



Deposited via The University of York.

White Rose Research Online URL for this paper:

<https://eprints.whiterose.ac.uk/id/eprint/165974/>

Version: Accepted Version

Article:

Mahentharan, Mayuri, Kouyoumdjian, Fiona G., de Oliveira, Claire et al. (2020) Prevalence and Predictors of Reincarceration after Correctional Center Release: A Population-based Comparison of Individuals with and without Schizophrenia in Ontario, Canada: Prévalence et prédicteurs de la réincarcération après la libération d'un centre correctionnel : une comparaison dans la population-de personnes souffrant ou non de schizophrénie en Ontario, Canada. Canadian Journal of Psychiatry. ISSN: 0706-7437

<https://doi.org/10.1177/0706743720953018>

Reuse

Items deposited in White Rose Research Online are protected by copyright, with all rights reserved unless indicated otherwise. They may be downloaded and/or printed for private study, or other acts as permitted by national copyright laws. The publisher or other rights holders may allow further reproduction and re-use of the full text version. This is indicated by the licence information on the White Rose Research Online record for the item.

Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.



**Prevalence and predictors of re-incarceration after
correctional centre release: a population-based comparison
of individuals with and without schizophrenia in Ontario,
Canada.**

Journal:	<i>The Canadian Journal of Psychiatry/La Revue canadienne de psychiatrie</i>
Manuscript ID	CJP-2020-140-OR.R1
Manuscript Type:	Original Research
Date Submitted by the Author:	21-Jun-2020
Complete List of Authors:	Mahentharan, Mayuri; Ontario Renal Network Kouyoumdjian, Fiona; McMaster University, Department of Family Medicine de Oliveira, Claire; University of York, Hull York Medical School/Centre for Health Economics; Centre for Addiction and Mental Health, Institute for Mental Health Policy Research Iwajomo, Tomi; Centre for Addiction and Mental Health, General Psychiatry Simpson, Alexander; Centre for Addiction and Mental Health (CAMH), Chief of Forensic Psychiatry Jones, Roland; Centre for Addiction and Mental Health, ; University of Toronto, Psychiatry Kurdyak, Paul; Centre for Addiction and Mental Health, General Psychiatry
Key Words:	Schizophrenia, Incarceration, Healthcare policy
Abstract:	<p>Objectives: Individuals with schizophrenia are over-represented in correctional facilities relative to their population-based prevalence. The purpose of this study was to determine the rate and predictors of reincarceration of individuals with schizophrenia after release from correctional facilities.</p> <p>Methods: This was a retrospective cohort study that included all people released from Ontario's provincial correctional facilities from January 1 to December 31, 2010. Individuals with schizophrenia were identified using a population-based algorithm. The primary outcome was time to reincarceration. Covariates included sociodemographic characteristics (age, sex, neighbourhood income quintile, urban/rural residence), health service utilization (primary care physician visits, psychiatrist visits, psychiatric and non-psychiatric hospitalizations, emergency department visits) and other clinical comorbidity. Survival analysis was used to examine the association between schizophrenia and re-incarceration.</p> <p>Results: Among 46,928 individuals, N = 3237 (7%) had a diagnosis of schizophrenia. Approximately 67.5% of these individuals were reincarcerated within five years following their first release in 2010,</p>

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

	<p>compared to 58.8% of individuals without schizophrenia. Individuals with schizophrenia were 40% (HR: 1.39, 95% CI: 1.33-1.45) more likely to be reincarcerated following release than the control group after adjusting for demographic characteristics. This association reduced to 8% (1.08, 95% CI:1.03-1.14) after adjusting for prior health service utilization, prior correctional involvement, and comorbidities.</p> <p>Conclusion: Individuals with schizophrenia were more likely to experience reincarceration after release from correctional facilities. This risk is partly explained by prior correctional involvement, health service utilization and comorbidities. Future research should focus on risk factors predicting the higher reincarceration rate and interventions to reduce correctional involvement.</p>

SCHOLARONE™
Manuscripts

1
2
3 Prevalence and predictors of re-incarceration after correctional centre release: a population-
4 based comparison of individuals with and without schizophrenia in Ontario, Canada.
5

6
7 Mayuri Mahentharan MSc¹

8 Fiona G. Kouyoumdjian MD MPH PhD^{2,3}

9 Claire de Oliveira PhD^{1,3,4}

10 Tomisin Iwajomo MPH^{1,3}

11 Alexander I F Simpson MBChB BMedSci⁵

12 Roland Jones MD PhD⁵

13 Paul Kurdyak MD PhD^{1,3,4}

14
15
16 Institutional Affiliations

17
18
19 ¹Institute for Mental Health Policy Research, CAMH, Toronto, ON

20 ²Department of Family Medicine, McMaster University, Hamilton, ON

21 ³ICES, Toronto, ON

22 ⁴Institute of Health Policy, Management and Evaluation, Faculty of Medicine, Toronto, ON

23 ⁵Division of Forensic Psychiatry, CAMH, Toronto, ON
24
25
26
27
28
29
30

31 Corresponding Author:

32
33
34 Paul Kurdyak

35 Institute for Mental Health Policy Research

36 CAMH

37 33 Russell Street, T305

38 Toronto, ON

39 M5S 2S1

40 Email: paul.kurdyak@camh.ca
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 Abstract
4
5

6 Objectives: Individuals with schizophrenia are over-represented in correctional facilities relative
7 to their population-based prevalence. The purpose of this study was to determine the rate and
8 predictors of reincarceration of individuals with schizophrenia after release from correctional
9 facilities.
10

11
12 Methods: This was a retrospective cohort study that included all people released from Ontario's
13 provincial correctional facilities from January 1 to December 31, 2010. Individuals with
14 schizophrenia were identified using a population-based algorithm. The primary outcome was
15 time to reincarceration. Covariates included sociodemographic characteristics (age, sex,
16 neighbourhood income quintile, urban/rural residence), health service utilization (primary care
17 physician visits, psychiatrist visits, psychiatric and non-psychiatric hospitalizations, emergency
18 department visits) and other clinical comorbidity. Survival analysis was used to examine the
19 association between schizophrenia and re-incarceration.
20
21

22
23 Results: Among 46,928 individuals, N = 3237 (7%) had a diagnosis of schizophrenia.
24 Approximately 67.5% of these individuals were reincarcerated within five years following their
25 first release in 2010, compared to 58.8% of individuals without schizophrenia. Individuals with
26 schizophrenia were 40% (HR: 1.39, 95% CI: 1.33-1.45) more likely to be reincarcerated following
27 release than the control group after adjusting for demographic characteristics. This association
28 reduced to 8% (1.08, 95% CI:1.03-1.14) after adjusting for prior health service utilization, prior
29 correctional involvement, and comorbidities.
30
31

32
33 Conclusion: Individuals with schizophrenia were more likely to experience reincarceration after
34 release from correctional facilities. This risk is partly explained by prior correctional
35 involvement, health service utilization and comorbidities. Future research should focus on risk
36 factors predicting the higher reincarceration rate and interventions to reduce correctional
37 involvement.
38
39

40
41 Keywords: Schizophrenia, Correctional Involvement, Incarceration, Health Services
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Introduction

Individuals with schizophrenia are at higher risk of incarceration compared to individuals without serious mental illness(1, 2). This higher rate of incarceration has translated into a schizophrenia prevalence in correctional facilities that is 3-6 times the population prevalence(3). Estimates from Canadian studies similarly suggest a higher prevalence of schizophrenia and other psychotic disorders in custodial populations(4, 5).

The higher rate of incarceration amongst individuals with schizophrenia may be due in part to higher rates of recidivism and potential re-incarceration, or effects of criminal justice interventions. For instance, reoffending after correctional facility release is increased by 40% amongst individuals with severe mental illnesses(3) compared to those without. In particular, a significant factor for higher risk of reincarceration for individuals with schizophrenia in contrast to those without is technical violation. Technical violations arise from criminal justice sanctions (court appearances, probation and parole requirement). Individuals with schizophrenia may have challenges adhering to probation and parole requirements resulting in a greater likelihood of getting new charges for these violations. The high rate of incarceration and reincarceration amongst individuals with schizophrenia may also be partially due to poor access to treatment(6), and evidence suggests that timely access to care among individuals with schizophrenia who have been released from correctional facilities can reduce the likelihood of reincarceration(7, 8).

1
2
3 The objective of this study was to determine the prevalence of schizophrenia in persons
4 released from Ontario correctional centres in 2010 and to estimate reincarceration rates among
5 these individuals ~~with~~when compared to those without a diagnosis of schizophrenia. We used
6 comprehensive population-based correctional and health administrative data for all Ontario
7 residents who were released from provincial correctional facilities in 2010.
8
9
10
11
12
13
14
15
16
17

18 **Methods**

19 **Study Setting and Design**

20 The Ontario provincial correctional system is responsible for the detention of all persons on
21 remand, and sentenced inmates subject to sentences of less than 2 years. Sentenced people
22 have an average length of stay of approximately 60 days, and people on remand of
23 approximately 40 days, although the median remand length of stay is closer to one week.
24
25
26
27
28
29
30
31
32
33
34

35 Individuals who were released from Ontario's provincial correctional facilities from January 1,
36 2010 to December 31, 2010 served as the study population, based on available data(9) (10).
37
38
39

40 Exclusion criteria included individuals whose age was less than 18 and greater than 105 at the
41 time of the first correctional facility release data in 2010 (the index event); individuals whose
42 data could not be linked to a valid identifier in the administrative data(10), individuals missing
43 information on their place of residence, and individuals who were not residents of Ontario for
44 the three years prior to the admission date of the index incarceration – as health service
45 utilization data would not be available for these individuals.
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Data Sources

The Ministry of Community Safety and Correctional Services dataset provided data for individuals within this cohort from 2005 to 2015. ~~Given that t~~The index release was the first release in 2010, and the maximum period of time for a provincial correctional event is 2 years. ~~Since the data are retrospective to 2005, a three-year lookback is the maximum amount of time for an individual with the longest detention (2 years) given the correctional data goes back to 2005. Therefore,~~ three years prior to correctional centre was the lookback duration that ensured the same correctional and health service utilization observation period for each subject regardless the duration of index correctional event duration. Subjects were followed from the index release in 2010 to a maximum follow up date of December 31, 2015 to capture correctional involvement and health service utilization.

The Ministry of Community Safety and Correctional Services provided socio-demographic data including age, sex, self-reported race, address on correctional entry (data on income quintile and rurality of residence were accessed at ICES, Toronto-Ontario's largest health data repository, using the address provided), and dates of entry and release from provincial custody from 2005 to 2015. These data were linked with health administrative data contained within ICES using valid ICES Key Numbers (IKN), which are unique person identifiers that are encoded Ontario Health Insurance Plan (OHIP) numbers. The linkage rate was approximately 97%.

Data related to health service utilization were obtained using administrative health information datasets including: the Canadian Institute for Health Information Discharge Abstract Database

1
2
3 (CIHI DAD), the Ontario Mental Health Reporting System (OMHRS), the National Ambulatory
4 Care Reporting System (NACRS), and Ontario Health Insurance Plan Claims Database (OHIP).
5
6 These health databases capture and report administrative, clinical, and demographic data such
7
8 as hospital admission and discharge, length of stay, emergency department registrations, and
9
10 ambulatory encounters. The Registered Persons Database (RPDB) was used to obtain
11
12 population and demographic data. The RPDB is a population-based registry maintained by the
13
14 Ministry of Health and Long-Term Care in Ontario. The dataset has demographic information on
15
16 individuals that use the health system including date of birth, sex, address, date of death, and
17
18 OHIP eligibility and status changes. All these data sources are held at ICES. ICES is an
19
20 independent, non-profit research institute whose legal status under Ontario's health
21
22 information privacy law allows it to collect and analyze health care and demographic data,
23
24 without consent, for health system evaluation and improvement. These datasets were linked
25
26 using unique encoded identifiers and analyzed at ICES. The use of data in this project was
27
28 authorized under section 45 of Ontario's Personal Health Information Protection Act, which
29
30 does not require review by a Research Ethics Board.
31
32
33
34
35
36
37
38
39
40
41
42
43

44 **Exposure Variable**

45
46
47 The provincial correctional sample was stratified based on the presence of a diagnosis of
48
49 schizophrenia prior to the index event. Persons with a schizophrenia diagnosis were identified
50
51 using a validated non-specific algorithm using OHIP billing codes, emergency department visits
52
53 and hospitalizations⁽¹¹⁾. Psychosis not otherwise specified (NOS) is often indistinguishable from
54
55
56
57
58
59
60

1
2
3 schizophrenia and therefore we included this diagnosis. The definition was ≥ 1 hospitalization
4 (DAD/OMHRS) or ≥ 3 OHIP claims in a three-year period with DSM-IV/ICD9 dx 295, 298, ICD10
5
6 F20, F25, F29⁽¹¹⁾.
7
8
9

