The impact of a Housing First intervention and health-related risk factors on incarceration among people with experiences of homelessness and mental illness in Canada

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Abstract

Objective To examine the effect of a Housing First (HF) intervention and health-related risk factors on incarceration among adults with experiences of homelessness and mental illness.

Methods Participants ($N = 508$) were recruited at the Toronto site of the At Home/Chez Soi study. The outcome was incarceration in Ontario from 2009 to 2014. Exposures were intervention group (HF vs. treatment as usual), Axis I mental health diagnoses, emergency department (ED) visit, and history of traumatic brain injury (TBI). Logistic regression was used to examine the association between exposures and incarceration.

Results Of 508 participants, 220 (43.3%) were incarcerated at least once during the study period. Among those incarcerated, 81.9% were male, 52.7% had been diagnosed with alcohol dependence/abuse, 60.9% had been diagnosed with substance dependence/abuse, 65.1% reported having visited an ED within the last 6 months, and 66.4% had a history of TBI. After adjusting for demographic covariates, substance dependence/abuse (aOR: 2.06; 95% CI: 1.40, 3.03), alcohol dependence/abuse (aOR: 1.52, 95% CI: 1.04, 2.22), ED visit (aOR: 1.54; 95% CI: 1.02, 2.32), and history of TBI (aOR: 2.60; 95% CI: 1.75, 3.85) were associated with incarceration. We found no significant effect of the HF intervention on incarceration outcome (aOR: 1.08; 95% CI: 0.76, 1.55).

Conclusions Among adults with experiences of homelessness and severe mental illness, those with substance and alcohol dependence/abuse disorders, history of TBI, and recent ED visits were at increased odds of incarceration. Strategies are needed to prevent and reduce incarceration for this population, including treatment of mental illness in the community.

Résumé

Objectif Examiner l'effet d'une intervention de Logement d'abord (LD) et de facteurs de risque liés à la santé sur l'incarcération d'adultes ayant vécu des épisodes de sans-abrisme et de maladie mentale.

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Méthode Les participants ($N = 508$) ont été recrutés sur le site torontois de l'étude At Home/Chez-Soi. L'issue à l'étude était l'incarcération en Ontario entre 2009 et 2014. Les expositions étaient le groupe d'intervention (LD vs. traitement habituel), les diagnostics de troubles de santé mentale de l'axe I, les visites aux services d'urgence (SU) et les antécédents de traumatisme crânio-cérébral (TCC). Nous avons procédé par régression logistique pour examiner l'association entre les expositions et l'incarcération.

Résultats Sur 508 participants, 220 (43,3 %) avaient été incarcérés au moins une fois durant la période de l'étude. Chez les personnes incarcérées, 81,9 % étaient des hommes, 52,7 % avaient un diagnostic de dépendance à l'alcool ou d'abus d'alcool, 60,9 % avaient un diagnostic de dépendance à des substances ou d'abus de substances, 65,1 % ont dit avoir visité les SU au cours des 6 mois antérieurs, et 66,4 % avaient des antécédents de TCC. Après ajustement en fonction des covariables démographiques, la dépendance aux substances/l'abus de substances (rapport de cotes ajusté [RCa] : 2,06; IC de 95 % : 1,40, 3,03), la dépendance à l'alcool/l'abus d'alcool (RCa : 1,52, IC de 95 % : 1,04, 2,22), les visites aux SU (RCa : 1,54; IC de 95 % : 1,02, 2,32) et les antécédents de TCC (RCa : 2,60; IC de 95 % : 1,75, 3,85) étaient associés à l'incarcération. Nous n'avons observé aucun effet significatif de l'intervention de LD sur l'issue d'incarcération (RCa : 1,08; IC de 95 % : 0,76, 1,55).

Conclusions Chez les adultes ayant vécu des épisodes de sans-abrisme et de maladie mentale grave, ceux qui avaient des troubles de dépendance/d'abus de substances et d'alcool, des antécédents de TCC et qui avaient visité les SU récemment présentaient une probabilité accrue d'incarcération. Il faut des stratégies pour prévenir et réduire l'incarcération dans cette population, y compris des stratégies de traitement des maladies mentales hors du milieu carcéral.

