875 (35.4%) | 506 (36.5%) | 0.02 | 5,176 (34.8%) | 533 (36.2%) | 0.03 | 8,679 (33.0%) | 453 (34.1%) | 0.02 | 12,930 (29.7%) | 347 (31.6%) | 0.04 | 14,563 (25.7%) | 179 (24.3%) | 0.03 | 11,968 (19.0%) | 78 (16.7%) | 0.06 |
| Osteoporosis | *68-72 | *1-5 | >0.1 | 753 - 757 | 162 - 166 | <0.1 | 1,060 (13.1%) | 170 (12.3%) | 0.02 | 2,387 (16.0%) | 214 (14.5%) | 0.04 | 5,208 (19.8%) | 265 (20.0%) | 0.00 | 10,355 (23.8%) | 247 (22.5%) | 0.03 | 16,217 (28.6%) | 195 (26.5%) | 0.05 | 20,035 (31.9%) | 128 (27.4%) | 0.10 |
| Depression | 382 (29.8%) | 69 (29.5%) | 0.01 | 2,948 (33.3%) | 593 (28.9%) | 0.10 | 2,762 (34.0%) | 413 (29.8%) | 0.09 | 4,478 (30.1%) | 457 (31.0%) | 0.02 | 7,298 (27.8%) | 435 (32.8%) | 0.11 | 10,816 (24.8%) | 377 (34.3%) | 0.21 | 12,555 (22.1%) | 249 (33.8%) | 0.26 | 11,251 (17.9%) | 135 (28.8%) | 0.26 |
| Gastrointestinal disease | 187 (14.6%) | 43 (18.4%) | 0.10 | 1,581 (17.9%) | 418 (20.4%) | 0.06 | 1,609 (19.8%) | 302 (21.8%) | 0.05 | 3,216 (21.6%) | 341 (23.2%) | 0.04 | 5,898 (22.4%) | 298 (22.4%) | 0.00 | 9,998 (22.9%) | 254 (23.1%) | 0.00 | 13,473 (23.8%) | 175 (23.8%) | 0.00 | 15,851 (25.2%) | 94 (20.1%) | 0.12 |
| Allergies | 288 (22.4%) | 51 (21.8%) | 0.02 | 1,814 (20.5%) | 467 (22.7%) | 0.06 | 1,724 (21.2%) | 274 (19.8%) | 0.04 | 2,983 (20.0%) | 301 (20.4%) | 0.01 | 5,348 (20.3%) | 262 (19.7%) | 0.02 | 9,381 (21.5%) | 215 (19.6%) | 0.05 | 12,053 (21.3%) | 123 (16.7%) | 0.12 | 13,953 (22.2%) | 93 (19.9%) | 0.06 |
| Cerebrovascular accident | 176 (13.7%) | 17 (7.3%) | 0.21 | 2,097 (23.7%) | 252 (12.3%) | 0.30 | 1,955 (24.1%) | 151 (10.9%) | 0.35 | 3,194 (21.4%) | 196 (13.3%) | 0.22 | 5,218 (19.9%) | 195 (14.7%) | 0.14 | 8,260 (19.0%) | 162 (14.8%) | 0.11 | 10,277 (18.1%) | 99 (13.5%) | 0.13 | 10,336 (16.4%) | 65 (13.9%) | 0.07 |
| Hypothyroidism | 136 (10.6%) | 30 (12.8%) | 0.07 | 1,067 (12.1%) | 300 (14.6%) | 0.08 | 989 (12.2%) | 247 (17.8%) | 0.16 | 1,956 (13.1%) | 266 (18.1%) | 0.14 | 3,995 (15.2%) | 267 (20.1%) | 0.13 | 7,394 (17.0%) | 233 (21.2%) | 0.11 | 10,910 (19.2%) | 154 (20.9%) | 0.04 | 13,613 (21.6%) | 101 (21.6%) | 0.00 |
| Other cardiovascular disease | *51-55 | *1-5 | >0.1 | 674 - 678 | 142 - 146 | <0.1 | 966 (11.9%) | 106 (7.6%) | 0.14 | 1,999 (13.4%) | 132 (9.0%) | 0.14 | 4,002 (15.2%) | 160 (12.0%) | 0.09 | 7,720 (17.7%) | 172 (15.7%) | 0.06 | 11,269 (19.9%) | 106 (14.4%) | 0.15 | 13,101 (20.8%) | 69 (14.7%) | 0.16 |
| Emphysema | 61 (4.8%) | 20 (8.5%) | 0.15 | 1,169 (13.2%) | 493 (24.0%) | 0.28 | 1,428 (17.6%) | 323 (23.3%) | 0.14 | 2,661 (17.9%) | 322 (21.9%) | 0.10 | 4,591 (17.5%) | 265 (20.0%) | 0.06 | 7,060 (16.2%) | 182 (16.6%) | 0.01 | 8,305 (14.6%) | 90 (12.2%) | 0.07 | 8,215 (13.1%) | 51 (10.9%) | 0.07 |
| Arteriosclerotic heart disease | 52 (4.1%) | 6 (2.6%) | 0.08 | 762 (8.6%) | 127 (6.2%) | 0.09 | 949 (11.7%) | 115 (8.3%) | 0.11 | 2,059 (13.8%) | 139 (9.4%) | 0.14 | 3,790 (14.4%) | 145 (10.9%) | 0.11 | 6,724 (15.4%) | 132 (12.0%) | 0.10 | 9,257 (16.3%) | 98 (13.3%) | 0.09 | 10,528 (16.7%) | 59 (12.6%) | 0.12 |
| Alzheimer's | *28-32 | *1-5 | * | 667 - 671 | 46 - 50 | >0.1 | 924 (11.4%) | 52 (3.8%) | 0.29 | 2,289 (15.4%) | 85 (5.8%) | 0.32 | 4,678 (17.8%) | 133 (10.0%) | 0.23 | 7,661 (17.6%) | 127 (11.6%) | 0.17 | 8,910 (15.7%) | 97 (13.2%) | 0.07 | 6,956 (11.1%) | 63 (13.5%) | 0.07 |
| Anemia | 122 (9.5%) | 15 (6.4%) | 0.12 | 895 (10.1%) | 240 (11.7%) | 0.05 | 963 (11.9%) | 193 (13.9%) | 0.06 | 1,763 (11.8%) | 222 (15.1%) | 0.10 | 3,340 (12.7%) | 196 (14.8%) | 0.06 | 5,808 (13.3%) | 187 (17.0%) | 0.10 | 8,221 (14.5%) | 102 (13.9%) | 0.02 | 10,080 (16.0%) | 79 (16.9%) | 0.02 |
| Congestive heart failure | 46 (3.6%) | 6 (2.6%) | 0.06 | 580 (6.6%) | 111 (5.4%) | 0.05 | 700 (8.6%) | 79 (5.7%) | 0.11 | 1,408 (9.5%) | 121 (8.2%) | 0.04 | 2,744 (10.4%) | 122 (9.2%) | 0.04 | 5,403 (12.4%) | 114 (10.4%) | 0.06 | 8,501 (15.0%) | 89 (12.1%) | 0.09 | 11,875 (18.9%) | 71 (15.2%) | 0.10 |
| Anxiety disorder | 169 (13.2%) | 41 (17.5%) | 0.12 | 1,313 (14.8%) | 371 (18.1%) | 0.09 | 1,193 (14.7%) | 254 (18.3%) | 0.10 | 2,245 (15.1%) | 249 (16.9%) | 0.05 | 3,556 (13.5%) | 223 (16.8%) | 0.09 | 5,263 (12.1%) | 161 (14.7%) | 0.08 | 6,168 (10.9%) | 98 (13.3%) | 0.08 | 6,286 (10.0%) | 68 (14.5%) | 0.14 |
| Renal failure | 102 (8.0%) | 6 (2.6%) | 0.24 | 751 (8.5%) | 135 (6.6%) | 0.07 | 800 (9.9%) | 102 (7.4%) | 0.09 | 1,492 (10.0%) | 131 (8.9%) | 0.04 | 2,809 (10.7%) | 127 (9.6%) | 0.04 | 4,859 (11.2%) | 120 (10.9%) | 0.01 | 7,097 (12.5%) | 79 (10.7%) | 0.06 | 8,290 (13.2%) | 47 (10.0%) | 0.10 |
| Cancer | 45 (3.5%) | 10 (4.3%) | 0.04 | 599 (6.8%) | 92 (4.5%) | 0.10 | 670 (8.3%) | 105 (7.6%) | 0.03 | 1,479 (9.9%) | 111 (7.5%) | 0.09 | 2,840 (10.8%) | 126 (9.5%) | 0.04 | 4,942 (11.3%) | 104 (9.5%) | 0.06 | 6,667 (11.8%) | 65 (8.8%) | 0.10 | 7,314 (11.6%) | 47 (10.0%) | 0.05 |
| Cataracts | *30-34 | *1-5 | * | 347 - 351 | 94 - 98 | <0.1 | 537 (6.6%) | 93 (6.7%) | 0.00 | 1,168 (7.8%) | 117 (7.9%) | 0.00 | 2,620 (10.0%) | 114 (8.6%) | 0.05 | 4,621 (10.6%) | 116 (10.6%) | 0.00 | 6,301 (11.1%) | 91 (12.4%) | 0.04 | 7,764 (12.3%) | 61 (13.0%) | 0.02 |
| Cardiac dysrhythmias | 16 (1.2%) | 0 (0.0%) | 0.16 | 190 (2.1%) | 25 (1.2%) | 0.07 | 275 (3.4%) | 28 (2.0%) | 0.08 | 538 (3.6%) | 41 (2.8%) | 0.05 | 1,288 (4.9%) | 43 (3.2%) | 0.08 | 2,726 (6.3%) | 39 (3.6%) | 0.13 | 4,203 (7.4%) | 41 (5.6%) | 0.08 | 5,063 (8.1%) | 27 (5.8%) | 0.09 |
| Peripheral vascular disease | *46-50 | *1-5 | * | 548 - 552 | 74 - 78 | >0.1 | 617 (7.6%) | 40 (2.9%) | 0.21 | 1,030 (6.9%) | 65 (4.4%) | 0.11 | 1,565 (6.0%) | 50 (3.8%) | 0.10 | 2,533 (5.8%) | 40 (3.6%) | 0.10 | 3,147 (5.5%) | 20 (2.7%) | 0.14 | 3,276 (5.2%) | 13 (2.8%) | 0.12 |

