# What are the Predictors of Volatile Substance Use in an Urban Community of Adults Who are Homeless?

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## ABSTRACT

The present study explored the prevalence of volatile substance use (VSU) in a community of homeless adults. The importance of individual life history characteristics (history of traumatic events, residential school history, mental and physical health conditions) were also examined with respect to past-year volatile substance use in this sample. Overall, the results indicate that a variety of traumatic events, particularly residential school history and a number of mental and physical health conditions, were significantly associated with VSU in this urban Canadian sample. These findings have novel implications for community interventions for VSU and highlight the importance of conceptualizing cultural and historical traumas in understanding VSU.


**Keywords:** homelessness, mental illness, physical illness, residential school, trauma, volatile substance use


## RÉSUMÉ

Dans cette étude, nous évaluons la prévalence de l'utilisation de substances volatiles (USV) dans une communauté d'adultes itinérants vivant en milieu urbain au Canada. Nous examinons également le lien entre des caractéristiques du cycle de vie (historique des événements traumatisants, séjours en pensionnat, maladies mentales et physiques) et l'utilisation de substances volatiles, durant l'année précédant notre étude, parmi ces personnes. Nos résultats montrent qu'un grand nombre d'événements traumatisants, en particulier des séjours en pensionnat et des maladies mentales et physiques, sont associés à l'USV dans notre échantillon. Ces résultats ont des implications en matière d'interventions communautaires dans les cas d'USV, et mettent en lumière l'importance de tenir compte des événements traumatisants de natures culturelle et historique pour mieux comprendre l'USV.


**Mots clés :** itinérance, maladie mentale, maladie physique, pensionnats, événements traumatisants, utilisation de substances volatiles

## INTRODUCTION

Research literature on volatile substance use (VSU) by adults is scarce, as VSU is most commonly studied as an issue among youth populations. However, clusters of adults who use volatile substances exist sporadically in communities across North America. Moreover, these communities are associated with such markedly poor outcomes that increased knowledge about adult VSU is needed to understand pathways to ameliorate these consequences. A number of pertinent psychosocial and community-related factors in youth have been found to be associated with VSU—factors such as poly-substance use, a history of disintegrating family environments, difficulties with schooling, low socio-economic status, impaired psychosocial functioning, and involvement in criminal activities (Dell, Gust, & MacLean, 2011; Howard, Bowen, Garland, Perron, & Vaughn, 2011; Howard, Perron, Vaughn, Bender, & Garland, 2010; Oetting & Webb, 1997).

VSU involves the inhalation or "sniffing" of volatile psychoactive chemicals (i.e., chemicals in spray paints, gasoline, etc.) that induce rapid intoxication via the pulmonary circulation system (Dell, Gust, & MacLean, 2011; Howard et al., 2011). Volatile solvents are believed to be more frequently in use in homeless populations due to their low cost and easy accessibility, making them a particularly pernicious substance to address via public health or social policies (Beauvais, 1997; Brouette & Anton, 2001). Alongside a sense

of euphoria or intoxication, which occurs after inhalation, VSU is also associated with a plethora of health problems. These include respiratory concerns, hallucinations, dizziness and disorientation, headaches, lethargy, speech and motor difficulties, and in some cases coma or sudden death (Cruz, 2011). Chronic use has been found to be associated with cardiac, digestive, dermatological, and liver issues and with neurological impairment, particularly in regions of the hippocampus and cerebrum (Al-Hajri & Del Bigio, 2010; Brouette & Anton, 2001; Cruz, 2011).

**Volatile Substance Use and Homelessness**

Homelessness is a pervasive, multifaceted issue affecting communities, families, and an estimated 150,000 to 300,000 individuals in Canada (Keller & Goering, 2013). In addition to socio-economic and housing challenges associated with homelessness, individuals without stable housing have increased mental and physical health difficulties (Boivin, Roy, Haley, & Galbaud du Fort, 2005; Schanzer, Dominguez, Shrout, & Caton, 2007), increased rates of mortality (Hwang, 2000; Williams & Stickley, 2011), and poorer quality of life (Williams & Stickley, 2011).