10 11 **Outcomes**

12
13
14
15 The primary outcome of this study was re-incarceration, measured as time to first readmission
16
17 to a provincial correctional facility after the date of first release in 2010. Secondary outcomes of
18
19 this study were measures of correctional events and health service utilization. Outcomes
20
21 included: the number of admissions to provincial correctional facilities within five years of the
22
23 index event, the total number of days in custody in provincial correctional facilities within five
24
25 years of the index event, and the time to first contact for each of the following health services
26
27 after release: primary care physician (PCP) contact (including total, mental health-related and
28
29 non-mental health-related contact), psychiatrist contact, emergency department visit (for all
30
31 causes and mental health reason), medical hospitalization and psychiatric hospitalization.
32
33
34
35
36
37
38
39
40

41 **Covariates**

42
43
44 Sociodemographic characteristics included age, sex, neighbourhood income quintile, and
45
46 urban/rural residence. Age was divided into six categories (18-29, 30-39, 40-49, 50-64, 65-74
47
48 and 75+ years). Neighbourhood income levels were obtained using Census Canada information
49
50 provided by Statistics Canada (May 2006). Neighbourhood income levels were divided into five
51
52 categories based on distribution, in which income level 1 was defined as the lowest income
53
54
55
56
57
58
59
60

1
2
3 quintile and level 5 as the highest based on dissemination areas⁽¹²⁾. Rurality was defined using
4
5 the Rurality Index of Ontario (RIO2008) score, areas that scored 0-39 were considered urban
6
7 and areas that scored 40 or more were considered rural⁽¹³⁾. Self-reported race and variables
8
9 describing provincial correctional involvement were obtained from the dataset provided by the
10
11 Ministry of Community Safety and Correctional Services. These categorical variables included:
12
13 the cumulative length of time in custody from all correctional admissions in three years prior to
14
15 the index incarceration, length of the index incarceration event, and the number of prior
16
17 correctional events in three years prior to the index incarceration.
18
19
20
21
22

23
24 PCP visits were defined as the total number of visits for all reasons for the periods mentioned
25
26 above. Visits to PCPs were further categorized as mental health related and non-mental health
27
28 related visits based on a validated algorithm using OHIP billing codes⁽¹⁴⁾. The total number of
29
30 psychiatry visits were also identified in OHIP billing codes. To differentiate between PCP and
31
32 psychiatrist visits, the ICES Physician Database (IPDP) was used to identify physician specialties
33
34 for accuracy. Total hospitalizations and psychiatric hospitalizations were identified in CIHI DAD
35
36 and OMHRS. The total number of emergency department visits was captured using NACRS.
37
38
39

40
41 Clinical characteristics of the sample were captured using the ACG[®] System Collapsed Adjusted
42
43 Diagnosis Groups (CADGs) from the John Hopkins ACG[®] System Version 10, which has 12
44
45 categories⁽¹⁵⁾. CADGs were used as a proxy measure of morbidity and have shown good
46
47 prediction of mortality in the general population⁽¹⁶⁾ and in a population of individuals with a
48
49 diagnosis of schizophrenia⁽¹⁵⁾.
50
51
52

53 54 **Statistical Analysis**

55
56
57
58
59
60

1
2
3 Health service utilization encounters were calculated for each participant in the three year
4
5 period before the entry date of the index incarceration and in the five year period after the
6
7 index release – defined as the first release in 2010. Healthcare utilization was also measured
8
9 during the index incarceration. We examined episodes in custody in the three years prior to the
10
11 entry date of the index incarceration and five years after the index event.
12
13
14
15

16 The descriptive data were summarized using frequencies and proportions for categorical data,
17
18 and defined based on the data distribution. The distribution of continuous variables was
19
20 measured using mean (standard deviation) and median (interquartile range) to measure the
21
22 variations. Cox proportional hazards model was selected as the most appropriate modelling
23
24 method to reflect our interest in the time to event, and to be able to include other covariates in
25
26 the time to event model. Violation of the Cox PH proportionality assumption was tested using
27
28 Schoenfeld residuals and time-dependent covariates in the analysis. All analyses were
29
30 performed in SAS version 9.4 (SAS Institute, Cary, NC)(17).
31
32
33
34
35
36
37
38
39

40 **Results**

41
42
43 In 2010, there were 51,013 individuals released from Ontario's provincial correctional facilities.
44
45 After excluding individuals who were missing information location on residence (N = 3448),
46
47 missing age variable (N = 5), younger than 18 at the index event (N = 17) or not Ontario
48
49 residents in the three years prior to the admission date of individuals' first incarceration in 2010
50
51
52
53
54
55
56
57
58
59
60

1
2
3 (N=615), the cohort included 46,928 individuals. Among the 46,928 individuals, 7% (N = 3237)
4
5 had a diagnosis of schizophrenia prior to the index event date.
6
7
8
9
10

11
12 The characteristics of individuals released from correctional facilities with and without
13
14 schizophrenia are outlined in Table 1. Individuals with schizophrenia were older, more likely to
15
16 be female, more likely to live in a neighbourhood in the lowest neighbourhood income quintile,
17
18 and less likely to reside in rural regions.
19
20
21
22
23
24
25

26
27 Correctional involvement in the three years prior to the index correctional entry date is
28
29 outlined in Table 2. Individuals with schizophrenia had almost double the median aggregate
30
31 length of correctional centre stay compared to individuals without schizophrenia (66 (IQR – 13-
32
33 176) vs. 38 (IQR – 7-123)). The median length of stay of the index event and the number of prior
34
35 incarcerations was also higher for individuals with schizophrenia. The prior health service
36
37 utilization is outlined in Supplementary Table 1, and shows higher rates of use of all prior health
38
39 services measured.
40
41
42
43
44
45
46
47

48 Correctional involvement following index correctional event release date is outlined in Table 3.
49
50 Slightly more individuals with schizophrenia had at least one incarceration event in the five
51
52 years following release than individuals without schizophrenia (67.5% vs. 58.8%). The median
53
54 time to re-incarceration was shorter for individuals with vs. without schizophrenia (156 days
55
56
57
58
59
60

1
2
3 (IQR 52-410) vs. 219 days (IQR 81-531)) although total length of time in custody did not differ
4
5
6 between the groups.
7
8
9

10
11
12 Supplementary Table 2 shows health service utilization in the five years following release from
13
14 correctional centres. As with health service utilization prior to correctional centre entry,
15
16 individuals with schizophrenia had higher rates of all health service utilization in comparison to
17
18 individuals without schizophrenia. Twenty-four percent of people with schizophrenia (N = 776;
19
20 24.0%) did not see a psychiatrist within 5 years following correctional centre release, and the
21
22 median time post-release for a person with schizophrenia to see a psychiatrist was 114 days
23
24
25
26 (IQR: 30-374).
27
28
29
30
31
32
33

34 In a multivariable Cox regression model adjusting for age, sex, neighbourhood income quintile
35
36 and rurality, individuals with schizophrenia had a 40% increased risk of reincarceration
37
38 (adjusted HR: 1.39; 95% CI 1.33-1.45)(Fig. 1A) compared to those without schizophrenia.
39
40
41 Further adjusting for prior correctional involvement, comorbidity, and prior health service
42
43 utilization, individuals with schizophrenia were only at 8% increased risk of reincarceration
44
45 compared to individuals without schizophrenia (adjusted HR: 1.08; 95% CI 1.03-1.14)(Fig. 1B).
46
47
48
49
50
51
52

53 Discussion

54
55
56
57
58
59
60

1
2
3 Approximately 1 in 14 individuals (7%) released from provincial correctional facilities in 2010
4
5 had a diagnosis of schizophrenia. People with schizophrenia had a higher number of
6
7 correctional encounters prior to and following release than individuals without schizophrenia,
8
9 and were 40% more likely to be reincarcerated within 5 years following correctional release
10
11 than individuals without schizophrenia. That this relative increase in re-incarceration was
12
13 substantially attenuated by prior health service utilization, correctional involvement and
14
15 comorbidity suggests that these factors may play an important role in re-incarceration. That
16
17 prior correctional involvement is an important contributor is not surprising; however, prior
18
19 health service utilization may point to opportunities to intervene if individuals with better pre-
20
21 incarceration access to care have reduced rates of reincarceration.
22
23
24
25
26
27
28
29

30 We found that individuals with schizophrenia are highly overrepresented in Ontario's provincial
31
32 correctional facilities compared to the general population, which is consistent with prior
33
34 research (3, 18-22). The schizophrenia prevalence within this cohort was notably high (7%),
35
36 compared with estimates of schizophrenia prevalence observed in prior studies(3) and in the
37
38 general population (approximately 1%)(23, 24). Our findings that a diagnosis of schizophrenia is
39
40 associated with a higher rate of re-incarceration is also consistent with existing literature(13,
41
42 14, 25, 26).
43
44
45
46
47
48
49

50 The findings also highlight service fragmentation following the index release in 2010. In the five
51
52 years following release, approximately 1 in 4 individuals with schizophrenia did not see a
53
54 psychiatrist. Given the complexities associated with support for individuals who have a
55
56
57
58
59
60

1
2
3 diagnosis of schizophrenia such as the continuation of antipsychotic medication, the need for
4
5 other psychosocial interventions such as cognitive behavioural therapy, the need for regular
6
7 physical health assessments, stable housing, among other socio-economic supports(27), timely
8
9 access to specialty mental health care services, including psychiatrists, quickly following release
10
11 should be an expected standard of care for individuals with schizophrenia who have had
12
13 correctional involvement. Indeed, 44% of individuals with schizophrenia had at least one
14
15 psychiatric hospitalization following index correctional event release. Lack of psychiatric care
16
17 and treatment may contribute to both re-incarceration and psychiatric hospitalizations. Indeed,
18
19 the same factors that create challenges adhering to conditions of release (parole, etc.) likely
20
21 contribute to challenges attending psychiatric follow-up.
22
23
24
25
26
27
28
29

30 There are several limitations that merit discussion. Given the limited availability of socio-
31
32 demographic data, we were unable to include largely cited socio-demographic factors
33
34 including: marital status, education level and housing status(8, 28-32). Our diagnosis of
35
36 schizophrenia relies on clinical codes in administrative health data rather than a comprehensive
37
38 clinical assessment, and there may be misclassification of schizophrenia status. However, the
39
40 algorithm used to identify individuals with a primary diagnosis of schizophrenia was validated
41
42 using population-based health administrative databases in Ontario(11). Finally, the correctional
43
44 data did not include information on the criminal charges or convictions. Distinguishing whether
45
46 individuals with schizophrenia within this cohort were incarcerated for violent or non-violent
47
48 crimes or for administrative offences such as failing to comply with probation/parole or to
49
50 attend court appearances could have contributed to the analysis in understanding the length of
51
52
53
54
55
56
57
58
59
60

1
2
3 correctional episodes and whether individuals were receiving the type of care necessary. In
4
5 addition, this study focused on Ontario's provincial correctional facilities and did not include
6
7 data on federal correctional involvement.
8
9

10 11 12 13 **Conclusion**

14
15 Individuals with schizophrenia are overrepresented in correctional facilities in comparison to
16
17 the general population. Additionally, individuals with schizophrenia also experience higher rates
18
19 of re-incarceration. Further work is needed to understand the needs of individuals with
20
21 schizophrenia and risk factors contributing to re-incarceration. However, these individuals
22
23 would likely benefit from more coordinated and integrated health service delivery following
24
25 correctional release.
26
27
28
29
30
31

32 33 **Data Access**

34
35 The dataset from this study is held securely in coded form at ICES. While data sharing
36
37 agreements prohibit ICES from making the dataset publicly available, access may be granted to
38
39 those who meet pre-specified criteria for confidential access, available at www.ices.on.ca/DAS.
40
41

42 The full dataset creation plan and underlying analytic code are available from the authors upon
43
44 request, understanding that the computer programs may rely upon coding templates or macros
45
46 that are unique to ICES and are therefore either inaccessible or may require modification.
47
48
49
50
51

52 53 **Acknowledgements**

54
55
56
57
58
59
60

1
2
3 This study was supported by ICES, which is funded by an annual grant from the Ontario Ministry
4
5 of Health and Long-Term Care (MOHLTC). Parts of this material are based on data and
6
7 information compiled and provided by: the Ontario Ministry of Health and Long-term Care and
8
9 the Canadian Institute for Health Information (CIHI). The analyses, conclusions, opinions and
10
11 statements expressed herein are solely those of the authors and do not reflect those of the
12
13 funding or data sources; no endorsement is intended or should be inferred.
14
15
16
17
18
19

