



# Unmet service needs and barriers to care of individuals experiencing absolute homelessness in Edmonton, Canada: a cross-sectional survey

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## Abstract

**Purpose** Individuals experiencing absolute homelessness have complex needs but limited access to services, contributing to high rates of morbidity and mortality. The aim of this article is to describe the perceived unmet service needs of individuals experiencing absolute homelessness, identify their barriers to care, and examine factors associated with specific unmet service needs.

**Methods** Using a cross-sectional survey, 150 individuals experiencing absolute homelessness were recruited from Edmonton's inner city and adjoining areas. The majority of participants were male (71.3%) and self-identified as Indigenous (74.0%). An adapted version of the Perceived Need for Care Questionnaire was used to measure past-year unmet needs for 4 types of services: hospital care, counselling, skills training, and harm reduction. Descriptive statistics and bivariate analyses were used; odds ratio and confidence intervals were calculated for statistically significant outcomes.

**Results** Overall, 89.3% of participants perceived a need for care for one or more general health and social services during the past year regarding their substance use and/or mental health problems; participants reported the highest levels of unmet need for counselling (42.9%) and skills training (39.2%). Though 73.3% of participants reported receiving any service, only 8.0% of participants reported having their perceived needs fully met.

**Conclusion** In this study, individuals reported a high percentage of unmet needs. By interacting and engaging with these hard-to-reach individuals, healthcare systems will be more equipped to service them and address their barriers to care. Better patient-centred care, housing and supports for this neglected and underserved population is needed.

**Keywords** Homelessness · Health disparities · Access to care · Healthcare utilization · Service needs

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## Introduction

Homelessness can be understood as a continuum of marginalized housing ranging from individuals living on the streets or “sleeping rough” (e.g. staying in tents or makeshift shelters), to residing in shelters, substandard housing and couch surfing [1, 2]. It is estimated that approximately 500,000 US Americans and 35,000 Canadians experience homelessness on any given night [3, 4]. Of individuals experiencing homelessness, it is estimated that 35% and 20% are “absolutely” homeless in the US and Canada respectively [4]. Unsheltered or absolute homelessness refers to individuals living on the streets or in parks, cars, abandoned buildings or in places not intended for human habitation [5]. Individuals experiencing absolute homelessness have complex needs but limited access to services, contributing to high rates of morbidity and mortality [6, 7]. The high prevalence of mental health illnesses and substance misuse among this population further complicates attempts to properly manage health and social conditions [8, 9]. Individuals experiencing absolute homelessness are substantially more likely to have alcohol and drug dependence than their housed counterparts, as well as have higher rates of psychiatric illness and disorders [10, 11].

While poorer physical health, substance misuse and mental health issues are highly prevalent in individuals experiencing homelessness, little is known about their service needs [12]. Previous research demonstrates that perceived unmet needs for social interventions, medication, counselling, skills training, harm reduction and hospital care are associated with housing stability and drug dependence [13]. Similarly, factors such as race, ethnicity, age, gender, and residential stability are associated with the utilization of specific health care services [12, 14]. However, minimal literature exists evaluating the utilization of services and the perceived service needs of individuals experiencing absolute homelessness [15].

The province of Alberta has the most significant homelessness problem per capita in Canada [16]. In the city of Edmonton, it is estimated that approximately 2000 individuals experience homelessness, 22% of which are unsheltered [17]. Among all homeless individuals living in Edmonton, almost a quarter reported addiction and substance abuse as contributing factors to their homelessness [17]. The Edmonton Drug Use and Health Survey conducted in 2014 provided detailed information on the health status and health service needs of people who use drugs residing in Edmonton’s inner city, however, data regarding health and substance use patterns among individuals experiencing absolute homelessness is limited [18]. To address this gap and to inform the designing,

implementing, and sustaining of a system of care that responds to the physical and mental health needs of homeless populations, the Undiagnosed Mental Illness in Individuals Experiencing Homelessness (UMIIEH) survey was conducted. The purpose of this survey was to provide information regarding the demographic, living situation, substance use patterns, physical and mental health, and service needs of individuals experiencing absolute homelessness in Edmonton, Canada.

