



Missed Opportunities: Childhood Learning Disabilities as Early Indicators of Risk among Homeless Adults with Mental Illness in Vancouver, British Columbia

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Learning problems and disabilities

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TITLE. Missed Opportunities: Childhood Learning Disabilities as Early Indicators of Risk among Homeless Adults with Mental Illness in Vancouver, British Columbia.

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Key words: homelessness, mental illness, learning disabilities

Learning problems and disabilities

ABSTRACT

Objectives. It is well documented that early learning problems and poor academic achievement adversely impact child development and a wide range of adult outcomes; however, these indicators have received scant attention among homeless adults. This study examines self-reported learning disabilities in childhood as predictors of duration of homelessness, mental and substance use disorders, physical health, and service utilization in a sample of homeless adults with current mental illness.

Design: This study was conducted using the baseline sample from a randomized controlled trial.

Setting: Participants were sampled from the community in Vancouver, British Columbia.

Participants: The total sample included 497 adult participants who met criteria for absolute homelessness or precarious housing and a current mental disorder based on a structured diagnostic interview. Learning disabilities in childhood were assessed by asking adult participants whether they thought they had a learning disability in childhood and if anyone had told them they had a learning disability. Only participants who responded positively to both questions (n=133) were included in the analyses.

Outcome measures. Primary outcomes include current mental disorders, substance use disorders, physical health, service utilization and duration of homelessness.

Results. In multivariable regression models, self-reported learning disability during childhood independently predicted self-reported educational attainment and lifetime duration of homelessness as well as a range of mental health, physical health, and substance use problems, but did not predict reported health or justice service utilization.

Conclusions. Childhood learning problems are overrepresented among homeless adults

1 Learning problems and disabilities

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3 with complex comorbidities and long histories of homelessness. Our findings are
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5 consistent with a growing body of literature indicating that adverse childhood events are
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8 potent risk factors for a number of adult health and psychiatric problems, including
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10 substance abuse. Results are discussed in the context of cumulative adversity and
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12 problem behaviour theory.
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15 **Trials registration number:** This trial has been registered with the International
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17 Standard Randomised Control Trial Number Register and assigned ISRCTN42520374.
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Learning problems and disabilities

ARTICLE SUMMARY

Article focus

- The relationship between self-reported learning disability in childhood as a predictor of adult homelessness and associated health and service use outcomes among a cohort of adult who are homeless and have a mental disorder.
- Primary outcomes include current mental disorders, substance use disorders, physical health, service utilization and duration of homelessness.
- How homelessness and the myriad of associated negative health and social outcomes might be prevented.

Key messages

- Childhood learning disabilities are overrepresented among homeless adults with complex comorbidities and predict a range of poor health outcomes in adulthood including mood and anxiety disorders, suicidal ideation, early and severe substance use, and physical health problems.
- Early risk factors are often longstanding and drive a trajectory of cumulative risk, potentially leading to severe psychopathology and social exclusion.

Strengths and limitations of this study

- Strengths include a large sample size, a diverse recruitment strategy, and structured diagnostic interviews for mental disorders.
- Limitations include retrospective, self-report of childhood learning disabilities.
- Lack of access to early trauma and family dysfunction variables as well as measures of general cognitive impairment at baseline.

Learning problems and disabilities

INTRODUCTION

Efforts to prevent homelessness require an understanding of the underlying causes and early indicators of risk. Research into the causes of homelessness suggests complex interactions between structural and individual factors, both of which are often present long before the onset of first homelessness.[1-2] The childhoods of homeless adults are disproportionately characterized by persistent poverty, residential mobility, school problems, and other stressful and/or traumatic experiences[3-5] particularly among homeless individuals with severe mental illness.[2]

While a growing body of research has examined the relationship between adverse childhood events and subsequent homelessness,[3, 4] few studies have examined the role of childhood learning disabilities. There is growing evidence that academic problems in school foreshadow later educational and employment difficulties and may affect multiple domains of functioning.[6]

In Canada, educational policies fall under provincial jurisdiction, therefore, definitions of learning disabilities (LD) vary widely and include learning problems, difficulties, disorders, as well as “children at risk.”[7] LD are assumed to be neurological in origin and affect the acquisition, organization, retention, understanding or use of verbal and/or nonverbal information.[8] According to Statistics Canada, 4.9% of children aged 6 to 15 have a LD, varying from 1.6% for children aged 6 to 7.2% among 10-year-olds.[9]

While the consequences of LD on childhood academic and social development are well documented,[10, 11] the impact in adulthood is challenging to assess. However,

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3 research suggests that LD often persist into adulthood and affect diverse aspects of
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5 functioning including employment, social relationships, quality of life, and mental and
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7 physical health.[12]
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10 In school settings, LD typically manifest as poor academic achievement, which is
11 associated with a greater number of school absences, suspensions, and grade retention as
12 well as externalizing and internalizing behaviour problems.[7-10] Almost one-third of
13 US adolescents with LD in the National Longitudinal Transition Study did not complete
14 high school and were less likely to enroll in subsequent vocational or academic programs
15 compared to their non-LD peers.[10]
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24 Research examining substance abuse among youth with LD remains
25 inconclusive.[13] Beitchman et al.[11] assessed 264 Canadian children for LD at ages 12
26 and 19, and for psychiatric and substance use disorders at age 19. Children who met
27 criteria for LD at ages 12 and 19 were more likely to develop a psychiatric or substance
28 use disorder compared to non-LD children at both time points. LD at 19 years of age
29 increased the risk for substance use disorder three-fold after controlling for behavioural
30 problems and family structure. Difficulties with executive functioning, academic failure,
31 low self-esteem, and poor social skills are viewed as the strongest predictors of substance
32 use disorder.[14]
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45 Compared to non-LD peers, youth with LD frequently report feelings of loneliness,
46 stress, depression, and suicide, among other psychiatric symptoms.[15, 16] For example,
47 in the National Longitudinal Study of Adolescent Health, the LD sample was twice as
48 likely to report a suicide attempt in the past year.[16] Longitudinal research on risk-
49 taking indicates that, compared to non-LD peers, adolescents with LD engage more
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1 Learning problems and disabilities

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3 frequently in various risk behaviours.[17] Therefore, the presence of LD in childhood
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5 appears to confer a general risk for adverse outcomes throughout adolescence and into
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7 adulthood.
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10 In identifying early indicators for homelessness, we are posing a larger question
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12 about how we might prevent homelessness and the myriad of associated negative health
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14 and social outcomes. There has been a resurgence of interest in early intervention as a
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16 means of preventing or attenuating a wide range of developmental outcomes in
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18 adulthood.[18] In this study, we focus on the relationship between early LD as a
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20 predictor of adult homelessness and associated health and service use outcomes. Unlike
21
22 family instability and dysfunction, which fall under the jurisdiction of child welfare
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24 agencies, LD can be identified and addressed within the school system and may serve as
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26 an early marker of social and developmental risk.
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31 **METHODS**

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33 The Vancouver At Home Project is a randomized controlled trial (RCT) involving
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35 homeless adults with mental illness in Vancouver, British Columbia. Study design and
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37 sample size were determined by the At Home/Chez Soi National Research Team which
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39 monitored activities at five different study sites.[19] Details related to the RCT protocol
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41 such as CONSORT have been reported elsewhere[19]. The current study focuses on
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43 baseline data from one study site (Vancouver) prior to randomization and does not
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45 incorporate any findings related to RCT elements.
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50 Eligibility criteria included legal adult status (19 years and older), current mental
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52 disorder on the MINI Neuropsychiatric Interview (MINI),[20] and being absolutely
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54 homeless or precariously housed. Absolute homelessness was defined as living on the
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3 streets or in an emergency shelter for at least the past seven nights with little likelihood of
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5 obtaining secure accommodation in the upcoming month. Precariously housed was
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7 defined as living in a rooming house, hotel or other transitional housing; in addition,
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9 individuals must have experienced at least two episodes of absolute homelessness in the
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11 past year, or one episode lasting for at least four weeks in the past year.
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15 Participants were recruited through referral from over 40 agencies available to
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17 homeless adults in Vancouver; the majority were recruited from homeless shelters, drop-
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19 in centres, homeless outreach teams, hospitals, community mental health teams, and
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21 criminal justice programs. We specifically targeted organizations that serve women,
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23 youth, aboriginal peoples, and gay/lesbian/transgender individuals in order to obtain as
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25 diverse and representative a sample as possible. Referral was initiated by service
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27 providers and a preliminary screening for eligibility was conducted via telephone with the
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29 referral agent. All participants met face-to-face with a trained research interviewer who
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31 explained procedures, obtained informed consent, and confirmed study eligibility. A
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33 cash honorarium of \$5 was provided for the screening process. Institutional ethics board
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35 approval was obtained through Simon Fraser University and the University of British
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37 Columbia.
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45 Approximately 85 individuals were turned away on the phone because they
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47 clearly did not meet eligibility criteria. In addition, approximately 100 individuals were
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49 invited to meet with an interviewer for further eligibility screening and/or to begin the
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51 baseline questionnaire but did not show up for an appointment. Whenever possible,
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53 appointments were rescheduled and interviewers tried to locate individuals in the
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55 community. Finally, 92 recruits completed the formal eligibility screening process but
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3 were deemed ineligible. When these individuals were compared with participants who
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5 were enrolled in the study, no significant differences were found in terms of current age
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7 or gender.
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11 If the individual met all study criteria, they were enrolled as a participant and the
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13 baseline interview commenced, consisting of a series of interviewer-administered
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15 questionnaires including socio-demographic characteristics, psychiatric symptoms,
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17 substance use, physical health, service use, and quality of life. Participants received a
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19 further cash honorarium of \$30 upon completion of the baseline interview. The
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21 following analyses are based upon data from the baseline questionnaires of 497
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23 participants recruited from October 2009 to June 2011.
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28 29 **Variables of interest**

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32 LD were assessed using the following questions, focusing on childhood: (1) “Do
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34 you think you had a learning problem or learning disability?” and (2) “Did anyone ever
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36 tell you that you have a learning problem or learning disability?” Only participants who
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38 responded positively to both questions were included in the analysis.
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42 With regard to mental disorders, Severe Cluster includes at least one of current
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44 Psychosis, Mood Disorder with Psychotic Features, and Hypomanic or Manic Episode, as
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46 identified through the MINI or documented physician diagnosis. Less Severe Cluster
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48 includes at least one of current Major Depressive Episode, Panic Disorder, and Post-
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50 traumatic Stress Disorder. Suicidality, Alcohol Dependence, and Substance Dependence
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52 were also identified using the MINI. Frequency and type of substance use over the past
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54 month were recorded using the Maudsley Addiction Profile (MAP).[21] Physical illness
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3 was assessed by self-report using a checklist of 30 chronic health conditions (lasting
4 longer than six months). Blood-borne infectious disease consisted of positive self-report
5 diagnosis of HIV, Hepatitis B or Hepatitis C. Head injury status was based on the
6 question “Did you ever receive a head injury that left you unconscious?” Shoplifting and
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8 selling drugs were assessed during the past month using the MAP.
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16 Self-reported involvement with health services was collected for the past six
17 months including visiting and talking to a health or service provider, Emergency Room
18 visits, and being transported by ambulance. Criminal justice services included contact
19 with the police that resulted in detention, arrest and court appearances. The Multnomah
20 Community Ability Scale (MCAS)[22] quantifies community functioning based on 17
21 items and was scored by the interviewer upon completion of the baseline interview.
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30 **Statistical analyses**

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33 Comparisons of categorical data between participants who did or did not report a
34 learning problem or disability were conducted using Pearson’s chi-square or Fisher’s
35 exact test. Comparisons of numeric variables (e.g., age at enrolment) between groups
36 were conducted using the Student t test and Wilcoxon’s rank-sum test. Univariate and
37 multivariable logistic regression analyses were used to model the independent
38 associations between childhood LD and a series of a priori outcome variables. Outcomes
39 variables that were significant at the $p \leq 0.10$ level were considered for univariate and
40 multivariable logistic regression analyses. Each variable was modeled in both univariate
41 and multivariate settings using childhood LD as an independent risk factor and the same
42 set of controlling variables (age at enrolment, age of first homelessness, gender, ethnicity,
43 marital status, and language spoken in the childhood home). Both unadjusted and
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Learning problems and disabilities

adjusted odds ratios and 95% confidence intervals (CI) are reported and all p-values are two-sided. SPSS-19 was used to conduct these analyses. Missing values ranged from zero to 4% and were excluded from the analyses.

RESULTS

In total, 497 participants completed the baseline questionnaire, and 133 (27%) responded positively to both indicators of childhood LD. The majority of the total sample was male (73%) and Caucasian (56%); the mean age at enrollment was 40.8 (SD=11.0) years; and the mean age when first homeless was 30.3 (SD=13.3) years. The median duration of lifetime homelessness was 36 months (IQR: 12-84 months). All bivariate comparisons by childhood LD are summarized in Tables 1 to 3. Tables 1 and 2 present demographic characteristics and current mental disorder status of participants by childhood LD status (yes vs. no).

[Insert Tables 1 and 2 about here]

Table 3 presents self-reported substance use (past month) and service use (past six months) characteristics by childhood LD status. Participants who reported having a childhood LD were significantly more likely to report a number of negative health outcomes related to physical health (i.e., blood-borne infectious diseases, migraine, and seizures), mental health (i.e., major depressive episode, panic disorder, high suicidality) and substance use (i.e., alcohol dependence, early initiation of drug use, daily drug use, and injection drug use).