Data are median (IQR) or No. (%).

CHESS, Changes in Health, End-Stage Disease and Symptoms and Signs; SCZ, schizophrenia; Std Diff, standardized difference

# Chapter 5: Transfers to Emergency Departments

## Preface

This chapter contains component article one addressing objective two, titled "Emergency Department Transfers among Long-Term Care Home Residents Living with Schizophrenia in Ontario, Canada". It was prepared for submission in the Journal of the American Medical Directors Association (JAMDA).

Samuel Tiukuvaara was the primary author was responsible for all aspects of its development including conceptualization, methodology, statistical analysis, interpretation of results, and manuscript writing. Drs. Jess Fiedorowicz, Colleen Webber, and Steven Hawken provided guidance and oversight throughout the process.

The research presented in this chapter was approved as part of the thesis proposal submitted to the School of Epidemiology and Public Health at the University of Ottawa in June 2024. An ICES privacy impact assessment was approved as a prerequisite for accessing the required data. The use of the data in this project is authorized under section 45 of Ontario's Personal Health Information Protection Act (PHIPA) and did not require review by a Research Ethics Board.

# JAMDA Title Page

## Title

Emergency Department Transfers among Long-Term Care Home Residents Living with Schizophrenia in Ontario, Canada

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## Running Title

ED Transfers among LTC Home Residents Living with Schizophrenia

## Keywords

Schizophrenia, nursing home, health services needs and demand, aging

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## Brief Summary

Schizophrenia was not associated with the rate of transfers from a long-term care home to an emergency department, including for ambulatory care sensitive conditions.

# Abstract

## Objective

Long-term care (LTC) residents living with schizophrenia have health statuses and needs that may impact their acute care use. We compared the rate of emergency department (ED) transfers for residents living with versus without schizophrenia.

## Design

Retrospective cohort study.

## Settings and Participants

Individuals admitted to LTC in Ontario between 2012 and 2023.

## Methods

Resident Assessment Instrument–Minimum Data Set 2.0 assessments were linked to emergency department records. Schizophrenia was identified using health records. Negative binomial regression modeled the rate of ED transfer (all-cause and for ambulatory care sensitive conditions [ACSC]) in the year following LTC admission.

## Results

We identified 231,325 residents with 99,035 ED transfers in the year following admission. There were 8,774 (3.8%) residents living with schizophrenia. The crude ED transfer rate for residents living with versus without schizophrenia was similar (0.63 vs. 0.61 per person-year), including for ACSC ED transfers (0.11 vs. 0.10 per person-year) and

non-ACSC ED transfers (0.52 vs. 0.51 per person-year). In multivariable regression, schizophrenia was not significantly associated with ED transfers (incidence rate ratio [IRR] 0.96, 95% confidence interval [CI] 0.92–1.01), ACSC ED transfers (IRR 1.02, 95% CI 0.93–1.13), or non-ACSC ED transfers (IRR 0.95, 95% CI 0.90–1.00). While the most frequent ED diagnoses were similar between groups, residents with schizophrenia were more frequently diagnosed with chronic obstructive pulmonary diseases, schizophrenia, and signs and symptoms involving emotional state.

## Conclusion and Implications

Our findings suggest LTC is supporting residents living with schizophrenia, but access to mental health care may be improved.

## Introduction

Schizophrenia is a serious and persistent mental illness (SPMI) that affects thinking, perception, self-experience, cognition, volition, affect, and behavior.[1] Individuals living with schizophrenia are at increased risk of admission to long-term care (LTC) homes, also known as nursing homes, and tend to enter at an earlier age than individuals living without schizophrenia.[2–5] For example, schizophrenia prevalence in Canadian LTC homes is 4%[6] compared to 1% in the general population.[7] This difference is thought to result from both the growing population of older individuals living with schizophrenia[8] and insufficient community-based housing and psychiatric care.[9] While LTC is designed to provide 24-h nursing and personal care for persons who require assistance with activities of daily living (ADL) and often have complex health needs, it may lack resources and expertise to support residents living with SPMIs such as staff knowledge of SPMIs and opportunities to meaningful engage in life.[9–12]

LTC capacity to support residents living with schizophrenia may be assessed by their frequency of emergency department (ED) transfers. When possible, it is preferable to manage conditions within the LTC home to align with residents' preferences[13] and avoid the negative impacts of ED transfers, such as iatrogenic complications and health decline,[14] financial cost,[15] and strain on emergency services.[16] However, ED transfers become necessary when residents' needs exceed the capabilities of LTC. In Ontario, ED transfer risk is highest during the first three months following LTC admission,[17] and among those who experience a transfer, half have a repeat transfers within the first year.[18] Factors

associated with an ED transfer include resident demographic characteristics, comorbidities, impaired ADLs, presence of advance directives, and LTC home characteristics.[19] In Canada, mental illnesses have been associated with fewer ED transfers despite similar physical comorbidities.[20] Conversely, schizophrenia specifically has been associated with 1.14-increase in ED transfers during the last year of life in Ontario, potentially because of inadequate access to treatment earlier in life.[21]

Half of ED transfers may be unnecessary, although it is challenging to determine "necessary".[14] One approach is to identify ED diagnoses that could have been managed with timely care within LTC, termed "ambulatory care sensitive conditions" (ACSCs).[22] The frequency of ACSC ED transfers has been utilized as a quality-of-care indicator, given LTC focuses on primary care and chronic disease management.[23] Schizophrenia has received limited attention in this context despite potentially influencing ACSC and non-ACSC ED transfer risk. For example, residents living with schizophrenia are generally healthier than other residents,[2,4] a factor that decreases ED transfer risk. Conversely, limited staff knowledge of schizophrenia may lead to misinterpretation of symptoms as medical emergencies and escalation to an ED. Existing literature has examined hospitalizations, rather than ED transfers, with mixed findings: schizophrenia has been associated with ACSC hospitalizations[24,25] but not nonavoidable or overall hospitalizations.[23,25] Examining ED transfers would capture more instances of acute care use because not all ED transfers result in hospitalization, but virtually all hospitalizations begin with an ED assessment.

The capacity of LTC to support residents living with schizophrenia is unclear due to perceived challenges and the paucity of studies. Residents living with schizophrenia

deserve quality care and LTC homes must be adequately supported to provide it. This study compared the ED transfer rate for Ontario LTC residents living with versus without schizophrenia in the year following LTC admission. We compared overall ED transfer rates, as well as transfers for ACSCs and non-ACSCs separately. Non-ACSC ED transfers may indicate acute medical issues that exceed the scope of LTC homes, while ACSC ED transfers may indicate the quality and timeliness of primary care and chronic disease management. We hypothesized residents living with schizophrenia would have a higher rate of ED transfers because of challenges co-managing mental and other medical illnesses. These findings will inform better care planning for LTC residents living with schizophrenia.

## Methods

This study is reported in accordance with the REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) reporting guideline.[26]

### Study Design and Population

We conducted a retrospective cohort study of all individuals newly admitted to Ontario LTC homes between April 1st, 2012, and March 31st, 2023. Ontario has a publicly funded insurance plan that covers medically necessary care[27] and Ontarians are generally eligible for LTC if they are ≥ 18 years old and require frequent nursing care, assistance with ADLs, or on-site monitoring that cannot be provided in the community.[28] Individuals were excluded if they could not be linked to the Registered Persons Database, had a death date recorded on or before their LTC admission date, were aged < 18 years or ≥ 105 years on

their LTC admission date, or were admitted for respite or convalescent care. Residents were followed for 365 days following LTC admission or until LTC discharge or death, whichever occurred first. Those who re-entered LTC within 30 days of discharge were classified as continuously admitted.