In 2009 the Mental Health Commission of Canada launched the At Home / Chez Soi research demonstration project—a multisite randomized controlled trial to assess the effectiveness of a Housing First intervention strategy in five Canadian sites (Pearson, Montgomery, & Locke, 2009; Tsemberis & Eisenberg, 2000; Tsemberis, Gulcur, & Nakae, 2004). The objectives of the study warranted evaluating the outcomes of housing stability, quality of life, physical and mental health status, social functioning, and community integration for both the Housing First and treatment-as-usual groups in five Canadian cities: Vancouver, Montreal, Toronto, Moncton, and Winnipeg (Goering et al., 2011). The focus of the Winnipeg site, where the percentage of homeless individuals with Aboriginal heritage (approx. 60–70%) far outweighs the percentage of individuals with Aboriginal heritage in the general population (approx. 10%) (Gessler, Maes, & Skelton, 2011; Laird, 2007), was to better understand issues of homelessness in this urban environment.

The issue of urban Aboriginal homelessness involves added layers of complexity, given historical and present-day cultural trauma. These include the historical and intergenerational trauma of colonization and residential schools (Dell & Lyons, 2007; Dell, Seguin, et al., 2011; Lavallee & Poole, 2009), challenges incurred in migrating from rural areas to the urban centre of Winnipeg (Distasio, Sylvestre, & Wall-Wieler, 2013), a lack of culturally appropriate supports (Hulchanski, Campsie, Chaus, Hwang, & Paradis, 2009), and other culturally related challenges such as discrimination. Among the five Canadian research sites, VSU was only prevalent in the Winnipeg site. VSU amplifies the compounded stigma and discrimination that many homeless individuals face. Individuals who use volatile substances have been reported to experience high levels of hostility and isolation from individuals who do not engage in VSU (MacLean, 2008). This finding was consistent with previous studies that indicate that VSU is more prevalent in minority groups and communities (Beauvais, 1997; Oetting & Webb, 1997).

**Current Study**

To date, research on VSU has been very limited, particularly in adult populations (Beauvais, 1997). Given the evidence suggesting that distinct demographic characteristics and patterns of use differ between adolescents and adults in the general population, this area of research is critical for understanding and

informing future intervention work (Wu & Ringwalt, 2006). Although the traumatic history and ethnic heritage of individuals using VSU has received limited attention, it was hypothesized that the subgroup of interest (individuals who use volatile substances) would be at greater risk for past trauma. Little is known about whether people with VSU are more likely to have experienced traumatic events in their lifetime or intergenerational attendance at residential schools. This lack of knowledge may have implications for the population's well-being and treatment, given the dangerous and isolating nature of the substance use. The focus of the current study is to provide the prevalence and descriptive correlates associated with VSU in an adult sample. Socio-demographic status, mental health, physical health, and traumatic experiences will be compared between homeless individuals who do and do not utilize volatile substances.

The research questions of the current study include:

1. What is the prevalence of VSU in an adult population who are homeless and have mental health issues?
2. Are there differences in the demographic variables (i.e., sex, age, length of time spent homeless) among VSU and nonVSU groups?
3. Are there differences among VSU and nonVSU groups in individual and total number of lifetime traumatic events?
4. What are the patterns of VSU and nonVSU groups in the reporting of self, parental, or grandparental attendance at residential schools?
5. Given the literature on comorbidity of physical and mental health conditions associated with VSU, are there differences between the VSU group and the nonVSU group in self-report of Axis I mental disorder or physical condition comorbidities?