Keywords Homeless persons · Mental health · Prisons · Public health · Substance-related disorders

Mots-clés Sans-abri · santé mentale · prisons · santé publique · troubles liés à une substance

Introduction

Homelessness remains a pervasive public health and social issue that affects many people in North America. It is estimated that more than 235,000 Canadians and 553,000 Americans were homeless in 2017 and 2016, respectively (Gaetz et al. 2016; Henry et al. 2017). People experiencing homelessness are more likely to suffer from mental illness, traumatic brain injury, substance misuse, and trauma compared with the general population (Cheung and Hwang 2004; Hwang 2001). They are also more likely to be involved with the criminal justice system through police interactions, arrests, or incarceration, compared with the general population (Roy et al. 2014).

The bidirectional relationship between homelessness and incarceration has been well documented (Cox et al. 2020; Gonzalez et al. 2018; McGuire and Rosenheck 2004; Tejani et al. 2014; Tsai et al. 2014; Tsai and Rosenheck 2012). A systematic review of homeless people with mental illness found lifetime prevalence of 62.9–90% for arrest, 28.1–80.0% for conviction, and 48.0–67.0% for incarceration (Roy et al. 2014). In response to the increasing number of homeless individuals, many cities in the United States, Canada, and other high-income countries have criminalized behaviours such as panhandling, queueing, and drinking alcohol in public, and even homelessness itself (Beckett and Herbert 2010; Crawford 2009). In Canada, the Ontario government enacted the Ontario Safe Streets Act to prohibit acts such as solicitation in public and disposal of needles. One of the consequences of such legislation is an increase in police interactions and incarceration of homeless individuals, especially those with mental illness (O'Grady et al. 2013). Manifestations of mental illness and substance misuse can further

increase the policing and detaining of homeless people (Brink et al. 2011; Chappell 2010).

Several studies have sought to examine correlates of incarceration among homeless populations to understand the relationship between homelessness and incarceration. Studies of homeless populations with mental illness in the USA have found that risk factors for incarceration include being male and African-American, having prior contact with the justice system, abusing substances, and experiencing severe psychiatric illness (Calsyn et al. 2005; McGuire and Rosenheck 2004). A study conducted in British Columbia found that people who were homeless and had been incarcerated were more likely to have a substance use disorder, depression, and a history of childhood emotional neglect, compared with people who were homeless and had never been incarcerated (Saddichha et al. 2014). Another study of predictors of criminal justice involvement among homeless individuals with mental illness found that being male, having Aboriginal status, and having a recent victimization history were independently associated with self-reported police re-arrest (Roy et al. 2016). Moreover, findings from a study that examined the nature of police interactions of homeless adults with mental illness in Toronto, Canada, enrolled in the At Home/Chez Soi study found prevalent charges were related to criminalization of homelessness and mental illness, such as acts of living (12.6%) (e.g., alcohol drinking, smoking, and soliciting in public) and administration of justice (21.2%) (e.g., failure to appear in court or comply to probation order) (Kouyoumdjian et al. 2019).

Several housing programs, particularly the Housing First (HF) model, have been developed and implemented to

improve housing attainment and retention in homeless adults with severe mental illness, which may help to break the vicious cycle of jail and homelessness (Malone 2009; Montgomery et al. 2013; Tejani et al. 2014). Housing First facilitates immediate access to housing, without any precondition of treatment for mental illness or substance use treatment, while providing supportive services to improve social reintegration and recovery (Leclair et al. 2019; Tsemberis 2010). Studies have demonstrated that HF is effective in increasing housing retention and stability (Stergiopoulos et al. 2019). Tsai and Rosenheck (2012) found that homeless adults with a history of incarceration benefitted from supported housing programs just as much as those without a history of incarceration. HF has also been shown to reduce criminal justice involvement in studies based in the USA (Kriegel et al. 2016; Tsai et al. 2010); however, findings from Canada-based studies found no reduction in criminal justice involvement, particularly self-reported police arrests (Aubry et al. 2016; Stergiopoulos et al. 2015).