## Data Sources

Data was obtained through ICES, an independent nonprofit research institute which collects and analyzes health administrative data for the purpose of health system evaluation, planning, and management. Most resident characteristics were captured via Resident Assessment Instrument Minimum Data Set (RAI-MDS) 2.0 admission assessments in the Continuing Care Reporting System. RAI-MDS 2.0 assessments are standardized assessment and screening tools mandated for all LTC residents within 14 days of admission, quarterly, and following significant changes in resident status.[29] Additional data were captured from the Discharge Abstract Database, National Ambulatory Care Reporting System, Ontario Health Insurance Plan Claims Database, and Ontario Mental Health Reporting System (datasets are described in **Supplementary Table 1**). These datasets were linked using unique encoded identifiers and analyzed at ICES.

## Exposure

Residents were identified as living with schizophrenia if they had ≥ 3 outpatient physician billings with a diagnosis of schizophrenia on the billing claims within a three-year period or ≥ 1 hospital record in the Discharge Abstract Database or Ontario Mental Health Reporting System with a schizophrenia diagnosis on the discharge record (see codes in

**Supplementary Table 2**). This algorithm has a sensitivity of 96.5% and a specificity of 57.1% in individuals with mental illnesses.[30] However, the algorithm accuracy is impacted if the relative mix of true schizophrenia and other mental illnesses often misclassified as schizophrenia changes (e.g., specificity potentially greater in LTC settings).

## Outcomes

The number of ED transfers during the follow-up period was captured from the National Ambulatory Care Reporting System. ED diagnoses were identified using the ICD-10-CA code for the main problem, defined as the problem considered by ED health care providers to be the most clinically significant reason for the visit that requires evaluation, treatment, or management.[31] ED transfer reasons were flagged as an ACSC, as identified in **Supplementary Table 3**.

Length of follow-up was calculated as the number of days from the LTC admission date to the last date of follow-up, excluding the number of days hospitalized captured from the Discharge Abstract Database and Ontario Mental Health Reporting System.

## Cohort Characteristics and Covariates

Age and sex were captured from the Registered Persons Database. Age was categorized as 18 – 49 years, 50 – 64 years, 65 – 69 years, 70 – 79 years, 80 – 84 years, 85 – 89 years, and 90 – 105 years. Marital status, highest level of education attained, Cognitive Performance Scale (scores range from 0-6), Activities of Daily Living Self-Performance Hierarchy (scores range from 0-6), Changes in Health, End-Stage Disease and Symptoms and Signs Scale (CHESS; scores range from 0-5), comorbidities, number of medications,

and presence of advance directives (i.e., do not resuscitate order and do not hospitalize order) were captured from RAI-MDS 2.0 admission assessments. Higher scores on the clinical outcome scales indicate greater impairment or health instability. LTC home urbanicity and number of beds were captured from the Continuing Care Reporting System. Codes used to classify cohort characteristics are detailed in **Supplementary Table 4**.

## Statistical Analysis

Descriptive statistics (i.e., means, standard deviations, medians, and interquartile ranges for continuous variables and proportions for categorical variables) were calculated to describe characteristics of residents living with and without schizophrenia. To assess the magnitude of differences between groups, standardized differences were calculated for each comparison and a threshold of ≥ 0.1 was utilized to indicate a meaningful difference.[32]

ED transfers were examined in three categories: (1) overall, (2) for ACSCs, and (3) for non-ACSCs. Crude ED transfer rates were calculated by dividing the total number of ED transfers by the total person-years of follow-up for the whole study population and stratified by schizophrenia status. Poisson regression was initially used to estimate the association between schizophrenia and ED transfer rates. However, evidence of overdispersion indicated by deviance-to degrees-of-freedom-ratios greater than one led to the use of negative binomial regression instead (see **Supplementary Table 5**). All models included an offset term to account for each resident's length of follow-up and adjusted for the confounding variables age (reference: ≥ 90 years), sex (reference: male), fiscal year of

admission (reference: 2022 - 2023), and the number of beds in the LTC home (reference: < 50 beds). Health-related variables were not included in the models, as they were considered mediators of the relationship between schizophrenia and ED transfers (i.e., likely a result of schizophrenia and on the casual pathway between schizophrenia and ED transfer).[33]

The ten most frequent ED diagnoses identified by three-character ICD-10-CA codes were tabulated by schizophrenia status.

Data preparation and analyses were performed using SAS, version 9.4 (SAS Institute, Cary NC). Smalls cells (i.e., < 6 observations) were suppressed in accordance with ICES policy to reduce the risk of individual identification.

## Results

The final study population included 231,325 residents, of whom 8,774 (3.8%) were living with schizophrenia (see **Figure 1**). Residents living with schizophrenia were younger (median age 72 years versus 85 years) and less likely to be married (15.6% versus 31.5%). They had a lower prevalence of hypertension, dementia, cerebrovascular accident, and congestive heart failure and a higher prevalence of diabetes mellitus and emphysema. More had lower CHESS scores. Function was more intact in residents living with schizophrenia, reflected on the Cognitive Performance Scale by more “borderline intact” scores (15.4% versus 10.3%) and on the ADL Self-Performance Hierarchy by more “supervision” scores (8.4% versus 5.5%) and fewer “extensive 2” scores (17.9% versus 24.0%). More medications were administered to residents living with schizophrenia

(median 10 versus 10). Fewer residents living with schizophrenia had "Do Not Resuscitate" (48.1% versus 69.4%) and "Do Not Hospitalize" orders (18.0% versus 25.9%). Additional characteristics are detailed in **Table 1**.

A greater proportion of residents living with schizophrenia remained in LTC at the end of follow-up (57.2% versus 51.9%), driven by fewer deaths (7.6% versus 15.8%) rather than LTC discharge (35.2% versus 32.2%). The median follow-up time was 365 days for residents living with schizophrenia (IQR 153 – 365 days) and without schizophrenia (IQR 114 – 365 days).

There were 99,035 ED transfers in the year following admission, of which 16,151 (16.3%) were for ACSCs. Most residents (71.4%) did not have an ED transfer, but among those who did, 58.0% had more than one (Figure 2). The crude rate of ED transfers was 0.61 per person-year overall, 0.10 per person-year for ACSCs, and 0.51 per person-year for non-ACSCs. The crude ED transfer rates were similar between residents living with versus without schizophrenia (see **Table 2**).

Schizophrenia was not associated with the number of ED transfers in the year following LTC admission in our crude or adjusted models, either overall (adjusted incidence rate ratio [aIRR] 0.96, 95% confidence interval [CI] 0.92 – 1.01), for ACSCs (aIRR 1.02, 95% CI 0.93 – 1.13), or for non-ACSCs (aIRR 0.95, 95% CI 0.90 – 1.00). See **Table 3** and **Supplementary Table 6** for details.

The ten most frequent ED diagnoses among residents living with versus without schizophrenia (see **Table 4**) were similar and included ICD-10-CA codes related to the

urinary system, pneumonia, chest or abdominal pain, head injuries, and cognitive impairment. However, some ED diagnoses were unique to each group. Residents living with schizophrenia had higher frequencies of diagnoses related to chronic obstructive pulmonary diseases, schizophrenia, and disturbances in emotional state (e.g., restlessness and agitation, unhappiness, and hostility). In contrast, residents living without schizophrenia more frequently had diagnoses related to anemia, heart failure, and dementia. The ten most frequent ED diagnoses accounted for 29.2% of ED diagnoses for residents living with schizophrenia and 29.9% of ED diagnoses for residents living without schizophrenia.

## Discussion

Our study found 28.6% of Ontario LTC home residents were transferred to an ED in the year following LTC admission. The rates of overall, ACSC, and non-ACSC ED transfers were 0.61, 0.10, and 0.51 per person-year, respectively. Schizophrenia was not significantly associated with ED transfer rate. The ten most frequent ED diagnoses were similar between residents living with versus without schizophrenia. However, chronic obstructive pulmonary diseases, schizophrenia, and symptoms and signs involving emotional state were more common among residents living with schizophrenia, whereas anemias, heart failure, and dementia were more common among those without schizophrenia.

We unexpectedly observed that ED transfer rates and frequent ED diagnoses were remarkably similar between residents living with versus without schizophrenia despite

differences in their sociodemographic and health characteristics. Several factors could have contributed to a *lower* ED transfer rate among residents living with schizophrenia, including their seemingly more intact general medical status (e.g., fewer documented comorbidities and less functional impairment) and decreased contact with family and friends who might otherwise notice and escalate concerns requiring ED transfer.[34] However, the apparently better health status may have been spurious, as individuals living with schizophrenia often experience underdetection and undertreatment of comorbidities,[35] which could mask true differences in health needs. Conversely, several factors could have contributed to a higher ED transfer rate among residents living with schizophrenia, such as the challenges of comanaging schizophrenia with other health conditions (e.g., differentiating overlapping symptoms and coordinating care across multiple providers) and a lower prevalence of advance directives (e.g., do-not-hospitalize orders).

