Catholic Health Association of Ontario
Association Catholique de la Santé de l'Ontario

COST OF SUPPORTIVE HOUSING PROGRAM

FOR PATIENTS WITH SERIOUS MENTAL ILLNESS

A RAPID REVIEW

FULL REPORT

Centre for Clinical Epidemiology and Evaluation

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ABBREVIATIONS

ACT	Assertive Community Treatment
ALC	Alternate Level of Care
AtH	Alternatives to Hospitalization
BH	Behavioural Health
DAD	Discharge Abstract Database
ITT	Interdisciplinary Transitional Team
NGOs	Non-Government Organizations
OMHRS	Ontario Mental Health Reporting System
PMPM	Per-Member-Per-Month
SMI	Serious Mental Illness

EXECUTIVE SUMMARY

Serious mental illness (SMI) refers to significant mental, behavioral, or emotional disorders such as schizophrenia, severe major depressive disorder, and bipolar disorders. SMI has a major impact on daily functioning and is linked to poor health, social and economic outcomes, and higher risk of mortality. Hospitalization is common for SMI treatment, and patients are at a greater risk for repeat hospitalization. Supportive housing programs have been effective in improving community functioning and reducing mental health hospitalizations in patients with SMI. The aim of this review is to summarize the economic evaluations of supportive housing for patients with SMI.

The information specialist conducted a thorough literature search using MEDLINE and Embase via Ovid, focusing on supportive housing, assisted living, mental health, mental illness, and substance use disorder. Search filters were applied to limit retrieval of certain types of documents and the search was limited to English language. The study selection process was meticulous, relying on rigorous PICOS criteria. The evidence was synthesized using a narrative approach, focusing on intervention programs and economic information.

A reviewer screened 660 abstracts and retrieved nine articles for full-text evaluation. One study was excluded due to an ineligible comparator, two studies had ineligible study designs, and one study had ineligible outcomes. Ultimately, four primary economic studies and one narrative review were included. The included studies were conducted in the United States, Australia, and Canada.

The first study by Chi et al. (2022) compared clinical and economic outcomes in the United States with and without a 'Wraparound Program' targeting adults with behavioral health problems. Rudoler et al. (2018) conducted a Canadian cost comparison study of inpatient mental health care and high-support housing for individuals with SMI. Neil et al. (2014) examined the cost differences associated with an Australian policy initiative known as "The Strategy." Siskind et al. (2013) compared the Alternatives to Hospitalization (AtH) program for individuals with SMI with acute psychiatric hospitalization in Brisbane, Australia. Lastly, Bond et al. (2001) reported

on the evidence for clinical effectiveness and cost of Assertive Community Treatment (ACT) for individuals with serious mental illness.

The included studies generally found that supportive housing resulted in cost savings compared to psychiatric inpatient care for individuals with SMI. Some studies reported sustained cost savings over the entire study period, while others noted high initial costs that were justified by long-term savings. However, some studies found minimal overall cost savings, which were offset by increased costs in other sectors. The cost analyses did not consider patient outcomes such as the rate of hospital admission or length of inpatient stay. Previous studies concluded that supportive housing and associated programs could be beneficial in clinical outcomes such as lower rates of hospitalization, incarceration, and homelessness.

Supportive housing has the potential to significantly address the mental health system challenges by providing a stable living environment for individuals capable of independent living. This approach could improve the quality of life for eligible patients and reduce the strain on hospital resources. Although providing supportive housing services can be costly, the potential cost savings and benefits for those receiving support could justify the expenses. Ultimately, investing in supportive housing could lead to improved outcomes for individuals with severe mental health challenges and more efficient use of healthcare resources.

EVIDENCE REPORT

Chapter 1. Introduction

1.1 Serious Mental Illness (SMI)

Serious mental illness (SMI) refers to a mental, behavioural, or emotional disorder that has a significant impact on daily functioning, such as schizophrenia, severe major depressive disorder, and bipolar disorders.[1] Although these disorders affect a small portion of the population, they are associated with poor health, social and economic outcomes, elevated risk of mortality, reduced life expectancy, high costs of care, and lost productivity.[2]

Hospitalization is a common part of the treatment of SMI. The Canadian age-standardized discharge rate, which measures the incidence of hospitalization for mental health and substance use disorders, has held at approximately 700 per 100,000 population over the past five years.[3] Ontario has seen a largely similar rate in the past five years, with a decrease to approximately 654 per 100,000 population in the 2022-2023 time frame.[3] We may assume hospitalized patients have SMI as hospitalizations for mental health typically only occur for severe cases. Patients hospitalized for mental health and substance use disorders stayed in hospital for a total of 5,858,882 days across Canada, with 2,172,072 of those days being in Ontario; the average length of stay was 21.5 days.[4] The estimated total cost per hospitalization for mental health or substance use disorders in Ontario ranges from $5,536 to $30,151.[5] Patients with SMI are at a greater risk for repeat hospitalization, which is defined as three or more episodes of care for mental health and substance use. Among Canadians in the 2022-2023 time period, those with one hospitalization for mental health or substance use disorders had a risk-adjusted rate of 13.2 for repeat hospitalization.[6] This means that, after accounting for differences in factors such as age, gender, and comorbidities, approximately 13.2% of individuals who were hospitalized had been hospitalized multiple times.

1.2 Supportive Housing Programs

In the mid-20th century, there was a significant shift in how Canadians with mental illness were cared for. This change, known as deinstitutionalization, involved the widespread closure of

inpatient beds and, in many cases, entire mental hospitals.[7] These closures were driven by growing skepticism about the long-held belief that individuals with mental illness were inherently violent, helpless, or posed a risk to others simply by being in close proximity.[7] This massive decrease in beds for patients with mental illness was ideally to be replaced with rehabilitation in the community.[7] However, very little planning had been done to ensure such patients had a successful life in the community.[7] Instead, in response to deinstitutionalization, we see many people living with mental illness re-circulating through a range of health care and justice system services such as emergency rooms, psychiatric hospitals, general hospitals, emergency shelters, domestic violence shelters, foster care, detoxification centres, and prisons.[8]

Supportive housing programs were developed to meet the needs of individuals with mental illness who do not require acute psychiatric care but require support to live independently in the community. Supportive housing programs typically include low-cost (delivered via rent-geared-to-income and rent supplement) housing units or complexes funded specifically for persons living with mental illness.[8,9] Supportive housing programs also often offer wraparound services in addition to housing, which may include medical services, psychological counselling, addiction support, peer support, and assistance with activities of daily living.[9]

Supportive housing programs have been shown to be effective in people with SMI. Compared to those receiving treatment as usual, those receiving supportive housing saw rapid improvements in community functioning and quality of life.[10] Supportive housing has also been shown to reduce mental health hospitalizations, breaking the cycle of repeated hospitalization and potentially leading to significant cost savings.[11]

Chapter 2. Methods

2.1 Search strategy

An information specialist conducted a literature search on key resources including MEDLINE and Embase via Ovid, and CINAHL. The search strategy (Appendix A) comprised both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were supportive housing, assisted living, mental health, mental illness, and substance use disorder. Search filters were applied to limit retrieval of comments, newspaper articles, editorials, conference abstracts, and letters. The search was also limited to the English language. The search was conducted on July 3, 2024. No date range was specified.