20 **Conflicts of Interest**

21
22 No author has a conflict of interest related to this study.
23
24
25

26 **Funding**

27
28 This study was funded by a grant from the Canadian Institutes for Health Research.
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

References

1. Ramsay CE, Goulding, S. M., Broussard, B., Cristofaro, S. L., Abedi, G. R., & Compton, M. T. Prevalence and psychosocial correlates of prior incarcerations in an urban, predominantly African-American sample of hospitalized patients with first-episode psychosis. *J Am Acad Psychiatry Law*. 2011;39(1):57-64.
2. Rautanen M, & Lauerma, H. Imprisonment and diagnostic delay among male offenders with schizophrenia. *Crim Behav Ment Health*. 2011;21(4):259-64.
3. Fazel S, & Seewald, K. Severe mental illness in 33,588 prisoners worldwide: systematic review and meta-regression analysis. *Br J Psychiatry*. 2012;200(5):364-73.
4. Bland RC, Newman, S. C., Thompson, A. H., & Dyck, R. J. Psychiatric disorders in the population and in prisoners. *Int J Law Psychiatry*. 1998;21(3):273-9.
5. Corrado RR, Cohen, I., Hart, S., & Roesch, R. Comparative examination of the prevalence of mental disorders among jailed inmates in Canada and the United States. *Int J Law Psychiatry*. 2000;23(5-6):633-47.
6. Fisher WH, Packer, I. K., Simon, L. J., & Smith, D. Community mental health services and the prevalence of severe mental illness in local jails: are they related? *Adm Policy Ment Health*. 2000;27(6):371-82.
7. Hawthorne WB, Folsom, D. P., Sommerfeld, D. H., Lanouette, N. M., Lewis, M., Aarons, G. A., Conklin, R. M., Solorzano, E., Lindamer, L. A., & Jeste DV. Incarceration Among Adults Who Are in the Public Mental Health System: Rates, Risk Factors, and Short-Term Outcomes. *Psychiatric Services*. 2012;63(1):26-32.

- 1
2
3 8. Lamberti JS. Understanding and preventing criminal recidivism among adults with
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
8. Lamberti JS. Understanding and preventing criminal recidivism among adults with
psychotic disorders. *Psychiatr Serv.* 2007;58(6):773-81.
9. Kouyoumdjian F, Schuler, A., Hwang, S. W. & Matheson, F. Research on the health of
people who experience detention or incarceration in Canada: a scoping review. *BMC public
health.* 2015;15(419):1-8.
10. Kouyoumdjian FG, Cheng S. Y., Fung, K., Orkin, A. M., McIsaac K. E., Kendall, C., Kiefer, L.,
Matheson, F. I., Green, S. E., and Hwang, S. W. . The health care utilization of people in prison
and after prison release: A population-based cohort study in Ontario, Canada. *PloS one.* August
3, 2018;13(8).
11. Kurdyak P, Lin, E., Green, D., & Vigod, S. Validation of a Population-Based Algorithm to
Detect Chronic Psychotic Illness. *Can J Psychiatry.* 2015;60(8):362-8.
12. Statistics Canada. Income in Canada 2015 [Available from:
<https://www.statcan.gc.ca/pub/75-202-x/2010000/analysis-analyses-eng.htm>].
13. Krajl B. Measuring Rurality - RIO2008 BASIC: Methodology and Results. Toronto (ON):
OMA Economics Department; 2009.
14. Steele L, Glazier R, Lin E, Evans M. Using administrative data to measure ambulatory
mental health service provision in primary care. *Med Care.* 2004;42(10):960-5.
15. Austin PC, Newman A, Kurdyak PA. Using the Johns Hopkins Aggregated Diagnosis
Groups (ADGs) to predict mortality in a population-based cohort of adults with schizophrenia in
Ontario, Canada. *Psychiatry Res.* 2012;196(1):32-7.

- 1
2
3 16. Austin PC, Walraven, C., Wodchis, W., Newman, A. & Anderson, G. M. Using the Johns
4 Hopkins Aggregated Diagnosis Groups (ADGs) to predict mortality in a general adult population
5 cohort in Ontario, Canada. Canadian Institutes of Health Research. 2011;40(10):932-9.
6
7
- 8
9
10 17. SAS. SAS System, Version 9: Installation and Administration Information. 2007.
11
- 12
13 18. Brinded PM, Simpson, A. I., Laidlaw, T. M., Fairley, N., & Malcolm, F. Prevalence of
14 psychiatric disorders in New Zealand prisons: a national study. Aust N Z J Psychiatry.
15 2001;35(2):166-73.
16
17
- 18
19
20 19. Sirdifield C, Gojkovic, D., Brooker, C., & Ferriter, M. A systematic review of research on
21 the epidemiology of mental health disorders in prison populations: a summary of findings. J
22 Forensic Psychi Ps. 2009;20(1):S78-S101.
23
24
- 25
26
27 20. Lafortune D. Prevalence and screening of mental disorders in short-term correctional
28 facilities. Int J Law Psychiatry. 2010;33(2):94-100.
29
- 30
31
32 21. Senior J, Birmingham, L., Harty, M. A., Hassan, L., Hayes, A. J., Kendall, K., King, C.,
33 Lathlean, J., Lowthian, C., Mills, A., Webb, R., Thornicroft, G., & Shaw, J. Identification and
34 management of prisoners with severe psychiatric illness by specialist mental health services.
35 Psychol Med. 2013;43(7):1511-20.
36
37
- 38
39
40 22. Fazel S, & Danesh, J. Serious mental disorder in 23000 prisoners: a systematic review of
41 62 surveys. Lancet. 2002;359(9306):545-50.
42
43
- 44
45
46 23. Goldner EM, Jones, W., & Waraich, P. Using administrative data to analyze the
47 prevalence and distribution of schizophrenic disorders. Psychiatric Services. 2003;54(7):1017-
48 21.
49
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 24. Khan S, Chiu, M., Simpson, A. I., Guttman, A., Jembere, N., & Kurdyak, P. Use of Mental
4
5 Health Services by Youths and Young Adults Before and During Correctional Custody: A
6
7 Population-Based Study. *Psychiatr Serv.* 2016;67(7):790-3.
8
9
- 10 25. Simpson AI, McMaster, J. J., & Cohen, S. N. Challenges for Canada in meeting the needs
11
12 of persons with serious mental illness in prison. *J Am Acad Psychiatry Law.* 2013;41(4):501-9.
13
14
- 15 26. National Institute of Health and Care Excellence. Psychosis and schizophrenia in adults.
16
17 2015.
18
19
- 20 27. Health Quality Ontario. Schizophrenia Care in the Community for Adults Ontario:
21
22 Queen's Printer for Ontario; 2019 [Available from: [https://www.hqontario.ca/Evidence-to-
23
24
25
26
27
28
29 Improve-Care/Quality-Standards/View-all-Quality-Standards/Schizophrenia-Care-in-the-
30
31 Community/The-Quality-Standard-In-Brief.](https://www.hqontario.ca/Evidence-to-Improve-Care/Quality-Standards/View-all-Quality-Standards/Schizophrenia-Care-in-the-Community/The-Quality-Standard-In-Brief)
32
- 33 28. Prince JD. Incarceration and hospital care. *J Nerv Ment Dis.* 2006;194(1):34-9.
34
- 35 29. Harty M, Jarrett, M., Thornicroft, G., & Shaw, J. Unmet needs of male prisoners under
36
37 the care of prison Mental Health Inreach Services. *J Forensic Psychi Ps.* 2012;23(3):285-96.
38
- 39 30. Prince JD, Akincigil, A., & Bromet, E. Incarceration rates of persons with first-admission
40
41 psychosis. *Psychiatr Serv.* 2007;58(9):1173-80.
42
- 43 31. Robertson AG, Swanson, J. W., Frisman, L. K., Lin, H., & Swartz, M. S. Patterns of justice
44
45 involvement among adults with schizophrenia and bipolar disorder: key risk factors. *Psychiatr*
46
47 *Serv.* 2014;65(7):931-8.
48
- 49 32. Wallace C, Mullen, P. E., & Burgess, P. Criminal offending in schizophrenia over a 25-year
50
51 period marked by deinstitutionalization and increasing prevalence of comorbid substance use
52
53 disorders. *Am J Psychiatry.* 2004;161(4):716-27.
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 1: Characteristics of study cohort, by schizophrenia diagnosis

Variable	Individuals without schizophrenia	Individuals with schizophrenia	Standardized Difference
	N (%)	N (%)	
Total	43,691 (93.1)	3,237 (7.0)	
Age			
Median (IQR)	32 (24-43)	36 (28-45)	0.30
18-29	19,007 (43.5)	1,004 (31.0)	0.26
30-39	10,775 (24.7)	936 (28.9)	0.10
40-49	9,175 (21.0)	825 (25.5)	0.11
50-64	4,322 (9.9)	425 (13.1)	0.10
65-74	354 (0.8)	39 (1.2)	0.04
75+	58 (0.1)	8 (0.2)	0.03
Sex			
Female	5,280 (12.1)	542 (16.7)	0.13
Male	38,411 (87.9)	2,695 (83.3)	0.13
Self-reported race			
Missing	2,952 (6.8)	223 (6.9)	0.01
Aboriginal	4,763 (10.9)	271 (8.4)	0.09
Black	5,248 (12.0)	447 (13.8)	0.05
East Asian	715 (1.6)	43 (1.3)	0.03
Hispanic	519 (1.2)	26 (0.8)	0.04
South Asian	908 (2.1)	68 (2.1)	0.00
South East Asian	557 (1.3)	46 (1.4)	0.01
West Asian/Arabic	671 (1.5)	46 (1.4)	0.01
White	25,973 (59.4)	1,958 (60.5)	0.02
Other racial origin	1,000 (2.3)	79 (2.4)	0.01
Declined to specify	130 (0.3)	12 (0.4)	0.01
Racial origin unknown	254 (0.6)	17 (0.5)	0.01
Income Quintile			
Missing	3,207 (7.3)	96 (3.0)	0.20
1	15,359 (35.2)	1,334 (41.2)	0.12
2	9,218 (21.1)	696 (21.5)	0.01
3	6,802 (15.6)	508 (15.7)	0.00
4	5,194 (11.9)	330 (10.2)	0.05
5	3,911 (9.0)	273 (8.4)	0.02
Rurality			
Missing	2,398 (5.5)	25 (0.8)	0.27
Urban	35,533 (81.3)	2,953 (91.2)	0.29
Rural	5,760 (13.2)	259 (8.0)	0.17
Comorbidity (cADGs)			

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Mean ± SD	3.0±2.1	4.2±2.0	0.60
Median (IQR)	3(1-4)	4(3-6)	0.61

Legend: IQR – interquartile range; cADGs – Collapsed Aggregated Diagnostic groups; SD – standard deviation

Table 2: Correctional involvement three years prior to the index* incarceration by schizophrenia diagnosis

Variable	Individuals without schizophrenia	Individuals with schizophrenia	Standardized Difference
	N (%)	N (%)	
Total	43,691 (93.1)	3,237 (7.0)	
Length of stay from all correctional entries in 3 years prior to index release			
Median (IQR)	38 (7-123)	66 (13-176)	0.26
No prior incarcerations	22,904 (52.4)	1,327 (41.0)	0.23
1-6	5,115 (11.7)	323 (10.0)	0.06
7-29	4,464 (10.2)	354 (10.9)	0.02
30-89	4,385 (10.0)	430 (13.3)	0.10
90-179	3,414 (7.8)	335 (10.3)	0.09
180-364	2,570 (5.9)	332 (10.3)	0.16
365+	839 (1.9)	136 (4.2)	0.13
Length of stay of index incarceration event			
Median (IQR)	7 (2-37)	11 (3-48)	0.16
1-6	21,101 (48.3)	1,324 (40.9)	0.15
7-29	10,104 (23.1)	840 (25.9)	0.07
30-89	7,434 (17.0)	638 (19.7)	0.07
90-119	1,813 (4.1)	140 (4.3)	0.01
120-364	2,966 (6.8)	273 (8.4)	0.06
365+	273 (0.6)	22 (0.7)	0.01
Number of prior incarcerations			
Median (IQR)	0 (0-2)	1 (0-3)	0.3
0	22,904 (52.4)	1,327 (41.0)	0.23
1	8,151 (18.7)	566 (17.5)	0.03
2	4,868 (11.1)	357 (11.0)	0.00
3	2,929 (6.7)	266 (8.2)	0.06
4	1,846 (4.2)	207 (6.4)	0.10
5	1,071 (2.5)	139 (4.3)	0.10
6	661 (1.5)	84 (2.6)	0.08
7	450 (1.0)	68 (2.1)	0.09
8	259 (0.6)	57 (1.8)	0.11
9	175 (0.4)	46 (1.4)	0.11
10+	377 (0.9)	120 (3.7)	0.19

*Index refers to the first correctional release for each individual in 2010 in Ontario.