## METHOD

### Participants and Data Collection Procedures

Data for this project are derived from the baseline data of the Winnipeg site of the At Home / Chez Soi research demonstration project (n=504). The data for the 504 participants included in this study are derived from their baseline interview, prior to being randomized to the intervention or treatment-as-usual conditions. Within the city of Winnipeg, participants were recruited for the study through referrals from both community and clinical sources. Trained interviewers, including those of Aboriginal descent with lived experience in mental health and homelessness, collected the data. Participants were contacted by the research team via mail, telephone, or clinical and social service contacts in the community that had referred them to the At Home / Chez Soi study. Trained interviewers met with the participants in community locations that were appropriate for confidential interviews (i.e., hospital meeting room, soup kitchen recreation room, university office space). Interviewers were responsible for recording participant responses and for clarifying any questions for the participants, within the limits of the study protocol. The Health Research Ethics Board at the University of Manitoba approved this study, and all participants provided written informed consent to participate. Each participant was also provided with an honorarium for his or her participation.

Additionally, all findings of this study were presented before the Aboriginal Lens and Lived Experience committees to ensure that the findings were interpreted and communicated in a culturally appropriate manner

that was as representative as possible of the experiences of the sample. The Aboriginal Lens committee served as an advisory group for study coordinators regarding the formation of study policies and the interpretation and presentation of study findings in a manner that reflected the values of the sample. The Lived Experience Circle was formed in 2010 by the Mental Health Commission of Canada as an advisory body to the At Home / Chez Soi study at the Winnipeg site. It is comprised almost entirely of people with lived experience of homelessness and mental illness. In addition to advising the research investigators regarding study procedures, the Circle's mandate has expanded over the years to include community events such as service fairs and knowledge exchange forums.

## Materials

**Volatile substance use.** This variable was based on self-report of any past-year solvent or inhalant use in response to questions from the Substance Abuse or Dependence portions of the Mini International Neuropsychiatric Interview (MINI). The MINI has been found to have comparable validity to the Structured Clinical Interview for DSM diagnoses (SCID-P) and the Composite International Diagnostic Interview for the ICD-10 (CIDI) (Amorim, Lecrubier, Weiller, Hergueta, & Sheehan, 1998; Lecrubier et al., 1997; Sheehan et al., 1997; Sheehan et al., 1998).

**Socio-demographic variables.** Sex, age, relationship status, level of education, length of homelessness, Aboriginal heritage, and a history in the care of child and family services were variables included in the analysis. Age was categorized into 18–39 years and 40+ years of age, based on the median age of participants. Marital status was dichotomized into two categories: 1) single, divorced, separated, or widowed; and 2) married or cohabitating. Years of homelessness was divided into two categories based on the median length of homelessness: a) 1–35 months homeless; and b) 36 or more months homeless. Aboriginal heritage data represent any self-report of North American indigenous heritage (i.e., First Nations, Metis, Inuit, etc.). History in care represents self-reported formal care support (i.e., foster home, group home, etc.) during the first 18 years of life.

**Lifetime traumatic events.** Traumatic events over the lifetime were measured through an instrument that inquired about 28 traumatic events derived from the World Health Organizations Composite Diagnostic Interview (Wittchen, 1994). A dichotomous total trauma variable was created to capture endorsement of >10 of the 28 events, based on the median number of events reported in the sample.

**Residential school history.** Personal, parental, or grandparental experiences of residential school history were measured by seven separate questions in which participants were asked: a) Did you attend residential school? b) Did your mother (father, mother's father, father's father …, etc.) attend residential school?

**Axis I mental disorders.** A select group of Axis I disorders based on DSM-IV diagnostic criteria were measured in this study: major depressive episode, manic episode, panic disorder, posttraumatic stress disorder, psychotic episode, and mood disorder with psychotic features. Alcohol- and drug-related substance abuse and dependence were measured in addition to suicidal risk (low/med/high). Mental health disorders were assessed by meeting MINI criteria (from the structured interview schedule) and/or by a physician's diagnosis. A total Axis I condition count variable was created to determine the presence of three or more Axis I conditions. This dichotomy was based on the median value of Axis I conditions reported in the sample.

**Physical health conditions.** The Comorbid Conditions Questionnaire, a dichotomous instrument, was utilized to capture participant self-report of 29 chronic and acute medical conditions. A dichotomous total physical conditions variable was created to indicate endorsement of >6 (the median of the sample) of the listed conditions.