The similar ED transfer rates among residents living with schizophrenia to other residents suggest their initial health needs are being managed with existing LTC resources with similar quality and timeliness. This contrasts the previous finding of increased ED transfers among residents living with schizophrenia during the last year of life in LTC,[21] suggesting a different trajectory in their health and needs compared to other residents over time, which warrants further investigation. Our findings, while reassuring, have not been examined elsewhere and do not necessarily indicate that residents living with schizophrenia are receiving high-quality care, a concept that is nuanced and encompasses not only safety and effectiveness but also holistic and person-centered dimensions.[36] Prior

LTC studies examining quality of care have found that schizophrenia is associated with greater receipt of antipsychotic medication [37,38] and psychiatric care[39–41] but lower receipt of other medications,[42–45] pain treatment,[43,44] and some specialist services.[46] More broadly, opportunities for LTC delivery improvement remain, as access to diagnostic testing and same-day physician assessment is limited in most LTC homes in Ontario.[47,48]

Access to mental health care is a need highlighted by more frequent ED diagnoses of schizophrenia and symptoms and signs involving emotional state, although the absolute rate of 3.5% was low. Schizophrenia has been previously shown to be associated with increased mental health-related ED transfers during the last year of life in LTC.[21] In Ontario, initial psychiatrist consultations for LTC residents tend to be delivered in LTC, while follow-up care is delivered outside LTC and virtual care is infrequent.[41] This approach poses logistical challenges, particularly for acute needs, as appointments and transportation need to be scheduled in advance. Additionally, only 11.3% of residents living with schizophrenia receive psychiatric services within 90 days of admission.[41] It may be that LTC becomes the primary provider of mental health care for individuals living with schizophrenia following admission. This has been observed in the United States, where 67.1% of residents living with SPMIs (i.e., bipolar disorder, schizophrenia, and other psychotic disorders) ceased receiving psychiatric care following admission.[46] To address this care gap, it is important to improve access to external psychiatric services and/or the capacity of LTC to deliver mental health care with the support of the province. The latter is urgent as the number of LTC registered psychiatric nurses in Canada has declined by 42.5% in the last decade.[49]

Key strengths of our study were the capture of the entire Ontario LTC population and their ED transfers, a one-year follow-up period offering a longer-term perspective compared to the 90-day follow-up commonly used in studies, and a modeling approach that accounted for all ED transfers during the follow-up period. Our study had two notable limitations inherent to research using administrative data. First, the schizophrenia ascertainment algorithm is prone to false positive, so the findings for ED transfer rates may have been biased towards null. Second, LTC's reasons for ED transfer were not captured in our health administrative data, which would have been informative to identify what needs exceeded LTC as only 47.5% of ED diagnoses align with a LTC's reasons for transfer.[50]

## Conclusions and Implications

The absence of a significant association between schizophrenia and ED transfer rates, along with similarities in ED diagnoses, suggest LTC is supporting the health needs of residents living with schizophrenia. These results may enhance LTC operators' confidence in admitting individuals with schizophrenia with respect to level of care needed and resource intensity. However, improving access to mental health care is important to supporting all care needs for this population.

## Disclosures and Acknowledgements

No conflicts of interest.

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## Tables and Figures

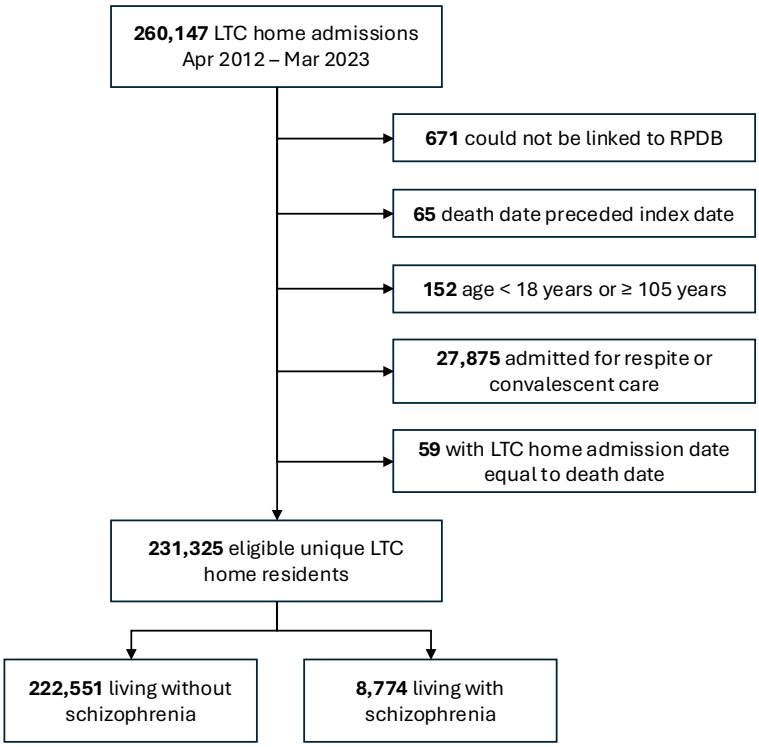


**Figure 1.** Flow diagram of cohort selection.

**Table 1**

Baseline characteristics

| Characteristic | Total | No Schizophrenia | Schizophrenia | Standardized Difference |
|---|---|---|---|---|
| Age | 85 (78-90) | 85 (79-90) | 72 (64-80) | 1.15 |
| Age category | | | | |
| 18 – 49 | 1,517 (0.7%) | 1,283 (0.6%) | 234 (2.7%) | 0.17 |
| 50 - 64 | 10,904 (4.7%) | 8,851 (4.0%) | 2,053 (23.4%) | 0.59 |
| 65 – 69 | 9,504 (4.1%) | 8,119 (3.6%) | 1,385 (15.8%) | 0.42 |
| 70 – 74 | 16,363 (7.1%) | 14,891 (6.7%) | 1,472 (16.8%) | 0.32 |
| 75 - 79 | 27,606 (11.9%) | 26,278 (11.8%) | 1,328 (15.1%) | 0.10 |
| 80 – 84 | 44,648 (19.3%) | 43,550 (19.6%) | 1,098 (12.5%) | 0.19 |
| 85 – 89 | 57,447 (24.8%) | 56,711 (25.5%) | 736 (8.4%) | 0.47 |
| ≥ 90 | 63,336 (27.4%) | 62,868 (28.2%) | 468 (5.3%) | 0.64 |
| Female sex | 145,053 (62.7%) | 139,828 (62.8%) | 5,225 (59.6%) | 0.07 |
| Marital status | | | | |
| Never married | 17,051 (7.4%) | 14,200 (6.4%) | 2,851 (32.5%) | 0.70 |
| Married | 71,406 (30.9%) | 70,039 (31.5%) | 1,367 (15.6%) | 0.38 |
| Previously married | 135,489 (58.6%) | 131,473 (59.1%) | 4,016 (45.8%) | 0.270 |
| Missing | 7,379 (3.2%) | 6,839 (3.1%) | 540 (6.2%) | 0.15 |
| Education | | | | |
| None | 2,381 (1.0%) | 2,254 (1.0%) | 127 (1.4%) | 0.04 |
| ≤ Highschool | 87,179 (37.7%) | 84,116 (37.8%) | 3,063 (34.9%) | 0.06 |
| > Highschool | 40,159 (17.4%) | 38,868 (17.5%) | 1,291 (14.7%) | 0.08 |
| Missing | 101,606 (43.9%) | 97,313 (43.7%) | 4,293 (48.9%) | 0.10 |
| Cognitive Performance Scale | | | | |
| Intact | 20,410 (8.8%) | 19,623 (8.8%) | 787 (9.0%) | 0.01 |
| Borderline Intact | 24,185 (10.5%) | 22,835 (10.3%) | 1,350 (15.4%) | 0.15 |
| Mild Impairment | 52,677 (22.8%) | 50,712 (22.8%) | 1,965 (22.4%) | 0.01 |
| Moderate Impairment | 88,229 (38.1%) | 84,996 (38.2%) | 3,233 (36.8%) | 0.03 |
| Moderate Severe Impairment | 21,453 (9.3%) | 20,741 (9.3%) | 712 (8.1%) | 0.04 |