Legend: IQR – interquartile range

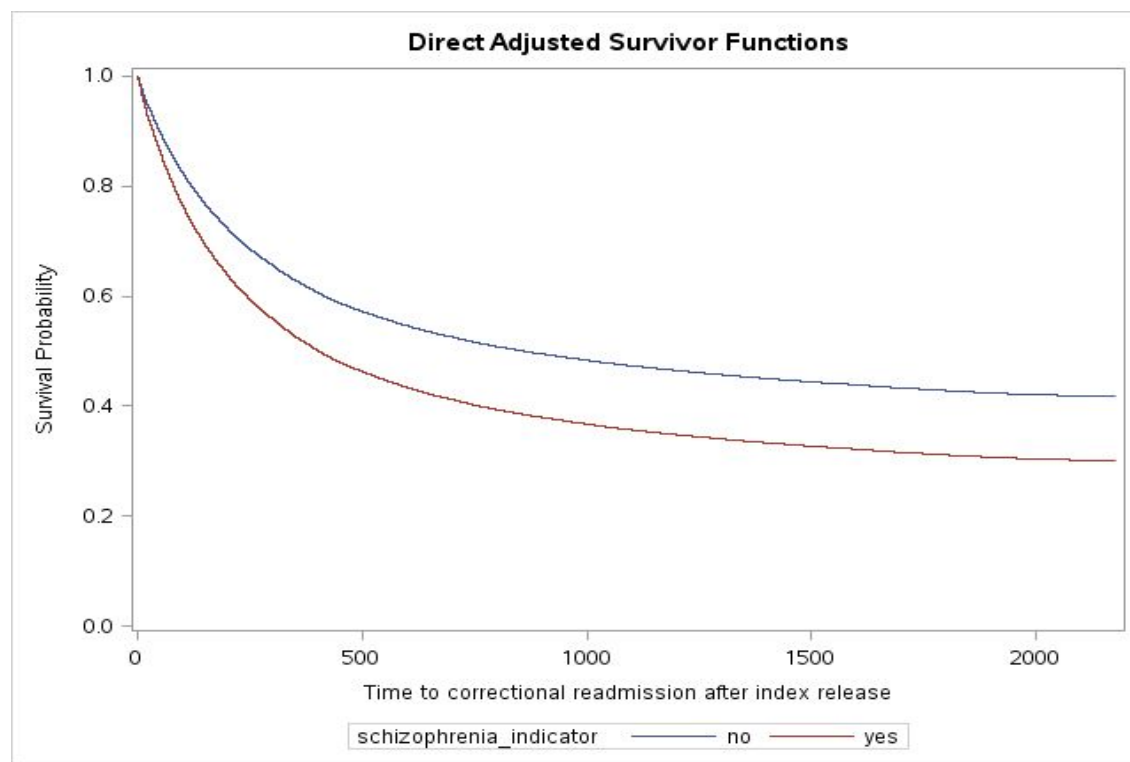
Table 3: Correctional involvement five years after index release, by schizophrenia diagnosis

Variable	Individuals without schizophrenia	Individuals with schizophrenia	Standardized Difference
	N (%)	N (%)	
Total	43,691 (93.1)	3,237 (7.0)	
Any re-incarceration within 5 years	25,703 (58.8)	2,185 (67.5)	0.18
Time to re-incarceration			
Median (IQR)	219 (81-531)	156 (52-410)	0.21
Not reincarcerated	17,988 (41.2)	1,052 (32.5)	0.18
1-30 days	2,853 (6.5)	359 (11.1)	0.16
31-60	2,249 (5.1)	259 (8.0)	0.12
61-90	1,908 (4.4)	184 (5.7)	0.06
91-240	6,503 (14.9)	528 (16.3)	0.04
241-365	3,143 (7.2)	240 (7.4)	0.01
366-730	4,554 (10.4)	330 (10.2)	0.01
731-1095	2,079 (4.8)	96 (3.0)	0.09
3 years +	2,414 (5.5)	189 (5.8)	0.01
Length of stay from all correctional events in 5 years after index release			
Median (IQR)	83 (20-204)	88 (23-222)	0.07
Not re-incarcerated	17,988 (41.2)	1,052 (32.5)	0.18
1-6 days	3,563 (8.2)	246 (7.6)	0.02
7-29	4,181 (9.6)	373 (11.5)	0.06
30-89	5,597 (12.8)	483 (14.9)	0.06
90-179	4,999 (11.4)	386 (11.9)	0.02
180-364	4,501 (10.3)	402 (12.4)	0.07
365-729	2,473 (5.7)	232 (7.2)	0.06
730+	389 (0.9)	63 (1.9)	0.09

*Index refers to the first correctional release for each individual in 2010 in Ontario.

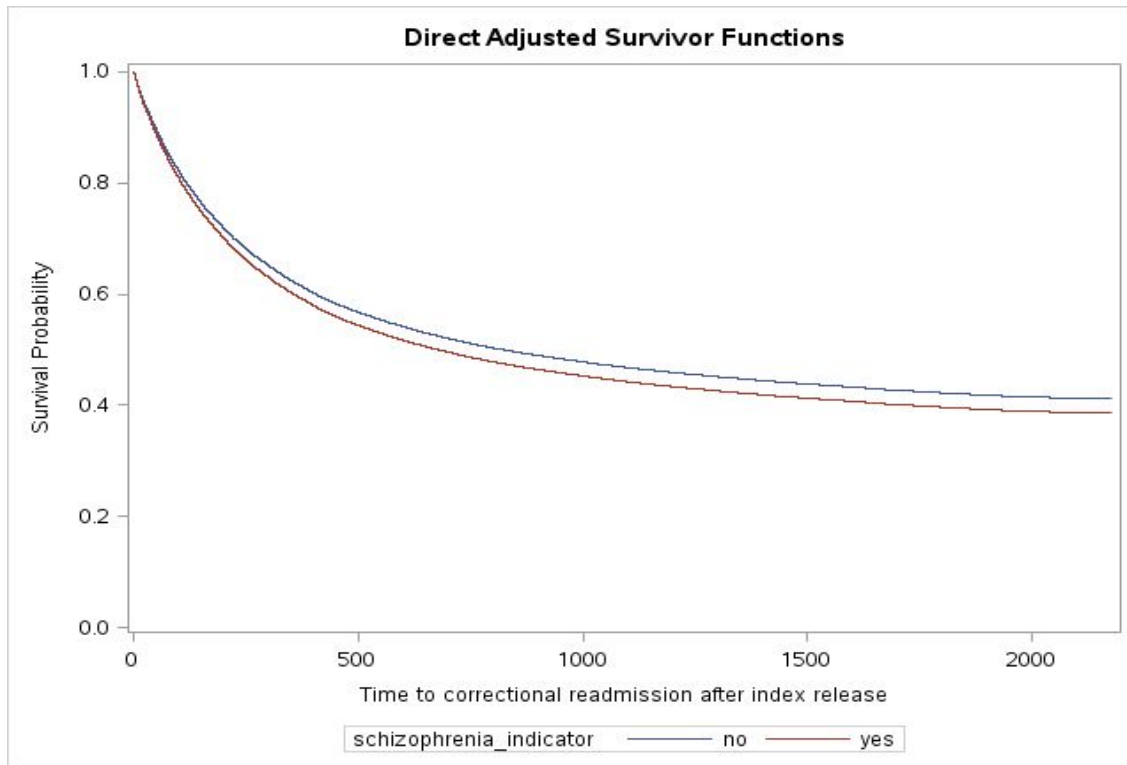
Legend: IQR – interquartile range

Figure 1A: Time to re-incarceration for individuals with and without schizophrenia from multivariable Cox regression*



*Adjusted for age, sex, neighbourhood income quintile and rurality.

Figure 1B: Recidivism survival curves between individuals with and without schizophrenia.*



*Adjusted for age, sex, neighbourhood income quintile, rurality, comorbidity, prior correctional involvement and prior health service utilization.

1
2
3 Prevalence and predictors of re-incarceration after correctional centre release: a population-
4 based comparison of individuals with and without schizophrenia in Ontario, Canada.
5
6

7 Mayuri Mahentharan MSc¹

8 Fiona G. Kouyoumdjian MD MPH PhD^{2,3}

9 Claire de Oliveira PhD^{1,3,4}

10 Tomisin Iwajomo MPH^{1,3}

11 Alexander I F Simpson MBChB BMedSci⁵

12 Roland Jones MD PhD⁵

13 Paul Kurdyak MD PhD^{1,3,4}
14
15

16 Institutional Affiliations 17 18

19 ¹Institute for Mental Health Policy Research, CAMH, Toronto, ON

20 ²Department of Family Medicine, McMaster University, Hamilton, ON

21 ³ICES, Toronto, ON

22 ⁴Institute of Health Policy, Management and Evaluation, Faculty of Medicine, Toronto, ON

23 ⁵Division of Forensic Psychiatry, CAMH, Toronto, ON
24
25
26
27
28
29
30

31 Corresponding Author: 32 33 34

35 Paul Kurdyak

36 Institute for Mental Health Policy Research

37 CAMH

38 33 Russell Street, T305

39 Toronto, ON

40 M5S 2S1

41 Email: paul.kurdyak@camh.ca
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Abstract

Objectives: Individuals with schizophrenia are over-represented in correctional facilities relative to their population-based prevalence. The purpose of this study was to determine the rate and predictors of reincarceration of individuals with schizophrenia after release from correctional facilities.

Methods: This was a retrospective cohort study that included all people released from Ontario's provincial correctional facilities from January 1 to December 31, 2010. Individuals with schizophrenia were identified using a population-based algorithm. The primary outcome was time to reincarceration. Covariates included sociodemographic characteristics (age, sex, neighbourhood income quintile, urban/rural residence), health service utilization (primary care physician visits, psychiatrist visits, psychiatric and non-psychiatric hospitalizations, emergency department visits) and other clinical comorbidity. Survival analysis was used to examine the association between schizophrenia and re-incarceration.

Results: Among 46,928 individuals, N = 3237 (7%) had a diagnosis of schizophrenia. Approximately 67.5% of these individuals were reincarcerated within five years following their first release in 2010, compared to 58.8% of individuals without schizophrenia. Individuals with schizophrenia were 40% (HR: 1.39, 95% CI: 1.33-1.45) more likely to be reincarcerated following release than the control group after adjusting for demographic characteristics. This association reduced to 8% (1.08, 95% CI:1.03-1.14) after adjusting for prior health service utilization, prior correctional involvement, and comorbidities.

Conclusion: Individuals with schizophrenia were more likely to experience reincarceration after release from correctional facilities. This risk is partly explained by prior correctional involvement, health service utilization and comorbidities. Future research should focus on risk factors predicting the higher reincarceration rate and interventions to reduce correctional involvement.

Keywords: Schizophrenia, Correctional Involvement, Incarceration, Health Services

Introduction

Individuals with schizophrenia are at higher risk of incarceration compared to individuals without serious mental illness(1, 2). This higher rate of incarceration has translated into a schizophrenia prevalence in correctional facilities that is 3-6 times the population prevalence(3). Estimates from Canadian studies similarly suggest a higher prevalence of schizophrenia and other psychotic disorders in custodial populations(4, 5).

The higher rate of incarceration amongst individuals with schizophrenia may be due in part to higher rates of recidivism and potential re-incarceration, or effects of criminal justice interventions. For instance, reoffending after correctional facility release is increased by 40% amongst individuals with severe mental illnesses(3) compared to those without. In particular, a significant factor for higher risk of reincarceration for individuals with schizophrenia in contrast to those without is technical violation. Technical violations arise from criminal justice sanctions (court appearances, probation and parole requirement). Individuals with schizophrenia may have challenges adhering to probation and parole requirements resulting in a greater likelihood of getting new charges for these violations. The high rate of incarceration and reincarceration amongst individuals with schizophrenia may also be partially due to poor access to treatment(6), and evidence suggests that timely access to care among individuals with schizophrenia who have been released from correctional facilities can reduce the likelihood of reincarceration(7, 8).