There are several limitations of studies that had examined the criminal justice involvement among homeless populations: previous studies in Canada had mainly focused on police interactions and arrests but not incarceration. While studies in the USA on the risk of incarceration in homeless adults provide important insights, these findings might not be generalizable to the Canadian context. Moreover, most relied on self-reported data, which may be less accurate compared with correctional administrative data. These studies also focused on demographic, socio-economic, and housing characteristics rather than specific mental health disorders and traumatic brain injury, which are prevalent in homeless populations and persist regardless of achievement in housing stability. Understanding specific mental health disorders associated with incarceration and their social and biological pathways can help to design blueprint policy to address the high incarceration rate among people experiencing homelessness and mental illness beyond victimizing and detaining them into correctional institutions.

In this context, our study aimed to address the gap in the research literature on health-related risk factors associated with incarceration and the impact of Housing First intervention in reducing the risk of incarceration among homeless adults in Canada. We used correctional administrative data to ascertain incarceration and examined the health-related risk factors of incarceration in adults with experiences of chronic homelessness and severe mental illness. We assessed whether specific mental health disorders, emergency department use, and a history of traumatic brain injury were associated with risk of incarceration.

Methods

Study design and population

The study population was drawn from a larger cohort of participants enrolled in the At Home/Chez Soi (AH/CS) study at the Toronto site. AH/CS was a Canadian multisite randomized trial that provided HF for people experiencing homelessness and mental illness. The design of the AH/CS study has been described in detail elsewhere (Hwang et al. 2012). Briefly, the Toronto site enrolled 575 homeless adults with severe mental health disorders between October 2009 and July 2011 and followed them for two years from study enrollment. Participants were recruited from shelters, hospitals, drop-in centres, outreach community programs, and mental health services across Toronto. Study eligibility criteria were: (1) aged 18 years and older; (2) absolutely homeless (i.e., having no fixed place to stay for at least seven nights previous to the study enrollment date with little likelihood of finding a place in the upcoming month) or precariously housed (e.g., living in single room occupancy or rooming house or hotel/motel, and having a history of 2 or more episodes of being absolutely homeless in the previous year, or having had one episode of being absolutely homeless for at least 4 weeks in the previous year prior to the study enrollment); and (3) presented with a serious mental health disorder with or without co-occurring substance use disorder, determined by the DSM-IV criteria using the Mini International Neuropsychiatric Interview 6.0 (MINI) (Sheehan et al. 1998). The study excluded people who had no legal status in Canada or were already a client of an assertive community treatment (ACT) or intensive case management (ICM) program. Prior to randomization, enrolled AH/CS participants were assessed on their level of need for mental health service based on information regarding their diagnosis, the severity of their mental health concerns, and community functioning. High-need (HN) participants were those with a diagnosis of a psychotic or bipolar disorder, community functioning disability (less than 62 on the Multnomah Community Ability Scale (MCAS) (Barker et al. 1994), and at least one of the following: (1) had been admitted to hospital due to a mental illness at least twice a year in the previous five years; (2) had a substance use disorder or had been arrested or incarcerated within the previous 6 months prior to enrollment. The remaining participants were categorized into a moderate-need (MN) group. Subsequently, participants in each level of need group were randomized into either Housing First treatment or treatment-as-usual group (TAU). The HN-HF group received rent supplements with ACT, while the MN-HF group received rent supplements and ICM. In contrast, the TAU group received access to standard care and social and housing services available in the community. For the purpose of the present study, we included participants from both HF and TAU groups who consented at the AH/CS baseline

interview to have their justice administrative records accessed and linked to the study survey data ($N = 547$, 95.1% of the 575 recruited participants).

Measurements

Incarceration

Provincial correctional data were obtained from the Ontario Ministry of the Solicitor General (MSG) (formerly known as the Ontario Ministry of Community Safety and Correctional Services) for participants who gave written informed consent to have their correctional data accessed and linkage was done using their names and date of birth. The MSG provided data from the Offender Tracking Information System (OTIS) and the Level of Service Inventory-Ontario Revised (LSI-OR) database, which included admission and release dates for each jail/prison stay for each participant for the period of 1 year prior to randomization up to five years after. For the purpose of this study, we included only participants whose correctional data were available after their baseline interviews and up to 2014.