### Procedure

First, the frequencies of VSU, socio-demographic characteristics, traumatic events, residential school experience, and mental and physical conditions were calculated in the sample.

Second, logistic regression analysis was used to estimate the relationship between past-year VSU and traumatic events, psychiatric conditions, physical health conditions, and socio-demographic variables.

## RESULTS

The prevalence of self-reported VSU was 6.5% (n=33). Participants reporting VSU were more likely to be of Aboriginal heritage, have less education, have more months of homelessness, and be cohabitating with another person or in a marital relationship (see Table 1). Participants with past-year VSU had an increased likelihood of reporting several traumatic events in their lifetime (see Table 2). Table 2 presents the data from participants who answered "yes" to each of the 28 traumatic items. Table 2 compares the rates of those who did report experiencing the event between the VSU and nonVSU groups. Individuals who answered "no" or were missing were not included in the table. This population was more likely to have experienced accidental trauma, such as harmful substance exposure, man-made disasters (i.e., fires), and to have a child who was seriously ill or injured. The trend for this population also included more interpersonal trauma, such as physical abuse as a child, spousal abuse, witnessing domestic violence, the accidental injury or killing of another person, and being stalked, than those who did not endorse VSU. VSU was also associated with reporting terror as a civilian and with a greater total number of traumatic events.

Table 3 lists the responses of participants with Aboriginal heritage (n=372) on questions relating to personal, parental, and grandparental attendance at residential schools. Logistic regressions were not performed on these variables due to limited power and small sample size.

In relation to Axis I disorders, VSU was associated with a higher proportion of a current mood disorder (depression) and substance-use disorders, though none of these associations were statistically significant, likely due to lack of power. VSU was associated with a 2.52 (95% CI 1.17, 5.40; $p$ =0.02) greater likelihood of having more than three current Axis I conditions.

Table 4 demonstrates that VSU was associated with increased reporting of physical health conditions such as Hepatitis C, HIV/AIDS, migraines, epilepsy or seizures, urinary incontinence, and total number of comorbid physical health conditions than those who had not utilized volatile substances within the past year. Similar to Table 1, Table 4 includes those participants whose self-report indicated that they had experienced the physical condition, whereas those who answered "no" or had missing data were not included in the table.

**Table 1**

**Associations of Socio-demographic Characteristics and Volatile Substance Use**

| | VSU | | OR (95% CI) | *P* Values |
|---|---|---|---|---|
| | No (*n*=471) | Yes (*n*=33) | | |
| Sex | | | | |
| Male (*n*=320) | 302 | 18 | 1.00 | 0.27 |
| Female (*n*=184) | 169 | 15 | 1.49 (0.73 to 3.03) | |
| Aboriginal heritage | | | | |
| Non-Aboriginal (*n*=127) | 126 | 1 | 1.00 | - |
| Aboriginal (*n*=374) | 342 | 32 | - | |
| Education | | | | |
| <High school (*n*=350) | 321 | 29 | 1.00 | - |
| >High school (*n*=152) | 149 | 3 | - | |
| Length of homelessness | | | | |
| 1–35 months (*n*=229) | 224 | 5 | 1.00 | **0.002** |
| 36+ months (*n*=260) | 235 | 25 | **4.77 (1.79 to 12.67)** | |
| Age | 471 | 3 | 0.98 (0.95 to 1.01) | 0.23 |
| Relationship status | | | | |
| Single (*n*=479) | 452 | 27 | 1.00 | **0.001** |
| Married/cohab. (*n*=24) | 18 | 6 | **5.58 (2.05 to 15.20)** | |
| History in care | | | | |
| No foster care (*n*=255) | 243 | 12 | 1.00 | 0.12 |
| Foster care (*n*=245) | 225 | 20 | 1.80 (0.86 to 3.77) | |

*Notes*. VSU = volatile substance use. OR = odds ratio. CI = confidence interval.
Minus sign (-) denotes that cell sizes were too small to perform regression analyses (*n*<5).