1
2
3 The objective of this study was to determine the prevalence of schizophrenia in persons
4 released from Ontario correctional centres in 2010 and to estimate reincarceration rates among
5 these individuals with compared to those without a diagnosis of schizophrenia. We used
6 comprehensive population-based correctional and health administrative data for all Ontario
7 residents who were released from provincial correctional facilities in 2010.
8
9
10
11
12
13
14
15
16
17

18 **Methods**

19 **Study Setting and Design**

20 The Ontario provincial correctional system is responsible for the detention of all persons on
21 remand, and sentenced inmates subject to sentences of less than 2 years. Sentenced people
22 have an average length of stay of approximately 60 days, and people on remand of
23 approximately 40 days, although the median remand length of stay is closer to one week.
24
25
26
27
28
29
30
31
32
33
34

35 Individuals who were released from Ontario's provincial correctional facilities from January 1,
36 2010 to December 31, 2010 served as the study population, based on available data(9) (10).
37
38
39

40 Exclusion criteria included individuals whose age was less than 18 and greater than 105 at the
41 time of the first correctional facility release data in 2010 (the index event); individuals whose
42 data could not be linked to a valid identifier in the administrative data(10), individuals missing
43 information on their place of residence, and individuals who were not residents of Ontario for
44 the three years prior to the admission date of the index incarceration – as health service
45 utilization data would not be available for these individuals.
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Data Sources

The Ministry of Community Safety and Correctional Services dataset provided data for individuals within this cohort from 2005 to 2015. Given that the index release was the first release in 2010, a three year lookback is the maximum amount of time for an individual with the longest detention (2 years) given the correctional data goes back to 2005. Therefore, three years prior to correctional centre was the lookback duration that ensured the same correctional and health service utilization observation period for each subject regardless the duration of index correctional event duration. Subjects were followed from the index release in 2010 to a maximum follow up date of December 31, 2015 to capture correctional involvement and health service utilization.

The Ministry of Community Safety and Correctional Services provided socio-demographic data including age, sex, self-reported race, address on correctional entry (data on income quintile and rurality of residence were accessed at ICES, Toronto-Ontario's largest health data repository, using the address provided), and dates of entry and release from provincial custody from 2005 to 2015. These data were linked with health administrative data contained within ICES using valid ICES Key Numbers (IKN), which are unique person identifiers that are encoded Ontario Health Insurance Plan (OHIP) numbers. The linkage rate was approximately 97%.

Data related to health service utilization were obtained using administrative health information datasets including: the Canadian Institute for Health Information Discharge Abstract Database (CIHI DAD), the Ontario Mental Health Reporting System (OMHRS), the National Ambulatory

Care Reporting System (NACRS), and Ontario Health Insurance Plan Claims Database (OHIP).

These health databases capture and report administrative, clinical, and demographic data such as hospital admission and discharge, length of stay, emergency department registrations, and ambulatory encounters. The Registered Persons Database (RPDB) was used to obtain population and demographic data. The RPDB is a population-based registry maintained by the Ministry of Health and Long-Term Care in Ontario. The dataset has demographic information on individuals that use the health system including date of birth, sex, address, date of death, and OHIP eligibility and status changes. All these data sources are held at ICES. ICES is 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. These datasets were linked using unique encoded identifiers and analyzed at ICES. The use of data in this project was authorized under section 45 of Ontario's Personal Health Information Protection Act, which does not require review by a Research Ethics Board.

Exposure Variable

The provincial correctional sample was stratified based on the presence of a diagnosis of schizophrenia prior to the index event. Persons with a schizophrenia diagnosis were identified using a validated non-specific algorithm using OHIP billing codes, emergency department visits and hospitalizations⁽¹¹⁾. Psychosis not otherwise specified (NOS) is often indistinguishable from schizophrenia and therefore we included this diagnosis. The definition was ≥ 1 hospitalization

1
2
3 (DAD/OMHRS) or ≥ 3 OHIP claims in a three-year period with DSM-IV/ICD9 dx 295, 298, ICD10
4
5 F20, F25, F29⁽¹¹⁾.
6
7

8 9 **Outcomes**

10
11
12 The primary outcome of this study was re-incarceration, measured as time to first readmission
13
14 to a provincial correctional facility after the date of first release in 2010. Secondary outcomes of
15
16 this study were measures of correctional events and health service utilization. Outcomes
17
18 included: the number of admissions to provincial correctional facilities within five years of the
19
20 index event, the total number of days in custody in provincial correctional facilities within five
21
22 years of the index event, and the time to first contact for each of the following health services
23
24 after release: primary care physician (PCP) contact (including total, mental health-related and
25
26 non-mental health-related contact), psychiatrist contact, emergency department visit (for all
27
28 causes and mental health reason), medical hospitalization and psychiatric hospitalization.
29
30
31
32
33
34
35
36
37
38

39 **Covariates**

40
41
42 Sociodemographic characteristics included age, sex, neighbourhood income quintile, and
43
44 urban/rural residence. Age was divided into six categories (18-29, 30-39, 40-49, 50-64, 65-74
45
46 and 75+ years). Neighbourhood income levels were obtained using Census Canada information
47
48 provided by Statistics Canada (May 2006). Neighbourhood income levels were divided into five
49
50 categories based on distribution, in which income level 1 was defined as the lowest income
51
52 quintile and level 5 as the highest based on dissemination areas⁽¹²⁾. Rurality was defined using
53
54
55
56
57
58
59
60

1
2
3 the Rurality Index of Ontario (RIO2008) score, areas that scored 0-39 were considered urban
4
5 and areas that scored 40 or more were considered rural⁽¹³⁾. Self-reported race and variables
6
7 describing provincial correctional involvement were obtained from the dataset provided by the
8
9 Ministry of Community Safety and Correctional Services. These categorical variables included:
10
11 the cumulative length of time in custody from all correctional admissions in three years prior to
12
13 the index incarceration, length of the index incarceration event, and the number of prior
14
15 correctional events in three years prior to the index incarceration.
16
17
18
19
20

21 PCP visits were defined as the total number of visits for all reasons for the periods mentioned
22
23 above. Visits to PCPs were further categorized as mental health related and non-mental health
24
25 related visits based on a validated algorithm using OHIP billing codes⁽¹⁴⁾. The total number of
26
27 psychiatry visits were also identified in OHIP billing codes. To differentiate between PCP and
28
29 psychiatrist visits, the ICES Physician Database (IPDP) was used to identify physician specialties
30
31 for accuracy. Total hospitalizations and psychiatric hospitalizations were identified in CIHI DAD
32
33 and OMHRS. The total number of emergency department visits was captured using NACRS.
34
35
36
37

38 Clinical characteristics of the sample were captured using the ACG[®] System Collapsed Adjusted
39
40 Diagnosis Groups (CADGs) from the John Hopkins ACG[®] System Version 10, which has 12
41
42 categories⁽¹⁵⁾. CADGs were used as a proxy measure of morbidity and have shown good
43
44 prediction of mortality in the general population⁽¹⁶⁾ and in a population of individuals with a
45
46 diagnosis of schizophrenia⁽¹⁷⁾.
47
48
49
50

51 **Statistical Analysis**

52
53
54
55
56
57
58
59
60

1
2
3 Health service utilization encounters were calculated for each participant in the three year
4
5 period before the entry date of the index incarceration and in the five year period after the
6
7 index release – defined as the first release in 2010. Healthcare utilization was also measured
8
9 during the index incarceration. We examined episodes in custody in the three years prior to the
10
11 entry date of the index incarceration and five years after the index event.
12
13
14
15

16 The descriptive data were summarized using frequencies and proportions for categorical data,
17
18 and defined based on the data distribution. The distribution of continuous variables was
19
20 measured using mean (standard deviation) and median (interquartile range) to measure the
21
22 variations. Cox proportional hazards model was selected as the most appropriate modelling
23
24 method to reflect our interest in the time to event, and to be able to include other covariates in
25
26 the time to event model. Violation of the Cox PH proportionality assumption was tested using
27
28 Schoenfeld residuals and time-dependent covariates in the analysis. All analyses were
29
30 performed in SAS version 9.4 (SAS Institute, Cary, NC)(18).
31
32
33
34
35
36
37
38
39

40 **Results**

41
42
43 In 2010, there were 51,013 individuals released from Ontario's provincial correctional facilities.
44
45 After excluding individuals who were missing information location on residence (N = 3448),
46
47 missing age variable (N = 5), younger than 18 at the index event (N = 17) or not Ontario
48
49 residents in the three years prior to the admission date of individuals' first incarceration in 2010
50
51
52
53
54
55
56
57
58
59
60

1
2
3 (N=615), the cohort included 46,928 individuals. Among the 46,928 individuals, 7% (N = 3237)
4
5 had a diagnosis of schizophrenia prior to the index event date.
6
7
8
9

10
11
12 The characteristics of individuals released from correctional facilities with and without
13
14 schizophrenia are outlined in Table 1. Individuals with schizophrenia were older, more likely to
15
16 be female, more likely to live in a neighbourhood in the lowest neighbourhood income quintile,
17
18 and less likely to reside in rural regions.
19
20
21
22
23
24
25

26
27 Correctional involvement in the three years prior to the index correctional entry date is
28
29 outlined in Table 2. Individuals with schizophrenia had almost double the median aggregate
30
31 length of correctional centre stay compared to individuals without schizophrenia (66 (IQR – 13-
32
33 176) vs. 38 (IQR – 7-123)). The median length of stay of the index event and the number of prior
34
35 incarcerations was also higher for individuals with schizophrenia. The prior health service
36
37 utilization is outlined in Supplementary Table 1, and shows higher rates of use of all prior health
38
39 services measured.
40
41
42
43
44
45
46
47

48 Correctional involvement following index correctional event release date is outlined in Table 3.
49
50 Slightly more individuals with schizophrenia had at least one incarceration event in the five
51
52 years following release than individuals without schizophrenia (67.5% vs. 58.8%). The median
53
54 time to re-incarceration was shorter for individuals with vs. without schizophrenia (156 days
55
56
57
58
59
60

1
2
3 (IQR 52-410) vs. 219 days (IQR 81-531)) although total length of time in custody did not differ
4
5
6 between the groups.
7
8
9
10

11
12 Supplementary Table 2 shows health service utilization in the five years following release from
13
14 correctional centres. As with health service utilization prior to correctional centre entry,
15
16 individuals with schizophrenia had higher rates of all health service utilization in comparison to
17
18 individuals without schizophrenia. Twenty-four percent of people with schizophrenia (N = 776;
19
20 24.0%) did not see a psychiatrist within 5 years following correctional centre release, and the
21
22 median time post-release for a person with schizophrenia to see a psychiatrist was 114 days
23
24
25
26 (IQR: 30-374).
27
28
29
30
31
32
33

34 In a multivariable Cox regression model adjusting for age, sex, neighbourhood income quintile
35
36 and rurality, individuals with schizophrenia had a 40% increased risk of reincarceration
37
38 (adjusted HR: 1.39; 95% CI 1.33-1.45)(Fig. 1A) compared to those without schizophrenia.
39
40
41 Further adjusting for prior correctional involvement, comorbidity, and prior health service
42
43 utilization, individuals with schizophrenia were only at 8% increased risk of reincarceration
44
45 compared to individuals without schizophrenia (adjusted HR: 1.08; 95% CI 1.03-1.14)(Fig. 1B).
46
47
48
49
50
51
52

53 Discussion

54
55
56
57
58
59
60

1
2
3 Approximately 1 in 14 individuals (7%) released from provincial correctional facilities in 2010
4
5 had a diagnosis of schizophrenia. People with schizophrenia had a higher number of
6
7 correctional encounters prior to and following release than individuals without schizophrenia,
8
9 and were 40% more likely to be reincarcerated within 5 years following correctional release
10
11 than individuals without schizophrenia. That this relative increase in re-incarceration was
12
13 substantially attenuated by prior health service utilization, correctional involvement and
14
15 comorbidity suggests that these factors may play an important role in re-incarceration. That
16
17 prior correctional involvement is an important contributor is not surprising; however, prior
18
19 health service utilization may point to opportunities to intervene if individuals with better pre-
20
21 incarceration access to care have reduced rates of reincarceration.
22
23
24
25
26
27
28
29

30 We found that individuals with schizophrenia are highly overrepresented in Ontario's provincial
31
32 correctional facilities compared to the general population, which is consistent with prior
33
34 research (3, 19-23). The schizophrenia prevalence within this cohort was notably high (7%),
35
36 compared with estimates of schizophrenia prevalence observed in prior studies(3) and in the
37
38 general population (approximately 1%)(24, 25). Our findings that a diagnosis of schizophrenia is
39
40 associated with a higher rate of re-incarceration is also consistent with existing literature(13,
41
42
43
44
45 14, 26, 27).
46
47
48
49

50 The findings also highlight service fragmentation following the index release in 2010. In the five
51
52 years following release, approximately 1 in 4 individuals with schizophrenia did not see a
53
54 psychiatrist. Given the complexities associated with support for individuals who have a
55
56
57
58
59
60