2.2 Study selection

The study selection process was meticulous and thorough. One reviewer carefully screened citations, reviewed titles and abstracts, and retrieved potentially relevant articles for assessment. The final selection of full-text articles was based on the rigorous PICOS criteria outlined in Table 1. Figure 1 provides an outline of the study selection process, ensuring the validity and reliability of the research.

Table 1. PICOS criteria.

Criteria	Description
Population	Individuals with serious mental health conditions
Intervention	Supportive housing programs
Comparator	Psychiatric inpatient care
Outcomes	• Cost • Cost comparison • Cost-effectiveness
Study Designs	Economic evaluations

HTA = Health Technology Assessment, RCT = Randomized Control Trial, SR = Systematic Review

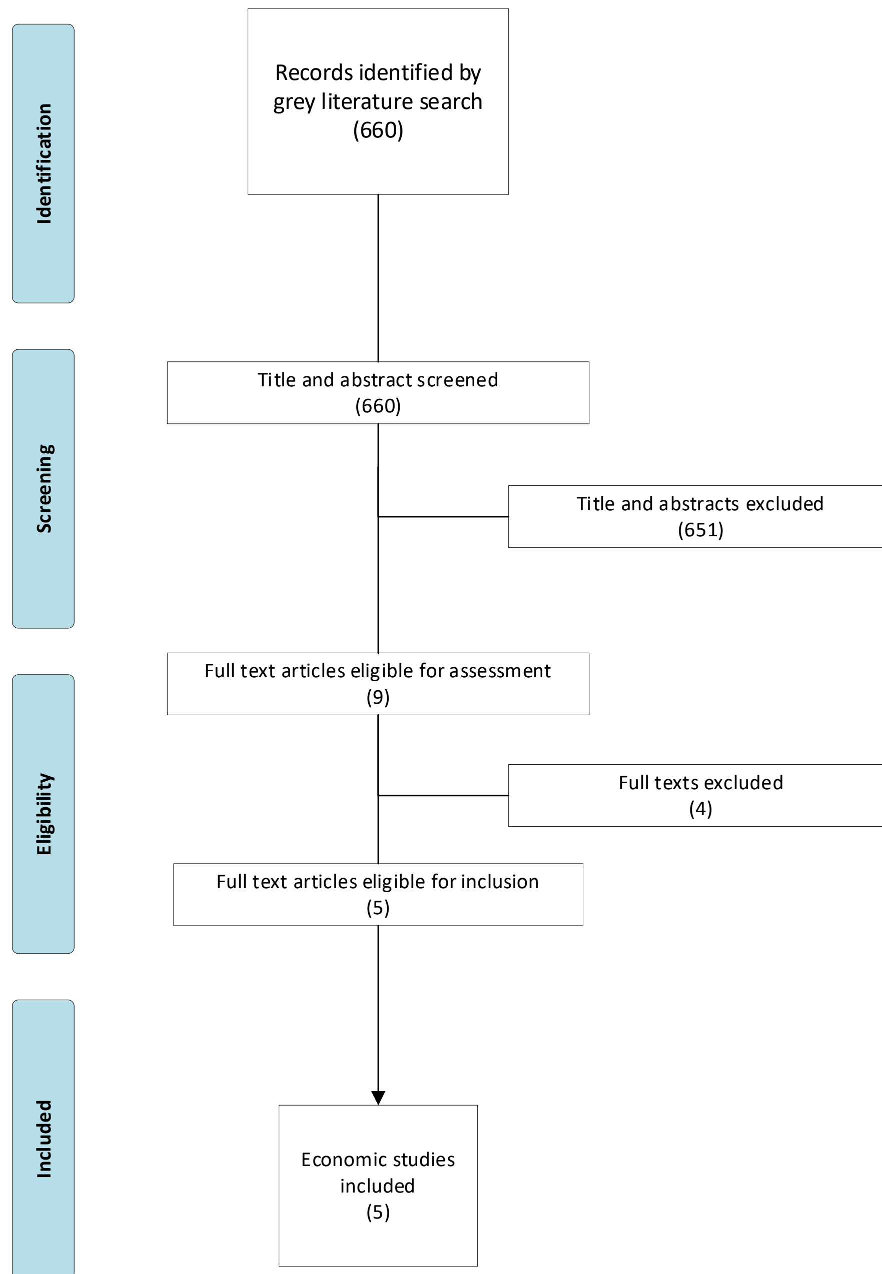
2.3 Exclusion Criteria

Articles that did not meet the selection criteria outlined in Table 1 were excluded. Studies focused on supportive housing for conditions other than SMI were excluded, as well as those comparing different versions of supportive housing.

2.4 Evidence synthesis

The evidence was synthesized using a narrative approach. Data on the intervention programs were extracted and systematically compared. Additionally, economic information from each included study was narratively analyzed and compared.

Figure 1. PRISMA diagram.



Chapter 3. **Results**

The reviewer screened 660 abstracts and retrieved nine articles for full-text evaluation. One study was excluded due to an ineligible comparator, two studies had ineligible study designs, and one study had ineligible outcomes. Ultimately, four primary economic studies and one narrative review were included. The included studies were conducted in the United States, Australia, and Canada. The participants of the included studies were patients with SMI, but they were not necessarily experiencing homelessness.

3.1 Study Characteristics

Chi et al. (2022)[12]

Chi et al. (2022)[12] conducted a retrospective study using Medicaid claims data to compare clinical and economic outcomes in the United States with and without a 'Wraparound Program' which targets adults with behavioural health problems enrolled in Medicaid managed care organizations. They collected data from 2685 patients in states with wraparound programs and compared the cost with that of 20,717 patients without wraparound programs. Conditions addressed by the program include bipolar disorder, depressive disorder, non-mood psychotic disorder, and substance dependence. The program integrates physical and behavioural health care across settings, including health clinics, psychiatric facilities, and home visits. It involves mobile crisis teams, bedside pharmacy delivery, intensive case management, and social support like housing and employment assistance. The study focused on costs and healthcare utilization of all-cause and behavioral health-related events.