[Insert Table 3 about here]

Unadjusted (UOR) and adjusted odds ratios (AOR) and 95% CI for variables included in the univariate and multivariable analyses are presented in Table 4. Results

1 Learning problems and disabilities

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3 from the multivariable logistic regression analyses indicate that reporting a childhood LD
4 independently predicted not entering high school (AOR: 2.21), lifetime duration of
5 homelessness greater than three years (AOR: 1.90), current major depressive episode
6 (AOR: 1.64), panic disorder (AOR: 1.86), alcohol dependence (AOR: 1.69), high
7 suicidality (AOR: 1.93), less severe cluster of mental disorders (AOR: 1.95), two or more
8 mental disorders (AOR: 2.06), infectious disease (AOR: 1.75), migraine (AOR: 2.50),
9 seizures (AOR: 2.23), head injury (AOR: 2.23), poor or fair overall health (AOR: 1.90),
10 injection drug use (AOR: 2.01), daily drug and alcohol use (AOR: 1.70), daily drug use
11 (not including alcohol) (AOR: 1.77), daily hard drug use (not including alcohol or
12 marijuana) (AOR: 1.79), early initiation of drug use (<14 years) (AOR: 1.60), shoplifting
13 in the past six months (AOR: 2.31), and talking to a health or social service provider in
14 the past six months (AOR: 2.00).

15 [Insert Table 4 about here]

16 **DISCUSSION**

17 Our multivariable models identified several factors that were associated with self-
18 reported childhood LD in a cohort of adults who are homeless and have a mental
19 disorder: longer lifetime duration of homelessness; less severe mental disorders as well as
20 multiple mental disorders and high suicidal ideation; early and severe substance use,
21 including injection drug use and daily use of both drugs and alcohol; and physical health
22 problems including infectious disease, head injury, multiple illnesses, and rating ones'
23 overall health as fair or poor. Despite the complex health needs of this sub-group, the
24 only service use variable that was predicted by childhood learning problems or
25 disabilities was very generic: talking to a health or social service provider in the past six
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3 months. A range of criminal justice variables as well as emergency room, ambulance
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5 utilization, and various other health services were not significant in our analyses.
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8 Collectively, our results indicate that childhood LD are overrepresented among homeless
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10 adults with complex comorbidities and predict a range of poor health outcomes in
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12 adulthood.
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15 These findings support previous research demonstrating a link between poor
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17 academic achievement and the psychological adversity faced by some adults.[6, 23]
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19 Studies of homeless and highly mobile children have identified that both groups show
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21 slower learning and academic progress than their residentially stable peers.[23] However,
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23 the risk of homelessness among people with LD has received scant attention in the
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25 research literature.[24, 25] Among our sample of homeless adults, 41% did not graduate
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27 from high school and 43% reported being in a special class in school, suggesting that
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29 learning and academic achievement was challenging throughout their school years and
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31 likely persists in adulthood.
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37 Our index of LD does not discriminate between focal and more general cognitive
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39 difficulties. Several studies have found increased rates of general cognitive impairment
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41 among homeless adults compared to housed comparison groups.[26, 27] In our sample of
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43 homeless adults with current mental disorders, 66% reported experiencing a head injury
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45 that left them unconscious. However, these injuries may have occurred in adulthood and
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47 it is well documented that homeless adults are more likely to experience a variety of
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49 accidents compared to housed counterparts.[27] It is also possible that childhood LD
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51 among our sample were related to psychological distress in the home.[24] Regardless of
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1 Learning problems and disabilities

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3 the origin of learning problems among homeless adults, it appears that they persist over
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5 time and are associated with significant functional impairment.
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8 Childhood LD independently predicted a range of substance use problems in our
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10 adult sample, including early initiation of drug use (before age 14). Abuse of alcohol and
11
12 other drugs places an individual at greater risk of homelessness, but is not a direct causal
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14 factor.[28] Along with other studies, our findings suggest that daily drug use is a
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16 common mediator for a range of early risk factors.[29] Previous research using our
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18 sample of homeless adults with mental disorders found that daily drug use significantly
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20 predicts duration of homelessness[30] as well as severity of mental health symptoms.[31]
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24 Cross-sectional, retrospective data cannot disentangle the unique predictors of
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26 homelessness and mental illness, but it is likely that negative childhood experiences have
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28 both direct and indirect (mediated by substance use) effects on participants' history of
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30 homelessness. Documentation of these underlying common factors points to a broad
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32 range of vulnerabilities for homelessness and mental illness. These common factors
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34 increase the complexity of personal problems as well as the duration of
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36 homelessness.[30] Therefore, substance dependence, especially when concurrent with
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38 mental illness among homeless populations, is not only a clinical problem but also a
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40 critical indicator for a range of other social and psychological problems that may need to
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42 be addressed before homelessness can be resolved.
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48 Problems such as homelessness that have long developmental trajectories, are
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50 perhaps best understood from models of cumulative adversity and amplification of
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52 risk.[32] Based on life course development and social learning theory, the risk
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54 amplification model addresses mechanisms through which experiences on the street
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1 Learning problems and disabilities

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3 amplify negative developmental effects originating in the family. According to this
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5 model, harmful behaviours and negative self-concept are perpetuated by the progressive
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7 accumulation of their own consequences. Thus, homelessness can be understood as the
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9 result of a developmental trajectory defined by successive environmental disruptions,
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11 each of which places individuals at greater risk for homelessness and associated risk
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13 factors.
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17 Individuals generally become homeless after experiencing a crisis due to limited
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19 income, social support, and personal coping skills.[5, 28] However, it is unclear what
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21 leads some people to become homeless while others do not. Problem Behaviour
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23 Theory[33, 34] suggests that various risk factors may comprise a cluster of risky
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25 behaviours that mediate the link from childhood adversity to illicit drug use in adulthood,
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27 rather than distinct independent pathways. Another potential pathway linking childhood
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29 adversity to adult homelessness is the likelihood that such adversity elevates individuals'
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31 risk for psychiatric disorders such as depression and substance abuse, which are risk
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33 factors for homelessness, by reducing one's ability to earn adequate income and maintain
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35 stable housing.
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40 **Implications**

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42 The growing body of research that suggests a trajectory of risk preceding the first episode
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44 of homelessness begs the question "Can outcomes such as homelessness be prevented?"
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47 Many researchers and policy makers have called for comprehensive preventive
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49 interventions for high-risk children in public and community settings.[35, 36] Supporting
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51 children's cognitive development and schooling is particularly important and early
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53 childhood education programs should be available for children at greatest risk. High risk
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1 Learning problems and disabilities

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3 includes established indicators such as early learning problems, abuse and/or neglect,
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5 behavioural and emotional problems, and early substance use. From a public health
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7 perspective, early interventions in childhood might change or moderate the cycle of
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9 homelessness across generations because early risk factors are often longstanding and
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11 drive a trajectory of cumulative risk, potentially leading to severe psychopathology and
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13 social exclusion.
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15 **Limitations**

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17 Despite the strengths of our study design (i.e., large sample size, diverse recruitment
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19 strategy, structured diagnostic interviews), several limitations must be considered. First,
20
21 all variables were based on participant self-report. Given that participants were selected
22
23 based on current mental disorder, accuracy of recall may have been compromised.
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25 Furthermore, participants were interviewed before being randomized to a housing
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27 intervention, therefore, some may have modified their responses in an attempt to
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29 influence the outcome of randomization. In addition, at baseline, we did not have access
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31 to early trauma or family dysfunction variables. Given the association between early
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33 trauma, foster care placements and adult homelessness,[2] it will be important to further
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35 examine the impact of these variables on later health and social outcomes. Similarly, we
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37 did not have access to measures of general cognitive impairment at baseline.
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39 Examination of current cognitive impairment, particularly as it relates to early learning
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41 problems, may shed light on current health and social functioning.
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50 **Future directions**

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52 Early indicators of risk clearly cannot explain all cases of homelessness. Many people
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54 without early risk factors become homeless and many who experience risk do not become
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1 Learning problems and disabilities

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3 homeless. Further research is needed to examine what differentially places people at risk
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5 for risk.[37] We need better theory and better data to understand how social factors
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7 regulate behaviours or distribute individuals into risk groups and how those social factors
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10 'push' individual trajectories toward or away from adverse outcomes. However, our
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12 results linking early learning problems to homelessness, mental illness and substance use
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14 are consistent with a growing body of research indicating that adverse childhood events
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16 are potent risk factors for a number of psychiatric and substance use disorders.[6]
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20 Real prevention with regard to homelessness and other social problems will
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22 require systemic social and policy changes that address the environments within which
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24 children adapt so that they can mature into well-functioning adults. Nonetheless, our
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26 findings, along with others', outline a risk profile that can guide future research into
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28 mechanisms and pathways through which childhood risks are translated into adult
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30 sequelae. Interventions that can effectively address childhood risk factors such as
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32 learning problems and disabilities may ultimately prevent critical social problems
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34 including homelessness and the enormous social and individual costs related to these
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36 problems.
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48
49 Canada and the US; 5 site coordinators; numerous service and housing providers; and
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51 persons with lived experience.
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55 **DECLARATION OF INTERESTS**

1 Learning problems and disabilities
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Learning problems and disabilities

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Learning problems and disabilities

Table 1: Comparisons of socio-demographic characteristics between participants who reported childhood learning problems or disabilities (LD-Yes; n=133) and those who did not (LD-No; n=364).¹

Variable	Total Sample N (%)	LD-No N (%)	LD-Yes N (%)	p value
Male gender	359 (73)	259 (72)	100 (76)	0.375
Age at enrolment				0.001**
19-25 years	36 (7)	25 (7)	11 (8)	
25-44 years	281 (57)	190 (52)	91 (68)	
Over 44 years	180 (36)	149 (41)	31 (23)	
Ethnicity				0.469
Aboriginal	77 (15)	52 (14)	25 (19)	
Caucasian	280 (56)	208 (57)	72 (54)	
Other	140 (28)	104 (29)	36 (27)	
Educational attainment (\leq Grade 8)	76 (15)	44 (12)	32 (25)	<0.001**
Single marital status	343 (70)	250 (69)	93 (70)	0.797
Language spoken at home during childhood (English)	392 (79)	282 (77)	110 (83)	0.206
Psychiatric hospitalization (past 5 years) longer than 6 months	57 (12)	43 (12)	14 (11)	0.686
Psychiatric hospitalization (past 5 years) 2 or more times	253 (53)	189 (54)	64 (50)	0.542
Employment history (at least 1 year of continuous work)	323 (65)	243 (67)	80 (60)	0.138
Jail (past 6 months)	68 (14)	46 (13)	22 (17)	0.262
Duration of homelessness				
Total lifetime (>3 years)	234 (48)	155 (43)	79 (61)	<0.001**
Longest single period (>1 year)	245 (50)	174 (48)	71 (55)	0.143
Age of first homelessness (<25 years)	214 (44)	143 (39)	71 (56)	0.001**
Overall health (poor or fair)	235 (47)	161 (44)	74 (56)	0.026*
MCAS total score (<56) #	244 (49)	177 (49)	67 (50)	0.730

¹ Each multivariable model was controlled for age (continuous measure), age of first homelessness age (continuous measure), gender, ethnicity (Aboriginals, Caucasian, Other), marital status (Single vs. Other) and language spoken in childhood home (English vs. Other).

Dichotomized based on median value.

**p \leq 0.001

*p \leq 0.05

Learning problems and disabilities

Table 2: Comparisons of mental disorders and physical illness between participants who reported childhood learning problems or disability (LD-Yes; n=133) and those who did not (LD-No; n=364).¹

Variable	Total sample N (%)	LD-No N (%)	LD-Yes N (%)	p value
<i>Mental Disorders (past month)</i>				
Major Depressive Episode	199 (40)	134 (37)	65 (49)	0.015*
Manic or Hypomanic Episode	97 (20)	64 (18)	33 (25)	0.072+
Post-traumatic Stress Disorder	129 (26)	88 (24)	41 (31)	0.122
Panic Disorder	104 (21)	64 (18)	40 (30)	0.002*
Mood Disorder with Psychotic Features	84 (17)	57 (16)	27 (20)	0.208
Psychotic Disorder	263 (53)	200 (55)	63 (47)	0.134
Alcohol dependence	121 (24)	79 (22)	42 (32)	0.023*
Substance dependence	288 (58)	205 (56)	83 (62)	0.224
Two or more mental disorders	240 (48)	158 (43)	82 (62)	<0.001**
High suicidality	87 (18)	54 (15)	33 (25)	0.010+
Less severe cluster	264 (53)	176 (48)	88 (66)	<0.001**
Severe cluster	363 (73)	267 (73)	96 (72)	0.794
<i>Physical Health</i>				
Migraine	157 (32)	94 (26)	63 (48)	<0.001**
Epilepsy or seizures	67 (14)	40 (11)	27 (21)	0.006*
Blood-borne infectious diseases	157 (32)	103 (29)	54 (41)	0.008*
Head injury	270 (56)	179 (51)	91 (71)	<0.001**
Two or more physical conditions	402 (81)	287 (78.8)	115 (86)	0.056+

¹ Each multivariable model was controlled for age (continuous), age of first homelessness age (continuous), gender, ethnicity (Aboriginals, Caucasian, Other), marital status (Single vs. Other) and language spoken in childhood home (English vs. Other).