1
2
3 diagnosis of schizophrenia such as the continuation of antipsychotic medication, the need for
4
5 other psychosocial interventions such as cognitive behavioural therapy, the need for regular
6
7 physical health assessments, stable housing, among other socio-economic supports(28), timely
8
9 access to specialty mental health care services, including psychiatrists, quickly following release
10
11 should be an expected standard of care for individuals with schizophrenia who have had
12
13 correctional involvement. Indeed, 44% of individuals with schizophrenia had at least one
14
15 psychiatric hospitalization following index correctional event release. Lack of psychiatric care
16
17 and treatment may contribute to both re-incarceration and psychiatric hospitalizations. Indeed,
18
19 the same factors that create challenges adhering to conditions of release (parole, etc.) likely
20
21 contribute to challenges attending psychiatric follow-up.
22
23
24
25
26
27
28
29

30 There are several limitations that merit discussion. Given the limited availability of socio-
31
32 demographic data, we were unable to include largely cited socio-demographic factors
33
34 including: marital status, education level and housing status(8, 29-33). Our diagnosis of
35
36 schizophrenia relies on clinical codes in administrative health data rather than a comprehensive
37
38 clinical assessment, and there may be misclassification of schizophrenia status. However, the
39
40 algorithm used to identify individuals with a primary diagnosis of schizophrenia was validated
41
42 using population-based health administrative databases in Ontario(11). Finally, the correctional
43
44 data did not include information on the criminal charges or convictions. Distinguishing whether
45
46 individuals with schizophrenia within this cohort were incarcerated for violent or non-violent
47
48 crimes or for administrative offences such as failing to comply with probation/parole or to
49
50 attend court appearances could have contributed to the analysis in understanding the length of
51
52
53
54
55
56
57
58
59
60

1
2
3 correctional episodes and whether individuals were receiving the type of care necessary. In
4
5 addition, this study focused on Ontario's provincial correctional facilities and did not include
6
7 data on federal correctional involvement.
8
9

10 11 12 13 **Conclusion**

14
15 Individuals with schizophrenia are overrepresented in correctional facilities in comparison to
16
17 the general population. Additionally, individuals with schizophrenia also experience higher rates
18
19 of re-incarceration. Further work is needed to understand the needs of individuals with
20
21 schizophrenia and risk factors contributing to re-incarceration. However, these individuals
22
23 would likely benefit from more coordinated and integrated health service delivery following
24
25 correctional release.
26
27
28
29
30
31

32 33 **Data Access**

34
35 The dataset from this study is held securely in coded form at ICES. While data sharing
36
37 agreements prohibit ICES from making the dataset publicly available, access may be granted to
38
39 those who meet pre-specified criteria for confidential access, available at www.ices.on.ca/DAS.
40
41
42 The full dataset creation plan and underlying analytic code are available from the authors upon
43
44 request, understanding that the computer programs may rely upon coding templates or macros
45
46 that are unique to ICES and are therefore either inaccessible or may require modification.
47
48
49
50
51

52 53 **Acknowledgements**

54
55
56
57
58
59
60

1
2
3 This study was supported by ICES, which is funded by an annual grant from the Ontario Ministry
4
5 of Health and Long-Term Care (MOHLTC). Parts of this material are based on data and
6
7 information compiled and provided by: the Ontario Ministry of Health and Long-term Care and
8
9 the Canadian Institute for Health Information (CIHI). The analyses, conclusions, opinions and
10
11 statements expressed herein are solely those of the authors and do not reflect those of the
12
13 funding or data sources; no endorsement is intended or should be inferred.
14
15
16
17
18
19

20 **Conflicts of Interest**

21
22 No author has a conflict of interest related to this study.
23
24
25

26 **Funding**

27
28 This study was funded by a grant from the Canadian Institutes for Health Research.
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

References

1. Ramsay CE, Goulding, S. M., Broussard, B., Cristofaro, S. L., Abedi, G. R., & Compton, M. T. Prevalence and psychosocial correlates of prior incarcerations in an urban, predominantly African-American sample of hospitalized patients with first-episode psychosis. *J Am Acad Psychiatry Law*. 2011;39(1):57-64.
2. Rautanen M, & Lauerma, H. Imprisonment and diagnostic delay among male offenders with schizophrenia. *Crim Behav Ment Health*. 2011;21(4):259-64.
3. Fazel S, & Seewald, K. Severe mental illness in 33,588 prisoners worldwide: systematic review and meta-regression analysis. *Br J Psychiatry*. 2012;200(5):364-73.
4. Bland RC, Newman, S. C., Thompson, A. H., & Dyck, R. J. Psychiatric disorders in the population and in prisoners. *Int J Law Psychiatry*. 1998;21(3):273-9.
5. Corrado RR, Cohen, I., Hart, S., & Roesch, R. Comparative examination of the prevalence of mental disorders among jailed inmates in Canada and the United States. *Int J Law Psychiatry*. 2000;23(5-6):633-47.
6. Fisher WH, Packer, I. K., Simon, L. J., & Smith, D. Community mental health services and the prevalence of severe mental illness in local jails: are they related? *Adm Policy Ment Health*. 2000;27(6):371-82.
7. Hawthorne WB, Folsom, D. P., Sommerfeld, D. H., Lanouette, N. M., Lewis, M., Aarons, G. A., Conklin, R. M., Solorzano, E., Lindamer, L. A., & Jeste DV. Incarceration Among Adults Who Are in the Public Mental Health System: Rates, Risk Factors, and Short-Term Outcomes. *Psychiatric Services*. 2012;63(1):26-32.

- 1
2
3 8. Lamberti JS. Understanding and preventing criminal recidivism among adults with
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
10. Kouyoumdjian FG, Cheng S. Y., Fung, K., Orkin, A. M., McIsaac K. E., Kendall, C., Kiefer, L.,
Matheson, F. I., Green, S. E., and Hwang, S. W. . The health care utilization of people in prison
and after prison release: A population-based cohort study in Ontario, Canada. PLoS One. August
3, 2018;13(8).
11. Kurdyak P, Lin, E., Green, D., & Vigod, S. Validation of a Population-Based Algorithm to
Detect Chronic Psychotic Illness. Can J Psychiatry. 2015;60(8):362-8.
12. Statistics Canada. Income in Canada 2015 [Available from:
<https://www.statcan.gc.ca/pub/75-202-x/2010000/analysis-analyses-eng.htm>].
13. Krajl B. Measuring Rurality - RIO2008 BASIC: Methodology and Results. Toronto (ON):
OMA Economics Department; 2009.
14. Steele LS, Glazier, R. H., Lin, E., & Evans, M. Using administrative data to measure
ambulatory mental health service provision in primary care. Medical Care. 2004;42(10):960-5.
15. John Hopkins University. Johns Hopkins ACG® Case-Mix Adjustment System Version 10
[Available from: <http://www.acg.jhsph.edu>].
16. Austin PC, Walraven, C., Wodchis, W., Newman, A. & Anderson, G. M. Using the Johns
Hopkins Aggregated Diagnosis Groups (ADGs) to predict mortality in a general adult population
cohort in Ontario, Canada. Canadian Institutes of Health Research. 2011;40(10):932-9.

- 1
2
3 17. Austin PC, Newman A, Kurdyak PA. Using the Johns Hopkins Aggregated Diagnosis
4
5 Groups (ADGs) to predict mortality in a population-based cohort of adults with schizophrenia in
6
7 Ontario, Canada. *Psychiatry Res.* 2012;196(1):32-7.
8
9
- 10 18. SAS. SAS System, Version 9: Installation and Administration Information. 2007.
11
12
- 13 19. Brinded PM, Simpson, A. I., Laidlaw, T. M., Fairley, N., & Malcolm, F. Prevalence of
14
15 psychiatric disorders in New Zealand prisons: a national study. *Aust N Z J Psychiatry.*
16
17 2001;35(2):166-73.
18
19
- 20 20. Sirdifield C, Gojkovic, D., Brooker, C., & Ferriter, M. A systematic review of research on
21
22 the epidemiology of mental health disorders in prison populations: a summary of findings.
23
24 *Journal of Forensic Psychiatry & Psychology.* 2009;20(1):S78-S101.
25
26
- 27 21. Lafortune D. Prevalence and screening of mental disorders in short-term correctional
28
29 facilities. *Int J Law Psychiatry.* 2010;33(2):94-100.
30
31
- 32 22. Senior J, Birmingham, L., Harty, M. A., Hassan, L., Hayes, A. J., Kendall, K., King, C.,
33
34 Lathlean, J., Lowthian, C., Mills, A., Webb, R., Thornicroft, G., & Shaw, J. Identification and
35
36 management of prisoners with severe psychiatric illness by specialist mental health services.
37
38 *Psychol Med.* 2013;43(7):1511-20.
39
40
- 41 23. Fazel S, & Danesh, J. Serious mental disorder in 23000 prisoners: a systematic review of
42
43 62 surveys. *Lancet.* 2002;359(9306):545-50.
44
45
46
- 47 24. Goldner EM, Jones, W., & Waraich, P. Using administrative data to analyze the
48
49 prevalence and distribution of schizophrenic disorders. *Psychiatric Services.* 2003;54(7):1017-
50
51 21.
52
53
54
55
56
57
58
59
60

- 1
2
3 25. Khan S, Chiu, M., Simpson, A. I., Guttman, A., Jembere, N., & Kurdyak, P. Use of Mental
4 Health Services by Youths and Young Adults Before and During Correctional Custody: A
5
6 Population-Based Study. *Psychiatr Serv.* 2016;67(7):790-3.
7
8
9
10 26. Simpson AI, McMaster, J. J., & Cohen, S. N. Challenges for Canada in meeting the needs
11 of persons with serious mental illness in prison. *J Am Acad Psychiatry Law.* 2013;41(4):501-9.
12
13
14
15 27. National Institute of Health and Care Excellence. Psychosis and schizophrenia in adults.
16
17 2015.
18
19
20 28. Health Quality Ontario. Schizophrenia Care in the Community for Adults Ontario:
21 Queen's Printer for Ontario; 2019 [Available from: [https://www.hqontario.ca/Evidence-to-
22 Improve-Care/Quality-Standards/View-all-Quality-Standards/Schizophrenia-Care-in-the-
23 Community/The-Quality-Standard-In-Brief](https://www.hqontario.ca/Evidence-to-Improve-Care/Quality-Standards/View-all-Quality-Standards/Schizophrenia-Care-in-the-Community/The-Quality-Standard-In-Brief).
24
25
26
27
28
29
30 29. Prince JD. Incarceration and hospital care. *J Nerv Ment Dis.* 2006;194(1):34-9.
31
32 30. Harty M, Jarrett, M., Thornicroft, G., & Shaw, J. Unmet needs of male prisoners under
33 the care of prison Mental Health Inreach Services. *Journal of Forensic Psychiatry & Psychology.*
34
35 2012;23(3):285-96.
36
37
38
39 31. Prince JD, Akincigil, A., & Bromet, E. Incarceration rates of persons with first-admission
40 psychosis. *Psychiatr Serv.* 2007;58(9):1173-80.
41
42
43
44 32. Robertson AG, Swanson, J. W., Frisman, L. K., Lin, H., & Swartz, M. S. Patterns of justice
45 involvement among adults with schizophrenia and bipolar disorder: key risk factors. *Psychiatr*
46
47 *Serv.* 2014;65(7):931-8.
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

33. Wallace C, Mullen, P. E., & Burgess, P. Criminal offending in schizophrenia over a 25-year period marked by deinstitutionalization and increasing prevalence of comorbid substance use disorders. *Am J Psychiatry*. 2004;161(4):716-27.

