



**Journal of Health Disparities Research and Practice**  
**Volume 8, Issue 1, Spring 2015, pp. 81 - 97**

© 2011 Center for Health Disparities Research

School of Community Health Sciences

University of Nevada, Las Vegas

## **Chronic Physical Health Conditions among Homeless**

Nooshin Nikoo, School of Population and Public Health & Institute of Mental Health, University of British Columbia

Marjan Motamed, Institute of Mental Health, Department of Psychiatry, University of British Columbia

Mohammad Ali Nikoo, Department of Psychiatry, University of British Columbia

Verena Strehlau, Department of Psychiatry & Institute of Mental Health, University of British Columbia

Erika Neilson, Institute of Mental Health, Department of Psychiatry, University of British Columbia

Sahoo Saddicha, Psychiatry, Melbourne Health

Michael Krausz, School of Population and Public Health, Department of Psychiatry, & Institute of Mental Health, University of British Columbia

### **ABSTRACT**

Objective: Morbidity and mortality among homeless individuals is higher than the general population. This study aims to determine the prevalence of current self-reported, chronic physical health conditions in a large sample of homeless people with sub-samples from shelters and street in British Columbia, Canada.

Methods: Cross-sectional survey applying modified version of the 'National Survey of Homeless Assistance Providers and Clients (NSHAPC)' questionnaire in multiple sites in Vancouver, Victoria and Prince George, British Columbia, Canada. Sample: Five hundred homeless individuals were surveyed between May and September of 2009. A person was defined as homeless if he/she had a self-identified living status of being without permanent housing prior to study entry for a minimum duration of one month. The main outcome measures were prevalence rates of self-reported chronic physical health conditions. A chronic physical health condition was defined as a condition, expected to last or had already lasted 6 months or more, which had been diagnosed by a health professional.

Results: The most commonly self-reported, chronic, physical health condition in this group of homeless participants was history of head injury with subsequent loss of consciousness, dizziness, confusion, or disorientation (63.6%) followed by back problems (38.8%), chronic hepatitis (34.6%), migraine headaches (29.2%), and arthritis (28.4%). Chronic obstructive lung disease was reported by 15.8% of the participants, and high blood pressure by 15.6%. 7.6% indicated they were HIV-positive and/or had AIDS.

Conclusion: Homeless people have a high prevalence of chronic physical health condition, in the following areas: neurological, musculoskeletal, infectious and respiratory diseases. Precarious living conditions and housing, poor nutrition, psychosocial stress, smoking, and substance use are among common detrimental risk factors for many of these conditions.

**Keywords:** chronic disease, homeless, HIV, Hepatitis C, back pain, physical health

## INTRODUCTION

Homelessness is an escalating global challenge especially in metropolitan areas. Absolute homelessness is defined as a living situation without physical accommodation and individuals described as being absolutely homeless often sleep outdoors, in emergency shelters or at other places not meant for human habitation (Stephen W. Hwang, 2001). Within developed countries, homelessness rates at a given time are now approximated to be near 1% of urban populations (Turnbull, Muckle, & Masters, 2007). Many efforts have been dedicated to calculating the magnitude of homelessness in Canada. One of the most recognized figures emerged from the 2001 Canadian Census, in which the size of the homeless population was reported at over 14,000, which likely is an underestimation of the actual number of homeless individuals (Patterson, Somers, McIntosh, Shiell, & Frankish, 2008).

The number of homeless people in Canada has grown in the last decade, as a result of many factors that involve Canada's urbanization practices (Frankish, Hwang, & Quantz, 2005). Recent data from a March, 2013 Ipsos Reid poll –A poll conducted by Canadian arm of the global Ipsos Group-suggests that as many as 1.3 million Canadians have experienced homelessness or precarious housing at some point during the past five years (Gaetz, Donaldson, Richter, & Gulliver, 2013). In 2007, the BC Ministry of Health assessed the number of inadequately housed people between 17,500 and 35,500 in British Columbia (Patterson, et al., 2008).