**p≤0.001

*p≤0.05

+ p≤0.10

Learning problems and disabilities

Table 3: Comparisons of substance use and service utilization between participants who reported childhood learning problems or disability (LD-Yes; n=133) and those who did not (LD-No; n=364).¹

Variable	Total sample N (%)	LD-No N (%)	LD-Yes N (%)	p value
<i>Substance Use (past month)</i>				
IV drug use	88 (18)	53 (15)	35 (27)	0.003*
Daily substance use (including alcohol)	143 (29)	91 (25)	52 (39)	0.002*
Daily drug use (no alcohol)	126 (25)	78 (21)	48 (36)	0.001*
Daily hard drug use (no alcohol, no marijuana)	74 (15)	45 (12)	29 (22)	0.009*
Daily alcohol use	26 (5)	17 (5)	9 (7)	0.367
Polysubstance use (no alcohol)	188 (38)	128 (35)	60 (45)	0.050+
Age first drunk (<14 years)	212 (45)	142 (42)	70 (56)	0.007*
Age of first drug use (<14 years)	178 (40)	114 (35)	64 (52)	0.001*
Sold drugs	50 (10)	32 (9)	18 (14)	0.140
Shop-lifting	62 (13)	34 (10)	28 (21)	0.001*
<i>Service Use (past 6 months)</i>				
Psychiatrist	134 (27)	109 (30)	25 (19)	0.013*
Addiction counselor	18 (4)	10 (3)	8 (6)	0.084+
Seen by a health/social service provider	384 (78)	276 (76)	108 (82)	0.204
Talked with a health/social service provider	112 (23)	69 (19)	43 (32)	0.002*
ER visit (yes/no)	281 (58)	204 (57)	77 (60)	0.594
Multiple ER visits (three or more)	107 (22)	71 (20)	36 (28)	0.058+
Ambulance (yes/no)	195 (40)	147 (41)	48 (36)	0.381
Police detention (yes/no)	80 (19)	61 (19)	19 (17)	0.610
Arrested (yes/no)	172 (36)	124 (35)	48 (38)	0.603
Multiple arrests (two or more)	75 (16)	48 (14)	27 (21)	0.044+
Court appearance	172 (35)	127 (36)	45 (35)	0.932
Justice program	48 (11)	30 (9)	18 (16)	0.076+

¹ Each multivariable model was controlled for age (continuous), age of first homelessness (continuous), gender, ethnicity (Aboriginals, Caucasian, Other), marital status (Single vs. Other) and language spoken in childhood home (English vs. Other).

**p<0.001

*p<0.05

+ p<0.10

Learning problems and disabilities

Table 4: Logistic regression analyses for socio-demographics, mental disorders, substance use and service utilization related outcomes based on early learning problems or disability (n=497).

Outcome Variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI) ¹
Age of first homelessness (<25 years) ²	1.96 (1.30, 2.95)**	1.52 (0.95, 2.44)
Lifetime duration of homelessness (>3 years) [#]	2.11 (1.40, 3.18)**	1.90 (1.19, 3.06)*
Education level (Grade 8 or less)	2.38 (1.43, 3.95)	2.20 (1.28, 3.81)
<i>Type of Mental Disorder</i>		
Major Depressive Episode	1.64 (1.10, 2.45)*	1.64 (1.07, 2.52)*
Manic or Hypomanic Episode	1.55 (0.96, 2.49)	1.51 (0.91, 2.51)
Panic Disorder	2.02 (1.28, 3.19)*	1.86 (1.15, 3.02)*
Alcohol dependence	1.67 (1.07, 2.59)*	1.69 (1.06, 2.69)*
Two or more mental disorders	2.10 (1.40, 3.15)**	2.06 (1.33, 3.19)**
High suicidality	1.89 (1.16, 3.09)*	1.93 (1.15, 3.24)*
Less severe cluster of mental disorders	2.10 (1.38, 3.16)**	1.95 (1.25, 3.04)*
<i>Physical Health</i>		
Blood-borne infectious diseases	1.76 (1.16, 2.66)*	1.75 (1.11, 2.74)*
Migraine	2.57 (1.70, 3.90)**	2.50 (1.62, 3.88)**
Seizures	2.11 (1.23, 3.61)*	2.23 (1.25, 4.00)*
Multiple physical illness	1.71 (0.98, 2.99)	2.16 (1.16, 4.02)*
Overall health (fair/poor)	1.57 (1.06, 2.35)*	1.90 (1.24, 2.92)*
History of head injury	2.33 (1.51, 3.59)*	2.23 (1.42, 3.50)*
<i>Substance Use</i>		
IV drug use	2.07 (1.28, 3.36)*	2.01 (1.19, 3.39)*
Daily drug use (no alcohol)	2.07 (1.34, 3.19)**	1.77 (1.12, 2.80)*
Daily drug use (no alcohol, no marijuana)	1.98 (1.18, 3.31)*	1.79 (1.03, 3.11)*
Daily substance use (including alcohol)	1.93 (1.26, 2.94)*	1.70 (1.09, 2.65)*
Poly-substance use (no alcohol)	1.50 (1.00, 2.24)	1.27 (0.82, 1.97)
Age first drunk (<14 years)	1.75 (1.16, 2.65)*	1.37 (0.88, 2.14)
Age of first drug use (<14 years)	1.98 (1.30, 3.02)**	1.60 (1.02, 2.50)*
	2.53 (1.46, 4.36)**	2.31 (1.30, 4.11)*
<i>Service Use</i>		
Talked with a health/social service provider	1.99 (1.30, 3.11)*	2.00 (1.25, 3.21)*
Multiple ER visits (three or more) [#]	1.12 (0.74, 1.68)	1.04 (0.67, 1.60)
Multiple arrests (two or more) [#]	1.70 (1.01, 2.87)*	1.65 (0.95, 2.86)
Justice program	1.76 (0.94, 3.92)	1.34 (0.59, 3.08)

¹ Each multivariable model was controlled for age (continuous), age of first homelessness (continuous), gender, ethnicity (Aboriginal, Caucasian, Other), marital status (Single, Other) and language spoken in the childhood home (English, Other).

Learning problems and disabilities

² This multivariable model was controlled for age (continuous), gender, ethnicity (Aboriginal, Caucasian, Other), marital status (Single, Other), and language spoken in the childhood home (English, Other).

Dichotomized based on median value.

**p≤0.001

*p≤0.05

For peer review only

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CONSORT 2010 checklist of information to include when reporting a randomised trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a randomised trial in the title (our findings focus on baseline data prior to the RCT elements. The RCT protocol and CONSORT details have been reported in a previous BMJ publication)	N/A
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	2-3
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale	5-6
	2b	Specific objectives or hypotheses	7
Methods			
Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio	NA (see 1a)
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	NA (see 1a)
Participants	4a	Eligibility criteria for participants	7-8
	4b	Settings and locations where the data were collected	7-8
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	NA (see 1a)
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	9-10
	6b	Any changes to trial outcomes after the trial commenced, with reasons	NA
Sample size	7a	How sample size was determined	7
	7b	When applicable, explanation of any interim analyses and stopping guidelines	NA
Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	NA (see 1a)
	8b	Type of randomisation; details of any restriction (such as blocking and block size)	NA (see 1a)
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	NA (see 1a)
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	NA (see 1a)

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2	Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how	NA
3				
4		11b	If relevant, description of the similarity of interventions	NA
5	Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes	10-11
6		12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses	NA
7				
8				
9	Results			
10	Participant flow (a	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and	NA (see 1a)
11	diagram is strongly		were analysed for the primary outcome	
12	recommended)	13b	For each group, losses and exclusions after randomisation, together with reasons	NA (see 1a)
13	Recruitment	14a	Dates defining the periods of recruitment (and follow-up)	9
14		14b	Why the trial ended or was stopped	NA
15	Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	Table 1 (p.23)
16	Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups	NA
17				
18	Outcomes and	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	Tables 2-4
19	estimation			(pp.24-26)
20		17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended	
21	Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory	
22				
23	Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	NA
24				
25	Discussion			
26	Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	16
27	Generalisability	21	Generalisability (external validity, applicability) of the trial findings	NA
28	Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	12-15
29				
30	Other information			
31	Registration	23	Registration number and name of trial registry	3
32	Protocol	24	Where the full trial protocol can be accessed, if available	7
33	Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	18
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39	*We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items. If relevant, we also			
40	recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials.			
41	Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org .			
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44	CONSORT 2010 checklist			
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Missed Opportunities: Childhood Learning Disabilities as Early Indicators of Risk among Homeless Adults with Mental Illness in Vancouver, British Columbia

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Manuscripts

Learning problems and disabilities

MANUSCRIPT COVER PAGE

**TITLE. Missed Opportunities: Childhood Learning Disabilities as Early Indicators
of Risk among Homeless Adults with Mental Illness in Vancouver, British Columbia.**

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Learning problems and disabilities

ABSTRACT

Objectives. It is well documented that early learning problems and poor academic achievement adversely impact child development and a wide range of adult outcomes; however, these indicators have received scant attention among homeless adults. This study examines self-reported learning disabilities in childhood as predictors of duration of homelessness, mental and substance use disorders, physical health, and service utilization in a sample of homeless adults with current mental illness.

Design: This study was conducted using the baseline sample from a randomized controlled trial.

Setting: Participants were sampled from the community in Vancouver, British Columbia.

Participants: The total sample included 497 adult participants who met criteria for absolute homelessness or precarious housing and a current mental disorder based on a structured diagnostic interview. Learning disabilities in childhood were assessed by asking adult participants whether they thought they had a learning disability in childhood and if anyone had told them they had a learning disability. Only participants who responded positively to both questions (n=133) were included in the analyses.

Outcome measures. Primary outcomes include current mental disorders, substance use disorders, physical health, service utilization and duration of homelessness.

Results. In multivariable regression models, self-reported learning disability during childhood independently predicted self-reported educational attainment and lifetime duration of homelessness as well as a range of mental health, physical health, and substance use problems, but did not predict reported health or justice service utilization.

Conclusions. Childhood learning problems are overrepresented among homeless adults

1 Learning problems and disabilities

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3 with complex comorbidities and long histories of homelessness. Our findings are
4
5 consistent with a growing body of literature indicating that adverse childhood events are
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7
8 potent risk factors for a number of adult health and psychiatric problems, including
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10 substance abuse. Results are discussed in the context of cumulative adversity and
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12 problem behaviour theory.
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15 **Trials registration number:** This trial has been registered with the International
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17 Standard Randomised Control Trial Number Register and assigned ISRCTN42520374.
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Learning problems and disabilities

ARTICLE SUMMARY

Article focus

- The relationship between self-reported learning disability in childhood as a predictor of adult homelessness and associated health and service use outcomes among a cohort of adult who are homeless and have a mental disorder.
- Primary outcomes include current mental disorders, substance use disorders, physical health, service utilization and duration of homelessness.
- How homelessness and the myriad of associated negative health and social outcomes might be prevented.

Key messages

- Childhood learning disabilities are overrepresented among homeless adults with complex comorbidities and predict a range of poor health outcomes in adulthood including mood and anxiety disorders, suicidal ideation, early and severe substance use, and physical health problems.
- Early risk factors are often longstanding and drive a trajectory of cumulative risk, potentially leading to severe psychopathology and social exclusion.

Strengths and limitations of this study

- Strengths include a large sample size, a diverse recruitment strategy, and structured diagnostic interviews for mental disorders.
- Limitations include retrospective self-report of childhood learning disabilities.
- Lack of access to early trauma and family dysfunction variables as well as measures of general cognitive impairment at baseline.

