



## The high burden of traumatic brain injury and comorbidities amongst homeless adults with mental illness



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### ARTICLE INFO

#### Article history:

Received 8 April 2016

Received in revised form

22 November 2016

Accepted 1 December 2016

#### Keywords:

Brain injuries

Homeless persons

Mental disorders

Psychiatric diagnosis

Health care delivery

Comorbidity

### ABSTRACT

**Objective:** characterize the prevalence of self-reported head injury with loss of consciousness (LOC) and associated demographic, clinical and service use factors in a sample of homeless adults with mental illness.

**Method:** Participants in the At Home/Chez Soi study were interviewed at the time of study enrollment regarding their history of head injuries, mental and physical health diagnoses and justice system and healthcare interactions. Sociodemographic and clinical data were also collected.

**Results:** Over half of the 2088 study respondents (52.6%,  $n = 1098$ ) reported a history of head injury with a LOC, which was associated with several demographic, clinical and service use variables in this population. With respect to specific mental health conditions, a history of head injury with LOC was associated with higher odds of current depression (OR = 2.18, CI: 1.83–2.60), manic episode or hypomanic episode (OR = 1.91, CI: 1.45–2.50), PTSD (OR = 2.98, CI: 2.44–3.65), panic disorder (OR = 2.37, CI: 1.91–2.93), mood disorder (OR = 1.78, CI: 1.40–2.26) and alcohol (OR = 2.09, CI: 1.75–2.49) and drug (OR = 1.73, CI: 1.46–2.06) misuse disorders, but reduced odds of having diagnosis of a psychotic disorder (OR = 0.63, CI: 0.53–0.76). A history of head injury with LOC was also associated with increased use of variety of services, including family medicine (OR = 1.33, CI: 1.12–1.59), criminal justice system (OR = 1.50, CI: 1.25–1.80) and the emergency department (OR = 1.03, CI: 1.01–1.05).

**Conclusions:** Amongst homeless adults with mental illness having a history of head injuries with LOC was independently associated with various adverse outcomes. These individuals constitute a high-risk group who may benefit from specialized services.

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### 1. Introduction

Traumatic brain injury (TBI) is a leading cause of disability worldwide with an estimated 10 million people affected each year (Faul et al., 2010; Hyder et al., 2007). TBI is defined as “an alteration

in brain function, or other evidence of brain pathology, caused by an external force” (NINDS Common Data Elements Team, 2012). The severity of TBI can be categorized based on the extent of damage to the brain, duration of alteration of consciousness or loss of memory, or degree of impact upon functional abilities. The length of loss of consciousness (LOC) following a TBI is positively associated with functional impairments (Hoge et al., 2008; Rohling et al., 2003). The majority of those who suffer a moderate to severe brain injury experience severe impairments that can significantly affect their

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mobility, self-care and ability to reintegrate into society (Shames et al., 2007). However, even among those who have sustained severe TBI, some will be able to return to productive employment with sufficient support (Shames et al., 2007).

Although the empirical literature is still evolving, recent research suggests that individuals who are homeless or vulnerably housed have experienced higher rates (reported up to 65%) of lifetime TBI (To et al., 2015; Topolovec-Vranic et al., 2012), compared to individuals in the general community (8.5%) (Silver et al., 2001). In a recent study, homeless men were estimated to have rates of head injury that were 14 times higher than those in the general population of Canada, with a rate 400 times higher among those who were chronically homeless with drinking problems (Svoboda and Ramsay, 2014).

Not only are the rates of TBI higher amongst individuals who are homeless, having experienced a TBI is associated with increased risk for adverse outcomes including seizures, mental health and drug problems, poorer physical and mental health status (Hwang et al., 2008), a greater likelihood of healthcare utilization, legal incidents, victimization (To et al., 2015), and a lifetime history of arrests, mental illness, and a family history of substance abuse (Topolovec-Vranic et al., 2014). Moreover, in a large sample (>1500) of homeless individuals receiving care across 40 general practitioner services in Glasgow, hospitalization for a head injury was 5.4 times higher than in the general population and was associated with more than twice the level of mortality as that observed among homeless people who had not been hospitalized for a head injury (McMillan et al., 2015).