A clear association between homelessness and poor physical health has been recognized (Turnbull, et al., 2007). Homeless persons are at higher risk for morbidity and mortality, in comparison with the general population (Stephen W Hwang, Wilkins, Tjepkema, O'Campo, & Dunn, 2009; O'Connell, 2005) with higher prevalence rates of chronic physical health conditions including infections, such as tuberculosis, HIV/AIDS, hepatitis, respiratory infections, and skin infections (Grangeiro et al., 2012; Khandor et al., 2011; Plevneshi et al., 2009; Ryan, 2008; Tan de Bibiana et al., 2011; Tyler et al., 2013; Vahdani, Hosseini-Moghaddam, Family, & Moheb-Dezfouli, 2009; Wiersma et al., 2010). Noninfectious diseases such as chronic obstructive lung/pulmonary disease, unintentional injuries, cardiovascular diseases, musculoskeletal disorders, seizure disorders and cancer also greatly affect this population's physical health status (Brown, Kiely, Bharel, & Mitchell, 2013; Crowe & Hardill, 1993; Kaldmae et al., 2011; Page, Thurston, & Mahoney, 2012; Snyder & Eisner, 2004; Topolovec-Vranic et al., 2012). Consequently, adverse health conditions can contribute to the commencement of homelessness, while poor living standards exacerbate the poor health status (Frankish, et al., 2005). Poor health in homeless individuals can be aggravated further by the many barriers to accessing primary health care services, such as lack of transportation to health care facilities, access to regular family doctors and the exposure to stigmatized attitude of some health care professionals (Khandor, et al., 2011).

The BC Health of the Homeless survey (BCHOHS) was conducted to provide a detailed and accurate description of self-reported, physical health conditions among a large sample of 500 homeless people in British Columbia as planning framework for this high need population.

## **METHODS**

### Study design and population

Detailed description of sampling procedure has been presented elsewhere (Torchalla et al., 2011). In brief, this study is a cross-sectional survey sampling homeless adults 19 years of age and older recruited between May and September of 2009, from multiple sites in three cities in British Columbia, Canada: Vancouver, Victoria, and Prince George. For this study, homelessness was self-identified as living, at least within the last month, in a shelter or on the street, outdoors and in abandoned and public buildings, subways, and vehicles. Individuals living in precarious housing (e.g. single hotel rooms, substandard homes) and institutions (e.g. jails/prisons, residential treatment facilities, domestic violence centers) were excluded from the study.

Fifty percent of participants were recruited from emergency shelters and 50% were recruited from living homeless on the streets. Purposive sampling recruited a significant proportion of women, Aboriginal people, and young people, subpopulations of homeless individuals that are often underrepresented in surveys.

Two hundred females and 299 males were recruited in 2009. People who did not fulfill the inclusion criteria of homelessness, who were unable to communicate in English, and/or who were unable or unwilling to give informed consent were excluded.

Each participant received \$30 for participating in research. The Behavioral Research Ethics Board of the University of British Columbia and the Providence Health Care Research Institute approved this study.

Eligible individuals interested in participation were then provided with the goals and rationale of the study and requirements for participation. Those who were able and willing to give written informed consent attended a one-session, face-to-face, structured, clinical interview. Research team members trained in survey conduction administered the survey to each participant. This usually took place in a research office, immediately after recruitment at shelters and streets. Some participants were interviewed at the shelters and drop-in centers where they felt more comfortable.

### Survey Instruments

A modified version of the 'National Survey of Homeless Assistance Providers and Clients (NSHAPC) – Health Chapter' a health status instrument that has been validated for use in homeless populations' studies, to assess recent (i.e. last 6 months) and chronic physical health conditions, health care utilization behavior, and barriers to accessing healthcare, was used. Information was assessed with single item and two response options (i.e., yes/no) (Burt, 1999).

Demographic information, including age, sex, marital status, housing situation, education, and self-identified ethnic background was obtained. The presence of self-reported, chronic, physical health conditions was determined by defining the conditions as "long term conditions", which were expected to last or had already lasted 6 or more months and that had been diagnosed by a healthcare professional. Prevalence of a current chronic physical health conditions was determined using the question, "*Do you have any of the following medical condition [diagnosed by a health professional]*" At each body system section, participants were

asked about having specific long-term physical health condition, as well as an open question to specify any other health condition in that category.

#### Statistical Analysis

All data were entered in Statistical software SPSS version 21.0 for Mac (SPSS Inc., Chicago, IL). Numerical variables were presented as mean (SD), while nominal and categorical variables were summarized by absolute frequencies and percentages.

The prevalence of categories of chronic health conditions was compared in different genders, age group, education level, and housing status using Fisher's exact test. P-value  $\bullet 0.05$  was considered significant.