1 Learning problems and disabilities
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6 **INTRODUCTION**
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8 Efforts to prevent homelessness require an understanding of the underlying causes and
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10 early indicators of risk. Research into the causes of homelessness suggests complex
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12 interactions between structural and individual factors, both of which are often present
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14 long before the onset of first homelessness.[1-2] The childhoods of homeless adults are
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16 disproportionately characterized by persistent poverty, residential mobility, school
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18 problems, and other stressful and/or traumatic experiences[3-5] particularly among
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20 homeless individuals with severe mental illness.[2]
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25 While a growing body of research has examined the relationship between adverse
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27 childhood events and subsequent homelessness,[3, 4] few studies have examined the role
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29 of childhood learning disabilities. There is growing evidence that academic problems in
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31 school foreshadow later educational and employment difficulties and may affect multiple
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33 domains of functioning.[6]
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37 In Canada, educational policies fall under provincial jurisdiction, therefore,
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39 definitions of learning disabilities (LD) vary widely and include learning problems,
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41 difficulties, disorders, as well as “children at risk.”[7] LD are assumed to be neurological
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43 in origin and affect the acquisition, organization, retention, understanding or use of verbal
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45 and/or nonverbal information.[8] According to Statistics Canada, 4.9% of children aged
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47 6 to 15 have a LD, varying from 1.6% for children aged 6 to 7.2% among 10-year-
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49 olds.[9]
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53 While the consequences of LD on childhood academic and social development are
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55 well documented,[10, 11] the impact in adulthood is challenging to assess. However,
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1 Learning problems and disabilities

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3 research suggests that LD often persist into adulthood and affect diverse aspects of
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5 functioning including employment, social relationships, quality of life, and mental and
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7 physical health.[12]
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10 In school settings, LD typically manifest as poor academic achievement, which is
11 associated with a greater number of school absences, suspensions, and grade retention as
12 well as externalizing and internalizing behaviour problems.[7-10] Almost one-third of
13 US adolescents with LD in the National Longitudinal Transition Study did not complete
14 high school and were less likely to enroll in subsequent vocational or academic programs
15 compared to their non-LD peers.[10]
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24 Research examining substance abuse among youth with LD remains
25 inconclusive.[13] Beitchman et al.[11] assessed 264 Canadian children for LD at ages 12
26 and 19, and for psychiatric and substance use disorders at age 19. Children who met
27 criteria for LD at ages 12 and 19 were more likely to develop a psychiatric or substance
28 use disorder compared to non-LD children at both time points. LD at 19 years of age
29 increased the risk for substance use disorder three-fold after controlling for behavioural
30 problems and family structure. Difficulties with executive functioning, academic failure,
31 low self-esteem, and poor social skills are viewed as the strongest predictors of substance
32 use disorder.[14]
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45 Compared to non-LD peers, youth with LD frequently report feelings of loneliness,
46 stress, depression, and suicide, among other psychiatric symptoms.[15, 16] For example,
47 in the National Longitudinal Study of Adolescent Health, the LD sample was twice as
48 likely to report a suicide attempt in the past year.[16] Longitudinal research on risk-
49 taking indicates that, compared to non-LD peers, adolescents with LD engage more
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3 frequently in various risk behaviours.[17] Therefore, the presence of LD in childhood
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5 appears to confer a general risk for adverse outcomes throughout adolescence and into
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7 adulthood.
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10 In identifying early indicators for homelessness, we are posing a larger question
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12 about how we might prevent homelessness and the myriad of associated negative health
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14 and social outcomes. There has been a resurgence of interest in early intervention as a
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16 means of preventing or attenuating a wide range of developmental outcomes in
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18 adulthood.[18] In this study, we focus on the relationship between early LD as a
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20 predictor of adult homelessness and associated health and service use outcomes. Unlike
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22 family instability and dysfunction, which fall under the jurisdiction of child welfare
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24 agencies, LD can be identified and addressed within the school system and may serve as
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26 an early marker of social and developmental risk.
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31 **METHODS**

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33 The Vancouver At Home Project is a randomized controlled trial (RCT) involving
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35 homeless adults with mental illness in Vancouver, British Columbia. Study design and
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37 sample size were determined by the At Home/Chez Soi National Research Team which
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39 monitored activities at five different study sites.[19] Details related to the RCT protocol
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41 such as CONSORT have been reported elsewhere[19]. The current study focuses on
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43 baseline data from one study site (Vancouver) prior to randomization and does not
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45 incorporate any findings related to RCT elements.
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50 Eligibility criteria included legal adult status (19 years and older), current mental
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52 disorder on the MINI Neuropsychiatric Interview (MINI),[20] and being absolutely
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54 homeless or precariously housed. Absolute homelessness was defined as living on the
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3 streets or in an emergency shelter for at least the past seven nights with little likelihood of
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5 obtaining secure accommodation in the upcoming month. Precariously housed was
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7 defined as living in a rooming house, hotel or other transitional housing; in addition,
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9 individuals must have experienced at least two episodes of absolute homelessness in the
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11 past year, or one episode lasting for at least four weeks in the past year.
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15 Participants were recruited through referral from over 40 agencies available to
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17 homeless adults in Vancouver; the majority were recruited from homeless shelters, drop-
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19 in centres, homeless outreach teams, hospitals, community mental health teams, and
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21 criminal justice programs. We specifically targeted organizations that serve women,
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23 youth, aboriginal peoples, and gay/lesbian/transgender individuals in order to obtain as
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25 diverse and representative a sample as possible. Referral was initiated by service
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27 providers and a preliminary screening for eligibility was conducted via telephone with the
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29 referral agent. All participants met face-to-face with a trained research interviewer who
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31 explained procedures, obtained informed consent, and confirmed study eligibility. A
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33 cash honorarium of \$5 was provided for the screening process. Institutional ethics board
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35 approval was obtained through Simon Fraser University and the University of British
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37 Columbia.
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44 Approximately 85 individuals were turned away on the phone because they
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46 clearly did not meet eligibility criteria. In addition, approximately 100 individuals were
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48 invited to meet with an interviewer for further eligibility screening and/or to begin the
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50 baseline questionnaire but did not show up for an appointment. Whenever possible,
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52 appointments were rescheduled and interviewers tried to locate individuals in the
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54 community. Finally, 92 recruits completed the formal eligibility screening process but
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3 were deemed ineligible. When these individuals were compared with participants who
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5 were enrolled in the study, no significant differences were found in terms of current age
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7 or gender.
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11 If the individual met all study criteria, they were enrolled as a participant and the
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13 baseline interview commenced, consisting of a series of interviewer-administered
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15 questionnaires including socio-demographic characteristics, psychiatric symptoms,
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17 substance use, physical health, service use, and quality of life. Participants received a
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19 further cash honorarium of \$30 upon completion of the baseline interview. The
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21 following analyses are based upon data from the baseline questionnaires of 497
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23 participants recruited from October 2009 to June 2011.
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28 29 **Variables of interest**

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32 LD were assessed using the following questions, focusing on childhood: (1) “Do
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34 you think you had a learning problem or learning disability?” and (2) “Did anyone ever
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36 tell you that you have a learning problem or learning disability?” Given the retrospective
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38 nature of these questions, only participants who responded positively to both questions
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40 were included in the analysis.
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45 With regard to mental disorders, Severe Cluster includes at least one of current
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47 Psychosis, Mood Disorder with Psychotic Features, and Hypomanic or Manic Episode, as
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49 identified through the MINI or documented physician diagnosis. Less Severe Cluster
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51 includes at least one of current Major Depressive Episode, Panic Disorder, and Post-
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53 traumatic Stress Disorder. Suicidality, Alcohol Dependence, and Substance Dependence
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55 were also identified using the MINI. Frequency and type of substance use over the past
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3 month were recorded using the Maudsley Addiction Profile (MAP).[21] Physical illness
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5 was assessed by self-report using a checklist of 30 chronic health conditions (lasting
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7 longer than six months). Blood-borne infectious disease consisted of positive self-report
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9 diagnosis of HIV, Hepatitis B or Hepatitis C. Head injury status was based on the
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11 question “Did you ever receive a head injury that left you unconscious?” Shoplifting and
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13 selling drugs were assessed during the past month using the MAP.
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19 Self-reported involvement with health services was collected for the past six
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21 months including visiting and talking to a health or service provider, Emergency Room
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23 visits, and being transported by ambulance. Criminal justice services included contact
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25 with the police that resulted in detention, arrest and court appearances. The Multnomah
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27 Community Ability Scale (MCAS)[22] quantifies community functioning based on 17
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29 items and was scored by the interviewer upon completion of the baseline interview.
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33 **Statistical analyses**

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35 Comparisons of categorical data between participants who did or did not report a
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37 learning problem or disability were conducted using Pearson’s chi-square or Fisher’s
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39 exact test. Comparisons of numeric variables (e.g., age at enrolment) between groups
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41 were conducted using the Student t test and Wilcoxon’s rank-sum test. Univariate and
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43 multivariable logistic regression analyses were used to model the independent
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45 associations between childhood LD and a series of a priori outcome variables. Outcomes
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47 variables that were significant at the $p \leq 0.10$ level were considered for univariate and
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49 multivariable logistic regression analyses. Each variable was modeled in both univariate
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51 and multivariate settings using childhood LD as an independent risk factor and the same
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53 set of controlling variables (age at enrolment, age of first homelessness, gender, ethnicity,
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3 marital status, and language spoken in the childhood home). Both unadjusted and
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5 adjusted odds ratios and 95% confidence intervals (CI) are reported and all p-values are
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7 two-sided. SPSS-19 was used to conduct these analyses. Missing values ranged from
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9 zero to 4% and were excluded from the analyses.
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12 13 **RESULTS**

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16 In total, 497 participants completed the baseline questionnaire; 178 participants (36%)
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18 thought they had a learning problem or disability in childhood, 182 (37%) reported being
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20 told they had a learning problem or disability, and 133 (27%) responded positively to
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22 both indicators of childhood LD. The majority of the total sample was male (73%) and
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24 Caucasian (56%); the mean age at enrollment was 40.8 (SD=11.0) years; and the mean
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26 age when first homeless was 30.3 (SD=13.3) years. The median duration of lifetime
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28 homelessness was 36 months (IQR: 12-84 months). All bivariate comparisons by
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30 childhood LD are summarized in Tables 1 to 3. Tables 1 and 2 present demographic
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32 characteristics and current mental disorder status of participants by childhood LD status
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34 (yes vs. no).
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40 [Insert Tables 1 and 2 about here]
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43 Table 3 presents self-reported substance use (past month) and service use (past six
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45 months) characteristics by childhood LD status. Participants who reported having a
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47 childhood LD were significantly more likely to report a number of negative health
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49 outcomes related to physical health (i.e., blood-borne infectious diseases, migraine, and
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51 seizures), mental health (i.e., major depressive episode, panic disorder, high suicidality)
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53 and substance use (i.e., alcohol dependence, early initiation of drug use, daily drug use,
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55 and injection drug use).
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3 [Insert Table 3 about here]

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5 Unadjusted (UOR) and adjusted odds ratios (AOR) and 95% CI for variables
6 included in the univariate and multivariable analyses are presented in Table 4. Results
7 from the multivariable logistic regression analyses indicate that reporting a childhood LD
8 independently predicted not entering high school (AOR: 2.21), lifetime duration of
9 homelessness greater than three years (AOR: 1.90), current major depressive episode
10 (AOR: 1.64), panic disorder (AOR: 1.86), alcohol dependence (AOR: 1.69), high
11 suicidality (AOR: 1.93), less severe cluster of mental disorders (AOR: 1.95), two or more
12 mental disorders (AOR: 2.06), infectious disease (AOR: 1.75), migraine (AOR: 2.50),
13 seizures (AOR: 2.23), head injury (AOR: 2.23), poor or fair overall health (AOR: 1.90),
14 injection drug use (AOR: 2.01), daily drug and alcohol use (AOR: 1.70), daily drug use
15 (not including alcohol) (AOR: 1.77), daily hard drug use (not including alcohol or
16 marijuana) (AOR: 1.79), early initiation of drug use (<14 years) (AOR: 1.60), shoplifting
17 in the past six months (AOR: 2.31), and talking to a health or social service provider in
18 the past six months (AOR: 2.00).

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20 [Insert Table 4 about here]

21 **DISCUSSION**

22 Our multivariable models identified several factors that were associated with self-
23 reported childhood LD in a cohort of adults who are homeless and have a mental
24 disorder: longer lifetime duration of homelessness; less severe mental disorders as well as
25 multiple mental disorders and high suicidal ideation; early and severe substance use,
26 including injection drug use and daily use of both drugs and alcohol; and physical health
27 problems including infectious disease, head injury, multiple illnesses, and rating ones'

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3 overall health as fair or poor. Despite the complex health needs of this sub-group, the
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5 only service use variable that was predicted by childhood learning problems or
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7 disabilities was very generic: talking to a health or social service provider in the past six
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9 months. A range of criminal justice variables as well as emergency room, ambulance
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11 utilization, and various other health services were not significant in our analyses.
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15 Collectively, our results indicate that childhood LD are overrepresented among homeless
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17 adults with complex comorbidities and predict a range of poor health outcomes in
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19 adulthood.
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22 These findings support previous research demonstrating a link between poor
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24 academic achievement and the psychological adversity faced by some adults.[6, 23]
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26 Studies of homeless and highly mobile children have identified that both groups show
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28 slower learning and academic progress than their residentially stable peers.[23] However,
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30 the risk of homelessness among people with LD has received scant attention in the
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32 research literature.[24, 25] Among our sample of homeless adults, 41% did not graduate
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34 from high school and 43% reported being in a special class in school, suggesting that
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36 learning and academic achievement was challenging throughout their school years and
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38 likely persists in adulthood in the form of poor literacy skills and difficulties finding and
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40 maintaining employment.
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46 Our index of LD does not discriminate between focal and more general cognitive
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48 difficulties, nor did we assess the presence of LD in adulthood. Several studies have
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50 found increased rates of general cognitive impairment among homeless adults compared
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52 to housed comparison groups.[26, 27] In our sample of homeless adults with current
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54 mental disorders, 66% reported experiencing a head injury that left them unconscious.
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1 Learning problems and disabilities