## DISCUSSION

The current study adds to the limited body of literature on adult populations who participate in VSU. Complementing research on VSU in youth populations and international literature on adult VSU, this study describes relevant demographic characteristics of a unique adult sample. It additionally contributes to the knowledge base by detailing associations with experiences of past trauma and residential school history, in conjunction with physical and psychiatric comorbidities. Understanding the histories and health status of a population with VSU and subgroups within the larger homeless population is a critical step in understanding their needs. As such, this is the first report investigating correlates of VSU in a Canadian sample of urban homeless adults.

**Table 2**

**Associations of Lifetime Traumatic Events and Volatile Substance Use**

| | VSU | | OR (95% CI) | *P* Values |
|---|---|---|---|---|
| | No *n* (%) | Yes *n* (%) | | |
| Combat/gang | 48 (10.3) | 1 (3.1) | - | - |
| Peacekeeper in war zone | 9 (1.9) | 0 (0) | - | - |
| Witness to atrocities | 49 (10.7) | 5 (15.6) | 1.55 (0.57 to 4.22) | 0.39 |
| **Harmful substance exposure** | **134 (28.7)** | **20 (62.5)** | **4.14 (1.97 to 8.71)** | **<0.001** |
| **Man-made disaster** | **147 (31.3)** | **17 (53.1)** | **2.49 (1.21 to 5.12)** | **0.01** |
| Motor vehicle accident | 221 (47.0) | 16 (50.0) | 1.13 (0.55 to 2.31) | 0.74 |
| Other accident | 138 (29.4) | 11 (34.4) | 1.26 (0.59 to 2.68) | 0.55 |
| Natural disaster | 76 (16.2) | 8 (25.0) | 1.73 (0.75 to 3.99) | 0.20 |
| Life-threatening illness | 188 (40.2) | 16 (50.0) | 1.49 (0.73 to 3.05) | 0.28 |
| Death of someone close | 381 (81.4) | 30 (93.8) | - | - |
| **Childhood injury or illness** | **69 (14.8)** | **9 (28.1)** | **2.25 (1.00 to 5.07)** | **0.05** |
| Witness to serious injury/corpse | 335 (71.7) | 28 (87.5) | - | - |
| Sexual assault (rape) | 256 (55.9) | 22 (71.0) | 1.93 (0.87 to 4.28) | 0.11 |
| Sexual assault (touch) | 282 (62.1) | 22 (73.3) | 1.68 (0.73 to 3.85) | 0.22 |
| **Child abuse (physical)** | **248 (53.2)** | **24 (77.4)** | **3.01 (1.27 to 7.13)** | **0.01** |
| **Spousal abuse** | **220 (46.8)** | **23 (74.2)** | **3.27 (1.43 to 7.45)** | **0.005** |
| **Witness to domestic violence** | **290 (62.4)** | **27 (84.4)** | **3.26 (1.23 to 8.62)** | **0.02** |
| **Stalked** | **192 (41.1)** | **21 (67.7)** | **3.01 (1.39 to 6.53)** | **0.005** |
| Kidnapped | 99 (21.1) | 7 (22.6) | 1.09 (.456 to 2.60) | 0.85 |
| Other physical abuse | 336 (71.3) | 24 (75.0) | 1.21 (0.53 to 2.75) | 0.66 |
| Mugged | 349 (74.3) | 27 (84.4) | 1.87 (0.71 to 4.97) | 0.21 |
| Purposely injured or killed | 107 (23.2) | 11 (34.4) | 1.73 (0.81 to 3.71) | 0.16 |
| **Person close to participant in accident (injured/killed)** | **88 (19.0)** | **11 (34.4)** | **2.23 (1.04 to 4.79)** | **0.04** |
| **Civilian in terror** | **43 (9.2)** | **7 (21.9)** | **2.77 (1.13 to 6.79)** | **0.03** |
| Civilian in war zone | 22 (4.7) | 1 (3.1) | - | - |
| Refugee | 7 (1.5) | 2 (6.3) | - | - |
| Other trauma | 143 (31.0) | 8 (25.0) | 0.74 (0.33 to 1.69) | 0.48 |
| Trauma to someone close | 264 (57.1) | 19 (61.3) | 1.19 (0.56 to 2.50) | 0.65 |
| **Total Trauma (>10)** | **218 (47.1)** | **21 (70.0)** | **2.62 (1.18 to 5.85)** | **0.02** |

*Notes.* VSU = volatile substance use. OR = odds ratio. CI = confidence interval.
Minus sign (-) denotes that cell sizes were too small to perform regression analyses ($n<5$).