Table 1: Characteristics of study cohort, by schizophrenia diagnosis

Variable	Individuals without schizophrenia	Individuals with schizophrenia	Standardized Difference
	N (%)	N (%)	
Total	43,691 (93.1)	3,237 (7.0)	
Age			
Median (IQR)	32 (24-43)	36 (28-45)	0.30
18-29	19,007 (43.5)	1,004 (31.0)	0.26
30-39	10,775 (24.7)	936 (28.9)	0.10
40-49	9,175 (21.0)	825 (25.5)	0.11
50-64	4,322 (9.9)	425 (13.1)	0.10
65-74	354 (0.8)	39 (1.2)	0.04
75+	58 (0.1)	8 (0.2)	0.03
Sex			
Female	5,280 (12.1)	542 (16.7)	0.13
Male	38,411 (87.9)	2,695 (83.3)	0.13
Self-reported race			
Missing	2,952 (6.8)	223 (6.9)	0.01
Aboriginal	4,763 (10.9)	271 (8.4)	0.09
Black	5,248 (12.0)	447 (13.8)	0.05
East Asian	715 (1.6)	43 (1.3)	0.03
Hispanic	519 (1.2)	26 (0.8)	0.04
South Asian	908 (2.1)	68 (2.1)	0.00
South East Asian	557 (1.3)	46 (1.4)	0.01
West Asian/Arabic	671 (1.5)	46 (1.4)	0.01
White	25,973 (59.4)	1,958 (60.5)	0.02
Other racial origin	1,000 (2.3)	79 (2.4)	0.01
Declined to specify	130 (0.3)	12 (0.4)	0.01
Racial origin unknown	254 (0.6)	17 (0.5)	0.01
Income Quintile			
Missing	3,207 (7.3)	96 (3.0)	0.20
1	15,359 (35.2)	1,334 (41.2)	0.12
2	9,218 (21.1)	696 (21.5)	0.01
3	6,802 (15.6)	508 (15.7)	0.00
4	5,194 (11.9)	330 (10.2)	0.05
5	3,911 (9.0)	273 (8.4)	0.02
Rurality			
Missing	2,398 (5.5)	25 (0.8)	0.27
Urban	35,533 (81.3)	2,953 (91.2)	0.29
Rural	5,760 (13.2)	259 (8.0)	0.17
Comorbidity (cADGs)			

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Mean ± SD	3.0±2.1	4.2±2.0	0.60
Median (IQR)	3(1-4)	4(3-6)	0.61

Legend: IQR – interquartile range; cADGs – Collapsed Aggregated Diagnostic groups; SD – standard deviation

Table 2: Correctional involvement three years prior to the index* incarceration by schizophrenia diagnosis

Variable	Individuals without schizophrenia	Individuals with schizophrenia	Standardized Difference
	N (%)	N (%)	
Total	43,691 (93.1)	3,237 (7.0)	
Length of stay from all correctional entries in 3 years prior to index release			
Median (IQR)	38 (7-123)	66 (13-176)	0.26
No prior incarcerations	22,904 (52.4)	1,327 (41.0)	0.23
1-6	5,115 (11.7)	323 (10.0)	0.06
7-29	4,464 (10.2)	354 (10.9)	0.02
30-89	4,385 (10.0)	430 (13.3)	0.10
90-179	3,414 (7.8)	335 (10.3)	0.09
180-364	2,570 (5.9)	332 (10.3)	0.16
365+	839 (1.9)	136 (4.2)	0.13
Length of stay of index incarceration event			
Median (IQR)	7 (2-37)	11 (3-48)	0.16
1-6	21,101 (48.3)	1,324 (40.9)	0.15
7-29	10,104 (23.1)	840 (25.9)	0.07
30-89	7,434 (17.0)	638 (19.7)	0.07
90-119	1,813 (4.1)	140 (4.3)	0.01
120-364	2,966 (6.8)	273 (8.4)	0.06
365+	273 (0.6)	22 (0.7)	0.01
Number of prior incarcerations			
Median (IQR)	0 (0-2)	1 (0-3)	0.3
0	22,904 (52.4)	1,327 (41.0)	0.23
1	8,151 (18.7)	566 (17.5)	0.03
2	4,868 (11.1)	357 (11.0)	0.00
3	2,929 (6.7)	266 (8.2)	0.06
4	1,846 (4.2)	207 (6.4)	0.10
5	1,071 (2.5)	139 (4.3)	0.10
6	661 (1.5)	84 (2.6)	0.08
7	450 (1.0)	68 (2.1)	0.09
8	259 (0.6)	57 (1.8)	0.11
9	175 (0.4)	46 (1.4)	0.11
10+	377 (0.9)	120 (3.7)	0.19

*Index refers to the first correctional release for each individual in 2010 in Ontario.

Legend: IQR – interquartile range

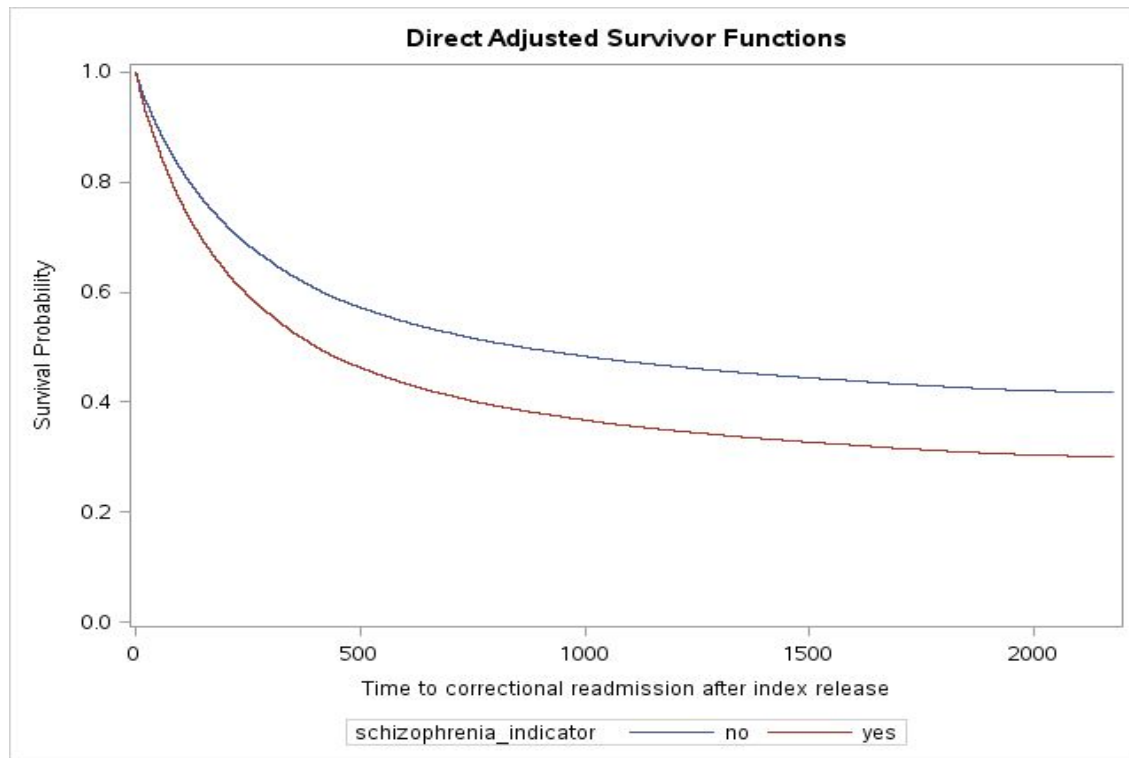
Table 3: Correctional involvement five years after index release, by schizophrenia diagnosis

Variable	Individuals without schizophrenia	Individuals with schizophrenia	Standardized Difference
	N (%)	N (%)	
Total	43,691 (93.1)	3,237 (7.0)	
Any re-incarceration within 5 years	25,703 (58.8)	2,185 (67.5)	0.18
Time to re-incarceration			
Median (IQR)	219 (81-531)	156 (52-410)	0.21
Not reincarcerated	17,988 (41.2)	1,052 (32.5)	0.18
1-30 days	2,853 (6.5)	359 (11.1)	0.16
31-60	2,249 (5.1)	259 (8.0)	0.12
61-90	1,908 (4.4)	184 (5.7)	0.06
91-240	6,503 (14.9)	528 (16.3)	0.04
241-365	3,143 (7.2)	240 (7.4)	0.01
366-730	4,554 (10.4)	330 (10.2)	0.01
731-1095	2,079 (4.8)	96 (3.0)	0.09
3 years +	2,414 (5.5)	189 (5.8)	0.01
Length of stay from all correctional events in 5 years after index release			
Median (IQR)	83 (20-204)	88 (23-222)	0.07
Not re-incarcerated	17,988 (41.2)	1,052 (32.5)	0.18
1-6 days	3,563 (8.2)	246 (7.6)	0.02
7-29	4,181 (9.6)	373 (11.5)	0.06
30-89	5,597 (12.8)	483 (14.9)	0.06
90-179	4,999 (11.4)	386 (11.9)	0.02
180-364	4,501 (10.3)	402 (12.4)	0.07
365-729	2,473 (5.7)	232 (7.2)	0.06
730+	389 (0.9)	63 (1.9)	0.09

*Index refers to the first correctional release for each individual in 2010 in Ontario.

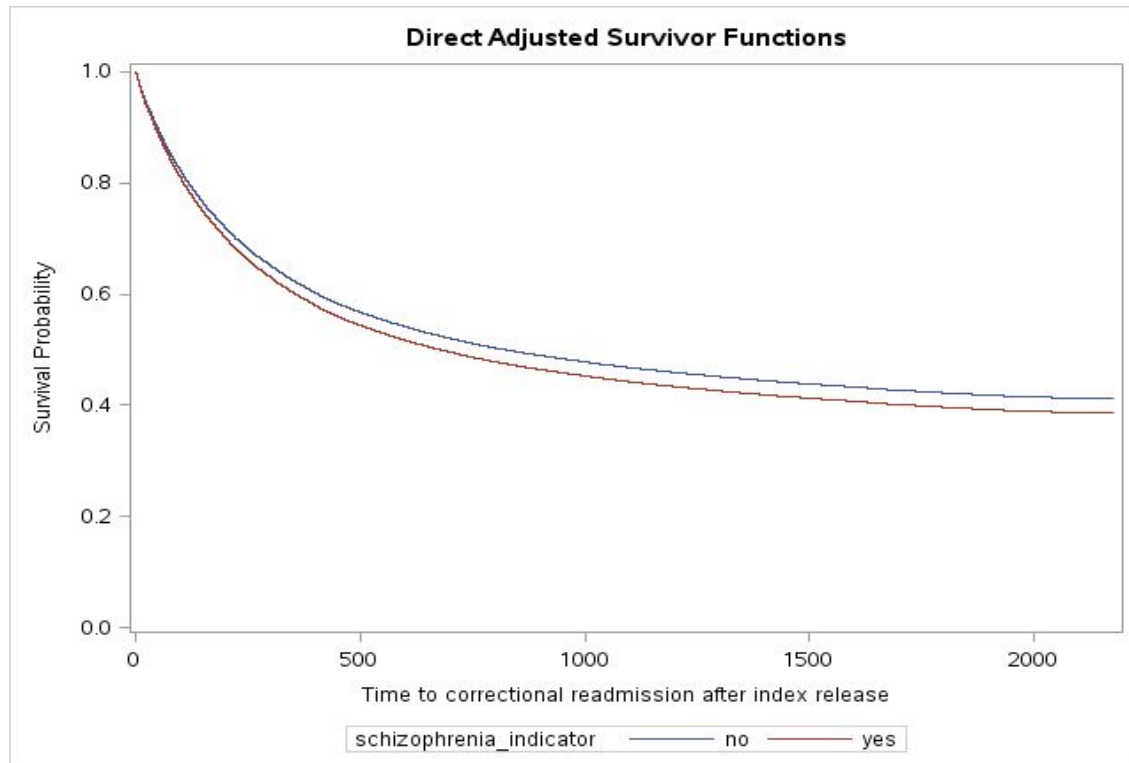
Legend: IQR – interquartile range

Figure 1A: Time to re-incarceration for individuals with and without schizophrenia from multivariable Cox regression*



*Adjusted for age, sex, neighbourhood income quintile and rurality.

Figure 1B: Recidivism survival curves between individuals with and without schizophrenia.*



*Adjusted for age, sex, neighbourhood income quintile, rurality, comorbidity, prior correctional involvement and prior health service utilization.