While we are starting to appreciate the potential burden of comorbid TBI in homelessness, there are little data available regarding the associations between homelessness, TBI and mental disorder diagnoses. In a 2013 review (Topolovec-Vranic and Ennis, 2013), only three studies were found which had specifically examined these associations (Hux et al., 2009; Hwang et al., 2008; Svoboda and Ramsay, 2014) and three additional studies have been published since (Mackelprang et al., 2014; To et al., 2015; Topolovec-Vranic et al., 2014). These studies have indicated that homeless individuals with a history of TBI are more likely to have had a history of mental disorder diagnoses or related symptoms (Hux et al., 2009; Hwang et al., 2008; Mackelprang et al., 2014; Svoboda and Ramsay, 2014; To et al., 2015; Topolovec-Vranic et al., 2014) or worse scores on mental health component subscores of quality of life screening measures (Hwang et al., 2008; To et al., 2015). It is important to note that in most of these studies, the construct of mental illness was considered in general terms and amongst relatively heterogeneous and not well characterized (in terms of mental health status) samples. Moreover, aside from Mackelprang and colleagues' (2014) study of homeless youth, these previous studies have not reported on specific mental disorder diagnoses (e.g. schizophrenia, psychotic disorder, posttraumatic stress disorder, suicidality, etc.) in relation to a history of TBI.

The At Home/Chez Soi study is a multisite randomized controlled trial of Housing First interventions, compared to Treatment as Usual (TAU) for homeless adults with mental illness (Goering et al., 2011). Over 2000 homeless and precariously housed men and women were recruited from 2009 to 2011 across five-sites in Canada. These participants underwent an extensive series of baseline assessments including the Mini International Neuropsychiatric Interview 6.0 (MINI) (Sheehan et al., 1998) to characterize their mental health status at the time of admission into the study. The primary results of the trial have been recently reported elsewhere (Aubry et al., 2016; Stergiopoulos et al., 2015). These data provide a unique opportunity to characterize the prevalence of head injury with LOC among adults experiencing homelessness and mental illness, and to explore the demographic, clinical and service

use factors associated with head injury with LOC among these individuals. These findings can help guide future research into the relationship between TBI, mental illness and homelessness, as well as service needs of this particularly vulnerable population.

### 1.1. Aims of the study

This study aimed to answer the following research questions: 1. Amongst a population of homeless individuals with mental illness in the At Home/Chez Soi study cohort, what were the self-reported rates of head injuries with a loss of consciousness? 2. For those individuals who self-reported a history of a loss of consciousness due to a head injury, were there any differences in demographic factors, mental and physical health variables, contact with criminal justice system, and health services access as compared to those without a history of a LOC due to a head injury? Based on previous literature, we hypothesized that approximately 50% of the study participants would have a self-reported history of head injury with LOC, and that those with such a history would have poorer mental and physical health status, and greater interaction with the justice system and healthcare utilization.

## 2. Materials and methods

### 2.1. At Home/Chez Soi study design

The At Home/Chez Soi study was registered with the International Standard Randomized Control Trial Number Register (ISRCTN 42520374). Approval for the study was received from the research ethics board of all participating institutions. Written informed consent was received from all study participants.

The study protocol and measures have been described in detail elsewhere (Goering et al., 2011). This non-blinded randomized controlled trial was conducted in five cities across Canada (Moncton, Montreal, Toronto, Winnipeg, and Vancouver). Eligibility criteria were legal adult status, absolutely homeless or precariously housed, the presence of a mental illness (eligible diagnoses were major depressive disorder, manic or hypomanic episode, mood disorder with psychotic features, panic disorder, post-traumatic stress disorder, and psychotic disorder) with or without a concurrent substance use disorder as determined by the Mini International Neuropsychiatric Interview 6.0 (MINI 6.0) (Sheehan et al., 1998). Exclusion criteria included: no legal status in Canada, relative homelessness (inhabiting spaces that do not meet the basic health and safety standards, such as living in overcrowded or hazardous conditions), and current client of an assertive community treatment (ACT) or intensive case management (ICM) program at study entry. This analysis is based on data from the baseline questionnaires collected during the enrollment period from October 2009 to July 2011.

### 2.2. Study measures

Data on demographic characteristics, homelessness history, health services use, criminal justice system involvement, and comorbid chronic medical conditions were obtained using questionnaires administered by interviewers during the screening and baseline visits.

Current mental illness and substance misuse were assessed using the MINI 6.0 (Sheehan et al., 1998). The MINI is a widely-used structured diagnostic interview instrument that has shown good overall diagnostic concordance with SCID-P and CIDI and can be administered in less than half the time needed than these longer more comprehensive instruments (Sheehan et al., 1998). As part of the At Home/Chez Soi study, participants were assessed for the

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