In Canada, jurisdiction over correctional facilities is shared between the provincial/territorial and federal government. Provincial correctional facilities hold people who are (1) on pre-trial detention (remand); (2) sentenced to two years less a day; (3) on immigration holds; (4) deemed not criminally responsible; (5) from out of province; (6) on national parole violation, and others. People who are sentenced to two years or more serve their sentences in a federal facility; however, almost all of the people serving two or more years are first held in the provincial system before transferring to a federal facility. For our study, incarceration was defined as being imprisoned or confined at least once (yes/no) in a provincial correctional facility during the period October 2009 to October 2014.

Health-related risk factors of incarceration

We identified the health-related risk factors for the model through a literature review (Roy et al. 2016).

Mental illness diagnoses We measured Axis I mental health disorders at baseline using the MINI 6.0 instrument: major depressive disorder, manic or hypomanic episodes, post-traumatic stress disorder (PTSD), panic disorder, mood disorder with psychotic features, psychotic disorder, alcohol dependence/abuse, substance dependence/abuse, and suicidality (Hwang et al. 2012).

Visit to ED services We asked participants if they had ever been to an ED during the 6 months prior to a baseline interview. ED visit was considered as a binary variable. We used

visit to ED as a proxy for healthcare utilization since it is commonly used by the homeless population as a point-of-entry into the healthcare system (Hwang 2001).

Traumatic brain injury To ascertain a history of TBI, participants were asked: “Have you ever had an injury to the head which knocked you out or left you dazed, confused or disoriented?” If they responded “Yes,” a series of follow-up questions were asked to further establish the details of the injuries. These questions have been used previously in studies of TBI in prison and homeless populations (Colantonio et al. 2014; Hwang et al. 2008). We dichotomized TBI into either having a history of TBI or not.

Demographic variables Demographic characteristics such as age (years), sex, and ethno-racial cultural identity (white, Black and other) were measured before the randomization of participants. We obtained these data using the Demographic, Housing, Vocational, and Service Use History instrument, which was created for the AH/CS study (Hwang et al. 2012).

HF intervention and level of mental health service needs We also examined the effect of the HF intervention (HF vs. TAU) and the level of need (HN vs. MN) on incarceration.

Statistical analysis

For our analysis, we included individuals whose data were complete for all health-related and demographic variables and for incarceration. The final sample size for our analysis consisted of 508 participants. We compared participants with at least one missing value and those with complete data on their demographic characteristics (Online Resource 1) and found no significant statistical difference. We also compared people who did and did not consent to have their correctional data accessed based on their demographic characteristics (Online Resource 2) and found no significant differences.

We compared demographic and health characteristics between participants who were incarcerated and those who were not. We reported frequency and percentage for categorical variables and mean and standard deviation for continuous variables. We used Pearson’s chi-square and t tests to assess for potential statistical significance between groups. We used logistic regression to examine the association between potential health-related risk factors and incarceration. We first examined the bivariate association between each health-related risk factor, HF intervention, and incarceration. We then fitted a second set of models to examine the independent association between each health-related risk factor and incarceration adjusting for age, sex, and ethno-racial cultural identity as potential confounders. Particularly, given our interest in seeing whether a history of ED use predicts incarceration independent of mental illness diagnosis, we further adjusted for mental illness

diagnosis for the association between ED visit and incarceration. We examined the relationship between each health-related risk factor and incarceration by adjusting for HF intervention, level of needs group assignment, and demographic characteristics. We also investigated the effect of HF and level of needs on incarceration, adjusted for ethno-racial cultural identity. For each regression model, we tested whether the intervention group modified the effect of the association, via an interaction term, between the health-related risk factor and incarceration. We reported both unadjusted (OR) and adjusted odds ratios (aOR) and their 95% confidence intervals (95% CI). We also tested for multi-collinearity between covariates using the variance inflation factor (VIF). All statistical analyses were two-tailed using a statistical significance level of 0.05 and conducted using STATA/SE 13.