**Table 3**
**Residential School History and Volatile Substance Use**

| | VSU | |
|---|---|---|
| | No (*n*=340) *n* (%) | Yes (*n*=32) *n* (%) |
| Own residential school | | |
| No (*n*=319) | 294 (86.5) | 25 (78.1) |
| Yes (*n*=46) | 40 (11.8) | 6 (18.8) |
| Don't know (*n*=7) | 6 (1.8) | 1 (3.1) |
| Mother residential school | | |
| No (*n*=155) | 145 (42.6) | 10 (31.3) |
| Yes (*n*=126) | 112 (32.9) | 14 (43.8) |
| Don't know (*n*=91) | 83 (24.4) | 8 (25.0) |
| Father residential school | | |
| No (*n*=155) | 149 (43.8) | 6 (18.8) |
| Yes (*n*=94) | 84 (24.7) | 10 (31.3) |
| Don't know (*n*=123) | 107 (31.5) | 16 (50.0) |
| Any grandparent residential school | | |
| No (*n*=51) | 51 (15.0) | 0 (0) |
| Yes (*n*=114) | 98 (28.8) | 16 (50.0) |
| Don't know (*n*=207) | 191 (56.2) | 16 (50.0) |

In this sample, we found that homeless individuals utilizing volatile substances were more likely than other homeless adults to report a variety of negative mental and physical health experiences. These included a greater number of traumatic events, meeting criteria for more than three Axis I psychiatric conditions, and having a greater number of physical comorbidities.

These findings should be considered in the context from which they have emerged, and thus it is essential to consider the impact of intergenerational experiences of trauma and colonization (Haskell & Randall, 2009; Kirkmayer & Valaskakis, 2009; Kirmayer, Brass, & Tait, 2000) within this sample. While VSU is not restricted to marginalized populations (Dell, Gust, & MacLean, 2011), homeless and precariously housed individuals within Winnipeg who use volatile substances are more likely to report being of Aboriginal descent. This finding is consistent across cultures and among other indigenous cultural groups (Beauvais, Wayman, Jumper-Thurman, Plested, & Helm, 2002; Beauvais, 1997; Bone, Dell, Koskie, Kushniruk, & Shorting, 2011; Dell et al., 2011; Oetting & Webb, 1997; Smart, 1997; Trimble, 1997). The use of volatile substances among individuals with Aboriginal heritage is nested within the past and present conditions of colonization, racism, stigma, and the loss of land, language, and culture (Dell & Lyons, 2007; Dell & Hopkins, 2011).