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3 However, these injuries may have occurred in adulthood and it is well documented that
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5 homeless adults are more likely to experience a variety of accidents compared to housed
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7 counterparts.[27] It is also possible that childhood LD among our sample were related to
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9 psychological distress in the home.[24] Regardless of the origin of learning problems
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11 among homeless adults, it appears that they persist over time and are associated with
12
13 significant functional impairment.
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17 Childhood LD independently predicted a range of substance use problems in our
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19 adult sample, including early initiation of drug use (before age 14). Abuse of alcohol and
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21 other drugs places an individual at greater risk of homelessness, but is not a direct causal
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23 factor.[28] Along with other studies, our findings suggest that daily drug use is a
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25 common mediator for a range of early risk factors.[29] Previous research using our
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27 sample of homeless adults with mental disorders found that daily drug use significantly
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29 predicts duration of homelessness[30] as well as severity of mental health symptoms.[31]
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34 Cross-sectional, retrospective data cannot disentangle the unique predictors of
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36 homelessness and mental illness, but it is likely that negative childhood experiences have
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38 both direct and indirect (mediated by substance use) effects on participants' history of
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40 homelessness. Documentation of these underlying common factors points to a broad
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42 range of vulnerabilities for homelessness and mental illness. These common factors
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44 increase the complexity of personal problems as well as the duration of
45
46 homelessness.[30] Therefore, substance dependence, especially when concurrent with
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48 mental illness among homeless populations, is not only a clinical problem but also a
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50 critical indicator for a range of other social and psychological problems that may need to
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52 be addressed before homelessness can be resolved.
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Learning problems and disabilities

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Problems such as homelessness that have long developmental trajectories, are perhaps best understood from models of cumulative adversity and amplification of risk.[32,33] Based on life course development and social learning theory, the risk amplification model addresses mechanisms through which experiences on the street amplify negative developmental effects originating in the family. According to this model, harmful behaviours and negative self-concept are perpetuated by the progressive accumulation of their own consequences. Thus, homelessness can be understood as the result of a developmental trajectory defined by successive environmental disruptions, each of which places individuals at greater risk for homelessness and associated risk factors. Individuals generally become homeless after experiencing a crisis due to limited income, social support, and personal coping skills.[5, 28] However, it is unclear what leads some people to become homeless while others do not. The risk amplification model may apply primarily to subgroups who are most vulnerable to a variety of structural contributors to homelessness such as poverty and the lack of affordable housing. Problem Behaviour Theory[34, 35] suggests that various risk factors may comprise a cluster of risky behaviours that mediate the link from childhood adversity to illicit drug use in adulthood, rather than distinct independent pathways. Another potential pathway linking childhood adversity to adult homelessness is the likelihood that such adversity elevates individuals' risk for psychiatric disorders such as depression and substance abuse, which are risk factors for homelessness, by reducing one's ability to earn adequate income and maintain stable housing.

53 Implications

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3 The growing body of research that suggests a trajectory of risk preceding the first episode
4 of homelessness begs the question “Can outcomes such as homelessness be prevented?”
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8 In addition to addressing structural barriers such as income inequality and affordable
9 housing, many researchers and policy makers have called for comprehensive preventive
10 interventions for high-risk children in public and community settings.[36, 37] Supporting
11 children’s cognitive development and schooling is particularly important and early
12 childhood education programs should be available for children at greatest risk. High risk
13 includes established indicators such as early learning problems, abuse and/or neglect,
14 behavioural and emotional problems, and early substance use. From a public health
15 perspective, early interventions in childhood might change or moderate the cycle of
16 homelessness across generations because early risk factors are often longstanding and
17 drive a trajectory of cumulative risk, potentially leading to severe psychopathology and
18 social exclusion. Despite the need for early intervention, our study also highlights the
19 need for identifying and addressing current learning problems among homeless adults.
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21 Learning problems may contribute to challenges with print and financial literacy,
22 obtaining and maintaining housing and employment, and a wide range of daily living
23 skills.
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43 **Limitations**

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45 Despite the strengths of our study design (i.e., large sample size, diverse recruitment
46 strategy, structured diagnostic interviews), several limitations must be considered. First,
47 all variables were based on participant self-report. Given that participants were selected
48 based on current mental disorder, accuracy of recall may have been compromised.
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50 Furthermore, participants were interviewed before being randomized to a housing
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Learning problems and disabilities

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3 intervention, therefore, some may have modified their responses in an attempt to
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5 influence the outcome of randomization. In addition, at baseline, we did not have access
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7 to early trauma or family dysfunction variables. Given the association between early
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9 trauma, foster care placements and adult homelessness,[2] it will be important to further
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11 examine the impact of these variables on later health and social outcomes. Similarly, we
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13 did not have access to measures of current LD or general cognitive impairment at
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15 baseline. Examination of current cognitive impairment, particularly as it relates to early
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17 learning problems, may shed light on current health and social functioning.
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22 **Future directions**

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24 Early indicators of risk clearly cannot explain all cases of homelessness. Many people
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26 without early risk factors become homeless and many who experience risk do not become
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28 homeless. Further research is needed to examine what differentially places people at risk
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30 for risk.[38] We need better theory and better data to understand how social factors
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32 regulate behaviours or distribute individuals into risk groups and how those social factors
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34 ‘push’ individual trajectories toward or away from adverse outcomes. However, our
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36 results linking early learning problems to homelessness, mental illness and substance use
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38 are consistent with a growing body of research indicating that adverse childhood events
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40 are potent risk factors for a number of psychiatric and substance use disorders.[6]
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46 Real prevention with regard to homelessness and other social problems will
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48 require systemic social and policy changes that address the environments within which
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50 children adapt so that they can mature into well-functioning adults. Nonetheless, our
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52 findings, along with others’, outline a risk profile that can guide future research into
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54 mechanisms and pathways through which childhood risks are translated into adult
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3 sequelae. Interventions that can effectively address childhood risk factors such as
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5 learning problems and disabilities may ultimately prevent critical social problems
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7 including homelessness and the enormous social and individual costs related to these
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9 problems.
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12 **ACKNOWLEDGEMENTS**

13
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15
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17
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19
20 Canada and the US; 5 site coordinators; numerous service and housing providers; and
21
22 persons with lived experience.
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26 **DECLARATION OF INTERESTS**

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29
30 Canada. The views expressed herein solely represent the authors.
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Learning problems and disabilities

Table 1: Comparisons of socio-demographic characteristics between participants who reported childhood learning problems or disabilities (LD-Yes; n=133) and those who did not (LD-No; n=364).¹

Variable	Total Sample N (%)	LD-No N (%)	LD-Yes N (%)	p value
Male gender	359 (73)	259 (72)	100 (76)	0.375
Age at enrolment				0.001**
19-25 years	36 (7)	25 (7)	11 (8)	
25-44 years	281 (57)	190 (52)	91 (68)	
Over 44 years	180 (36)	149 (41)	31 (23)	
Ethnicity				0.469
Aboriginal	77 (15)	52 (14)	25 (19)	
Caucasian	280 (56)	208 (57)	72 (54)	
Other	140 (28)	104 (29)	36 (27)	
Educational attainment (\leq Grade 8)	76 (15)	44 (12)	32 (25)	<0.001**
Single marital status	343 (70)	250 (69)	93 (70)	0.797
Language spoken at home during childhood (English)	392 (79)	282 (77)	110 (83)	0.206
Psychiatric hospitalization (past 5 years) longer than 6 months	57 (12)	43 (12)	14 (11)	0.686
Psychiatric hospitalization (past 5 years) 2 or more times	253 (53)	189 (54)	64 (50)	0.542
Employment history (at least 1 year of continuous work)	323 (65)	243 (67)	80 (60)	0.138
Jail (past 6 months)	68 (14)	46 (13)	22 (17)	0.262
Duration of homelessness				
Total lifetime (>3 years)	234 (48)	155 (43)	79 (61)	<0.001**
Longest single period (>1 year)	245 (50)	174 (48)	71 (55)	0.143
Age of first homelessness (<25 years)	214 (44)	143 (39)	71 (56)	0.001**
Overall health (poor or fair)	235 (47)	161 (44)	74 (56)	0.026*
MCAS total score (<56) #	244 (49)	177 (49)	67 (50)	0.730

¹ Each multivariable model was controlled for age (continuous measure), age of first homelessness age (continuous measure), gender, ethnicity (Aboriginals, Caucasian, Other), marital status (Single vs. Other) and language spoken in childhood home (English vs. Other).

Dichotomized based on median value.

**p \leq 0.001

*p \leq 0.05

Learning problems and disabilities

Table 2: Comparisons of mental disorders and physical illness between participants who reported childhood learning problems or disability (LD-Yes; n=133) and those who did not (LD-No; n=364).¹

Variable	Total sample N (%)	LD-No N (%)	LD-Yes N (%)	p value
<i>Mental Disorders (past month)</i>				
Major Depressive Episode	199 (40)	134 (37)	65 (49)	0.015*
Manic or Hypomanic Episode	97 (20)	64 (18)	33 (25)	0.072+
Post-traumatic Stress Disorder	129 (26)	88 (24)	41 (31)	0.122
Panic Disorder	104 (21)	64 (18)	40 (30)	0.002*
Mood Disorder with Psychotic Features	84 (17)	57 (16)	27 (20)	0.208
Psychotic Disorder	263 (53)	200 (55)	63 (47)	0.134
Alcohol dependence	121 (24)	79 (22)	42 (32)	0.023*
Substance dependence	288 (58)	205 (56)	83 (62)	0.224
Two or more mental disorders	240 (48)	158 (43)	82 (62)	<0.001**
High suicidality	87 (18)	54 (15)	33 (25)	0.010+
Less severe cluster	264 (53)	176 (48)	88 (66)	<0.001**
Severe cluster	363 (73)	267 (73)	96 (72)	0.794
<i>Physical Health</i>				
Migraine	157 (32)	94 (26)	63 (48)	<0.001**
Epilepsy or seizures	67 (14)	40 (11)	27 (21)	0.006*
Blood-borne infectious diseases	157 (32)	103 (29)	54 (41)	0.008*
Head injury	270 (56)	179 (51)	91 (71)	<0.001**
Two or more physical conditions	402 (81)	287 (78.8)	115 (86)	0.056+

¹ Each multivariable model was controlled for age (continuous), age of first homelessness age (continuous), gender, ethnicity (Aboriginals, Caucasian, Other), marital status (Single vs. Other) and language spoken in childhood home (English vs. Other).

**p≤0.001

*p≤0.05

+ p≤0.10

Learning problems and disabilities

Table 3: Comparisons of substance use and service utilization between participants who reported childhood learning problems or disability (LD-Yes; n=133) and those who did not (LD-No; n=364).¹

Variable	Total sample N (%)	LD-No N (%)	LD-Yes N (%)	p value
<i>Substance Use (past month)</i>				
IV drug use	88 (18)	53 (15)	35 (27)	0.003*
Daily substance use (including alcohol)	143 (29)	91 (25)	52 (39)	0.002*
Daily drug use (no alcohol)	126 (25)	78 (21)	48 (36)	0.001*
Daily hard drug use (no alcohol, no marijuana)	74 (15)	45 (12)	29 (22)	0.009*
Daily alcohol use	26 (5)	17 (5)	9 (7)	0.367
Polysubstance use (no alcohol)	188 (38)	128 (35)	60 (45)	0.050+
Age first drunk (<14 years)	212 (45)	142 (42)	70 (56)	0.007*
Age of first drug use (<14 years)	178 (40)	114 (35)	64 (52)	0.001*
Sold drugs	50 (10)	32 (9)	18 (14)	0.140
Shop-lifting	62 (13)	34 (10)	28 (21)	0.001*
<i>Service Use (past 6 months)</i>				
Psychiatrist	134 (27)	109 (30)	25 (19)	0.013*
Addiction counselor	18 (4)	10 (3)	8 (6)	0.084+
Seen by a health/social service provider	384 (78)	276 (76)	108 (82)	0.204
Talked with a health/social service provider	112 (23)	69 (19)	43 (32)	0.002*
ER visit (yes/no)	281 (58)	204 (57)	77 (60)	0.594
Multiple ER visits (three or more)	107 (22)	71 (20)	36 (28)	0.058+
Ambulance (yes/no)	195 (40)	147 (41)	48 (36)	0.381
Police detention (yes/no)	80 (19)	61 (19)	19 (17)	0.610
Arrested (yes/no)	172 (36)	124 (35)	48 (38)	0.603
Multiple arrests (two or more)	75 (16)	48 (14)	27 (21)	0.044+
Court appearance	172 (35)	127 (36)	45 (35)	0.932
Justice program	48 (11)	30 (9)	18 (16)	0.076+

¹ Each multivariable model was controlled for age (continuous), age of first homelessness (continuous), gender, ethnicity (Aboriginals, Caucasian, Other), marital status (Single vs. Other) and language spoken in childhood home (English vs. Other).

**p<0.001

*p<0.05

+ p<0.10

Learning problems and disabilities

Table 4: Logistic regression analyses for socio-demographics, mental disorders, substance use and service utilization related outcomes based on early learning problems or disability (n=497).