Rudoler et al. (2018)[13]

Rudoler et al. (2018)[13] was a Canadian cost comparison study that compared the per diem costs of inpatient mental health care with those of high-support housing for individuals with SMI in Ontario. The study collected data from 41,465 patients in the Ontario Mental Health Reporting System (OMHRS). They compared the cost of Alternate Level of Care (ALC) programs to acute care hospitalization. The ALC High Support Housing Initiative was designed for SMI patients who were occupying acute care beds while awaiting discharge to more appropriate settings. Upon

discharge from the Centre for Addiction and Mental Health, patients in the intervention group were placed in ALC housing. Outcomes for the intervention group were compared with those of patients who remained hospitalized at the Centre for Addiction and Mental Health and other hospitals. The Initiative consisted of four key components: high-support housing with 24/7 staff assistance, step-up housing to promote greater independence, an interdisciplinary transitional team (ITT) to facilitate community reintegration, and a flex fund to support individualized care plans during transitions. Many patients were also experiencing cognitive impairments, medical complexities, or substance use disorders alongside SMI. The per-diem inpatient costs for the year before and after the intervention were reported separately using data from two sources: the Discharge Abstract Database (DAD), a national database containing demographic, clinical, and administrative information on inpatient hospital admissions, and the Ontario Mental Health Reporting System (OMHRS), which includes data on individuals admitted to designated adult mental health beds in Ontario.

Neil et al. (2014)[14]

Neil et al. examined the cost differences associated with an Australian policy initiative known as "The Strategy." After its launch in 2000, this initiative aimed to integrate acute care into the mainstream healthcare system and expand community-based non-acute care for individuals with SMI, specifically those with psychosis. Over time, the strategy evolved into a wraparound care approach, incorporating support and services provided by non-government organizations (NGOs) for individuals with all types of mental illness. The study compared the costs of psychosis—including health sector costs, costs in other sectors, and productivity/time-loss costs—for the years 2000 and 2010 from a societal perspective.

Siskind et al. (2013)[15]

Siskind et al. (2013)[15] compared the Alternatives to Hospitalisation (AtH) program for individuals with SMIs, including psychosis, mood disorders, anxiety disorders, personality disorders, and substance abuse, with acute psychiatric hospitalization in Brisbane, Australia. One hundred ninety-three patients in the intervention group were initially treated in a hospital before

being transferred to the AtH program. In comparison, 371 patients in the control group were selected from hospitals in the same region that did not offer AtH. The cost and clinical outcomes were compared in the study. The AtH program provides short-term crisis housing in facilities with 24-hour staffing to help stabilize patients and reduce psychiatric admissions. Patients can "step up" from community care to avoid hospitalization or "step down" from inpatient care to shorten hospital stays. The program features an acute psychiatric unit, community outreach services, a psychiatric emergency department, and a mobile crisis team. The study compared healthcare utilization and costs between patients in the AtH program and those admitted to standard psychiatric care.

Bond et al. (2001)[16]

Bond et al. (2001)[16] was a narrative review that reported on the evidence for clinical effectiveness and cost of Assertive Community Treatment (ACT), an American program designed for individuals with SMI, including schizophrenia-spectrum disorders, bipolar disorder, major depression, and severe anxiety disorders. ACT utilizes a multidisciplinary team to provide intensive, community-based services, offering support with medications, housing, finances, and daily living to help patients thrive in the community. To qualify for ACT, patients needed to have significant functional impairments in areas such as social relationships, work, leisure, and self-care. They must have a history of intensive psychiatric treatment, often including multiple psychiatric hospitalizations.

3.2 Economic Evidence

All costs have been converted to 2024 Canadian dollars and adjusted for inflation to facilitate comparison.[17,18] Included studies broadly found supportive housing initiatives to be cost-saving over comparators. However, the mechanism of these cost savings differed.

Chi et al. (2022)[12] found a short-term decrease in cost associated with the wraparound program. A 27.2% decrease in behavioral health-related costs was observed in the wraparound states compared to the non-wraparound states in the first follow-up month. However, this reduction did not persist in the second follow-up month and beyond, with no associations

observed between the wraparound and per-member-per-month total all-cause or behavioral health-related costs. However, among a subset of high-cost patients at baseline, the wraparound was associated with an 18.1% reduction in inpatient all-cause cost during the entire study period.

Rudoler et al. (2018)[13] found general cost savings for ALC clients over inpatient hospitalization, with per diem cost savings of $178 and $204, resulting in annual cost savings of approximately $64,942 to $73,855 per client. The authors tested the results in multiple scenarios in sensitivity analysis. The intervention remained cost-saving in most scenarios. However, the authors found this result to be highly sensitive to health systems costs for clients in the ALC program—high healthcare costs incurred while in the ALC program would reduce the cost savings of the intervention.

Neil et al. (2014)[14] observed little change in the total average annual costs of psychosis over ten years following policy implementation. The average annual costs were $98,835 in 2000 and $104,544 in 2010, adjusted for inflation and reported in constant 2024 prices. Cost savings were seen in the health sector, with annual costs of $38,319 in 2000 and $34,219 in 2010, adjusted for inflation and reported in 2024 prices. Mental health inpatient care costs saw a 52% reduction between 2000 and 2010. However, these cost savings were counteracted by increases in costs of community mental health services, pharmaceuticals, and community support groups.

Siskind et al. (2013)[15] reported significantly lower per diem costs for AtH compared to psychiatric bed-days at $387 and $1410, respectively. The authors reported that total costs per patient in the control group were higher ($7,541) than the per-patient cost in the AtH program ($3,894). Thus, it was concluded that AtH provided significant cost savings to mental health services. In addition to cost, AtH patients spent five fewer days in the hospital than patients in the control group.

Bond et al. (2001)[16] reported two estimates of annual per-patient costs of ACT at $17,718 and $20,307, compared to about half those estimates for standard case management. However, the authors argued that despite the large upfront costs of ACT, these costs are justifiable due to a reduction in the long-term cost of other resources, particularly hospital costs.