Also, prevalence was compared in different ethnicities using Chi-square test. However, since the nonwhite and nonaboriginal ethnicity subcategory had a very small size, Fisher's exact test was applied to compare each one of ethnicity groups with the other two groups for their reported chronic health conditions. Those chronic conditions with P-Value  $\bullet 0.05$  in this stage would be reported as significant prevalent condition for that ethnicity.

## RESULTS

### Socio-demographic context of the study (Table-1)

Forty percent (n=200) of the participants who completed the study were female. The average age of participants was 37.9 years (SD=11.0) with 15% of the participants being 24 years old or younger.

Table 1- Socio-demographic characteristics of participants in BC Homeless Survey, from May to September 2009

Variable	Number (%) Total Sample N=500
Youth (Age $\bullet$ 24) <sup>a</sup>	75 (15.0)
<u>Gender</u>	
Female	200 (40)
Male	299 (59.8)
Missing	1 (0.2)
<u>Ethnicity</u>	
White	280 (56.0)
Aboriginal	199 (39.8)
Other <sup>b</sup>	21 (4.2)
<u>Current housing</u>	
Street	250 (50.0)
Shelter	250 (50.0)
<u>Education</u>	
Less than high School education	318 (63.6)
Married/partnered Common law	49 (9.8)

<sup>a</sup> Mean Age of the surveyed population + Standard deviation is  $37.9 \pm 11.0$

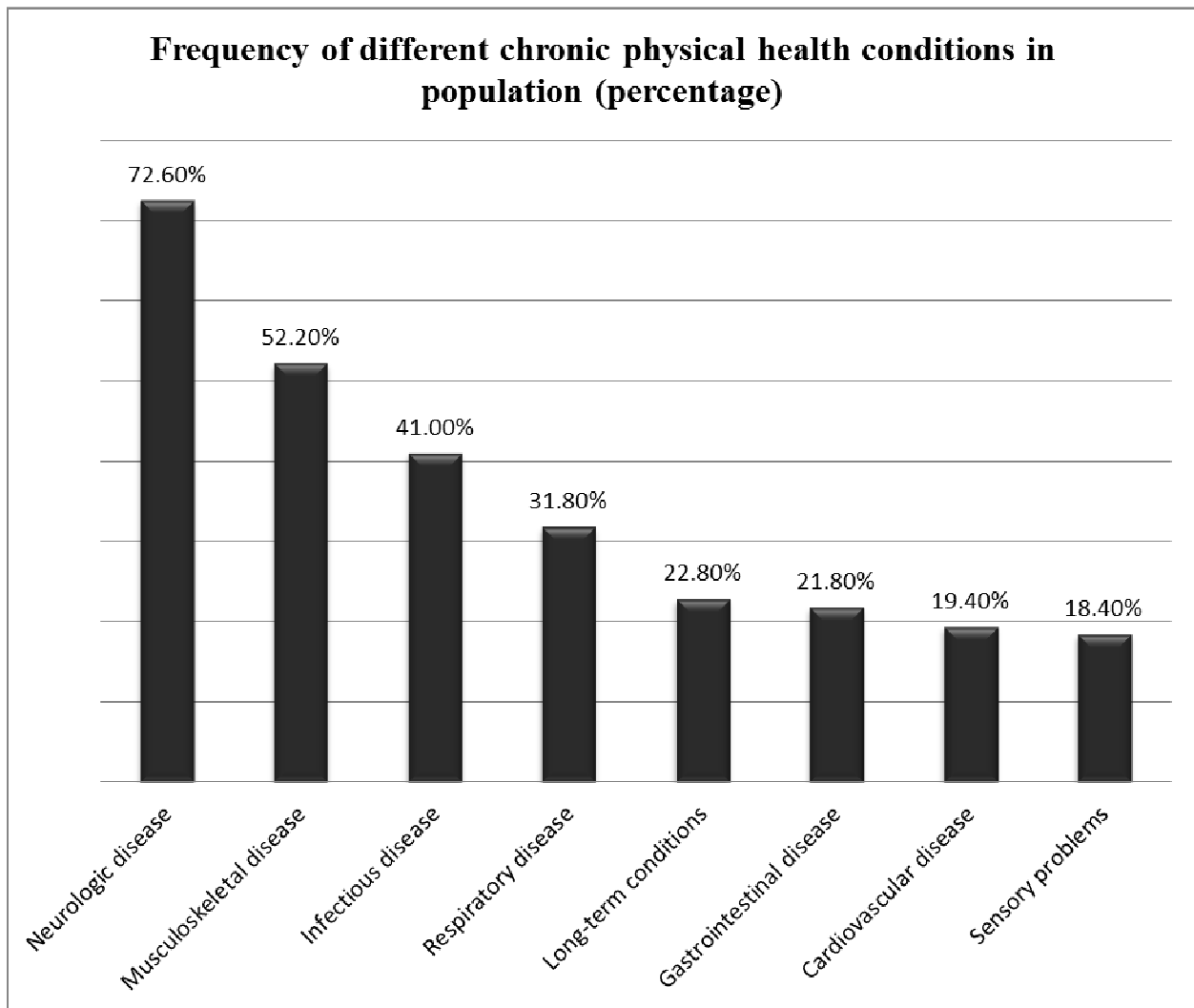
<sup>b</sup> includes Black/African (2.2%); Asian (1.2%); Hispanic/Latin American (0.8%); ethnic background was selected as self identified from a list of categories including: European/Caucasian, Aboriginal, African, Asian, Hispanic/Latin American, and Other. The ethnic background classified as "Other", included Black/African, Asian, and Hispanic/Latin American. The participants who self-identified themselves as Aboriginal in this study, represented peoples throughout British Columbia and included: Cree, Carrier, Dene, Gitksan, Sekani, Ojibway, Coast Salish and