Outcome Variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI) ¹
Age of first homelessness (<25 years) ²	1.96 (1.30, 2.95)**	1.52 (0.95, 2.44)
Lifetime duration of homelessness (>3 years) [#]	2.11 (1.40, 3.18)**	1.90 (1.19, 3.06)*
Education level (Grade 8 or less)	2.38 (1.43, 3.95)	2.20 (1.28, 3.81)
<i>Type of Mental Disorder</i>		
Major Depressive Episode	1.64 (1.10, 2.45)*	1.64 (1.07, 2.52)*
Manic or Hypomanic Episode	1.55 (0.96, 2.49)	1.51 (0.91, 2.51)
Panic Disorder	2.02 (1.28, 3.19)*	1.86 (1.15, 3.02)*
Alcohol dependence	1.67 (1.07, 2.59)*	1.69 (1.06, 2.69)*
Two or more mental disorders	2.10 (1.40, 3.15)**	2.06 (1.33, 3.19)**
High suicidality	1.89 (1.16, 3.09)*	1.93 (1.15, 3.24)*
Less severe cluster of mental disorders	2.10 (1.38, 3.16)**	1.95 (1.25, 3.04)*
<i>Physical Health</i>		
Blood-borne infectious diseases	1.76 (1.16, 2.66)*	1.75 (1.11, 2.74)*
Migraine	2.57 (1.70, 3.90)**	2.50 (1.62, 3.88)**
Seizures	2.11 (1.23, 3.61)*	2.23 (1.25, 4.00)*
Multiple physical illness	1.71 (0.98, 2.99)	2.16 (1.16, 4.02)*
Overall health (fair/poor)	1.57 (1.06, 2.35)*	1.90 (1.24, 2.92)*
History of head injury	2.33 (1.51, 3.59)*	2.23 (1.42, 3.50)*
<i>Substance Use</i>		
IV drug use	2.07 (1.28, 3.36)*	2.01 (1.19, 3.39)*
Daily drug use (no alcohol)	2.07 (1.34, 3.19)**	1.77 (1.12, 2.80)*
Daily drug use (no alcohol, no marijuana)	1.98 (1.18, 3.31)*	1.79 (1.03, 3.11)*
Daily substance use (including alcohol)	1.93 (1.26, 2.94)*	1.70 (1.09, 2.65)*
Poly-substance use (no alcohol)	1.50 (1.00, 2.24)	1.27 (0.82, 1.97)
Age first drunk (<14 years)	1.75 (1.16, 2.65)*	1.37 (0.88, 2.14)
Age of first drug use (<14 years)	1.98 (1.30, 3.02)**	1.60 (1.02, 2.50)*
	2.53 (1.46, 4.36)**	2.31 (1.30, 4.11)*
<i>Service Use</i>		
Talked with a health/social service provider	1.99 (1.30, 3.11)*	2.00 (1.25, 3.21)*
Multiple ER visits (three or more) [#]	1.12 (0.74, 1.68)	1.04 (0.67, 1.60)
Multiple arrests (two or more) [#]	1.70 (1.01, 2.87)*	1.65 (0.95, 2.86)
Justice program	1.76 (0.94, 3.92)	1.34 (0.59, 3.08)

¹ Each multivariable model was controlled for age (continuous), age of first homelessness (continuous), gender, ethnicity (Aboriginal, Caucasian, Other), marital status (Single, Other) and language spoken in the childhood home (English, Other).

Learning problems and disabilities

² This multivariable model was controlled for age (continuous), gender, ethnicity (Aboriginal, Caucasian, Other), marital status (Single, Other), and language spoken in the childhood home (English, Other).

Dichotomized based on median value.

**p≤0.001

*p≤0.05

For peer review only



CONSORT 2010 checklist of information to include when reporting a randomised trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a randomised trial in the title (our findings focus on baseline data prior to the RCT elements. The RCT protocol and CONSORT details have been reported in a previous BMJ publication)	N/A
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	2-3
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale	5-6
	2b	Specific objectives or hypotheses	7
Methods			
Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio	NA (see 1a)
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	NA (see 1a)
Participants	4a	Eligibility criteria for participants	7-8
	4b	Settings and locations where the data were collected	7-8
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	NA (see 1a)
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	9-10
	6b	Any changes to trial outcomes after the trial commenced, with reasons	NA
Sample size	7a	How sample size was determined	7
	7b	When applicable, explanation of any interim analyses and stopping guidelines	NA
Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	NA (see 1a)
	8b	Type of randomisation; details of any restriction (such as blocking and block size)	NA (see 1a)
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	NA (see 1a)
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	NA (see 1a)

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2	Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how	NA
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4		11b	If relevant, description of the similarity of interventions	NA
5	Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes	10-11
6		12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses	NA
7				
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9	Results			
10	Participant flow (a	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and	NA (see 1a)
11	diagram is strongly		were analysed for the primary outcome	
12	recommended)	13b	For each group, losses and exclusions after randomisation, together with reasons	NA (see 1a)
13	Recruitment	14a	Dates defining the periods of recruitment (and follow-up)	9
14		14b	Why the trial ended or was stopped	NA
15	Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	Table 1 (p.23)
16	Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups	NA
17				
18	Outcomes and	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	Tables 2-4
19	estimation			(pp.24-26)
20		17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended	
21	Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory	
22				
23	Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	NA
24				
25	Discussion			
26	Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	16
27	Generalisability	21	Generalisability (external validity, applicability) of the trial findings	NA
28	Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	12-15
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30	Other information			
31	Registration	23	Registration number and name of trial registry	3
32	Protocol	24	Where the full trial protocol can be accessed, if available	7
33	Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	18
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39	*We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items. If relevant, we also			
40	recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials.			
41	Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org .			
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44	CONSORT 2010 checklist			
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8 **MANUSCRIPT COVER PAGE**
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10
11 **TITLE. Missed Opportunities: Childhood Learning Disabilities as Early Indicators**
12
13 **of Risk among Homeless Adults with Mental Illness in Vancouver, British Columbia.**
14

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41 **Key words:** homelessness, mental illness, learning disabilities
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10 **ABSTRACT**

11 **Objectives.** It is well documented that early learning problems and poor academic
12 achievement adversely impact child development and a wide range of adult outcomes;
13 however, these indicators have received scant attention among homeless adults. This
14 study examines self-reported learning disabilities in childhood as predictors of duration
15 of homelessness, mental and substance use disorders, physical health, and service
16 utilization in a sample of homeless adults with current mental illness.
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19 **Design:** This study was conducted using the baseline sample from a randomized
20 controlled trial.
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23 **Setting:** Participants were sampled from the community in Vancouver, British Columbia.
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26 **Participants:** The total sample included 497 adult participants who met criteria for
27 absolute homelessness or precarious housing and a current mental disorder based on a
28 structured diagnostic interview. Learning disabilities in childhood were assessed by
29 asking adult participants whether they thought they had a learning disability in childhood
30 and if anyone had told them they had a learning disability. Only participants who
31 responded positively to both questions (n=133) were included in the analyses.
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34 **Outcome measures.** Primary outcomes include current mental disorders, substance use
35 disorders, physical health, service utilization and duration of homelessness.
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38 **Results.** In multivariable regression models, self-reported learning disability during
39 childhood independently predicted self-reported educational attainment and lifetime
40 duration of homelessness as well as a range of mental health, physical health, and
41 substance use problems, but did not predict reported health or justice service utilization.
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44 **Conclusions.** Childhood learning problems are overrepresented among homeless adults
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8 with complex comorbidities and long histories of homelessness. Our findings are
9 consistent with a growing body of literature indicating that adverse childhood events are
10 potent risk factors for a number of adult health and psychiatric problems, including
11 substance abuse. Results are discussed in the context of cumulative adversity and
12 problem behaviour theory.
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18 **Trials registration number:** This trial has been registered with the International
19 Standard Randomised Control Trial Number Register and assigned ISRCTN42520374.
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8 **ARTICLE SUMMARY** 9

10 **Article focus**

- 11 • The relationship between self-reported learning disability in childhood as a
12 predictor of adult homelessness and associated health and service use outcomes
13 among a cohort of adult who are homeless and have a mental disorder.
14
- 15 • Primary outcomes include current mental disorders, substance use disorders,
16 physical health, service utilization and duration of homelessness.
17
- 18 • How homelessness and the myriad of associated negative health and social
19 outcomes might be prevented.
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25 **Key messages**

- 26 • Childhood learning disabilities are overrepresented among homeless adults with
27 complex comorbidities and predict a range of poor health outcomes in adulthood
28 including mood and anxiety disorders, suicidal ideation, early and severe
29 substance use, and physical health problems.
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- 32 • Early risk factors are often longstanding and drive a trajectory of cumulative risk,
33 potentially leading to severe psychopathology and social exclusion.
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39 **Strengths and limitations of this study**

- 40 • Strengths include a large sample size, a diverse recruitment strategy, and
41 structured diagnostic interviews for mental disorders.
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- 43 • Limitations include retrospective self-report of childhood learning disabilities.
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- 45 • Lack of access to early trauma and family dysfunction variables as well as
46 measures of general cognitive impairment at baseline.
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10 INTRODUCTION

11 Efforts to prevent homelessness require an understanding of the underlying causes and
12 early indicators of risk. Research into the causes of homelessness suggests complex
13 interactions between structural and individual factors, both of which are often present
14 long before the onset of first homelessness.[1-2] The childhoods of homeless adults are
15 disproportionately characterized by persistent poverty, residential mobility, school
16 problems, and other stressful and/or traumatic experiences[3-5] particularly among
17 homeless individuals with severe mental illness.[2]
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25 While a growing body of research has examined the relationship between adverse
26 childhood events and subsequent homelessness,[3, 4] few studies have examined the role
27 of childhood learning disabilities. There is growing evidence that academic problems in
28 school foreshadow later educational and employment difficulties and may affect multiple
29 domains of functioning.[6]
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35 In Canada, educational policies fall under provincial jurisdiction, therefore,
36 definitions of learning disabilities (LD) vary widely and include learning problems,
37 difficulties, disorders, as well as “children at risk.”[7] LD are assumed to be neurological
38 in origin and affect the acquisition, organization, retention, understanding or use of verbal
39 and/or nonverbal information.[8] According to Statistics Canada, 4.9% of children aged
40 6 to 15 have a LD, varying from 1.6% for children aged 6 to 7.2% among 10-year-
41 olds.[9]
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49 While the consequences of LD on childhood academic and social development are
50 well documented,[10, 11] the impact in adulthood is challenging to assess. However,
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6 Learning problems and disabilities

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8 research suggests that LD often persist into adulthood and affect diverse aspects of
9
10 functioning including employment, social relationships, quality of life, and mental and
11
12 physical health.[12]

13
14 In school settings, LD typically manifest as poor academic achievement, which is
15
16 associated with a greater number of school absences, suspensions, and grade retention as
17
18 well as externalizing and internalizing behaviour problems.[7-10] Almost one-third of
19
20 US adolescents with LD in the National Longitudinal Transition Study did not complete
21
22 high school and were less likely to enroll in subsequent vocational or academic programs
23
24 compared to their non-LD peers.[10]

25
26 Research examining substance abuse among youth with LD remains
27
28 inconclusive.[13] Beitchman et al.[11] assessed 264 Canadian children for LD at ages 12
29
30 and 19, and for psychiatric and substance use disorders at age 19. Children who met
31
32 criteria for LD at ages 12 and 19 were more likely to develop a psychiatric or substance
33
34 use disorder compared to non-LD children at both time points. LD at 19 years of age
35
36 increased the risk for substance use disorder three-fold after controlling for behavioural
37
38 problems and family structure. Difficulties with executive functioning, academic failure,
39
40 low self-esteem, and poor social skills are viewed as the strongest predictors of substance
41
42 use disorder.[14]

43
44 Compared to non-LD peers, youth with LD frequently report feelings of loneliness,
45
46 stress, depression, and suicide, among other psychiatric symptoms.[15, 16] For example,
47
48 in the National Longitudinal Study of Adolescent Health, the LD sample was twice as
49
50 likely to report a suicide attempt in the past year.[16] Longitudinal research on risk-
51
52 taking indicates that, compared to non-LD peers, adolescents with LD engage more
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6 Learning problems and disabilities

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8 frequently in various risk behaviours.[17] Therefore, the presence of LD in childhood
9
10 appears to confer a general risk for adverse outcomes throughout adolescence and into
11
12 adulthood.

13
14 In identifying early indicators for homelessness, we are posing a larger question
15
16 about how we might prevent homelessness and the myriad of associated negative health
17
18 and social outcomes. There has been a resurgence of interest in early intervention as a
19
20 means of preventing or attenuating a wide range of developmental outcomes in
21
22 adulthood.[18] In this study, we focus on the relationship between early LD as a
23
24 predictor of adult homelessness and associated health and service use outcomes. Unlike
25
26 family instability and dysfunction, which fall under the jurisdiction of child welfare
27
28 agencies, LD can be identified and addressed within the school system and may serve as
29
30 an early marker of social and developmental risk.

31 **METHODS**

32
33 The Vancouver At Home Project is a randomized controlled trial (RCT) involving
34
35 homeless adults with mental illness in Vancouver, British Columbia. Study design and
36
37 sample size were determined by the At Home/Chez Soi National Research Team which
38
39 monitored activities at five different study sites.[19] Details related to the RCT protocol
40
41 such as CONSORT have been reported elsewhere[19]. The current study focuses on
42
43 baseline data from one study site (Vancouver) prior to randomization and does not
44
45 incorporate any findings related to RCT elements.

46
47 Eligibility criteria included legal adult status (19 years and older), current mental
48
49 disorder on the MINI Neuropsychiatric Interview (MINI),[20] and being absolutely
50
51 homeless or precariously housed. Absolute homelessness was defined as living on the
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6 Learning problems and disabilities

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8 streets or in an emergency shelter for at least the past seven nights with little likelihood of
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10 obtaining secure accommodation in the upcoming month. Precariously housed was
11
12 defined as living in a rooming house, hotel or other transitional housing; in addition,
13
14 individuals must have experienced at least two episodes of absolute homelessness in the
15
16 past year, or one episode lasting for at least four weeks in the past year.