Chapter 4. **Discussion**

The included studies generally found that supportive housing resulted in cost savings compared to psychiatric inpatient care for individuals with SMI. A Canadian study demonstrated that supportive housing programs could result in cost savings in the Canadian context. Some studies reported sustained cost savings over the entire study period, while others noted high initial costs that were justified by long-term savings. However, some studies found minimal overall cost savings, which were offset by increased costs in other sectors, suggesting that supportive housing may only be cost-effective for individuals with high baseline healthcare costs.

The cost analyses did not consider patient outcomes such as the rate of hospital admission or inpatient stay. Homelessness was not a criterion for inclusion for the target population. Previous studies concluded that supportive housing and associated programs could be beneficial in clinical outcomes such as lower rates of hospitalization, incarceration, and homelessness, potentially proving cost-effective when assessed in an economic model. It is important to consider the broader impact of healthcare interventions, including their effects on patient outcomes and societal issues such as homelessness. By incorporating these factors into cost analyses, we can better understand the overall value and effectiveness of various healthcare initiatives. This approach can also help us identify opportunities to address social determinants of health and improve overall population well-being.

Supportive housing has the potential to play an important role in addressing the current mental health crisis across Canada. By providing a stable and supportive living environment, supportive housing programs can benefit individuals capable of living independently. This approach has the potential to not only improve the quality of life for eligible patients but also to alleviate the strain on acute care resources in hospitals, allowing them to better serve patients who require more intensive treatment. While the provision of supportive housing services can be quite intensive and, therefore, costly, the potential cost savings associated with reducing the utilization of other resources and the tangible benefits for those receiving support from a community support program could justify these expenses.

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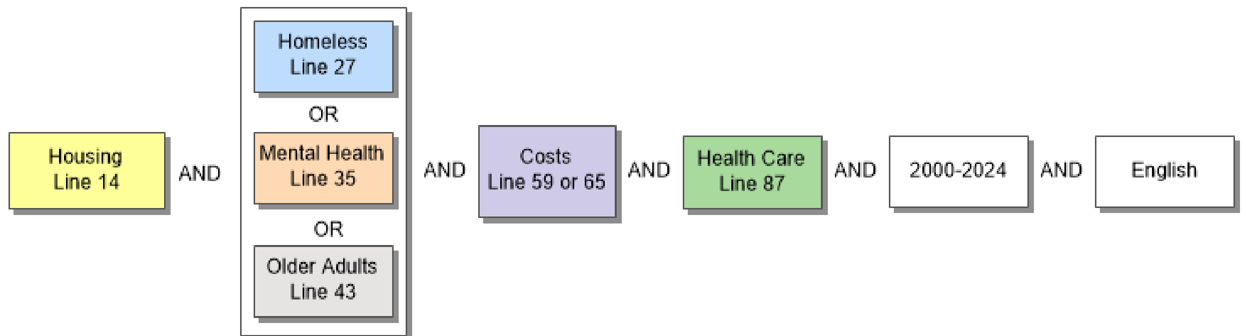
APPENDIX

Appendix A. Search

- Please note that the search strategy searched all three target populations together and exported results for each population separately.