**Table 4**

**Comorbid Health Conditions With Volatile Substance Use**

| | VSU | | OR (95% CI) | *P* Values |
|---|---|---|---|---|
| | No *n* (%) | Yes *n* (%) | | |
| Tuberculosis | 17 (3.7) | 2 (6.1) | - | - |
| Asthma | 121 (26.1) | 11 (33.3) | 1.42 (0.67 to 3.01) | 0.36 |
| Emphysema/bronchitis | 73 (15.9) | 4 (12.5) | - | - |
| Hepatitis B | 11 (2.4) | 1 (3.2) | - | - |
| **Hepatitis C** | **82 (18.1)** | **17 (53.1)** | **5.13 (2.46 to 10.69)** | **< 0.001** |
| **HIV/AIDS** | **15 (3.3)** | **5 (15.6)** | **5.48 (1.85 to 16.21)** | **0.002** |
| Any other STD | 23 (5.0) | 3 (9.4) | - | - |
| **Migraines** | **223 (47.4)** | **24 (72.7)** | **2.95 (1.34 to 6.49)** | **0.007** |
| **Seizures/epilepsy** | **64 (13.6)** | **12 (36.4)** | **3.62 (1.70 to 7.71)** | **0.001** |
| Effects of stroke | 35 (7.8) | 3 (9.7) | - | - |
| Alzheimer/dementia | 9 (2.0) | 1 (3.2) | - | - |
| High blood pressure | 138 (30.9) | 9 (27.3) | 0.84 (0.38 to 1.85) | 0.67 |
| Heart disease | 19 (4.2) | 3 (9.4) | - | - |
| Ulcer | 61 (13.5) | 8 (25.0) | 2.13 (0.92 to 4.96) | 0.08 |
| Bowel problems | 42 (9.1) | 5 (16.1) | 1.92 (0.70 to 5.27 | 0.20 |
| Bladder/kidney trouble | 95 (20.5) | 11 (34.4) | 2.03 (0.95 to 4.35) | 0.07 |
| **Urinary incontinence** | **96 (20.4)** | **14 (42.4)** | **2.88 (1.39 to 5.95)** | **0.004** |
| **Skin problems** | **121 (25.8)** | **14 (42.4)** | **2.12 (1.03 to 4.36)** | **0.04** |
| Back problems | 287 (60.9) | 21 (63.6) | 1.12 (0.54 to 2.34) | 0.76 |
| Foot problems | 203 (43.2) | 16 (48.5) | 1.24 (0.61 to 2.51) | 0.55 |
| Dental problems | 258 (54.9) | 19 (57.6) | 1.12 (0.55 to 2.28) | 0.77 |
| Bug infestation | 104 (22.4) | 8 (25.8) | 1.21 (0.53 to 2.78) | 0.66 |
| Joint problems/arthritis | 211 (45.8) | 20 (60.6) | 1.82 (0.89 to 3.75) | 0.10 |
| Anemia | 109 (25.4) | 11 (36.7) | 1.70 (0.79 to 3.69) | 0.18 |
| Liver problems | 38 (8.3) | 3 (10.0) | - | - |
| Cancer | 15 (3.4) | 1 (3.1) | - | - |
| Thyroid condition | 29 (6.6) | 2 (7.4) | - | - |
| Diabetes | 53 (12.3) | 1 (3.3) | - | - |
| Head injury | 384 (82.2) | 28 (84.8) | 1.21 (0.45 to 3.23) | 0.70 |
| **Total conditions (>6)** | **229 (48.6)** | **25 (75.8)** | **3.30 (1.46 to 7.47)** | **0.004** |

*Notes*. VSU = volatile substance use. OR = odds ratio. CI = confidence interval.
Minus sign (-) denotes that cell sizes were too small to perform regression analyses ($n$<5).

As a means of exploring the link between current VSU and past experiences of colonization, the relationship between personal, parental, and grandparental residential school attendance was investigated. The findings indicated a pattern (i.e., higher percentages of attendance across all categories) of increased attendance compared with individuals who did not use volatile substances. More specifically, statistical analyses demonstrated that individuals who used volatile substances had an increased likelihood of having a father who attended residential schools or not knowing if their father attended. The impact of residential school attendance in this sample of adults reflects findings among youth populations in which the use of volatile substances has been linked to poverty, family breakdown, poor social and economic structures, and loss of self-respect (Dell & Beauchamp, 2006). The pattern of responses from participants who did not know about their ancestor attendance at residential school is also a meaningful finding. Feedback from the participants, the Lived Experience Circle, and the Aboriginal Lens committee regarding these results suggests that the disconnect between generations may be the result of such historical trauma or the lack of discussion between generations about such experiences. The impact of intergenerational trauma and residential school attendance on the health and well-being of its participants requires further study.