17
18 Participants were recruited through referral from over 40 agencies available to
19
20 homeless adults in Vancouver; the majority were recruited from homeless shelters, drop-
21
22 in centres, homeless outreach teams, hospitals, community mental health teams, and
23
24 criminal justice programs. We specifically targeted organizations that serve women,
25
26 youth, aboriginal peoples, and gay/lesbian/transgender individuals in order to obtain as
27
28 diverse and representative a sample as possible. Referral was initiated by service
29
30 providers and a preliminary screening for eligibility was conducted via telephone with the
31
32 referral agent. All participants met face-to-face with a trained research interviewer who
33
34 explained procedures, obtained informed consent, and confirmed study eligibility. A
35
36 cash honorarium of \$5 was provided for the screening process. Institutional ethics board
37
38 approval was obtained through Simon Fraser University and the University of British
39
40 Columbia.

41
42 Approximately 85 individuals were turned away on the phone because they
43
44 clearly did not meet eligibility criteria. In addition, approximately 100 individuals were
45
46 invited to meet with an interviewer for further eligibility screening and/or to begin the
47
48 baseline questionnaire but did not show up for an appointment. Whenever possible,
49
50 appointments were rescheduled and interviewers tried to locate individuals in the
51
52 community. Finally, 92 recruits completed the formal eligibility screening process but
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6 Learning problems and disabilities

7
8 were deemed ineligible. When these individuals were compared with participants who
9
10 were enrolled in the study, no significant differences were found in terms of current age
11
12 or gender.
13

14
15 If the individual met all study criteria, they were enrolled as a participant and the
16
17 baseline interview commenced, consisting of a series of interviewer-administered
18
19 questionnaires including socio-demographic characteristics, psychiatric symptoms,
20
21 substance use, physical health, service use, and quality of life. Participants received a
22
23 further cash honorarium of \$30 upon completion of the baseline interview. The
24
25 following analyses are based upon data from the baseline questionnaires of 497
26
27 participants recruited from October 2009 to June 2011.
28

29 **Variables of interest**

30
31
32 LD were assessed using the following questions, focusing on childhood: (1) “Do
33
34 you think you had a learning problem or learning disability?” and (2) “Did anyone ever
35
36 tell you that you have a learning problem or learning disability?” ~~Only Given the~~
37
38 retrospective nature of these questions, only participants who responded positively to
39
40 both questions were included in the analysis.
41

42 With regard to mental disorders, Severe Cluster includes at least one of current
43
44 Psychosis, Mood Disorder with Psychotic Features, and Hypomanic or Manic Episode, as
45
46 identified through the MINI or documented physician diagnosis. Less Severe Cluster
47
48 includes at least one of current Major Depressive Episode, Panic Disorder, and Post-
49
50 traumatic Stress Disorder. Suicidality, Alcohol Dependence, and Substance Dependence
51
52 were also identified using the MINI. Frequency and type of substance use over the past
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6 Learning problems and disabilities

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8 month were recorded using the Maudsley Addiction Profile (MAP).[21] Physical illness
9
10 was assessed by self-report using a checklist of 30 chronic health conditions (lasting
11
12 longer than six months). Blood-borne infectious disease consisted of positive self-report
13
14 diagnosis of HIV, Hepatitis B or Hepatitis C. Head injury status was based on the
15
16 question “Did you ever receive a head injury that left you unconscious?” Shoplifting and
17
18 selling drugs were assessed during the past month using the MAP.
19

20
21 Self-reported involvement with health services was collected for the past six
22
23 months including visiting and talking to a health or service provider, Emergency Room
24
25 visits, and being transported by ambulance. Criminal justice services included contact
26
27 with the police that resulted in detention, arrest and court appearances. The Multnomah
28
29 Community Ability Scale (MCAS)[22] quantifies community functioning based on 17
30
31 items and was scored by the interviewer upon completion of the baseline interview.

32 **Statistical analyses**

33
34 Comparisons of categorical data between participants who did or did not report a
35
36 learning problem or disability were conducted using Pearson’s chi-square or Fisher’s
37
38 exact test. Comparisons of numeric variables (e.g., age at enrolment) between groups
39
40 were conducted using the Student t test and Wilcoxon’s rank-sum test. Univariate and
41
42 multivariable logistic regression analyses were used to model the independent
43
44 associations between childhood LD and a series of a priori outcome variables. Outcomes
45
46 variables that were significant at the $p \leq 0.10$ level were considered for univariate and
47
48 multivariable logistic regression analyses. Each variable was modeled in both univariate
49
50 and multivariate settings using childhood LD as an independent risk factor and the same
51
52 set of controlling variables (age at enrolment, age of first homelessness, gender, ethnicity,
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6 Learning problems and disabilities

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8 marital status, and language spoken in the childhood home). Both unadjusted and
9
10 adjusted odds ratios and 95% confidence intervals (CI) are reported and all p-values are
11
12 two-sided. SPSS-19 was used to conduct these analyses. Missing values ranged from
13
14 zero to 4% and were excluded from the analyses.

15 16 17 RESULTS

18
19 In total, 497 participants completed the baseline questionnaire; 178 participants (36%)
20
21 thought they had a learning problem or disability in childhood, 182 (37%) reported being
22
23 told they had a learning problem or disability, and 133 (27%) responded positively to
24
25 both indicators of childhood LD. The majority of the total sample was male (73%) and
26
27 Caucasian (56%); the mean age at enrollment was 40.8 (SD=11.0) years; and the mean
28
29 age when first homeless was 30.3 (SD=13.3) years. The median duration of lifetime
30
31 homelessness was 36 months (IQR: 12-84 months). All bivariate comparisons by
32
33 childhood LD are summarized in Tables 1 to 3. Tables 1 and 2 present demographic
34
35 characteristics and current mental disorder status of participants by childhood LD status
36
37 (yes vs. no).

38 [Insert Tables 1 and 2 about here]

39
40 Table 3 presents self-reported substance use (past month) and service use (past six
41
42 months) characteristics by childhood LD status. Participants who reported having a
43
44 childhood LD were significantly more likely to report a number of negative health
45
46 outcomes related to physical health (i.e., blood-borne infectious diseases, migraine, and
47
48 seizures), mental health (i.e., major depressive episode, panic disorder, high suicidality)
49
50 and substance use (i.e., alcohol dependence, early initiation of drug use, daily drug use,
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52 and injection drug use).

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8 [Insert Table 3 about here]
9

10 Unadjusted (UOR) and adjusted odds ratios (AOR) and 95% CI for variables
11 included in the univariate and multivariable analyses are presented in Table 4. Results
12 from the multivariable logistic regression analyses indicate that reporting a childhood LD
13 independently predicted not entering high school (AOR: 2.21), lifetime duration of
14 homelessness greater than three years (AOR: 1.90), current major depressive episode
15 (AOR: 1.64), panic disorder (AOR: 1.86), alcohol dependence (AOR: 1.69), high
16 suicidality (AOR: 1.93), less severe cluster of mental disorders (AOR: 1.95), two or more
17 mental disorders (AOR: 2.06), infectious disease (AOR: 1.75), migraine (AOR: 2.50),
18 seizures (AOR: 2.23), head injury (AOR: 2.23), poor or fair overall health (AOR: 1.90),
19 injection drug use (AOR: 2.01), daily drug and alcohol use (AOR: 1.70), daily drug use
20 (not including alcohol) (AOR: 1.77), daily hard drug use (not including alcohol or
21 marijuana) (AOR: 1.79), early initiation of drug use (<14 years) (AOR: 1.60), shoplifting
22 in the past six months (AOR: 2.31), and talking to a health or social service provider in
23 the past six months (AOR: 2.00).
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37 [Insert Table 4 about here]
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39 **DISCUSSION**

40 Our multivariable models identified several factors that were associated with self-
41 reported childhood LD in a cohort of adults who are homeless and have a mental
42 disorder: longer lifetime duration of homelessness; less severe mental disorders as well as
43 multiple mental disorders and high suicidal ideation; early and severe substance use,
44 including injection drug use and daily use of both drugs and alcohol; and physical health
45 problems including infectious disease, head injury, multiple illnesses, and rating ones'
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8 overall health as fair or poor. Despite the complex health needs of this sub-group, the
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10 only service use variable that was predicted by childhood learning problems or
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12 disabilities was very generic: talking to a health or social service provider in the past six
13
14 months. A range of criminal justice variables as well as emergency room, ambulance
15
16 utilization, and various other health services were not significant in our analyses.
17
18 Collectively, our results indicate that childhood LD are overrepresented among homeless
19
20 adults with complex comorbidities and predict a range of poor health outcomes in
21
22 adulthood.

23
24 These findings support previous research demonstrating a link between poor
25
26 academic achievement and the psychological adversity faced by some adults.[6, 23]
27
28 Studies of homeless and highly mobile children have identified that both groups show
29
30 slower learning and academic progress than their residentially stable peers.[23] However,
31
32 the risk of homelessness among people with LD has received scant attention in the
33
34 research literature.[24, 25] Among our sample of homeless adults, 41% did not graduate
35
36 from high school and 43% reported being in a special class in school, suggesting that
37
38 learning and academic achievement was challenging throughout their school years and
39
40 likely persists in adulthood in the form of poor literacy skills and difficulties finding and
41
42 maintaining employment.

43
44 Our index of LD does not discriminate between focal and more general cognitive
45
46 difficulties, nor did we assess the presence of LD in adulthood. Several studies have
47
48 found increased rates of general cognitive impairment among homeless adults compared
49
50 to housed comparison groups.[26, 27] In our sample of homeless adults with current
51
52 mental disorders, 66% reported experiencing a head injury that left them unconscious.
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9 However, these injuries may have occurred in adulthood and it is well documented that
10 homeless adults are more likely to experience a variety of accidents compared to housed
11 counterparts.[27] It is also possible that childhood LD among our sample were related to
12 psychological distress in the home.[24] Regardless of the origin of learning problems
13 among homeless adults, it appears that they persist over time and are associated with
14 significant functional impairment.
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20 Childhood LD independently predicted a range of substance use problems in our
21 adult sample, including early initiation of drug use (before age 14). Abuse of alcohol and
22 other drugs places an individual at greater risk of homelessness, but is not a direct causal
23 factor.[28] Along with other studies, our findings suggest that daily drug use is a
24 common mediator for a range of early risk factors.[29] Previous research using our
25 sample of homeless adults with mental disorders found that daily drug use significantly
26 predicts duration of homelessness[30] as well as severity of mental health symptoms.[31]
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33 Cross-sectional, retrospective data cannot disentangle the unique predictors of
34 homelessness and mental illness, but it is likely that negative childhood experiences have
35 both direct and indirect (mediated by substance use) effects on participants' history of
36 homelessness. Documentation of these underlying common factors points to a broad
37 range of vulnerabilities for homelessness and mental illness. These common factors
38 increase the complexity of personal problems as well as the duration of
39 homelessness.[30] Therefore, substance dependence, especially when concurrent with
40 mental illness among homeless populations, is not only a clinical problem but also a
41 critical indicator for a range of other social and psychological problems that may need to
42 be addressed before homelessness can be resolved.
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8 Problems such as homelessness that have long developmental trajectories, are
9 perhaps best understood from models of cumulative adversity and amplification of
10 risk.^[32,33] Based on life course development and social learning theory, the risk
11 amplification model addresses mechanisms through which experiences on the street
12 amplify negative developmental effects originating in the family. According to this
13 model, harmful behaviours and negative self-concept are perpetuated by the progressive
14 accumulation of their own consequences. Thus, homelessness can be understood as the
15 result of a developmental trajectory defined by successive environmental disruptions,
16 each of which places individuals at greater risk for homelessness and associated risk
17 factors.
18

19 Individuals generally become homeless after experiencing a crisis due to limited
20 income, social support, and personal coping skills.^[5, 28] However, it is unclear what
21 leads some people to become homeless while others do not. The risk amplification model
22 may apply primarily to subgroups who are most vulnerable to a variety of structural
23 contributors to homelessness such as poverty and the lack of affordable housing.
24

25 Problem Behaviour Theory^[33,34, 34,35] suggests that various risk factors may comprise a
26 cluster of risky behaviours that mediate the link from childhood adversity to illicit drug
27 use in adulthood, rather than distinct independent pathways. Another potential pathway
28 linking childhood adversity to adult homelessness is the likelihood that such adversity
29 elevates individuals' risk for psychiatric disorders such as depression and substance
30 abuse, which are risk factors for homelessness, by reducing one's ability to earn adequate
31 income and maintain stable housing.
32

33 **Implications**

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8 The growing body of research that suggests a trajectory of risk preceding the first episode
9
10 of homelessness begs the question “Can outcomes such as homelessness be prevented?”

11
12 In addition to addressing structural barriers such as income inequality and affordable

13
14 housing. Many researchers and policy makers have called for comprehensive
15
16 preventive interventions for high-risk children in public and community settings.^{[3536,}
17
18 ^{3637]} Supporting children’s cognitive development and schooling is particularly
19
20 important and early childhood education programs should be available for children at
21
22 greatest risk. High risk includes established indicators such as early learning problems,
23
24 abuse and/or neglect, behavioural and emotional problems, and early substance use.