A.1 MEDLINE

```
Search was executed on:    July 3, 2024
Search Results:
Database: Ovid MEDLINE(R) ALL <1946 to July 02, 2024>
```




```
Search Strategy:
--------------------------------------------------------------------------------
Search #1
1      ((support$ or subsidi#ed) adj3 hous$).ti,ab,kf. (2995)
2      housing/ (20643)
3      public housing/ (1653)
4      Assisted Living Facilities/ (1634)
5      housing.ti,ab,kf. (40777)
6      housing first.mp. [Included in line 5] (428)
7      (congregate? adj2 (living or setting)).mp. (261)
8      Assisted living.mp. (3652)
9      Community-based care.mp. (1726)
10      Community Homes for Opportunity.mp. (3)
11      Supported accommodation.mp. (158)
12      scattered-site.ti,ab,kf. (38)
13      place-based.ti,ab,kf. (1415)
14      or/1-13 [Housing] (61534)

15      Ill-Housed Persons/ (10237)
16      homeless$.mp. (15481)
17      vagran$.ti,ab,kf. (355)
18      Ill-Housed Person$.ti,ab,kf. (6)
19      unhoused.mp. (194)
20      Veterans/ (23286)
21      veteran$.ti,ab,kf. (48001)
22      Vulnerable Populations/ (13132)
23      ((vulnerable or underserved or under served or disadvantaged or
        sensitive) adj3 (group? or population? or patient? or
        people?)).ti,ab,kf. (72515)
24      ((deprived or destitute? or impoverished or low income or marginali#ed
        or poverty) adj3 (men or wom#n or people?)).ti,ab,kf. (8481)
25      (street adj3 (person? or people?)).ti,ab,kf. (196)
26      (person? adj3 (shelter$ or unshelter$ or hostel?)).mp. (109)
27      or/15-26 [Homeless] (154223)
```

```
28     14 and 27 [Housing & Homeless] (5856)

29     exp Mental Disorders/ [includes Substance-Related Disorders] (1497743)
30     substance addiction.mp. (664)
31     mental health.ti,ab,kf. (252177)
32     substance abuse?.mp. (59884)
33     "substance use disorder?".mp. (22771)
34     mental illness$.mp. (43692)
35     or/29-34 [Mental Health] (1684053)

36     14 and 35 [Housing & Mental Health] (9610)

37     aged/ or "aged, 80 and over"/ or centenarians/ or nonagenarians/ or
        octogenarians/ or frail elderly/ (3530795)
38     Geriatrics/ (31734)
39     Geriatric Nursing/ (13917)
40     (elder* or eldest or frail* or geriatri* or old age* or oldest old* or
        senior* or senium or very old* or septuagenarian* or octagenarian* or
        octogenarian* or nonagenarian* or centarian* or centenarian* or
        supercentenarian* or older people or older subject* or older patient* or
        older age* or older adult* or older man or older men or older male* or
        older woman or older women or older female* or older population* or
        older person*).ti,ab,kf. (737854)
41     Aging/ (256787)
42     *health services for the aged/ (14139)
43     or/37-42 [Older Adults] (3959760)
44     14 and 43 [Housing & Older Adults] (12047)
45     "costs and cost analysis"/ or "cost allocation"/ or cost-benefit
        analysis/ (146539)
46     "cost control"/ or "cost savings"/ (34308)
47     cost-effectiveness analysis/ (932)
48     health care costs/ or direct service costs/ or drug costs/ or employer
        health costs/ or hospital costs/ (73241)
49     health expenditures/ (24833)
50     capital expenditures/ (2003)
51     "cost of illness"/ (32601)
52     ec.fs. [Economics] (445454)
53     (cost or costs or costing).ti,ab,kf. (768671)
54     (cost adj2 analysis).ti,ab,kf. (36988)
55     health expenditure?.ti,ab,kf. (5810)
56     economic analysis.mp. (7489)
57     "outcome and process assessment, health care"/ (28619)
58     outcome assessment, health care/ (83548)
59     or/45-58 [Costs] (1199464)

60     feasibility studies/ (86706)
61     pilot projects/ (153507)
62     program evaluation/ (67877)
63     comparative study/ (1920494)
64     Comparative Effectiveness Research/ (4041)
65     or/60-64 [Evaluation] (2189339)

66     59 or 65 (3285831)

67     and/14,27,66 [Housing & Homeless & Costs] (1252)
68     and/14,35,66 [Housing & Mental Health & Costs] (1942)
69     and/14,43,66 [Housing & Older Adults & Costs] (2589)

70     "Patient Acceptance of Health Care"/ (56440)
71     Ambulatory Care/ (46941)
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72     Medicaid/ (28579)
73     hospitalization/ or "length of stay"/ or patient admission/ or patient
        discharge/ or patient handoff/ or patient readmission/ or patient
        transfer/ (303195)
74     health outcome$.mp. (89626)
75     exp Health Services/ (2492813)
76     "Health Services Needs and Demand"/ (55517)
77     health intervention?.mp. (24699)
78     ((health or service?) adj4 (utili#ation or access or visit?)).ti,ab,kf.
        (101475)
79     ((hospital or emergency) adj4 (admission? or stay or readmission or
        utili#ation or visit?)).ti,ab,kf. (241064)
80     hospitali#ation.ti,ab,kf. (205879)
81     emergency medical services/ or advanced trauma life support care/ or
        call centers/ or emergency medical dispatch/ or emergency room visits/
        or emergency services, psychiatric/ or hotlines/ or poison control
        centers/ (59071)
82     emergency service, hospital/ or trauma centers/ (103542)
83     (emergency adj (department? or room? or ward? or center? or
        centre?)).ti,ab,kf. (161926)
84     ambulances/ (7129)
85     ambulance?.ti,ab,kf. (13978)
86     treatment outcome/ (1196416)
87     or/70-86 [Health Care] (3967715)

88     and/14,27,66,87 [Housing & Homeless & Costs & Health Care] (780)
89     and/14,35,66,87 [Housing & Mental Health & Costs & Health Care] (1269)
90     and/14,43,66,87 [Housing & Older Adults & Costs & Health Care] (1509)
91     88 or 89 or 90 [Searches #1,2,3 Combined] (2676)

92     comment/ or editorial/ or letter/ or news/ (2469299)
93     91 not 92 (2644)
94     limit 93 to English language (2551)

95     remove duplicates from 94 (2549)
96     limit 95 to yr="2014 -Current" (1019)

97     88 and 96 [Homeless Search] (360)
98     89 and 96 [Mental Health Search] (486)
99     90 and 96 [Older Adults Search] (518)
100     or/97-99 (1019)
101     98 not (97 or 99) [Mental Health Search Unique Results] (207)
102     99 not (97 or 98) [Older Adults Search Unique Results] (357)
103     or/97,101-102 [Unique Search Results] (924)
104     96 not 103 [Remaining] (95)

Search #2
105     (supportive housing or supported housing).ti,ab,kf. (941)
106     homeless$.mp. (15481)
107     mental illness$.mp. (43692)
108     aged/ or "aged, 80 and over"/ or frail elderly/ (3530787)
109     (elder$ or frail$ or geriatri$ or senior$ or older population$ or older
        person$ or older adult$).ti,ab,kf. (566959)
110     108 or 109 (3728837)
111     or/106-107,110 (3778928)
112     105 and 111 (698)
113     limit 112 to english language (680)
114     limit 113 to yr="2014 -Current" (483)
115     114 not 96 [Search Extra] (402)

116     106 and 115 [Homeless Extra] (285)
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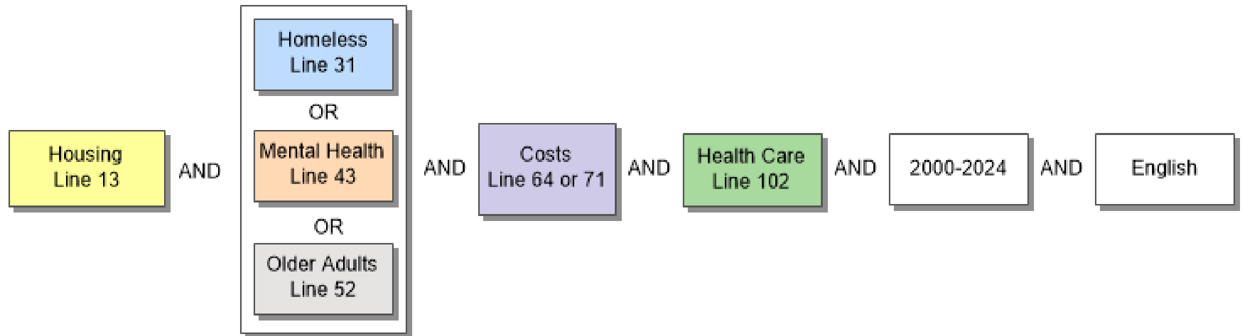
```
117     107 and 115 (138)
118     117 not 116 [Mental Illness Extra] (75)
119     110 and 115 (88)
120     119 not (116 or 118) [Older Adults Extra] (42)

Combined Results
121     97 or 116 [Homeless Search #1 & #2] (645)
122     101 or 118 [Mental Health Search #1 & #2] (282)
123     102 or 120 [Older Adults Search #1 & #2] (399)
```

A.2 Embase

```
Database: Embase <1974 to 2024 July 02>
Search Strategy:
```




```
----------------------------------------------------------------
Search #1
1      ((support$ or subsidi#ed) adj3 hous$).ti,ab,kf. (3633)
2      housing/ (32294)
3      housing first program/ (4)
4      housing.ti,ab,kf. (47864)
5      housing first.ti,ab,kf. [included in line 4] (484)
6      Assisted living.mp. (5034)
7      (congregate? adj2 (living or setting)).mp. (284)
8      Community-based care.mp. (2043)
9      Community Homes for Opportunity.mp. (3)
10      Supported accommodation.mp. (227)
11      scattered-site.ti,ab,kf. (45)
12      place-based.ti,ab,kf. (1463)
13      or/1-12 [Housing] (68366)