Results

Table 1 presents the description of the demographic and health-related characteristics of the incarcerated and non-incarcerated groups. Of the 508 study participants, 220

(43.3%) had at least one incarceration episode during the period 2009 to 2014. Compared to the non-incarcerated group, the incarcerated group was younger (38.2 years old vs. 42.3 years old) and had a higher proportion of participants who were male (81.9%), frequent ED users (65.1%), and had a history of TBI (66.4%). Alcohol and substance dependence/abuse were more prevalent among people who experienced incarceration compared with those who did not. Moreover, the incarcerated group was more likely to be in the high-need group compared with the non-incarcerated group (38.2% vs. 29.9%). The Housing First intervention group was more likely to have at least one incarceration episode during the follow-up period compared with the TAU group (55.9% vs. 44.1%) but the difference was not significant.

We found no significant association between incarceration and HF intervention (aOR: 1.08, 95% CI: 0.76, 1.55) and level of needs (aOR: 1.41; 95% CI: 0.97, 2.05), when adjusted for ethno-racial cultural identity (Table 2). Table 3 presents unadjusted and adjusted ORs and 95% CIs for the association between mental illness, ED visit, and history of TBI with incarceration. After adjusting for demographic characteristics, participants with substance dependence or

Table 1 Baseline characteristics of study participants at the AH/CS Toronto site by whether they experienced incarceration over the follow-up period

Characteristics	Any incarceration between periods 2009 and 2014		<i>p</i> value
	No (<i>n</i> = 288, 56.7%) Frequency (%) or mean (SD)	Yes (<i>n</i> = 220, 43.3%) Frequency (%) or mean (SD)	
Sex ^a			< 0.000*
Male	172 (59.7)	183 (83.2)	
Female	116 (40.3)	37 (16.8)	
HF intervention ^a			0.696
HF group	156 (54.1)	123 (55.9)	
TAU group	132 (45.83)	97 (44.1)	
Level of mental health service needs ^a			0.049
High needs	86 (29.9)	84 (38.2)	
Moderate needs	202 (70.1)	136 (61.8)	
Mean age (years) at enrollment ^b	42.1 (12.7)	38.1 (9.9)	< 0.000*
Ethnic background ^a			0.312
White	97 (33.7)	86 (39.1)	
Black	99 (34.4)	76 (34.6)	
Other ethnic minority	92 (31.9)	58 (26.4)	
Mental illness diagnosis ^a			
Depression	116 (40.3)	71 (32.3)	0.064
PTSD	65 (22.6)	55 (25.0)	0.523
Panic disorder	44 (15.3)	28 (12.7)	0.414
Mood disorder with psychotic features	66 (22.9)	47 (21.4)	0.677
Manic or hypomanic episodes	27 (9.38)	27 (12.3)	0.294
Psychotic disorder	97 (33.7)	87 (39.6)	0.173
Alcohol dependence/abuse	105 (36.5)	116 (52.7)	< 0.000*
Substance dependence/abuse	108 (37.5)	134 (60.9)	< 0.000*
Suicidality	194 (67.4)	145 (65.9)	0.731
Health service utilization ^a			
ED visits in the 6 months prior to baseline	155 (53.8)	144 (65.5)	0.008*
Traumatic brain injury ^a	123 (42.7)	149 (67.7)	< 0.000*

^a Chi-square test

^b 2-tailed *t* test

*Significant *p* value

SD, standard deviation

Table 2 Unadjusted and adjusted ORs and 95% CIs for the association between HF intervention and level of mental health services need among AH/CS participants at the Toronto site ($N = 508$)

	Incarceration vs. non-incarceration			
	Unadjusted associations		Adjusted associations ^a	
	OR (95% CI)	<i>p</i> value	OR (95% CI)	<i>p</i> value
HF intervention				
HF group	1.07 (0.75, 1.53)	0.696	1.08 (0.76, 1.55)	0.655
TAU group	Ref.		Ref.	
Level of mental health service needs				
High needs	1.45 (1.00, 2.10)	0.049	1.41 (0.97, 2.05)	0.070
Moderate needs	Ref.		Ref.	