25
26 From a public health perspective, early interventions in childhood might change or
27
28 moderate the cycle of homelessness across generations because early risk factors are
29
30 often longstanding and drive a trajectory of cumulative risk, potentially leading to severe
31
32 psychopathology and social exclusion. Despite the need for early intervention, our study
33
34 also highlights the need for identifying and addressing current learning problems among
35
36 homeless adults. Learning problems may contribute to challenges with print and
37
38 financial literacy, obtaining and maintaining housing and employment, and a wide range
39
40 of daily living skills.

41 **Limitations**

42
43 Despite the strengths of our study design (i.e., large sample size, diverse recruitment
44
45 strategy, structured diagnostic interviews), several limitations must be considered. First,
46
47 all variables were based on participant self-report. Given that participants were selected
48
49 based on current mental disorder, accuracy of recall may have been compromised.
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51 Furthermore, participants were interviewed before being randomized to a housing
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6 Learning problems and disabilities

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8 intervention, therefore, some may have modified their responses in an attempt to
9
10 influence the outcome of randomization. In addition, at baseline, we did not have access
11
12 to early trauma or family dysfunction variables. Given the association between early
13
14 trauma, foster care placements and adult homelessness,[2] it will be important to further
15
16 examine the impact of these variables on later health and social outcomes. Similarly, we
17
18 did not have access to measures of current LD or general cognitive impairment at
19
20 baseline. Examination of current cognitive impairment, particularly as it relates to early
21
22 learning problems, may shed light on current health and social functioning.

23 24 **Future directions**

25
26 Early indicators of risk clearly cannot explain all cases of homelessness. Many people
27
28 without early risk factors become homeless and many who experience risk do not become
29
30 homeless. Further research is needed to examine what differentially places people at risk
31
32 for risk.[3738] We need better theory and better data to understand how social factors
33
34 regulate behaviours or distribute individuals into risk groups and how those social factors
35
36 ‘push’ individual trajectories toward or away from adverse outcomes. However, our
37
38 results linking early learning problems to homelessness, mental illness and substance use
39
40 are consistent with a growing body of research indicating that adverse childhood events
41
42 are potent risk factors for a number of psychiatric and substance use disorders.[6]

43
44 Real prevention with regard to homelessness and other social problems will
45
46 require systemic social and policy changes that address the environments within which
47
48 children adapt so that they can mature into well-functioning adults. Nonetheless, our
49
50 findings, along with others’, outline a risk profile that can guide future research into
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52 mechanisms and pathways through which childhood risks are translated into adult

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8 sequelae. Interventions that can effectively address childhood risk factors such as
9
10 learning problems and disabilities may ultimately prevent critical social problems
11
12 including homelessness and the enormous social and individual costs related to these
13
14 problems.

15 16 **ACKNOWLEDGEMENTS**

17
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19
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21
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23
24 Canada and the US; 5 site coordinators; numerous service and housing providers; and
25
26 persons with lived experience.

27 28 **DECLARATION OF INTERESTS**

29
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31
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Learning problems and disabilities

Table 1: Comparisons of socio-demographic characteristics between participants who reported childhood learning problems or disabilities (LD-Yes; n=133) and those who did not (LD-No; n=364).¹

Variable	Total Sample N (%)	LD-No N (%)	LD-Yes N (%)	p value
Male gender	359 (73)	259 (72)	100 (76)	0.375
Age at enrolment				0.001**
19-25 years	36 (7)	25 (7)	11 (8)	
25-44 years	281 (57)	190 (52)	91 (68)	
Over 44 years	180 (36)	149 (41)	31 (23)	
Ethnicity				0.469
Aboriginal	77 (15)	52 (14)	25 (19)	
Caucasian	280 (56)	208 (57)	72 (54)	
Other	140 (28)	104 (29)	36 (27)	
Educational attainment (≤Grade 8)	76 (15)	44 (12)	32 (25)	<0.001**
Single marital status	343 (70)	250 (69)	93 (70)	0.797
Language spoken at home during childhood (English)	392 (79)	282 (77)	110 (83)	0.206
Psychiatric hospitalization (past 5 years) longer than 6 months	57 (12)	43 (12)	14 (11)	0.686
Psychiatric hospitalization (past 5 years) 2 or more times	253 (53)	189 (54)	64 (50)	0.542
Employment history (at least 1 year of continuous work)	323 (65)	243 (67)	80 (60)	0.138
Jail (past 6 months)	68 (14)	46 (13)	22 (17)	0.262
Duration of homelessness				<0.001**
Total lifetime (>3 years)	234 (48)	155 (43)	79 (61)	
Longest single period (>1 year)	245 (50)	174 (48)	71 (55)	0.143
Age of first homelessness (<25 years)	214 (44)	143 (39)	71 (56)	0.001**
Overall health (poor or fair)	235 (47)	161 (44)	74 (56)	0.026*
MCAS total score (<56) #	244 (49)	177 (49)	67 (50)	0.730

¹ Each multivariable model was controlled for age (continuous measure), age of first homelessness age (continuous measure), gender, ethnicity (Aboriginals, Caucasian, Other), marital status (Single vs. Other) and language spoken in childhood home (English vs. Other).

Dichotomized based on median value.

**p≤0.001

*p≤0.05

Learning problems and disabilities

Table 2: Comparisons of mental disorders and physical illness between participants who reported childhood learning problems or disability (LD-Yes; n=133) and those who did not (LD-No; n=364).¹

Variable	Total sample N (%)	LD-No N (%)	LD-Yes N (%)	p value
<i>Mental Disorders (past month)</i>				
Major Depressive Episode	199 (40)	134 (37)	65 (49)	0.015*
Manic or Hypomanic Episode	97 (20)	64 (18)	33 (25)	0.072+
Post-traumatic Stress Disorder	129 (26)	88 (24)	41 (31)	0.122
Panic Disorder	104 (21)	64 (18)	40 (30)	0.002*
Mood Disorder with Psychotic Features	84 (17)	57 (16)	27 (20)	0.208
Psychotic Disorder	263 (53)	200 (55)	63 (47)	0.134
Alcohol dependence	121 (24)	79 (22)	42 (32)	0.023*
Substance dependence	288 (58)	205 (56)	83 (62)	0.224
Two or more mental disorders	240 (48)	158 (43)	82 (62)	<0.001**
High suicidality	87 (18)	54 (15)	33 (25)	0.010+
Less severe cluster	264 (53)	176 (48)	88 (66)	<0.001**
Severe cluster	363 (73)	267 (73)	96 (72)	0.794
<i>Physical Health</i>				
Migraine	157 (32)	94 (26)	63 (48)	<0.001**
Epilepsy or seizures	67 (14)	40 (11)	27 (21)	0.006*
Blood-borne infectious diseases	157 (32)	103 (29)	54 (41)	0.008*
Head injury	270 (56)	179 (51)	91 (71)	<0.001**
Two or more physical conditions	402 (81)	287 (78.8)	115 (86)	0.056+

¹ Each multivariable model was controlled for age (continuous), age of first homelessness (continuous), gender, ethnicity (Aboriginals, Caucasian, Other), marital status (Single vs. Other) and language spoken in childhood home (English vs. Other).

**p≤0.001

*p≤0.05

+ p≤0.10

Learning problems and disabilities

Table 3: Comparisons of substance use and service utilization between participants who reported childhood learning problems or disability (LD-Yes; n=133) and those who did not (LD-No; n=364).¹

Variable	Total sample N (%)	LD-No N (%)	LD-Yes N (%)	p value
<i>Substance Use (past month)</i>				
IV drug use	88 (18)	53 (15)	35 (27)	0.003*
Daily substance use (including alcohol)	143 (29)	91 (25)	52 (39)	0.002*
Daily drug use (no alcohol)	126 (25)	78 (21)	48 (36)	0.001*
Daily hard drug use (no alcohol, no marijuana)	74 (15)	45 (12)	29 (22)	0.009*
Daily alcohol use	26 (5)	17 (5)	9 (7)	0.367
Polysubstance use (no alcohol)	188 (38)	128 (35)	60 (45)	0.050+
Age first drunk (<14 years)	212 (45)	142 (42)	70 (56)	0.007*
Age of first drug use (<14 years)	178 (40)	114 (35)	64 (52)	0.001*
Sold drugs	50 (10)	32 (9)	18 (14)	0.140
Shop-lifting	62 (13)	34 (10)	28 (21)	0.001*
<i>Service Use (past 6 months)</i>				
Psychiatrist	134 (27)	109 (30)	25 (19)	0.013*
Addiction counselor	18 (4)	10 (3)	8 (6)	0.084+
Seen by a health/social service provider	384 (78)	276 (76)	108 (82)	0.204
Talked with a health/social service provider	112 (23)	69 (19)	43 (32)	0.002*
ER visit (yes/no)	281 (58)	204 (57)	77 (60)	0.594
Multiple ER visits (three or more)	107 (22)	71 (20)	36 (28)	0.058+
Ambulance (yes/no)	195 (40)	147 (41)	48 (36)	0.381
Police detention (yes/no)	80 (19)	61 (19)	19 (17)	0.610
Arrested (yes/no)	172 (36)	124 (35)	48 (38)	0.603
Multiple arrests (two or more)	75 (16)	48 (14)	27 (21)	0.044+
Court appearance	172 (35)	127 (36)	45 (35)	0.932
Justice program	48 (11)	30 (9)	18 (16)	0.076+

¹ Each multivariable model was controlled for age (continuous), age of first homelessness age (continuous), gender, ethnicity (Aboriginals, Caucasian, Other), marital status (Single vs. Other) and language spoken in childhood home (English vs. Other).

**p≤0.001

*p≤0.05

+ p≤0.10

Learning problems and disabilities

Table 4: Logistic regression analyses for socio-demographics, mental disorders, substance use and service utilization related outcomes based on early learning problems or disability (n=497).

Outcome Variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI) ¹
Age of first homelessness (<25 years) ²	1.96 (1.30, 2.95)**	1.52 (0.95, 2.44)
Lifetime duration of homelessness (>3 years) [#]	2.11 (1.40, 3.18)**	1.90 (1.19, 3.06)*
Education level (Grade 8 or less)	2.38 (1.43, 3.95)	2.20 (1.28, 3.81)
<i>Type of Mental Disorder</i>		
Major Depressive Episode	1.64 (1.10, 2.45)*	1.64 (1.07, 2.52)*
Manic or Hypomanic Episode	1.55 (0.96, 2.49)	1.51 (0.91, 2.51)
Panic Disorder	2.02 (1.28, 3.19)*	1.86 (1.15, 3.02)*
Alcohol dependence	1.67 (1.07, 2.59)*	1.69 (1.06, 2.69)*
Two or more mental disorders	2.10 (1.40, 3.15)**	2.06 (1.33, 3.19)**
High suicidality	1.89 (1.16, 3.09)*	1.93 (1.15, 3.24)*
Less severe cluster of mental disorders	2.10 (1.38, 3.16)**	1.95 (1.25, 3.04)*
<i>Physical Health</i>		
Blood-borne infectious diseases	1.76 (1.16, 2.66)*	1.75 (1.11, 2.74)*
Migraine	2.57 (1.70, 3.90)**	2.50 (1.62, 3.88)**
Seizures	2.11 (1.23, 3.61)*	2.23 (1.25, 4.00)*
Multiple physical illness	1.71 (0.98, 2.99)	2.16 (1.16, 4.02)*
Overall health (fair/poor)	1.57 (1.06, 2.35)*	1.90 (1.24, 2.92)*
History of head injury	2.33 (1.51, 3.59)*	2.23 (1.42, 3.50)*
<i>Substance Use</i>		
IV drug use	2.07 (1.28, 3.36)*	2.01 (1.19, 3.39)*
Daily drug use (no alcohol)	2.07 (1.34, 3.19)**	1.77 (1.12, 2.80)*
Daily drug use (no alcohol, no marijuana)	1.98 (1.18, 3.31)*	1.79 (1.03, 3.11)*
Daily substance use (including alcohol)	1.93 (1.26, 2.94)*	1.70 (1.09, 2.65)*
Poly-substance use (no alcohol)	1.50 (1.00, 2.24)	1.27 (0.82, 1.97)
Age first drunk (<14 years)	1.75 (1.16, 2.65)*	1.37 (0.88, 2.14)
Age of first drug use (<14 years)	1.98 (1.30, 3.02)**	1.60 (1.02, 2.50)*
	2.53 (1.46, 4.36)**	2.31 (1.30, 4.11)*
<i>Service Use</i>		
Talked with a health/social service provider	1.99 (1.30, 3.11)*	2.00 (1.25, 3.21)*
Multiple ER visits (three or more) [#]	1.12 (0.74, 1.68)	1.04 (0.67, 1.60)
Multiple arrests (two or more) [#]	1.70 (1.01, 2.87)*	1.65 (0.95, 2.86)
Justice program	1.76 (0.94, 3.92)	1.34 (0.59, 3.08)

¹ Each multivariable model was controlled for age (continuous), age of first homelessness age (continuous), gender, ethnicity (Aboriginal, Caucasian, Other), marital status (Single, Other) and language spoken in the childhood home (English, Other).

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8 ² This multivariable model was controlled for age (continuous), gender, ethnicity
9 (Aboriginal, Caucasian, Other), marital status (Single, Other), and language spoken in the
10 childhood home (English, Other).

11 # Dichotomized based on median value.

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