Although much research has focussed on improving access to health care and housing for individuals experiencing homelessness, minimal research has focussed on those experiencing absolute homelessness [15]. The aims of this study were to describe the perceived unmet service needs of individuals experiencing absolute homelessness, identify their barriers to care, and examine whether socioeconomic marginalization, severity of substance use, and severity of health symptoms are associated with specific unmet service needs. Interacting and engaging with them on their own terms is critical to inform health care system planning, reduce mortality, and improve the health and social outcomes of this highly underserved population.

## Methods

### Study design

UMIIEH was a cross-sectional survey conducted between November 2017 and June 2018 in Edmonton. Participants were recruited by convenience sampling from Edmonton’s inner city, adjoining parkland areas, river valley and Boyle Street Community Services. Interviews were carried out by trained and experienced staff. The study protocol received ethical approval from the University of Alberta’s Health Research Ethics Board, Panel B.

### Recruitment

To be eligible for the study, participants had to report experiencing absolute homelessness in Edmonton within the last 6 months, defined as camping or “sleeping rough” in parkland/river valley areas or staying on the street with infrequent shelter stay. Individuals were recruited by the Street Outreach workers from Boyle Street Community Services and the 24/7 Crisis Diversion Team (CDT). The Outreach staff started recruitment at 7am, usually ending at 3 pm, hiking in the river valley and parklands. Outreach staff already had established relationships with individuals within the community and were therefore well received and invited into tents or shelters to conduct the survey. The 24/7 CDT would recruit from streets, doorways and bus shelters, starting at 3 pm and ending at 3am. The majority of recruitment

was done during the winter months with temperatures averaging minus 20–30 °C (68–86 °F). Once participants provided their written consent, surveys were completed in about 15–30 min. Participants were provided with a \$20 cash honorarium upon survey completion. Similarly, as the majority of participants identified as Indigenous, cultural protocols were followed and small pouches of tobacco were offered to participants. Data was collected from 150 individuals; one individual's data was excluded partway through due to delayed onset of intoxication.

## Measures

The UMIIEH study utilized a structured survey instrument, including 57 single, multi-item, and brief qualitative measures divided into five sections:

1. Basic demographic information: age, biological sex, ethnicity.
2. Living situation: stability of, and satisfaction with, living arrangements.
3. Substance use: use of alcohol, non-beverage alcohol, stimulants, and opioids.
4. Physical and mental health status and symptoms: three previously validated instruments were administered. The EQ-5D-3L is a standardized tool used to measure health-related quality of life and includes the following 5 dimensions of health: mobility, self-care, usual activities, pain/ discomfort, and anxiety/depression, and can be categorized into no problems or problems [19]. The Colorado Symptom Index (CSI) assesses psychological symptom severity with a short self-report measure of psychological symptoms that range in severity and type—8 items from the CSI assessment were included in this study [20]. Finally, the Kessler Psychological Distress Scale (K6) is a measure of psychological distress during the past 30 days and includes six questions regarding a person's emotional state with responses recorded using a 5-category scale (none of the time, a little of the time, some of the time, most of the time, and all of the time) [21].
5. Health service utilization and unmet care needs: an adapted version of the Perceived Need for Care Questionnaire was used (PNCQ), a reliable and validated instrument designed for community-based samples to measure past-year unmet service needs [22]. We asked participants: "In the past 12 months, have you received [SERVICE] because of problems with your emotions, mental health, or use of alcohol or drugs?" and repeated the question for each of four categories of service including hospital care, counselling, skills training, and harm reduction. Participants could respond: "no I did not need this kind of help [no need]", "yes in the past 12 months

and I got enough service as I needed [served]", "yes in the past 12 months and I did not get as much service as I needed [underserved]", or "no, but I think I needed this kind of help in last 12 months [unserved]". All participants reporting unserved or underserved needs for one or more of the four target services were categorized as having perceived unmet need for care. Additionally, this question series was used to assess whether or not participants had 'perceived need' for services (e.g. were served, underserved or unserved) and whether or not participants had any 'service use' (e.g. were served and underserved).

## Statistical analyses

Descriptive statistics (percentages, means) were used for demographic information, substance use patterns as well as mental and physical health status. Bivariate analyses including the Kruskal–Wallis Rank Sum Test and the Pearson's Chi-squared test were used to compare participants reporting a perceived need or no need for hospitalized care, counselling, skills training, and harm reduction services in relation to the study covariates, such as mean age, sex, and ethnicity, and the independent variables, such as housing situation, substance use, psychological symptom severity, psychological distress, and health-related quality of life. Odds ratios (ORs) and 95% confidence intervals (CI) were calculated for outcomes that were statistically significant. The barriers to care for specific services were reported through descriptive statistics. The statistical programme R 3.61 was used for all analyses and a significance level of 0.05 [23].