^a Adjusted for ethno-racial cultural identity

abuse (aOR: 2.06; 95% CI: 1.40, 3.03) and alcohol dependence or abuse (aOR: 1.52; 95% CI: 1.04, 2.22) had significantly increased odds for incarceration. Similarly, ED visit (aOR: 1.58; 95% CI: 1.06, 2.34) and a history of TBI (aOR: 2.60; 95% CI: 1.75, 3.85) were positively associated with incarceration. When adjusted for demographic characteristics and mental illness diagnosis, ED visit remained significantly associated with incarceration (aOR: 1.54; 95% CI: 1.02, 2.32) (result not shown). When we further adjusted for the HF intervention and level of need for mental health service, the association between incarceration and each health-related risk factor did not change compared with the simpler models (Online Resource 3). Therefore, we chose to present the more parsimonious models as our main findings. There was no statistically significant interaction

between the HF intervention group and each health-related risk factor, and there was no significant multi-collinearity in any model.

Discussion

This study adds to the growing literature on risk factors for incarceration among individuals with experiences of homelessness and mental illness. We found a very high rate of incarceration (43.3%) in our study population. This figure is higher than incarceration rates found in US studies of adults with co-occurring mental illness and substance abuse disorder (38%) and homeless populations (35%) (Luciano et al. 2014; Tsai and Rosenheck 2012). Our rate of incarceration is in line with Kouyoumdjian et al. (2019), who also used the AH/CS Toronto study population to investigate the participants' involvement with the Toronto Police Service and found high rates of police interactions (51.7% for the first year and 43.0% in the second year).

Our study found the HF intervention (ACT/ICM plus rent supplements) did not significantly reduce the risk of incarceration. Despite HF having shown to be effective in improving housing stability in people experiencing homelessness (Baxter et al. 2019; Stergiopoulos et al. 2019), its effectiveness in improving other life dimensions, such as reducing criminal justice system involvement, remains controversial (Leclair et al. 2019). For instance, other studies that had used the AH/CS study data found no significant difference between HF and TAU groups in the number of self-reported arrests over the two-year follow-up period (Aubry et al. 2016; Stergiopoulos et al. 2015). However, in non-randomized studies, HF-based programs were shown to reduce criminal justice

Table 3 Unadjusted and adjusted ORs and 95% CIs for the association between mental health diagnoses, ED visits, and TBI and incarceration among AH/CS participants at the Toronto site ($N = 508$)

Baseline characteristics	Incarceration vs. non-incarceration			
	Unadjusted associations		Adjusted associations ^a	
	OR (95% CI)	<i>p</i> value	OR (95% CI)	<i>p</i> value
Substance dependence/abuse	2.60 (1.81, 3.73)	< 0.000	2.06 (1.40, 3.03)	< 0.000
Alcohol dependence/abuse	1.94 (1.36, 2.78)	< 0.000	1.52 (1.04, 2.22)	0.032
Depression	0.71 (0.50, 1.02)	0.064	0.70 (0.47, 1.04)	0.078
PTSD	1.14 (0.76, 1.73)	0.132	1.13 (0.73, 1.75)	0.580
Manic or hypomanic episodes	1.35 (0.77, 2.38)	0.295	1.59 (0.86, 2.92)	0.137
Panic disorder	0.81 (0.49, 1.35)	0.415	0.91 (0.53, 1.56)	0.729
Mood disorder	0.91 (0.60, 1.40)	0.677	0.86 (0.55, 1.36)	0.526
Psychotic disorder	1.29 (0.89, 1.85)	0.173	1.25 (0.84, 1.85)	0.268
Suicidality	0.94 (0.65, 1.36)	0.731	0.95 (0.64, 1.43)	0.828
ED visit past 6 months	1.63 (1.13, 2.33)	0.008	1.58 (1.06, 2.34)	0.023
TBI	2.82 (1.95, 4.06)	0.000	2.60 (1.75, 3.85)	< 0.000

^a Adjusted for age, sex, ethno-racial background

involvement including incarceration when compared with other supported housing programs (Kriegel et al. 2016; Tsai et al. 2010; Whittaker et al. 2016). Our findings suggest that while the HF approach is effective in helping people exit homelessness, additional mental health, substance use, and income supports may be needed to reduce justice system involvement. The present study provides important insights on the health-related factors associated with increased risk of incarceration. We found that substance and alcohol dependence/abuse, ED visit, and a history of TBI were significantly associated with increased risk of incarceration in bivariate analyses and they remained significant after adjusting for demographic characteristics.