14      homelessness/ (14222)
15      homeless person/ (3380)
16      homeless man/ (162)
17      homeless woman/ (134)
18      homeless youth/ (609)
19      vulnerable population/ (29223)
20      disadvantaged population/ (1448)
21      homeless$.ti,ab,kf. (18433)
22      (street adj3 (person? or people?)).ti,ab,kf. (252)
23      vagran$.ti,ab,kf. (379)
24      Ill-Housed Person$.ti,ab,kf. (6)
25      unhoused.mp. (248)
26      veteran/ (37472)
27      veteran$.ti,ab,kf. (64129)
28      ((vulnerable or underserved or under served or disadvantaged or
sensitive) adj3 (group? or population? or patient? or people?)).ti,ab,kf.
(98752)
```

```
29     ((deprived or destitute? or impoverished or low income or marginali#ed
or poverty) adj3 (men or wom#n or people?)).ti,ab,kf. (9471)
30     (person? adj3 (shelter$ or unshelter$ or hostel?)).mp. (129)
31     or/14-30 [Homeless] (208302)

32     13 and 31 [Housing & Homeless] (7269)

33     exp mental disease/ (2832179)
34     mental health/ (231683)
35     psychological well-being/ (34574)
36     substance abuse/ (59881)
37     drug dependence/ (73246)
38     mental health.ti,ab,kf. (305712)
39     substance abuse?.mp. (78208)
40     "substance use disorder?".mp. (29274)
41     mental illness$.mp. (57856)
42     substance? addiction.mp. (898)
43     or/33-42 [Mental Health] (3042777)

44     13 and 43 [Housing & Mental Health] (15164)

45     aged/ (3866200)
46     frail elderly/ or very elderly/ (328431)
47     aged hospital patient/ (1474)
48     geriatrics/ (34710)
49     geriatric nursing/ (12503)
50     aging/ (327443)
51     (elder* or eldest or frail* or geriatri* or old age* or oldest old* or
senior* or senium or very old* or septuagenarian* or octagenarian* or
octogenarian* or nonagenarian* or centarian* or centenarian* or
supercentenarian* or older people or older subject* or older patient* or older
age* or older adult* or older man or older men or older male* or older woman or
older women or older female* or older population* or older person*).ti,ab,kf.
(1001727)
52     or/45-51 [Older Adults] (4435146)

53     13 and 52 [Housing & Older Adults] (13611)

54     "cost"/ (64691)
55     economic evaluation/ or "cost control"/ or "cost effectiveness
analysis"/ or "cost minimization analysis"/ or "cost of illness"/ or "cost
utility analysis"/ (293076)
56     "cost benefit analysis"/ or "cost benefit model"/ (97354)
57     economic analysis.mp. (10262)
58     "health care cost"/ (236808)
59     outcome assessment/ (896435)
60     (cost adj2 analysis).ti,ab,kf. (57783)
61     "hospitalization cost"/ (11039)
62     (cost or costs or costing).ti,ab,kf. (1021854)
63     health expenditure?.mp. (7355)
64     or/54-63 [Costs] (2113479)

65     program evaluation/ (19789)
66     "program cost effectiveness"/ (1113)
67     *comparative study/ (26636)
68     comparative effectiveness/ (151154)
69     pilot study/ (221353)
70     feasibility study/ (198885)
71     or/65-70 (592999)

72     or/64,71 [Costs] (2610609)
```

```
73     and/13,31,72 [Housing & Homeless & Costs] (1354)
74     and/13,43,72 [Housing & Mental Health & Costs] (2318)
75     and/13,52,72 [Housing & Older Adults & Costs] (2072)

76     public health service/ (73737)
77     treatment outcome/ (1003778)
78     hospital care/ (28525)
79     hospital admission/ (299504)
80     hospitalization/ (575780)
81     health care utilization/ (101504)
82     ambulatory care/ (42836)
83     emergency health service/ or emergency outpatient clinic/ or hospital
emergency service/ (128456)
84     emergency ward/ (230571)
85     psychiatric emergency service/ (495)
86     prescription/ (268957)
87     community mental health service/ (904)
88     mental health service/ (67775)
89     hospital readmission/ (108811)
90     prescription drug/ (13887)
91     hospital utilization/ (2883)
92     emergency treatment/ or emergency care/ (82351)
93     "length of stay"/ (292614)
94     ((health$ or service?) adj4 (utili#ation or access or visit?)).ti,ab,kf.
(175049)
95     ((hospital? or emergency) adj4 (admission? or stay or readmission? or
utili#ation or visit?)).ti,ab,kf. (412555)
96     primary medical care/ (139871)
97     hospitali#ation.ti,ab,kf. (348832)
98     ambulance/ (16880)
99     ambulance?.ti,ab,kf. (20966)
100     exp mental health care/ (157625)
101     "hospital use".mp. (2774)
102     or/76-101 [Health Care] (3166791)

103     and/13,31,72,102 [Housing & Homeless & Costs & Health Care] (741)
104     and/13,43,72,102 [Housing & Mental Health & Costs & Health Care] (1166)
105     and/13,52,72,102 [Housing & Older Adults & Costs & Health Care] (701)

106     or/103-105 [Searches #1,2,3 Combined] (1827)

107     editorial/ or letter/ or note/ (2949805)
108     106 not 107 (1748)
109     limit 108 to conference abstracts (478)
110     108 not 109 (1270)
111     limit 110 to medline (274)
112     110 not 111 (996)
113     limit 112 to english language (978)
114     remove duplicates from 113 (975)
115     limit 114 to yr="2014 -Current" (628)

116     103 and 115 [Homeless Search] (255)
117     104 and 115 [Mental Health Search] (403)
118     105 and 115 [Older Adults Search] (269)
119     117 not (116 or 118) [Mental Health Search Unique Results] (160)
120     118 not (116 or 117) [Older Adults Search Unique Results] (129)

121     or/116,119-120 [Unique Search Results] (544)
122     115 not 121 [Remaining] (84)
```

```
Search #2
123     (supportive housing or supported housing).ti,ab,kf. (1095)
124     homeless$.mp. (22532)
125     mental illness$.mp. (57856)
126     (elder$ or frail$ or geriatri$ or old age$ or senior$ or older
population$ or older person$).ti,ab,kw,kf. (686723)
127     aged/ or frail elderly/ or very elderly/ (3879225)
128     126 or 127 (4115954)
129     or/124-125,128 (4184545)
130     123 and 129 (805)
131     editorial/ or letter/ or note/ (2949805)
132     130 not 131 (796)
133     limit 132 to conference abstracts (82)
134     132 not 133 (714)
135     limit 134 to medline (347)
136     134 not 135 (367)
137     limit 136 to english language (355)
138     remove duplicates from 137 (349)
139     138 not 114 (302)
140     limit 139 to yr="2014 -Current" (179)
141     124 and 140 [Homeless extra] (132)
142     125 and 140 (66)
143     142 not 141 [Mental Health extra] (35)
144     128 and 140 (33)
145     144 not (141 or 143) [Older Adults Extra] (12)