| | | | | |
|---|---|---|---|---|
| Severe Impairment | 18,453 (8.0%) | 17,920 (8.1%) | 533 (6.1%) | 0.08 |
| Very Severe Impairment | 5,918 (2.6%) | 5,724 (2.6%) | 194 (2.2%) | 0.02 |
| ADL Self-Performance Hierarchy Scale | | | | |
| Independent | 5,542 (2.4%) | 5,229 (2.3%) | 313 (3.6%) | 0.07 |
| Supervision | 13,043 (5.6%) | 12,306 (5.5%) | 737 (8.4%) | 0.11 |
| Limited | 32,642 (14.1%) | 31,177 (14.0%) | 1,465 (16.7%) | 0.08 |
| Extensive 1 | 68,737 (29.7%) | 65,935 (29.6%) | 2,802 (31.9%) | 0.05 |
| Extensive 2 | 54,897 (23.7%) | 53,329 (24.0%) | 1,568 (17.9%) | 0.15 |
| Dependent | 47,842 (20.7%) | 46,232 (20.8%) | 1,610 (18.3%) | 0.06 |
| Total Dependence | 8,622 (3.7%) | 8,343 (3.7%) | 279 (3.2%) | 0.03 |
| CHESS | | | | |
| 0 | 109,473 (47.3%) | 104,343 (46.9%) | 5,130 (58.5%) | 0.23 |
| 1 | 79,628 (34.4%) | 77,020 (34.6%) | 2,608 (29.7%) | 0.11 |
| 2 | 31,326 (13.5%) | 30,507 (13.7%) | 819 (9.3%) | 0.14 |
| 3 | 8,322 (3.6%) | 8,161 (3.7%) | 161 (1.8%) | 0.11 |
| 4 | 2,185 (0.9%) | 2,135 (1.0%) | 50 (0.6%) | 0.05 |
| 5 | 391 (0.2%) | 385 (0.2%) | 6 (0.1%) | 0.03 |
| Comorbidities | | | | |
| Hypertension | 149,667 (64.7%) | 145,176 (65.2%) | 4,491 (51.2%) | 0.29 |
| Dementia | 142,112 (61.4%) | 138,430 (62.2%) | 3,682 (42.0%) | 0.41 |
| Diabetes Mellitus | 62,071 (26.8%) | 59,164 (26.6%) | 2,907 (33.1%) | 0.14 |
| Emphysema | 35,227 (15.2%) | 33,482 (15.0%) | 1,745 (19.9%) | 0.13 |
| Cerebrovascular Accident | 42,636 (18.4%) | 41,499 (18.6%) | 1,137 (13.0%) | 0.16 |
| Congestive heart failure | 31,958 (13.8%) | 31,245 (14.0%) | 713 (8.1%) | 0.19 |
| Number of Medications | 10 (7-13) | 10 (7-13) | 10 (7-14) | 0.14 |
| Do not resuscitate order | | | | |
| No | 58,929 (25.5%) | 54,991 (24.7%) | 3,938 (44.9%) | 0.43 |
| Yes | 158,570 (68.5%) | 154,353 (69.4%) | 4,217 (48.1%) | 0.44 |

| | | | | |
|---|---|---|---|---|
| Missing | 13,826 (6.0%) | 13,207 (5.9%) | 619 (7.1%) | 0.05 |
| Do not hospitalize order | | | | |
| No | 157,046 (67.9%) | 150,500 (67.6%) | 6,546 (74.6%) | 0.16 |
| Yes | 59,313 (25.6%) | 57,731 (25.9%) | 1,582 (18.0%) | 0.19 |
| Missing | 14,966 (6.5%) | 14,320 (6.4%) | 646 (7.4%) | 0.04 |
| LTC home urbanicity | | | | |
| Urban | 198,437 (85.8%) | 190,633 (85.7%) | 7,804 (88.9%) | < 0.1 |
| Rural | 32,749 (14.2%) | *31780-31784 | *965-969 | < 0.1 |
| Missing | 139 (0.1%) | *134-138 | *1-5 | < 0.1 |
| LTC home number of beds | | | | |
| < 50 | 6,582 (2.8%) | 6,364 (2.9%) | 218 (2.5%) | 0.02 |
| 50 - 99 | 47,329 (20.5%) | 45,637 (20.5%) | 1,692 (19.3%) | 0.03 |
| 100 - 149 | 57,145 (24.7%) | 55,071 (24.7%) | 2,074 (23.6%) | 0.03 |
| ≥ 150 | 120,269 (52.0%) | 115,479 (51.9%) | 4,790 (54.6%) | 0.05 |

Data are median (IQR) or No. (%).

**Table 2**

ED transfer rate (number of transfers per person year) overall and according to schizophrenia status.

| | Overall | ACSC | Non-ACSC |
|---|---|---|---|
| Overall | 0.61 | 0.10 | 0.51 |
| Schizophrenia | | | |
| Yes | 0.63 | 0.11 | 0.52 |
| No | 0.61 | 0.10 | 0.51 |

**Table 3**

Association of schizophrenia with rate of ED transfers in the year following admission to LTC. The adjusted model included covariates for age category (18 – 64 years, 65 – 79 years, 80 – 84 years, 85 – 89 years, and ≥ 90 years), sex, fiscal year of admission, and the number of beds in the LTC home.

| Model | Overall | Ambulatory Care Sensitive Condition | Not Ambulatory Care Sensitive Condition |
|---|---|---|---|
| Crude | 1.03 (1.00 – 1.06) | 1.07 (0.99 – 1.15) | 1.02 (0.99 – 1.06) |
| Adjusted | 0.96 (0.92 – 1.01) | 1.02 (0.93 – 1.13) | 0.95 (0.90 – 1.00) |

**Table 4**

The most frequent emergency room diagnoses identified by three-character ICD-10-CA codes and stratified by schizophrenia status. ED diagnoses qualifying or potentially qualifying as ACSCs are bolded.

| Schizophrenia | | | No Schizophrenia | | |
|---|---|---|---|---|---|
| Code | Descriptor | Frequency | Code | Descriptor | Frequency |
| **N39** | **Other disorders of the urinary system** | **188 (4.6%)** | **N39** | **Other disorders of the urinary system** | **5,106 (5.4%)** |
| R07 | Pain in throat and chest | 144 (3.5%) | S01 | Open wound of head | 4,996 (5.3%) |
| **J44** | **Other chronic obstructive pulmonary disease** | **138 (3.4%)** | S09 | Other and unspecified injuries of the head | 3,487 (3.7%) |
| **J18** | **Pneumonia, organism unspecified** | **133 (3.3%)** | **J18** | **Pneumonia, organism unspecified** | **3,267 (3.4%)** |
| S01 | Open wound of head | 133 (3.3%) | R07 | Pain in throat and chest | 2,657 (2.8%) |
| R10 | Abdominal and pelvic pain | 111 (2.7%) | D64 | Other anaemias | 2,032 (2.1%) |
| S09 | Other and unspecified injuries of the head | 105 (2.6%) | R10 | Abdominal and pelvic pain | 1,798 (1.9%) |
| R41 | Other symptoms and signs involving cognitive functions and awareness | 91 (2.2%) | I50 | Heart failure | 1,759 (1.9%) |
| F20 | Schizophrenia | 82 (2.0%) | F03 | Unspecified dementia | 1,652 (1.7%) |
| R45 | Symptoms and signs involving emotional state | 63 (1.5%) | R41 | Other symptoms and signs involving cognitive functions and awareness | 1,649 (1.7%) |
| | Missing | 2 | | Missing | 39 |

## Manuscript Supplement

**Supplementary Table 1**

Description of health administrative data sets utilized. The Ontario Personal Health Information Protection Act allowed personal health information to be utilized without consent for the for the purposes of health system evaluation, planning, and management. The Ontario Coroners Act allowed personal information of deceased individuals for the purpose of research, data analysis, and the compilation of statistical information related to the health and safety of the public.

| Data Set | Description |
|---|---|
| Continuing Care Reporting System | Contains clinical, demographic, and administrative information on residents in residential and hospital-based continuing care facilities (e.g., LTC homes) as well as information on facility characteristics. Data is primarily collected using RAI-MDS 2.0 assessments. |
| Discharge Abstract Database | Contains administrative, clinical and demographic information on acute inpatient facility discharges. Data on patients in adult designated inpatient mental health beds in Ontario were included in this database until October 1st, 2005, after which they were included in OMHRS. |
| National Ambulatory Care Reporting System | Contains demographic, administrative, clinical and service-specific data for hospital-based and community-based ambulatory care (e.g., emergency departments). |
| Ontario Drug Benefit Database | contains medical drug claims and pharmacy and practitioner information. The ODB program provides drug benefits for Ontarians aged ≥ 65 years and certain individuals age < 65 years (e.g., LTC home residents). |
| Ontario Health Insurance Plan Claims Database | Contains data on claims for services provided by health care providers (e.g., medical doctors) including date of service, |

| | |
|---|---|
| | patient served, diagnosis, and service provided. |
| Ontario Mental Health Reporting System | contains data on all individuals receiving adult mental health services in Ontario. Data is collected using the Resident Assessment Instrument Mental Health version 2.0. |