Our findings are consistent with previous studies of people who were not homeless but experienced severe mental disorders. In one study of 198 people with co-occurring mental health and substance use disorders living in two urban areas, substance abuse was associated with a greater likelihood of incarceration (Luciano et al. 2014). Several mechanisms may explain the link between drug and alcohol misuse and incarceration in homeless populations. Illicit substance use, including consumption of alcohol in public spaces, is considered a crime in many justice systems (including Ontario) and therefore, drug and alcohol possession increase the risk of being incarcerated. This is especially likely to occur among people experiencing homelessness and mental illness whose presence in public spaces may draw increased attention from the police when using substances and alcohol (Kouyoumdjian et al. 2019). Likewise, substance misuse may be associated with disruptive or violent behaviours, which may also increase the likelihood of being incarcerated (Elbogen and Johnson 2009), especially given the risk of increased attention for homeless persons as noted.

We found significantly elevated odds of incarceration associated with having a recent ED visit, even after accounting for demographic characteristics as well as mental illness diagnosis. There are several potential explanations for this finding. There may be common antecedent variables that lead to both ED use and incarceration, such as illicit drug use and symptomatic mental illness (Roy et al. 2016). Further, homelessness itself may lead to ED use through exposure to heat, cold, or assault, and recent research has suggested that periods of homelessness may elevate the risk of criminal justice system involvement (Ellsworth 2018). ED use may also indicate a lack of access to adequate primary care or psychiatric care, which may be important for managing chronic conditions that could lead to incarceration (Fazel and Grann 2006). The association could also reflect residual confounding or could be spurious. Further research is necessary to understand this association.

Similar to prior research on TBI in people who are homeless and precariously housed (Hwang et al. 2008; Stubbs et al. 2020), our study found a high prevalence of TBI among AH/

CS participants (53.0% vs. 67.7% and 53.1% respectively). Consistent with previous findings by McIsaac et al. (2016), we also found that a history of TBI increased the odds of incarceration in our study population. Previous research suggests that TBI may lead to personality disorders, such as anti-social, borderline, obsessive-compulsive, and paranoid personality disorders (Hibbard et al. 2000). TBI can also result in increased aggression, impulsivity, and feelings of apathy (Roy et al. 2017; Warriner and Velikonja 2006), each of which can further heighten the risk of incarceration. Neurological, psychiatric, and behavioural changes following a TBI may increase the likelihood of justice system involvement of individuals experiencing homelessness and mental illness.

The study has some limitations. First, participants in the HF group were housed over part of the study period, which may affect their risk of incarceration. However, we explored the effect of the HF intervention, as well as level of need group assignment on each health-related risk factor and did not identify a significant effect on the observed findings. Second, we used participants' health data measured at baseline, which may not accurately reflect participants' health status at the time of incarceration since health status may change over time. However, mental health and substance use disorders identified at baseline represent severe mental illness that is likely to remain constant over the study period. Indeed, a recent study of AH/CS participants found that the severity of substance use did not significantly decrease over the 6 years of follow-up in both HF and TAU groups (Stergiopoulos et al. 2019). Third, the present study examined self-reported data for ED visit within 6 months prior to baseline interview and lifetime history of TBI and this information may be subject to recall or misreporting bias. However, we dichotomized ED visit into any visit vs. none, which has been shown to be a reliable indicator of healthcare utilization (Carroll et al. 2016). Fourth, the study did not explore the types of crimes and the nature of incarceration experience because the data were not available, limiting our ability to identify pathways underlying the relationship between the risk factors and incarceration. Finally, our study included people with experiences of homelessness and mental illness in one large urban area and therefore cannot be generalized to the entire homeless population or to other jurisdictions. Despite the limitations above, our study is one of the first to examine the impact of Housing First on the health-related risk factors of incarceration among individuals with experiences of homelessness and mental illness in Canada. We used a large and diverse sample based on age, gender, and ethno-racial identity. Moreover, we used correctional administrative data to identify incarceration, which is likely to be more accurate than self-reported data.