Combined Searches
146     116 or 141 [Homeless combined search results] (387)
147     119 or 143 [Mental Health combined search results] (195)
148     120 or 145 [Older Adults combined search results] (141)
```

A.3 CINAHL

Database: CINAHL (EBSCOhost)

UBC access: https://resources.library.ubc.ca/page.php?details=cinahl---cumulative-index-to-nursing-and-allied-health-literature&id=38

Ebsco Account: mimi.doyle-waters@ubc.ca

Search Name: Supportive Housing 2024

Date: July 3, 2024

#	Query	Results
S61	S59 AND LA ENGLISH Limiters - Publication Date: 20140101-20241231	397
S60	S59 AND LA ENGLISH	725
S59	S56 OR S57 OR S58	729
S58	S11 AND S28 AND S37 AND S55	425
S57	S11 AND S24 AND S37 AND S55	281
S56	S11 AND S19 AND S37 AND S55	225
S55	S41 OR S42 OR S43 OR S44 OR S45 OR S46 OR S47 OR S48 OR S49 OR S50 OR S51 OR S52 OR S53 OR S54	1,633,527
S54	(MH "Patient Care+")	954,440
S53	TI health outcome* OR TI health outcome*	11,233

S52	(MH "Treatment Outcomes")	439,249
S51	TI ambulance* OR AB ambulance*	7,295
S50	(MH "Ambulances")	5,248
S49	TI ((emergency N2(department* or room* or ward* or center* or centre*))) OR AB ((emergency N2(department* or room* or ward* o)	78,247
S48	(MH "Health Services for the Indigent") OR (MH "Health Services for LGBTQ+ Persons") OR (MH "Health Services for Older Persons") OR (MH "Health Services for Persons with Disabilities") OR (MH "Health Services, Indigenous")	11,505
S47	(MH "Mental Health Services") OR (MH "Community Mental Health Services") OR (MH "Emergency Services, Psychiatric+")	49,756
S46	(MH "Emergency Service+")	73,648
S45	(MH "Emergency Medical Services+")	120,540
S44	TI hospitali?ation OR AB hospitali?ation	63,624
S43	(TI ((hospital or emergency) N4 (admission* or stay or readmission or utili?ation or visit*))) OR (AB ((hospital or emergency) N4 (admission* or stay or readmission or utili?ation or visit*)))	89,556
S42	(TI ((health or service*) N4 (utili?ation or access or visit*))) OR (AB ((health or service*) N4 (utili?ation or access or visit*)))	66,544
S41	(MH "Patient Admission") OR (MH "Length of Stay") OR (MH "Hospitalization")	114,112
S40	S11 AND S28 AND S37	827
S39	S11 AND S24 AND S37	514
S38	S11 AND S19 AND S37	386
S37	S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36	325,719
S36	(MH "Outcome Assessment")	0
S35	TI economic analysis OR AB economic analysis	4,829
S34	TI health expenditure* OR AB health expenditure*	5,190
S33	TI ((cost or costs or costing)) OR AB ((cost or costs or costing))	197,278
S32	(MH "Costs and Cost Analysis")	19,592
S31	(MH "Cost Control+") OR (MH "Cost Effectiveness Analysis") OR (MH "Cost Benefit Analysis") OR (MH "Cost Savings") OR (MH "Health Facility Costs") OR (MH "Health Care Costs+") OR (MH "Nursing Costs") OR (MH "Costs and Cost Analysis+")	137,641
S30	(MH "Economic Aspects of Illness")	11,193
S29	S11 AND S28	9,593
S28	S26 OR S27	1,114,852
S27	TI ((elder* or eldest or frail* or geriatri* or old age* or oldest old* or senior* or senium or very old* or septuagenarian* or octagenarian* or octogenarian* or nonagenarian* or centarian* or centenarian* or supercentenarian* or older people or older subject* or older patient* or older age* or older adult* or older man or older men or older male* or older woman or older women or older female* or older population* or older person*)) OR AB ((elder* or eldest or frail* or geriatri* or old age* or oldest old* or senior* or senium or very old* or septuagenarian* or octagenarian* or octogenarian* or nonagenarian*	376,017

	or centarian* or centenarian* or supercentenarian* or older people or older subject* or older patient* or older age* or older adult* or older man or older men or older male* or older woman or older women or older female* or older population* or older person*))	
S26	(MH "Aged+")	967,138
S25	S11 AND S24	6,716
S24	S21 OR S22 OR S23	723,100
S23	(TI ((substance N3 (addiction* or abus*))) OR (((substance N3 (addiction* or abus*)))	61,912
S22	(ti (mental health or mental illness*)) OR (ab (mental health or mental illness*))	73,882
S21	(MH "Mental Disorders+")	674,023
S20	S11 AND S19	4,021
S19	S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18	36,213
S18	((deprived or destitute? or impoverished or low income or marginali#ed or poverty) N3 (men or wom#n or people?))	6,825
S17	unhoused	110
S16	TI (street N5 (person* or people* or involved or entrenched)) OR AB (street N5 (person* or people* or involved or entrenched))	563
S15	TI (vulnerabl* N3 (population* or group*)) OR AB (vulnerabl* N3 (population* or group*))	15,956
S14	TI (homeless* or unsheltered) OR AB (homeless* or unsheltered)	10,953
S13	(MH "Homelessness")	5,336
S12	(MH "Homeless Persons")	6,757
S11	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10	29,330
S10	(MH "Assisted Living")	3,469
S9	TI housing OR AB housing	14,716
S8	place-based	707
S7	scattered-site	27
S6	supported accommodation	183
S5	housing first	443
S4	TI (support* N3 hous*) OR AB (support* N3 hous*)	2,446
S3	TI (subsidi?ed N3 hous*) OR AB (subsidi?ed N3 hous*)	211
S2	(MH "Public Housing")	1,376
S1	(MH "Housing+")	16,306

Note

There will be overlap with MEDLINE and Embase

Appendix B. Detailed Economic Data

Table B1: Economic data from Chi et al. 2022[12] – 2024 (CAD)*

	Intervention	Comparator