Supplement Table 1

Health Service Utilization Three Years Prior to the Index Incarceration*

Variable	Individuals without schizophrenia	Individuals with schizophrenia	Standardized Difference
	N (%)	N (%)	
Total	43,691 (93.1)	3,237 (7.0)	
Total number visits to PCP			
Median (IQR)	5 (1-14)	13 (5-28)	0.58
0	8,005 (18.3)	210 (6.5)	0.36
1-5	14,135 (32.4)	659 (20.4)	0.27
6-10	7,394 (16.9)	569 (17.6)	0.02
11-15	4,244 (9.7)	401 (12.4)	0.09
16-20	2,460 (5.6)	288 (8.9)	0.13
21+	7,453 (17.1)	1,110 (34.3)	0.40
Total number of MH visits to PCP			
Median (IQR)	0 (0-3)	5 (1-12)	0.92
0	23,706 (54.3)	565 (17.5)	0.83
1-5	12,931 (29.6)	1,187 (36.7)	0.15
6-10	2,564 (5.9)	551 (17.0)	0.36
11-15	951 (2.2)	287 (8.9)	0.30
16-20	552 (1.3)	160 (4.9)	0.21
21+	2,987 (6.8)	487 (15.0)	0.27
Total number of non-MH visits to PCP			
Median (IQR)	4 (1-10)	6 (2-14)	0.30
0	9,143 (20.9)	396 (12.2)	0.24
1-5	16,903 (38.7)	1,180 (36.5)	0.05
6-10	7,750 (17.7)	601 (18.6)	0.02
11-15	3,875 (8.9)	328 (10.1)	0.04
16-20	2,044 (4.7)	222 (6.9)	0.09
21+	3,976 (9.1)	510 (15.8)	0.2
Total number of psychiatrist visits			
Median (IQR)	0 (0-0)	4 (0-12)	1.42
0	36,536 (83.6)	885 (27.3)	1.37
1-3	4,248 (9.7)	710 (21.9)	0.34
4-6	1,180 (2.7)	399 (12.3)	0.37
7-9	533 (1.2)	276 (8.5)	0.34
10+	1,194 (2.7)	967 (29.9)	0.79
Total ED visits			
Median (IQR)	1 (0-3)	3 (1-8)	0.60

1				
2				
3	0	15,189 (34.8)	531 (16.4)	0.43
4	1-5	22,118 (50.6)	1,549 (47.9)	0.06
5	6-10	4,042 (9.3)	528 (16.3)	0.21
6	11-15	1,215 (2.8)	237 (7.3)	0.21
7	16-20	493 (1.1)	121 (3.7)	0.17
8	21+	634 (1.5)	271 (8.4)	0.32
9				
10	Total hospitalizations			
11	Median (IQR)	0 (0-0)	1 (0-2)	0.94
12	0	37,706 (86.3)	1,523 (47.0)	0.92
13	1-3	5,572 (12.8)	1,316 (40.7)	0.66
14	4-6	311 (0.7)	276 (8.5)	0.38
15	7-9	63 (0.1)	68 (2.1)	0.19
16	10+	39 (0.1)	54 (1.7)	0.10
17				
18	Total inpatient days			
19	Median (IQR)	0 (0-0)	2 (0-24)	0.97
20	0	38,048 (87.1)	1,550 (47.9)	0.92
21	1-10	4,147 (9.5)	521 (16.1)	0.20
22	11-89	1,451 (3.3)	921 (28.5)	0.73
23	90-180	32 (0.1)	162 (5.0)	0.32
24	181+	13 (0.0)	83 (2.6)	0.23
25				
26	Total psychiatric hospitalizations			
27	Median (IQR)	0 (0-0)	0 (0-2)	1.08
28	0	42,062 (96.3)	1,814 (56.0)	1.07
29	1-3	1,555 (3.6)	1,130 (34.9)	0.87
30	4-6	61 (0.1)	215 (6.6)	0.37
31	7-9	8 (0.0)	48 (1.5)	0.17
32	10+	**	**	**
33				
34	Total psychiatric hospital days			
35	Median (IQR)	0 (0-0)	0 (0-22)	1.08
36	0	42,134 (96.4)	1,825 (56.4)	1.07
37	1-10	795 (1.8)	337 (10.4)	0.36
38	11-89	734 (1.7)	843 (26.0)	0.75
39	90-180	20 (0.0)	151 (4.7)	0.31
40	181+	8 (0.0)	81 (2.5)	0.22
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				

*Index refers to the first correctional release for each individual in 2010 in Ontario.

Legend: PCP – primary care physician; IQR – interquartile range; MH – mental health

Notes: ** Suppressed values due to n<6

Supplementary Table 2

Health service utilization outcomes five years after the index release*

Schizophrenia Indicator				
Variable	Individuals without schizophrenia	Individuals with schizophrenia	All Persons	Standardized Difference
	N (%)	N (%)	N (%)	
Total	43,691 (93.1)	3,237 (7.0)	46,928 (100)	
Number of PCP visits				
Median (IQR)	10 (3-28)	19 (7-43)	11 (3-29)	0.38
0	5,794 (13.3)	164 (5.1)	5,958 (12.7)	0.29
1-5	9,659 (22.1)	501 (15.5)	10,160 (21.7)	0.17
6-10	6,410 (14.7)	434 (13.4)	6,844 (14.6)	0.04
11-15	4,394 (10.1)	317 (9.8)	4,711 (10.0)	0.01
16-20	3,182 (7.3)	293 (9.1)	3,475 (7.4)	0.06
21+	14,252 (32.6)	1,528 (47.2)	15,780 (33.6)	0.30
Number of MH visits to PCP				
Median (IQR)	1 (0-6)	7 (2-19)	1 (0-7)	0.72
0	18,749 (42.9)	454 (14.0)	19,203 (40.9)	0.68
1-5	13,168 (30.1)	992 (30.6%)	14,160 (30.2)	0.01
6-10	3,217 (7.4)	522 (16.1)	3,739 (8.0)	0.27
11-15	1,523 (3.5)	314 (9.7)	1,837 (3.9)	0.25
16-20	832 (1.9)	207 (6.4)	1,039 (2.2)	0.23
21+	6,202 (14.2)	748 (23.1)	6,950 (14.8)	0.23
Number of non-MH visits to PCP				
Median (IQR)	7 (2-16)	8 (3-21)	7 (2-17)	0.17
0	6,837 (15.6)	313 (9.7)	7,150 (15.2)	0.18
1-5	12,505 (28.6)	934 (28.9)	13,439 (28.6)	0.01
6-10	7,685 (17.6)	562 (17.4)	8,247 (17.6)	0.01
11-15	5,026 (11.5)	383 (11.8)	5,409 (11.5)	0.01
16-20	3,223 (7.4)	230 (7.1)	3,453 (7.4)	0.01
21+	8,415 (19.3)	815 (25.2)	9,230 (19.7)	0.14
Total number of psychiatrist visits				
Median (IQR)	0 (0-1)	6 (1-20)	0 (0-1)	1.2
0	31,830 (72.9)	776 (24.0)	32,606 (69.5)	1.12
1-5	7,163 (16.4)	787 (24.3)	7,950 (16.9)	0.20
6-10	1,806 (4.1)	399 (12.3)	2,205 (4.7)	0.30
11-15	861 (2.0)	288 (8.9)	1,149 (2.4)	0.31
16-20	536 (1.2)	212 (6.5)	748 (1.6)	0.28
21+	1,495 (3.4)	775 (23.9)	2,270 (4.8)	0.63
Total ED visits				
Median (IQR)	2 (0-5)	4 (1-12)	2 (0-5)	0.47
0	11,846 (27.1)	491 (15.2)	12,337 (26.3)	0.30
1-5	21,590 (49.4)	1,351 (41.7)	22,941 (48.9)	0.15
6-10	5,844 (13.4)	510 (15.8)	6,354 (13.5)	0.07
11-15	2,093 (4.8)	303 (9.4)	2,396 (5.1)	0.18

1					
2					
3	16-20	897 (2.1)	162 (5.0)	1,059 (2.3)	0.18
4	21+	1,421 (3.3)	420 (13.0)	1,841 (3.9)	0.36
5	Total Mental Health Related				
6	ED Visits				
7	Median (IQR)	0 (0-0)	1 (0-3)	0 (0-0)	0.75
8	0	34,264 (78.4)	1,478 (45.7)	35,742 (76.2)	0.72
9	1-5	8,299 (19.0)	1,297 (40.1)	9,596 (20.4)	0.47
10	6-10	616 (1.4)	189 (5.8)	805 (1.7)	0.24
11	11-15	186 (0.4)	105 (3.2)	291 (0.6)	0.21
12	16-20	85 (0.2)	48 (1.5)	133 (0.3)	0.14
13	21+	241 (0.6)	120 (3.7)	361 (0.8)	0.22
14	Total hospitalizations				
15	Median (IQR)	0 (0-0)	1 (0-3)	0 (0-0)	0.84
16	0	34,475 (78.9)	1,383 (42.7)	35,858 (76.4)	0.80
17	1-5	8,582 (19.6)	1,529 (47.2)	10,111 (21.5)	0.61
18	6-10	451 (1.0)	226 (7.0)	677 (1.4)	0.31
19	11-15	115 (0.3)	56 (1.7)	171 (0.4)	0.15
20	16-20	39 (0.1)	25 (0.8)	64 (0.1)	0.10
21	21+	29 (0.1)	18 (0.6)	47 (0.1)	0.09
22	Total inpatient days				
23	Median (IQR)	0 (0-0)	4 (0-45)	0 (0-0)	0.87
24	0	34,946 (80.0)	1,420 (43.9)	36,366 (77.5)	0.80
25	1-10	5,420 (12.4)	463 (14.3)	5,883 (12.5)	0.06
26	11-89	2,969 (6.8)	818 (25.3)	3,787 (8.1)	0.52
27	90-180	231 (0.5)	238 (7.4)	469 (1.0)	0.36
28	181-365	74 (0.2)	122 (3.8)	196 (0.4)	0.26
29	366+	51 (0.1)	176 (5.4)	227(0.5)	0.33
30	Total psychiatric				
31	hospitalizations				
32	Median (IQR)	0 (0-0)	0 (0-2)	0 (0-0)	0.97
33	0	40,975 (93.8)	1,817 (56.1)	42,792 (91.2)	0.96
34	1-5	2,583 (5.9)	1,206 (37.3)	3,789 (8.1)	0.82
35	6-10	107 (0.2)	158 (4.9)	265 (0.6)	0.30
36	11-15	18 (0.0)	42 (1.3)	60 (0.1)	0.15
37	16-20	7 (0.0)	10 (0.3)	17 (0.0)	0.07
38	21+	**	**	**	**
39	Total number of psychiatric				
40	hospital days				
41	Median (IQR)	0 (0-0)	0 (0-35)	0 (0-0)	0.97
42	0	41,045 (93.9)	1,838 (56.8)	42,883 (91.4)	0.96
43	1-10	1,131 (2.6)	224 (6.9)	1,355 (2.9)	0.20
44	11-89	1,321 (3.0)	687 (21.2)	2,008 (4.3)	0.58
45	90-180	107 (0.2)	200 (6.2)	307 (0.7)	0.34
46	181-365	43 (0.1)	112 (3.5)	155 (0.3)	0.26
47	366+	44 (0.1)	176 (5.4)	220 (0.5)	0.33

*Index refers to the first correctional release for each individual in 2010 in Ontario.

Legend: PCP – primary care physician; IQR – interquartile range; MH – mental health

Notes: ** Suppressed values due to n<6

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 **Prévalence et prédicteurs de la réincarcération après la libération d'un centre correctionnel :**
4 **une comparaison dans la population-de personnes souffrant ou non de schizophrénie en**
5 **Ontario, Canada.**
6
7

8
9 **Objectifs :** Les personnes souffrant de schizophrénie sont surreprésentées dans les
10 établissements correctionnels relativement à leur prévalence dans la population. La présente
11 étude a pour but de déterminer le taux et les prédicteurs de la réincarcération des personnes
12 souffrant de schizophrénie après leur libération des établissements correctionnels.
13
14
15
16

17
18 **Méthodes :** Il s'agissait d'une étude de cohorte rétrospective qui incluait toutes les personnes
19 libérées des établissements correctionnels provinciaux de l'Ontario du 1^{er} janvier au 31
20 décembre 2010. Les personnes souffrant de schizophrénie ont été identifiées à l'aide d'un
21 algorithme dans la population. Le résultat principal était le temps écoulé jusqu'à la
22 réincarcération. Les covariables étaient notamment les caractéristiques sociodémographiques
23 (âge, sexe, quintile de revenu du quartier, résidence urbaine/rurale), l'utilisation des services de
24 santé (visites à des médecins de soins de première ligne, visites à un psychiatre, hospitalisations
25 psychiatriques ou autres, visites au service d'urgence) et d'autre morbidité clinique. L'analyse
26 de survie a servi à examiner l'association entre la schizophrénie et la réincarcération.
27
28
29
30
31
32
33
34
35
36

37 **Résultats :** Parmi les 46 928 personnes, N = 3 237 (7 %) avaient un diagnostic de schizophrénie.
38 Environ 67,5 % de celles-ci ont été réincarcérées dans les 5 années suivant leur première
39 libération en 2010, comparé à 58,8 % des personnes ne souffrant pas de schizophrénie. Les
40 personnes souffrant de schizophrénie étaient 40 % (RR : 1,39; IC à 95 % 1,33 à 1,45) plus
41 susceptibles d'être réincarcérées après une libération que le groupe témoin après ajustement
42 des caractéristiques démographiques. Cette association s'est réduite à 8 % (1,08; IC à 95 % 1,03
43 à 1,14) après ajustement pour utilisation précédente des services de santé, implication
44 correctionnelle précédente et comorbidités.
45
46
47
48
49
50
51
52

53 **Conclusion :** Les personnes souffrant de schizophrénie étaient plus susceptibles de connaître
54 une réincarcération après une libération des établissements correctionnels. Ce risque
55
56
57
58
59
60

1
2
3 s'explique en partie par l'implication correctionnelle précédente, l'utilisation des services de
4 santé, et les comorbidités. La recherche future devrait mettre l'accent sur les facteurs de risque
5 qui prédisent le taux de réincarcération plus élevé et sur les interventions pour réduire
6 l'implication correctionnelle.
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60