## Results

### Sample description

The ages of survey participants ranged from 23 to 66 years, with a median of 42.0 and interquartile range of 35.0–49.0. The majority of survey participants were male ( $n = 107$ , 71.3%). A large majority of participants self-identified as Indigenous (First Nations, Metis, or Inuit;  $n = 111$ , 74.0%), while 24.7% ( $n = 37$ ) as Caucasian, and only one participant ( $n = 1$ , 0.7%) as Middle Eastern. Participants mainly lived in parks ( $n = 64$ , 42.7%) or the street ( $n = 54$ , 36.0%), and the majority lived alone ( $n = 103$ , 68.7%). When asked about their current living situation, 91 participants (60.2%) reported that it was very unstable and 95 (63.3%) indicated that they were dissatisfied with their current living situation. The majority of participants had been in their living situation for over 18 months ( $n = 94$ , 62.7%). With regards to their substance use in the last 6 months, almost all participants reported consuming alcohol ( $n = 132$ , 88.0%), and of those

who drank alcohol, 27.3% ( $n = 36$ ) reported non-beverage alcohol consumption. Similarly, 74.6% ( $n = 112$ ) reported using one or more stimulants and only 32.2% ( $n = 48$ ) of participants reported using illicit opioids.

Health-related quality of life as measured by the EQ-5D-3L demonstrated that 87.9% of participants reported physical problems with pain/discomfort, anxiety/depression, self-care, usual activities and mobility. Psychological symptom severity scores ranged from 6 to 40, with a median score of 26.0 (interquartile range of 14). The median psychological distress score was 10 (interquartile range of 11), with 86 participants (57.7%) scoring less than or equal to 12, indicating low probability of nonspecific psychological distress, while 42.3% ( $n = 63$ ) scored greater than or equal to 13, indicating a high probability of nonspecific psychological distress.

Participant demographics, living situation, substance use, as well as physical and mental health status, are represented in the supplementary information (Table S1). As this data set has more than 40 female participants (28.7%), which is a large number for this rarely studied group, descriptive data has also been separated by gender (Table S1). The only significant differences between male and female participants were with age ( $P = 0.002$ ), ethnicity ( $P = 0.012$ ), and living arrangement ( $P = 0.002$ ).

### Unmet service need

Though 73.3% of participants ( $n = 110$ ) reported receiving any service, only 8.0% of participants ( $n = 12$ ) reported having their perceived needs fully met, while 65.8% ( $n = 98$ ) reported having an unmet service need. Participants reported the highest levels of unmet need for counselling ( $n = 63$ , 42.9%) and skills training ( $n = 58$ , 39.2%), while harm reduction and hospital care were the services with the highest level of fully met needs ( $n = 56$ , 37.6%;  $n = 23$ , 15.6%).

Overall, 89.3% of participants ( $n = 134$ ) perceived a need for care for one or more general health and social services during the past year. Participants who reported unmet needs for one or more services were more likely than those reporting no unmet service needs to be younger ( $P = 0.004$ ), use stimulants ( $P = 0.046$ ), use opioids ( $P = 0.015$ ), experience less health-related problems ( $P = 0.021$ ), experience greater psychological distress ( $P = 0.012$ ), and experience more severe psychological symptoms ( $P = 0.006$ ) (Table 1). Ethnicity, gender, living arrangement, living stability, length of stay, and alcohol use did not statistically differ between the two groups.

### Correlates of unmet service needs

Table S2 in the supplemental information summarizes the characteristics of individuals who reported a perceived need

or no need for each service. Participants who reported a perceived need for all four services (hospital care, counselling, skill training, and harm reduction) had a significantly higher median CSI score than those who reported no need for the services ( $P < 0.001$ ,  $P = 0.004$ ,  $P = 0.026$ ,  $P < 0.001$  respectively). Participants who reported a perceived need for counselling, skill training, and harm reduction were significantly younger than those who reported no need for these services ( $P = 0.025$ ,  $P = 0.038$ ,  $P < 0.001$ ). Similarly, participants who reported severe psychological distress were significantly more likely to also report a higher perceived need for hospital care ( $P = 0.002$ , OR = 3.18, 95% CI 1.58–6.37), counselling ( $P = 0.002$ , OR = 3.93, 95% CI 1.66–9.3), and skills training ( $P < 0.006$ , OR = 2.77, 95% CI 1.38–5.58) relative to participants who did not report severe psychological distress.