**Supplementary Table 2**

Diagnostic or billing codes used to identify schizophrenia

| Criterion | Code | Dataset |
|---|---|---|
| Outpatient physician billings | 295 | OHIP |
| Hospitalization records | ICD-10-CM codes F20 or F25 | DAD |
| Mental health hospitalization records | Prior to 2016: DSM-IV code 295<br>Between 2016 and March 31st, 2019: DSM-V code 295<br>From April 1st, 2019: ICD-10-CM code F20 and F25 | OMHRS |

DAD, Discharge Abstract Database; OHIP, Ontario Health Insurance Program; OMHRS, Ontario Mental Health Reporting System

**Supplementary Table 3**

Emergency department diagnoses classified as ambulatory care sensitive conditions

| Condition | ICD-10-CA Codes | Exclude |
|---|---|---|
| Angina pectoris | I20, I2382, I240, I248, I249 | Cases with surgical procedure (CCI procedure: 1, 2, 5) |
| Asthma | J45 | |
| Cellulitis | L03 | Cases with surgical procedures (CCI: 1, 2, 5) |
| Chronic obstructive pulmonary disease | J41–J44, J47, J20 (only when "other diagnosis" of J41–J44, J47 is present), J12–J16, J18 (only when "other diagnosis" of J41–J44, J47 is present) | |
| Congestive heart failure | I50, J81 | Cases with surgical procedures (CCI: 1IJ50, 1HZ85, 1IH76, 1HB53, 1HD53, 1HZ53, 1HB55, 1HD55, 1HZ55, 1HB54, 1HD54) |
| Dehydration | E86 | |
| Diabetes mellitus | E101, E106, E107, E109, E110, E111, E116, E117, E119, E130, E131, E136, E137, E139, E140, E141, E146, E147, E149 | |
| Gastroenteritis | K52 | |
| Grand mal seizure disorders | G40, G41 | |
| Hypertension | I100, I101, I11 | Cases with surgical procedures (CCI: 1IJ50, 1HZ85, 1IJ76, 1HB53, 1HD53, 1HZ53, 1HB55, 1HD55, 1HZ55, 1HB54, 1HD54) |
| Hypoglycemia | E162 | |
| Kidney or urinary tract infection | N10, N151, N11, N136, N390 | |
| Pneumonia | J12–J16, J18 | |
| Severe ear, nose, or throat infection | J02, J03, J312 | |

ICD-10-CA, International Statistical Classification of Diseases and Related Health Problems-Tenth Revision-Canada.

**Supplementary Table 4**

Codes used to describe resident and facility characteristics upon LTC admission

| Variable | Code | Dataset | Note |
|---|---|---|---|
| Age | BDATE | RPDB | |
| Sex | SEX | RPDB | |
| Marital status | A5 | CCRS | Categorized as missing, never married, married, and previously married (widowed, separated, or divorced) |
| Education | AB7 | CCRS | Categorized as missing, none, ≤ high school (≤ 8$^{th}$ grade, 9$^{th}$ – 11$^{th}$ grade, or high school), and > high school (technical or trade school, some college, bachelor's degree, or graduate degree) |
| Cognitive Performance Scale | CPS | CCRS | |
| ADL-Self Performance Hierarchy Scale | ADL_HIERARCHY | CCRS | |
| CHESS | CHESS | CCRS | |
| Hypertension | I1H | CCRS | |
| Dementia | I1V or I1R | CCRS | |
| Diabetes mellitus | I1A | CCRS | |
| Emphysema | I1KK | CCRS | |
| Cerebrovascular accident | I1U | CCRS | |
| Congestive heart failure | I1F | CCRS | |
| Number of medications | O1 | CCRS | |
| Do not resuscitate order | A12A | CCRS | |
| Do no hospitalize order | A12B | CCRS | |
| LTC home urbanicity | FAC_URBAN_RURAL_CODE | CCRS | |

| | | | |
|---|---|---|---|
| LTC home number of beds | DESIGNATED_MOH_BEDS | CCRS | Categorized as < 50, 50 – 99, 100 – 149, and ≥ 150 |

CCRS, Continuing Care Reporting System; DAD, Discharge Abstract Database; NACRS, National Ambulatory Care Reporting System; ONMARG, Ontario Marginalization Index; OMHRS, Ontario Mental Health Reporting System; RPDB, Registered Person Database

**Supplementary Table 5**

Model fit statistics for Poisson and negative binomial regression of emergency department transfers. The adjusted models included covariates for age category, sex, fiscal year of admission, and the number of beds in the LTC home.

| Model | Deviance/Degrees Freedom | AIC |
|---|---|---|
| Overall | | |
| Poisson crude | 1.34 | 459,228.8 |
| Poisson adjusted | 1.33 | 455,384.1 |
| Negative binomial crude | 0.76 | 424,721.1 |
| Negative binomial adjusted | 0.76 | 422,319.1 |
| ACSC | | |
| Poisson crude | 0.44 | 131,286.1 |
| Poisson adjusted | 0.43 | 130,062.3 |
| Negative binomial crude | 0.27 | 127,212.8 |
| Negative binomial adjusted | 0.28 | 126,224.6 |
| Not ACSC | | |
| Poisson crude | 1.20 | 404,374.3 |
| Poisson adjusted | 1.18 | 401,552.1 |
| Negative binomial crude | 0.70 | 376,858.9 |
| Negative binomial adjusted | 0.70 | 375,008.6 |

ACSC, ambulatory care sensitive condition; AIC, Akaike Information Criteria.

**Supplementary Table 6**

Negative binomial regression estimates for number of emergency department transfers

| Parameter | Overall | ACSC | Non-ACSC |
|---|---|---|---|
| Intercept | 0.92 (0.87 - 0.98) | 0.12 (0.1 - 0.13) | 0.78 (0.73 - 0.83) |
| Schizophrenia | 0.96 (0.92 – 1.01) | 1.02 (0.93 – 1.13) | 0.95 (0.90 – 1.00) |
| Age | | | |
| 18 – 49 | 1.55 (1.4 - 1.71) | 1.24 (1 - 1.54) | 1.61 (1.44 - 1.79) |
| 50 - 64 | 1.27 (1.22 - 1.33) | 1.25 (1.14 - 1.36) | 1.27 (1.21 - 1.33) |
| 65 – 69 | 1.19 (1.13 - 1.24) | 1.2 (1.09 - 1.32) | 1.18 (1.12 - 1.24) |
| 70 - 74 | 1.08 (1.04 - 1.13) | 1.1 (1.01 - 1.19) | 1.08 (1.03 - 1.12) |
| 75 - 79 | 1.03 (0.99 - 1.06) | 1.07 (1 - 1.14) | 1.02 (0.98 - 1.05) |
| 80 – 84 | 1.03 (1 - 1.05) | 1.06 (1.01 - 1.13) | 1.02 (0.99 - 1.05) |
| 85 – 89 | 1.04 (1.02 - 1.07) | 1.07 (1.01 - 1.13) | 1.04 (1.01 - 1.07) |
| 90 – 105 | 1.00 | 1.00 | 1.00 |
| Female | 0.74 (0.72 - 0.75) | 0.71 (0.69 - 0.74) | 0.75 (0.73 - 0.76) |
| Fiscal year | | | |
| 2012 - 2013 | 1.2 (1.15 - 1.25) | 1.49 (1.38 - 1.62) | 1.14 (1.09 - 1.19) |
| 2013 - 2014 | 1.22 (1.17 - 1.27) | 1.47 (1.35 - 1.59) | 1.17 (1.12 - 1.22) |
| 2014 - 2015 | 1.21 (1.16 - 1.25) | 1.45 (1.33 - 1.57) | 1.16 (1.11 - 1.21) |
| 2015 - 2016 | 1.17 (1.12 - 1.22) | 1.39 (1.27 - 1.51) | 1.12 (1.08 - 1.17) |
| 2016 - 2017 | 1.13 (1.09 - 1.18) | 1.34 (1.23 - 1.45) | 1.09 (1.05 - 1.14) |
| 2017 - 2018 | 1.12 (1.08 - 1.16) | 1.25 (1.15 - 1.36) | 1.09 (1.04 - 1.14) |
| 2018 - 2019 | 1.11 (1.07 - 1.16) | 1.27 (1.17 - 1.38) | 1.08 (1.04 - 1.13) |
| 2019 - 2020 | 0.83 (0.8 - 0.87) | 0.89 (0.81 - 0.97) | 0.81 (0.78 - 0.85) |
| 2020 - 2021 | 0.75 (0.72 - 0.79) | 0.74 (0.67 - 0.83) | 0.75 (0.72 - 0.79) |
| 2021 - 2022 | 0.94 (0.91 - 0.98) | 0.88 (0.81 - 0.96) | 0.95 (0.92 - 0.99) |
| 2022 - 2023 | 1.00 | 1.00 | 1.00 |
| LTC home number of beds | | | |
| < 50 | 1.00 | 1.00 | 1.00 |
| 50 – 99 | 0.91 (0.86 - 0.96) | 1.13 (1.01 - 1.27) | 0.87 (0.82 - 0.92) |

| | | | |
|---|---|---|---|
| 100 – 149 | 0.82 (0.78 - 0.86) | 0.92 (0.82 - 1.03) | 0.8 (0.76 - 0.85) |
| ≥ 150 | 0.79 (0.75 - 0.84) | 0.83 (0.75 - 0.93) | 0.79 (0.75 - 0.83) |
| Dispersion | 6.61 (6.37 - 6.85) | 113.16 (87.09 - 149.32) | 7.19 (6.9 - 7.5) |

ACSC, ambulatory care sensitive condition; LTC, long-term care.