Pre-intervention all cause total cost PMPM (SD)	$2,108.14 (7,878.98)	$2,550.74 (8,983.09)
Post-intervention all cause total cost PMPM (SD)	$2,769.68 (7,624.06)	$3,302.98 (12,930.40)
Pre-intervention BH-related total cost PMPM (SD)	$1,410.64 (7,588.09)	$1,456.00 (7,200.23)
Post-intervention BH-related total cost PMPM (SD)	$1,904.84 (6,651.30)	$2,170.70 (11,202.28)
Pre-intervention all cause inpatient visit cost PMPM (SD)	$1,506.05 (7,588.09)	$1,604.57 (8,615.57)
Post-intervention all cause inpatient visit cost PMPM (SD)	$1,937.68 (7,189.29)	$2,186.35 (12,489.38)
Pre-intervention BH-related inpatient visit cost PMPM (SD)	$1,201.08 (6,862.43)	$1,155.73 (7,101.71)
Post-intervention BH-related inpatient visit cost PMPM (SD)	$1,626.47 (6,518.38)	$1,751.57 (11,086.55)
Pre-intervention all cause inpatient visit cost PMPM (SD)	$223.64 (855.46)	$267.42 (994.65)
Pre-intervention all cause inpatient visit cost PMPM (SD)	$247.10 (846.07)	$304.96 (1,323.06)
Pre-intervention all cause inpatient visit cost PMPM (SD)	$103.22 (442.58)	$106.35 (589.59)
Pre-intervention all cause inpatient visit cost PMPM (SD)	$107.91 (534.86)	$115.73 (749.11)
Pre-intervention all cause outpatient/wraparound cost PMPM (SD)	$348.75 (1,027.48)	$650.58 (1,745.32)
Post-intervention all cause outpatient/wraparound cost PMPM (SD)	$572.40 (1,545.14)	$778.83 (2,469.41)
Pre-intervention BH-related outpatient/wraparound cost PMPM (SD)	$96.96 (481.69)	$189.23 (788.21)
Post-intervention BH-related outpatient/wraparound cost PMPM (SD)	$168.91 (550.50)	$295.58 (1,110.38)

*for ease of comparison, all costs are converted to CAD and adjusted for inflation[17 18]

Note: Some Cost components may not sum up to total due to rounding

BH = Behavioural Health, PMPM = Per-Member-Per-Month

Table B2: Economic data from Rudoler et al. (2018)[13] – 2024 (CAD)*

	Intervention	CAMH	All
One year before discharge/assessment inpatient care (DAD) per diem cost (SD)	$6.37 (38.20)	$7.64 (25.47)	$12.73 (44.57)
One year after discharge/assessment inpatient care (DAD) per diem cost (SD)	$3.82 (15.28)	$ 2.29 (8.66)	$2.42 (13.88)
One year before discharge/assessment inpatient care (OMHRS) per diem cost (SD)	$769.12 (231.75)	$844.24 (183.37)	$846.79 (198.65)
One year after discharge/assessment inpatient care (OMHRS) per diem cost (SD)	$286.51 (328.53)	$947.39 (78.95)	$930.83 (162.99)
One year before discharge/assessment ED visits per diem cost (SD)	$1.27 (2.55)	2.55 (3.82)	1.53 (2.80)
One year after discharge/assessment ED visits per diem cost (SD)	$1.40 (3.57)	$0.89 (1.53)	$0.64 (1.40)
One year before discharge/assessment outpatient drugs per diem cost (SD)	$1.3 (4)	$0.8 (3)	$0.9 (2.5)
One year after discharge/assessment outpatient drugs per diem cost (SD)	$6.37 (8.91)	$1.66 (10.95)	$0.64 (6.11)
One year before discharge/assessment same day surgery per diem cost (SD)	$2.55 (8.91)	$1.53 (8.91)	$0.76 (5.60)
One year after discharge/assessment same day surgery per diem cost (SD)	$1.40 (7.39)	$1.40 (7.39)	$0.76 (4.20)
One year before discharge/assessment long-term care per diem cost (SD)	$2.55 (19.10)	$1.27 (12.73)	$3.82 (21.65)
One year before discharge/assessment physician services per diem cost (SD)	$35.65 (20.37)	$35.65 (26.74)	$17.83 (25.47)

One year after discharge/assessment physician services per diem cost (SD)	$20.37 (16.55)	$35.65 (28.01)	$16.55 (30.56)
One year before discharge/assessment other care per diem cost (SD)	$0.51 (1.53)	$1.27 (3.95)	$3.82 (20.37)
One year after discharge/assessment other care per diem cost (SD)	$0.51 (1.40)	$1.27 (3.95)	$3.82 (20.37)
One year before discharge/assessment total per diem cost (SD)	$818.78 (227.93)	$895.18 (170.63)	$886.27 (177.00)
One year after discharge/assessment total per diem cost (SD)	$361.64 (333.62)	$989.41 (80.22)	$955.03 (154.08)
Average per diem health services cost before discharge/assessment (95% CI)	$818.78 (765.30 - 873.53)	$895.18 (846.79-1,070.90)	$886.27 (884.99-913.01)
Average per diem health services cost after discharge/assessment (95% CI)	$361.64 (282.69-440.59)	$989.41 (966.49-1,012.33)	$955.03 (932.11-977.95)

for ease of comparison, all costs are converted to CAD and adjusted for inflation[17] [18]

Note: Some Cost components may not sum up to total due to rounding

DAD = Discharge Abstracts Database, OMHRS = Ontario Mental Health Reporting System

Table B3: Economic data from Neil et al. (2014)[14] – 2024 (CAD)*

	2000	**2010**
Average annual health sector costs per patient	$38,319.08	$34,219.43
Average annual other sector costs per patient	$9,695.11	$17,923.33
Average annual time loss costs per patient	$50,820.47	$52,401.71
Average annual total costs per patient	$98,834.66	$104,544.48

for ease of comparison, all costs are converted to CAD and adjusted for inflation[17] [18]

Note: Some Cost components may not sum up to total due to rounding

Table B4: Economic data from Siskind et al. (2013)[15] – 2024 (CAD)*

	AtH
Total program cost	**$3,894.10**
Total reduction in costs per patient to the mental health service	$7,541.40
Total per diem program cost	**$386.72**
Total psychiatric inpatient bed-day	$1,409.61

for ease of comparison, all costs are converted to CAD and adjusted for inflation[17 18]

Note: Some Cost components may not sum up to total due to rounding

AtH = Alternatives to Hospitalisation