More specifically, participants who reported a perceived need for hospital care were also more likely to report physical health problems ( $P = 0.005$ , OR = 5.34, 95% CI 1.67–17.18) and report opioids use in the last 6 months ( $P = 0.017$ , OR = 1.66, 95% CI 0.67–4.09). Conversely, participants who reported a perceived need for counselling were 2.45 times more likely to report stimulant use in the last 6 months ( $P = 0.043$ , 95% CI 1.11–5.46). Similarly, participants who reported a perceived need for skill training were 2.03 times more likely to report an unstable living situation ( $P = 0.025$ , 95% CI 1.04–3.99) and 2.11 times more likely to be absolutely homeless for more than 18 months ( $P = 0.045$ , 95% CI 1.07–4.17). Finally, participants who reported a perceived need for harm reduction services were more likely to report stimulant use ( $P < 0.001$ , OR = 13.75, 95% CI 4.95–38.17), opioid use ( $P < 0.001$ , OR = 11.61, 95% CI 4.51–29.87), physical health problems ( $P = 0.036$ , OR = 3.48, 95% CI 1.17–10.34) and more likely to live in a parkland ( $P = 0.005$ , OR = 2.25, 95% CI 1.15–4.39). There were no significant differences in sex, ethnicity, living arrangement and alcohol use between participants reporting a perceived need or no need for care.

### Barriers to care

Participants were asked to specify what barriers stopped them from receiving any or enough health and social services in the past 12 months, summarized in Table 2. The most frequently endorsed reasons for unmet needs were motivational barriers including ‘I prefer to manage my own care’ ( $n = 121$ , 25.6%) and ‘I did not want to get help at the time’ ( $n = 61$ , 12.9%). The most common structural barriers included ‘I didn’t know where to find help’ ( $n = 52$ , 11.0%) and ‘I was only allowed a limited amount of time’ ( $n = 48$ , 10.2%).

Across all 4 services, the main motivational barrier to care was ‘I prefer to manage my own care’ but structural barriers

**Table 1** Differences among individuals who report one or more unmet need and no unmet needs

Characteristics	No unmet need ( <i>n</i> = 14)	One or more unmet need ( <i>n</i> = 128)	<i>P</i> value
Age; median [IQR]	51.50 [42.50, 56.00]	41.00 [34.00, 48.00]	0.004
Sex; <i>n</i> (%)			
Male	13 (92.9)	91 (71.1)	0.153
Female	1 (7.1)	37 (28.9)	
Ethnicity; <i>n</i> (%)			
Caucasian	6 (42.9)	29 (22.7)	0.181
Indigenous	8 (57.1)	99 (77.3)	
Living arrangement; <i>n</i> (%)			
Alone	8 (57.1)	90 (70.3)	0.532
Partner	3 (21.4)	22 (17.2)	
Immediate family	0 (0.0)	3 (2.3)	
Friend	3 (21.4)	13 (10.2)	
Living stability; <i>n</i> (%)			
Very unstable	5 (35.7)	81 (63.3)	0.073
A little unstable	1 (7.1)	13 (10.2)	
Neutral	5 (35.7)	21 (16.4)	
A little stable	0 (0.0)	5 (3.9)	
Very stable	3 (21.4)	8 (6.2)	
Length of stay; <i>n</i> (%)			
More than 18 months	5 (35.7)	50 (39.1)	1
Less than 18 months	9 (64.3)	78 (60.9)	
Alcohol use; <i>n</i> (%)			
Yes	13 (92.9)	112 (87.5)	0.879
No	1 (7.1)	16 (12.5)	
Stimulants use; <i>n</i> (%)			
Yes	7 (50.0)	100 (78.1)	0.046
No	7 (50.0)	28 (21.9)	
Opioids use; <i>n</i> (%)			
Yes	0 (0.0)	46 (35.9)	0.015
No	14 (100.0)	82 (64.1)	
Health-related quality of life; <i>n</i> (%)			
Problem	9 (64.3)	115 (89.8)	0.021
No problem	5 (35.7)	13 (10.2)	
Psychological distress; <i>n</i> (%)			
Yes	1 (7.1)	59 (46.1)	0.012
No	13 (92.9)	69 (53.9)	
Psychological symptom severity; median [IQR]	16.00 [9.75, 23.25]	27.00 [20.00, 32.00]	0.006

differed across the 4 services. ‘I didn’t know where to find help’ was the main structural barrier for counselling, harm reduction, and skills training services, while ‘I was only allowed a limited amount of time’ was the main structural barrier for hospital care services.