This study also indicates that individuals who utilize volatile substances have spent more time being homeless over the course of their lifetime, which is consistent with documented findings that adolescents living on the streets are more likely than those who are housed to report VSU (Villatoro, Cruz, Ortiz, & Medina-Mora, 2011). This finding adds to previous literature asserting that VSU is associated with populations who experience low socio-economic status and high levels of discrimination (Oetting & Webb, 1997) .

The findings of this study mirror previous research, which indicates that individuals who use volatile substances are more likely to report Axis I mood disorders and poly-substance use (Wu, Howard, & Pilowsky, 2008; Wu & Howard, 2007; Wu & Ringwalt, 2006).

In addition to highlighting the current links between VSU and physical and psychiatric health conditions, this study provides an added layer of evidence that past traumatic life experiences influence current experiences of health and well-being. This is the first study of its kind to report on traumatic events associated with VSU in an adult population, though previous studies have explored associations between trauma and solvent use in adolescent populations (Howard, Balster, Cottler, Wu, & Vaughn, 2008; Perron, Howard, Maitra, & Vaughn, 2009; Perron & Howard, 2009). The presence of traumatic lifetime events in this study was not meant to represent the prevalence of posttraumatic stress disorder in this population, but rather to elucidate one of the ways in which the cumulative and intergenerational trauma extends to the everyday experiences of Aboriginal peoples. These findings, taken alongside the residential school histories of the participants, allow us to see the processes by which complex and collective historical trauma has affected and continues to affect Aboriginal communities (Gone, 2013). Further, understanding how trauma affects mental health requires additional exploration of current structural problems experienced by Aboriginal people, such as poverty and discrimination (Kirmayer, Gone, & Moses, 2014).

Our findings need to be interpreted with caution in light of some of the limitations of the data. First, this study is limited by the small sample size and lack of statistical power for analyses. Many of the comparisons within this study could not be made or probed with more stringent covariate-adjusted logistic regression analyses because of the small sample size. Concurrently, the prevalence of VSU among this population may have been underestimated due to the stigma associated with reporting use of this type of drug (MacLean,

2008). Second, findings of this study are limited by the self-report nature of the data. Self-report data is becoming an increasingly popular means of collecting data in population-based mental health and substance use research; however, there is reason to believe that self-report may be inconsistent with administrative data (Rhodes, Lin, & Mustard, 2002). Third, the operational definition of *volatile substance us*e is limited in this study. This is because self-report of VSU in the past year does not provide specificity in the frequency, duration, or dose of use by participants. As well, due to the exploratory nature of this paper, a large number of analyses were computed in order to cover a wide range of correlates. The increased number of analyses increases the risk of type one error, and thus further research should address this limitation.

## CONCLUSIONS

This paper presents exploratory analysis on variables of trauma and physical and mental health conditions associated with VSU in a population of homeless adults in a Canadian community. Overall, VSU is associated with higher reported rates of lifetime trauma and current physical and mental health concerns. This is important, as risk factors such as poorer mental and physical health are associated with a poorer quality of life, decreased life span, and mortality (Dell & Lyons, 2007; Elias, Mignone, Hall, Hong, Hart, & Sareen, 2012; Hibbs et al., 1994; Kertesz et al., 2005; Sareen, Cox, Stein, Afifi, Fleet, & Asmundson, 2007). These findings require further research, but the initial patterns point to implications for health service provision, since homeless individuals who utilize volatile substances may be more likely to require health services due to their increased health risks than those who are homeless and do not use volatile substances. Additionally those who use volatile substances may experience more treatment barriers (Frohlich, Fransoo, & Roos, 2001; Perron, Mowbray, Bier, Vaughn, Krentzman, & Howard, 2011). We speculate that the pervasive traumatic history and current postcolonial structural barriers experienced by these individuals and their communities contribute to relying on coping resources such as VSU despite the plethora of health consequences that inevitably follow from chronic use. These findings speak to the importance of developing and targeting culturally informed treatment and recovery options for VSU in adult populations, in addition to youth populations, as there is currently little programming in Canada aimed at the issue of chronic volatile substance use by adults.

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