This study has important policy implications. Our findings showed that the HF intervention had no significant effect in reducing the likelihood of incarceration among people with experiences of homelessness and mental illness. Adding

specific criminogenic-based support services to the existing HF program may help reduce criminal justice involvement. For instance, it may be useful to incorporate psychiatry and forensic knowledge in existing supportive services and programs provided to homeless offenders (Leclair et al. 2019). After transitioning into stable housing, people with experiences of homelessness continue to face complex issues such as lack of sustainable income, discrimination, substance dependence and abuse, and social isolation (Patterson et al. 2015). These factors may increase their risk of being incarcerated. Therefore, in addition to mental health and addiction rehabilitation services, individuals who are homeless with mental illness may benefit from better integration in their local community by improving access to and engagement in meaningful work, community networking, and volunteer group activities, which could help to minimize their risk of criminal involvement and victimization and reduce offending behaviours.

We also found that substance or alcohol dependence/abuse and a history of TBI and ED visits were associated with increased odds of incarceration among AH/CS study participants. These findings highlight the need to provide more programs and services, especially in correctional institutions, which can help to mitigate harms and reduce the risk of incarceration among those at highest risk. Enhancing access to medical care may also help to prevent incarceration for people experiencing homelessness, such as improving access to treatment for people with opioid addiction (Perry et al. 2015), though there is a lack of evidence specific to people who experience homelessness. Furthermore, structural interventions, including provision of housing in conjunction with addiction and mental health services, could prevent both homelessness and criminal behaviours related to substance misuse (Mitchell et al. 2017). In correctional facilities, enhanced use of risk and health assessment tools could be used in sentencing decisions and serve to indicate the need for treatment and supportive programs for individuals in custody as well as those who are released to the community. An Independent Review of Ontario Corrections report found a lack of consistent use of risk assessment in provincial correctional facilities (Sapers et al. 2017). The report noted that the Level of Service Inventory-Ontario Revised risk assessment tool, which is used to inform decisions regarding sentencing, security classification, and supportive program eligibility, was only conducted for people who are sentenced to more than 90 days in correctional institutions and/or to those serving in the community. Such a risk assessment can benefit those who are detained or are sentenced to a shorter period in custody; this is especially relevant to homeless individuals who may not be able to afford bail. There may also be opportunities to link individuals while in custody with healthcare services in the community to address ongoing health needs that may contribute to criminal justice involvement, such as substance misuse and TBI-related problems (Hedrich et al. 2011).

Conclusion

We found that people experiencing homelessness and mental illness have high risk of incarceration (43.3%) over five years. Substance and alcohol dependence/abuse, prior history of TBI, and high ED visit were each associated with increased odds of incarceration. Our findings point to the value in providing social and health supportive services to homeless individuals to help address homelessness, improve their health, and reduce their criminal justice involvement. Future research should further focus on understanding their incarceration experiences and type of offence to aid policy and supportive programs reform.

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Author contributions Cilia Mejia-Lancheros, Fiona G. Kouyoumdjian, James Lachaud, Stephen W Hwang, and Linh Luong contributed to the study conception and design the study. Linh Luong performed the analysis of the de-identified data. Linh Luong, Cilia Mejia-Lancheros, and James Lachaud interpreted the first results with intellectual inputs provided by Fiona G. Kouyoumdjian and Stephen W Hwang. The first draft of the manuscript was written by Linh Luong and Cilia Mejia-Lancheros and all authors commented on previous versions of the manuscript. All co-authors read and approved the final manuscript.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (Research Ethics Board of St. Michael's Hospital in Toronto, Ontario, Canada. REB#09-208) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed written consent was obtained from all individual participants included in the study to both participate in the AH/CS trial and to have their correctional data accessed and linked to the study survey data.

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