## Discussion

The fact that most of this sample have been in their current housing situation for over 18 months, sleeping unsheltered

**Table 2** Barriers to care

	All services <i>n</i> = 472	Counselling <i>n</i> = 193	Harm reduction <i>n</i> = 31	Hospital care <i>n</i> = 112	Skills training <i>n</i> = 136
Motivational barriers (%)					
“I prefer to manage my own care”	121 (25.6)	48 (24.9)	8 (25.8)	27 (24.1)	38 (27.9)
“I didn’t think anything would help”	37 (7.8)	20 (10.4)	4 (12.9)	4 (3.6)	9 (6.6)
“I was afraid to ask for help or what others might think of me”	45 (9.5)	19 (9.8)	3 (9.7)	10 (8.9)	13 (9.6)
“I did not want to get help at the time”	61 (12.9)	24 (12.4)	3 (9.7)	15 (13.4)	19 (14.0)
Structural barriers (%)					
“I didn’t know where to find help”	52 (11.0)	23 (11.9)	5 (16.1)	5 (4.5)	19 (14.0)
“I couldn’t financially afford the treatment”	33 (7.0)	13 (6.7)	2 (6.5)	7 (6.3)	11 (8.1)
“I asked for help, but did not receive it”	46 (9.7)	20 (10.4)	1 (3.2)	15 (13.4)	10 (7.4)
“The wait-list was too long/there was no space available for me”	29 (6.1)	10 (5.2)	4 (12.9)	7 (6.3)	8 (5.9)
“I was only allowed a limited amount of time”	48 (10.2)	16 (8.3)	1 (3.2)	22 (19.6)	9 (6.6)

despite being in one of the coldest cities in Canada, where temperatures often fall below  $-20\text{ }^{\circ}\text{C}$  ( $-4\text{ }^{\circ}\text{F}$ ) during the winter, is concerning. This population is characterized by a combination of poor physical and mental health as well as alcohol and/or substance misuse, which is also shown in other homeless populations [4, 11, 13, 15, 24]. Extremely instable and underserved individuals with complex concurrent disorders and traumatizing lifestyles often lose any practical and social support, especially without appropriate housing. Seriously vulnerable individuals are excluded from society and care services with the consequence of a significantly decreased life expectancy [25]. Typically, government agencies and experts lay out the needs of individuals experiencing homelessness in a "father knows best" way, but individuals experiencing homelessness perceive needs differently than others. The services provided therefore do not always match the services wanted. A first step in getting street entrenched populations indoors and into contact with primary and mental health care providers and housing staff is to meet them where they are and engage with them on their own terms. This study described the service needs and barriers to care of individuals experiencing absolute homelessness as perceived by them, which is essential for health care system planning and improving the outcomes of this highly underserved population.

### General unmet needs for health care services

The participants within our sample reported much higher unmet needs for care relative to population-based surveys conducted in North America and Western Europe among the general population [26, 27]. Within homeless populations, emergency-sheltered individuals use health services significantly more than do unsheltered individuals [28]. This

is consistent with local findings, as our sample reported much higher perceived needs for care than another sample of marginalized individuals who use drugs within the same city of Edmonton [13]. This reflects the limited effectiveness of local outreach efforts and the difficulty in directing individuals experiencing absolute homelessness to care. Unsheltered individuals rely on street-based outreach, drop-in centre-based services and specific homeless-directed services, whereas sheltered homeless individuals, along with the aforementioned services, have greater accessibility to resources and capabilities offered by shelters [29].