# Chapter 6: Discussion

## Main Findings

We found 3.8% of newly admitted Ontario LTC residents were living with schizophrenia between 2012 and 2022. Schizophrenia prevalence increased following the COVID-19 pandemic onset from 3.6% to 4.4%. Younger residents, and to a lesser extent female residents, had a higher schizophrenia prevalence.

Compared to residents living without schizophrenia, fewer residents living with schizophrenia were married or had contact with family or friends. Both groups reported similar education attainment but more residents living with schizophrenia were missing information on their education attainment. Prior to admission, more residents living with schizophrenia lived in areas that were urban, lower income, and more marginalized. Also, more residents living with schizophrenia were homeless in the prior five years. In terms of entry source, more residents living with schizophrenia were admitted from an inpatient psychiatry service and fewer were admitted from home with or without home care. Despite these differences, both groups were admitted in a similar distribution to LTC homes based on LTC home number of beds although a slightly greater proportion of residents living with schizophrenia were admitted to urban LTC homes.

Health status was overall similar or better for residents living with schizophrenia. They had lower prevalence of most comorbidities except for increased prevalence of diabetes mellitus, anxiety disorders, depression, and emphysema. They also had a lower

estimated risk of mortality measured by the Charlson Comorbidity Index and less health instability measured by the CHESS. Functioning was more intact as measured by the Cognitive Performance Scale and ADL Self-Performance Hierarchy. The frequency of aggressive behaviours, measured by the Aggressive Behaviour Scale, were similar between both groups overall. However, among residents without dementia, those living with schizophrenia had more frequent aggressive behaviours.

Types of healthcare needs differed by schizophrenia status. Residents living with schizophrenia were administered more medications, but fewer required help from staff for locomotion and more were categorized into the lower intensity "behavioural problems" RUG category.

Follow-up data for ED transfers was complete among both groups (i.e., no missingness) but more residents living with schizophrenia remained in LTC at the end of the follow-up period due to fewer deaths. The crude ED transfer rates were similar between both groups, which were 0.61 per person-year for all-cause transfers, 0.10 per person-year for ACSCs, and 0.51 per person-year for non-ACSCs. Schizophrenia was not significantly associated any type of ED transfer. The ten most frequent ED diagnoses among residents living with versus without schizophrenia were similar, except residents living with schizophrenia had higher frequencies of diagnoses related to chronic obstructive pulmonary diseases, schizophrenia, and disturbances in emotional state.

## Connections to Existing Research

The literature examining schizophrenia and aging, particularly within the context of LTC, is sparse and frequently groups schizophrenia together with other SMPIs as a single diagnostic category.[126] Our findings were generally consistent with prior studies and contribute new knowledge in this field. By focusing on a single SPMI, schizophrenia, our findings are specific and may meaningfully inform delivery of LTC to this population. This distinction is important as SPMIs are separate illnesses despite sharing similarities.

Our observed schizophrenia prevalence in LTC was similar to other 2.9% in Western Canadian provinces, 3.6% in the 2004 National Nursing Home Survey (i.e., USA), and 3.2% in New Zealand.[4,50,127] Changes in schizophrenia prevalence, unlike the increase in SPMI (i.e., schizophrenia and bipolar disorder) in American LTC homes from 6.4% in 2000 to 18.6% in 2017, were consistent over time except for a slight increase following the COVID-19 pandemic onset. This period saw the number of LTC admissions decline, and more broadly, acute care use decline in Ontario.[128] It may be that pre-existing inequities caused individuals living with schizophrenia to experience the pandemic's effects differently (e.g., access to in-person community services disrupted due to infection prevention measures), leading to LTC admission, but understanding of this is incomplete.[129] Alternatively, there may have been more detection of schizophrenia or increased medical needs requiring LTC admission among individuals living with schizophrenia, but we found no evidence to suggest either of these.

Frequently reported sociodemographic differences for residents living with schizophrenia (i.e., younger age and female sex) were present in our findings as were less frequently reported or less specific characteristics (e.g., unmarried, having less contact with friends, and admission from an inpatient psychiatry service).[4,6,130,131] Our study added further detail regarding prior area of residence findings of lower income and increased marginalization, which was expected as individuals living with schizophrenia are less likely to finish their education and gain employment[21] and more likely to become homeless.[23] Notably, a greater proportion of had lived in prior areas characterized by less marginalization related to age and labor force, which tended to be in urban areas on the Ontario Marginalization Index Map.[132]

Age related comorbidities (e.g., dementia, arthritis, osteoporosis) were less prevalent and cognitive function and ADLs were more intact among residents with schizophrenia, as expected.[4,133] Schizophrenia-associated comorbidities (e.g., diabetes mellitus, depression, emphysema, anxiety) were more prevalent among this group, also as expected. Unexpectedly, cardiovascular comorbidities were less prevalent despite their association with antipsychotic use and schizophrenia.[33] Given the well-established association between schizophrenia and early mortality,[34,35] it is possible that individuals living with schizophrenia and cardiovascular comorbidities did not survive long enough to be admitted to LTC. However, this is unlikely as the residents living with schizophrenia were relatively young and had a high prevalence of other comorbidities (e.g., diabetes mellitus) associated with a greater risk of mortality.[34] If there were individuals living with schizophrenia and cardiovascular comorbidities, they may have been residing elsewhere

(e.g., community or hospital) or their cardiovascular comorbidities were not identified on their RAI-MDS 2.0 admission assessment. The latter is plausible as individuals living with schizophrenia are less likely to be treated for cardiovascular diseases compared to the general population,[134] meaning cardiovascular diseases would not have been flagged on RAI-MDS 2.0 admission assessment if they did not affect their care plan. Future research identifying the disposition of this subgroup could help establish profiles of older individuals living with schizophrenia for targeted care, whether in LTC or elsewhere.

Measures of healthcare needs were limited to a few measures focused on core LTC services, each of which represented a substantial proportion of staff workload.[135] We sought to examine measures that captured direct staff action, recognizing that resident health status did not fully capture healthcare needs (e.g., the presence of comorbidities did not necessarily indicate a need for care, and their absence did not imply minimal care requirements). Support provided for locomotion and resource allocation for nursing and personal care were decreased among residents with versus without schizophrenia and previously discussed. Interestingly, residents living with schizophrenia received slightly more medications than expected, given fewer comorbidities that may justify prescribing and prior studies associating schizophrenia with decreased receipt of some medications in LTC.[69,70,72,73] It is possible that use of multiple antipsychotic or other psychotropic medications use accounts for this difference as they are central to schizophrenia treatment and antipsychotic polypharmacy is common.[136] This is a potential area for further research to better understand and optimize prescribing given that Canadian guidelines discourage the use of multiple antipsychotics except under specific

circumstances.[137] Notably, polypharmacy interventions in residents living with mental illness have been shown to reduce the number of medications and improve prescribing appropriateness, although they may not impact clinical outcomes.[138]

ED transfer rates and frequent ED diagnoses were remarkably similar between residents living with versus without schizophrenia, suggesting comparable frequencies of acute medical issues and care provision. This contrasts with a previous study that reported increased all-cause ED transfers for residents living with schizophrenia in their last year of life,[139] although the difference may have resulted from examining a different period of admission and suboptimal delivery of end-of-life care to residents living with schizophrenia.[140] Other studies, such as those reporting decreased ED transfers for residents with mental health illnesses or symptoms[130] or increased ACSC hospitalizations for residents living with schizophrenia,[76,77] are less comparable because of differences in exposure and outcome definitions. Despite our finding, further research examining the quality of care provided to residents living with schizophrenia is needed because ED transfer rates are a single, high-level measurement that does not capture the nuances of care quality.