### Availability of harm reduction services

Among health and social services, harm reduction services usually have the lowest access threshold relative to other services, which might explain why this is the most met need in our sample [30]. Additionally, harm reduction programmes can also provide a wide range of support services and linkages to other healthcare services for individuals who are unable or unwilling to access other services due to social or structural factors [31]. Specifically, our findings demonstrated that opioid users and stimulant users were most likely to perceive a need for harm reduction services. This may be because needle-syringe programmes for injection drug users, opioid substitution therapy for opiate users, and antiretroviral therapy for people living with HIV are the most basic services for them [32]. Interestingly, our sample reported a lower level of perceived need for harm reduction services in 2018 than a similar sample of marginalized individuals in Edmonton in 2014 [18]. This observed shift is mainly due to the provincial change in political leadership, from a conservative party to a more progressive party, which led to an increase in funding of harm reduction services and the opening of supervised consumption sites [33–35]. As harm

reduction services are cost-effective, easily accessible and very beneficial, our findings suggest that harm reduction is an effective public health response that supports the needs of individuals experiencing absolute homelessness and can provide a point-of-entry into the healthcare system for these vulnerable individuals [36, 37].

### Reactive health service utilization

The use of acute care services was very prevalent within our sample, especially among opioid users and individuals with poor self-rated physical health. Similar findings among individuals experiencing homelessness with chronic health conditions and recent substance misuse have been reported in the literature [38, 39]. Without adequate access to services which aim to reduce risk, prevent disease and promote health, homeless individuals are predisposed to worse health outcomes for preventable conditions and are susceptible to more hospital admissions as a result [40].

### Counselling and skills training services lacking

The most unmet service needs reported by participants in this sample included counselling and skills training. These services have been shown to reduce use of substances and psychological distress, as well as improve mental health, use of services, housing, self-care management, and safe community participation [41–43]. More specifically, counselling services among homeless methamphetamine users has been shown to reduce drug use and improve mental health outcomes, which corresponds to the significant higher perceived need for counselling reported by stimulant users in our sample [41]. In addition, educational and practical components that support self-management and housing stability would greatly benefit individuals with unstable housing conditions, who reported a significantly higher perceived need for skills training services [44].

### Barriers to Care

Individuals within our sample reported stronger motivational barriers than structural barriers. This may reflect the resentment in accessing care due to the concern of care providers not adequately assisting or being less inclined to provide assistance to those with mental health and substance use problems [45]. Lowered structural barriers may be related to universal health care offered in Canada, which improves accessibility of care and services. However, common reported structural barriers included not knowing where to find help or asking for help and not receiving any. This may be a reflection of this specific isolated population, which has minimal access to resources guiding them towards appropriate care services [31, 45, 46]. However, engaging patients in

care is a professional challenge and the traditional settings in health care often do not work for these individuals, in part because of the negative attitudes, biases, and behaviours which oppress them [9, 47, 48]. A disproportionate number of individuals in our study self-identified as Indigenous, which draws attention to the complex intersecting historical and contemporary factors contributing to homelessness among Indigenous peoples in Canada [49]. This unequal burden of homelessness highlights the need for Indigenous specific services that are relevant, respectful and effective in supporting Indigenous people's wellness, transition out of homelessness and maintenance and securing of a home [49].

### Limitations

The study employed non-probability sampling methods and is therefore not necessarily generalizable to the entire population of individuals experiencing absolute homelessness. Additionally, the cross-sectional nature of the study does not enable examination of temporal relationships. Similarly, the study relied on self-report data over a 12-month period. However, most studies on perceived need for care adopt this time frame allowing for comparisons between published literature [26]. Finally, perceived need is not the same as expert-assessed need for care and could have led the sample to overestimate or underestimate their need for care.

### Conclusion

Long term homelessness is characterised by serious multi-morbidity (mental illness, physical illness and substance misuse) indicating high vulnerability and special service needs. Despite that, most individuals from this sample did not have access to appropriate care. High psychological distress was found to increase the perceived need of all services, while other factors such as stimulant use, opioid use, housing instability, and physical health were associated with specific perceived needs. The Canadian system of care is not in a position to appropriately serve these hard-to-reach patients, which contributes to their very high mortality. A first step in getting street entrenched populations indoors and into contact with primary and mental health care providers and housing staff is to engage with them on their own terms and develop services that resonate with them and that address their specific healthcare needs.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s00127-021-02080-2>.

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**Availability of data and material** The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

**Code availability** Statistical codes for this manuscript using statistical programme R 3.61 are available upon request to the corresponding author.

#### Declaration

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

**Ethics approval** This study has been approved by the University of Alberta' Health Research Ethics Board and has therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

**Consent to participate** All participants gave their informed consent prior to their inclusion in the study.

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