The similarity in ED outcomes between residents living with versus without schizophrenia was unexpected as health and function, a contributing factor the ED transfer, were documented to be more intact among residents living with schizophrenia upon admission. Based on this factor alone, lower ED transfer rates would have been anticipated in this group. It may it that residents living with schizophrenia experienced greater frailty because of under detection of health status and/or health deterioration

following admission. Under detection of comorbidities in individuals living with schizophrenia has been documented outside of LTC[28], potentially arising from diagnostic overshadowing (i.e., physical illness misattributed to comorbid mental illness).[141] This underscores the need for LTC staff to rigorously assess physical health upon admission, including screening for existing and potentially undiagnosed comorbidities. Health deterioration, also known as deconditioning and often studied in hospitals,[142] may be relevant to residents living with schizophrenia because they have risk factors including longer lengths of LTC stay,[6,61–63] comorbid anxiety and depression, and self-isolation in their rooms.[58] Longer stays may amplify the impact of risk factors over time, with the effects of deconditioning (e.g., increased ED transfers) likely emerging later in the follow-up period. However, residents living without schizophrenia also had with risk factors (e.g., more comorbidities and impaired functioning) and it is unclear why residents living with schizophrenia might experience more deconditioning. Unfortunately, evidence-based deconditioning intervention are lacking, particularly for patients in acute mental health wards.[143]

The ED diagnoses for residents living with schizophrenia provide additional insight into their health status and suggest targeted interventions for improved health. The number one diagnosis, other disorder of the urinary system, may have been related to urinary tract infection risk factors diabetes mellitus and urinary incontinence.[79,144] Managing these could involve antipsychotic medication adjustment[145] and lead to both reduced stigmatization and prevention of urinary tract infection. Managing antipsychotic medications as well as other medications could also reduce falls that likely resulted in

head injuries, as residents living with schizophrenia had no other clear risk factors for falls like impaired ADLs.[146] Pneumonia and chronic obstructive pulmonary disease exacerbations may have been related to smoking,[147] which can be addressed by LTC adoption of STOP (Smoking Treatment for Ontario Patients)[148] which provides free nicotine replacement therapy. The mental health diagnoses (i.e., schizophrenia and signs and symptoms involving emotional state) suggest better access to mental health care is needed, which typically is provided outside LTC,[66] although the absolute proportion of these ED transfers was small (3.5%).

Our observed schizophrenia prevalence of 4% in LTC compared to the overall prevalence of 1% in Ontario[1] indicates individuals living with schizophrenia are overrepresented in LTC. This is also occurring in the US, where individuals living with schizophrenia are at increased risk of admission compared to individual without mental illness, particularly between the ages of 40 years and 64 years.[5] Factors associated with admission among individuals living with schizophrenia include a more severe course of schizophrenia, impaired cognition and ADLs, and absence of a spouse.[60,149] While we did not compare individuals living with schizophrenia in LTC versus community settings, we observed more intact physical health among residents living with versus without schizophrenia, suggesting other factors influenced their admissions. Unfortunately, the reason for LTC admission was not captured in our data. Health professionals in Ontario have suggested that younger LTC residents could be cared for in communities if timely resources (e.g., home care, mental health services and supportive housing) were available.[150] This reflects a broader picture that LTC is sometimes serving as a substitute

for community-based housing and psychiatric care.[9] It may also be that residents living with schizophrenia were sometimes lacking a supportive social network prior to admission, as reflected by a greater proportion of them previously living in marginalized neighborhoods (e.g., less social cohesiveness), being unmarried, and not having personal contact with family and friends once admitted to LTC. The Ontario Government has recognized the importance of these factors and is integrating them into upcoming quality standards for schizophrenia care.[151] For example, the improvement will be measured by the proportion of individuals with schizophrenia receiving assertive community treatment (i.e., treatment, rehabilitation, and support provided by a multidisciplinary team) and intensive case management (i.e., coordination of services, supports, and resources for mental health, housing, addictions, justice, and education) within two weeks of referral. However, the health of some individuals living with schizophrenia may exceed what can be cared for in community settings, highlighting the need for investment in mental health expertise within LTC and for addressing existing workforce shortages.[59]

## Strengths

### Study Designs

The use of both cross-sectional and cohort study designs was well-suited to the research objectives, with the added advantage that their typical limitations were not particularly relevant in this context. The cross-sectional study captured health status and healthcare needs at the time of admission, with epidemiologic concerns of temporality and incidence not necessary to optimizing services for residents living with schizophrenia.

The cohort study examined the association between schizophrenia and ED transfer rates, benefiting from complete follow-up and the fact that most residents remained in LTC at the end of the observation period. Although residents living without schizophrenia were more likely to die within the one-year period following LTC admission, this was accounted by using an offset for person-time in the analysis.

## Study Population

Virtually all newly admitted LTC residents in Ontario were captured in the study, minimizing the risk of selection bias related to enrollment and resulting in a large sample size that enhanced statistical power and the precision of estimates. The focus on newly admitted residents instead of all residents (i.e., newly and previously admitted residents) eliminated prevalence-incidence bias (i.e., findings would reflect longer surviving and potentially healthier residents) and improved the interpretability of results, as findings are specific to newly admitted residents.

## Data Availability

The RAI-MDS 2.0 admission assessments and other health administrative data enabled rich description of the study population. The data was trustworthy as it was generated at the time of each healthcare encounter in a standardized manner, most variables were reliable and valid,[152,153] and little missingness was present. Additionally, retrospective analysis of the existing data made studying a large sample with a year of follow-up feasible.

### Exposure Detection

The algorithm used to detect schizophrenia based on hospitalization and physician service claims data was both validated and has been cited in over 200 studies. Its widespread use facilitates comparability across studies by ensuring consistent exposure definitions. The high sensitivity provides confidence that nearly all residents living with schizophrenia were accurately identified. However, the low specificity raises concern that some residents living without schizophrenia may have been misclassified, potentially biasing results toward the null. Nevertheless, the reported specificity may not reflect the true specificity of the algorithm. The validation study was conducted in a population with a high prevalence of mental illness, where initial diagnoses of schizophrenia may have been later revised to another mental illness. This context suggests the algorithm's actual specificity may be higher than reported.

## Limitations

Notable limitations included those inherent to health administrative data (i.e., data availability and information bias) and observational study designs (i.e., confounding).

### Data Availability

Most variables relevant to the thesis objectives were available through the RAI-MDS, which contained a rich description of general medical needs for LTC residents. However, key variables such as reason for LTC admission and reason for ED transfer were not available. Their inclusion would have allowed for a more explicit understanding of

health needs, rather than relying on inference. Additionally, a more nuanced measure of schizophrenia (e.g., Positive and Negative Syndrome Scale) could have enabled a more detailed analysis of the relationship between schizophrenia and health outcomes than the binary exposure variable used, which may have oversimplified the diverse ways residents experienced the illness.

## Information Bias

The validity of study variables, particularly health conditions, was subject to potential misclassification. Under detection of health status in individuals living with schizophrenia has been noted outside of LTC[28] and is especially relevant for variables derived from prior health encounters (e.g., Charlson Comorbidity Index) or history gathering from the resident or their families (e.g., change in cognitive status or ADL function in the 90 days prior to admission). For instance, if residents living with schizophrenia had been less likely to receive acute care prior to admission, their Charlson Comorbidity Index scores may have been spuriously low. This challenge was addressed by separating and reporting residents without prior acute care use as a "missing" category such that scores of zero were true zeros. Additionally, residents living with schizophrenia often had fewer family and friends present during admission, increasing the likelihood that declines in function prior to admission were not captured and CHESS scores being spuriously low.

Regarding comorbidity measurement, the RAI-MDS 2.0 has demonstrated sensitivity of ≥ 0.80 for only 12 out of 43 diagnoses when compared to hospital records.[154]

Two key considerations arise from this validation study. First, hospital records used as the reference standard were not a true gold standard, limiting confidence in the validation results. Second, the RAI-MDS 2.0 only documents health conditions that affect the resident's functioning or care plan. Thus, residents may have had health conditions documented in hospital records and recognized by LTC but not documented on the RAI-MDS 2.0. Despite this uncertainty regarding the presence or absence of comorbidities, we believe clinically important diagnoses were captured, as physicians routinely review RAI-MDS 2.0 entries for accuracy.

### Confounding

The major limitation in observational studies is confounding, which we addressed by including covariates in our statistical model analyzing ED transfers. We did not have substantive knowledge to identify confounders using a directed acyclical graph but instead used VanderWeele's principles of confounder selection.[114] This process was challenging as schizophrenia onset typically occurs early in life, leaving few variables that satisfy the "pretreatment" criterion. As a result, commonly considered confounders (e.g., health status) might have been on the pathway from schizophrenia to ED transfer. Adjusting for these variables could underestimate schizophrenia's effect. Therefore, our final models were parsimonious but, in our view, yielded reliable estimates.

## Conclusion and Implications

Individuals living with schizophrenia are overrepresented Ontario LTC, comprising comprise 3.8% of residents. They have distinct health statuses and healthcare needs,

often require less support for physical health and functioning. The absence of a significant association between schizophrenia and ED transfer rates, along with similarities in ED diagnoses, suggest LTC has the capacity to generally support residents living with schizophrenia. These findings may enhance LTC operators' confidence in admitting individuals with schizophrenia with respect to level of care needed and resource intensity. However, improving access to mental health care in LTC is important to supporting all care needs for this population. Future research to explore underlying drivers of admission and factors beyond general medical needs would deepen our understanding and improve care planning for this population. Despite limitations in the health administrative data, our findings offer valuable perspectives for LTC home operators, clinicians, and healthcare policymakers on the healthcare needs of residents living with schizophrenia.

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