Metis.

Prevalence of chronic physical health conditions

Neurological (72.6%, n=363), infectious (47.2%, n=236) and musculoskeletal (41.0%, n=205) conditions were the most common chronic health conditions respectively (Figure 1), affecting homeless people surveyed in BC, in 2009. Prior head trauma/injuries with subsequent loss of consciousness dizziness, confusion, or disorientation were the most common physical conditions affecting 318 individuals (63.6%) followed in frequency by back problems (excluding fibromyalgia and arthritis) in 194 (38.8%) individuals and Hepatitis B/C in 173 individuals (34.6%).

Figure -1-Frequency of self-reported physical health conditions by 500 homeless individuals in BC Homeless Survey, from May to September 2009.



There was a high prevalence of migraine headache (29.2%, n=146) and arthritis (excluding fibromyalgia) (28.4%, n=142) in this population (Table 2).

Table-2- Frequencies and percentages of chronic physical health conditions

<b>Chronic physical health conditions</b>	<b>n (%)</b>
<b><u>Cardiovascular</u></b>	<b>97 (19.4%)*</b>
High blood pressure	78 (15.6 %)
Heart disease	16 (3.2%)
Other	22 (4.4%)
Specified as Heart murmur	8 (1.6%)
Not specified	14 (2.8%)
<b><u>Respiratory</u></b>	<b>159 (31.8%)</b>
Asthma	114 (22.8%)
Emphysema	19 (3.8%)
Chronic bronchitis	61 (12.2%)
Chronic obstructive pulmonary disease (COPD)	11 (2.2%)
Other and not specified	7 (1.4%)
<b><u>Gastrointestinal</u></b>	<b>109 (21.8%)</b>
Cirrhosis (Damaged liver from alcohol or drugs)	30 (6%)
Chronic diarrhea	18 (3.6%)
Intestinal or stomach ulcers	53 (10.6%)
Urinary incontinence	23 (4.6%)
Bowel disorders (Crohn's disease, ulcerative colitis, Irritable bowel syndrome or bowel incontinence)	22 (4.4%)
Other and not specified	11 (2.2%)
<b><u>Musculoskeletal</u></b>	<b>261(52.2%)</b>
Arthritis	142 (28.4%)
Back problems, (excluding fibromyalgia and arthritis)	194 (38.8%)
Problems in walking, lost limb, physical Handicap(s)	119 (23.8%)
Other	35 (7.0%)
Specified as "history of fracture"	10 (2.0%)
Specified as Fibromyalgia	3 (0.6%)
Not specified	22 (4.4%)
<b><u>Infectious</u></b>	<b>205 (41.0%)</b>
HIV infection or AIDS	38 (7.6%)
Tuberculosis exposure or positive TB test	32 (6.4%)
Hepatitis B or C	173 (34.6%)
Other	11 (2.2%)
Not specified	6 (1.2%)
<b><u>Neurologic</u></b>	<b>363 (72.6%)</b>
Epilepsy	17 (3.4%)
Fetal alcohol syndrome or fetal alcohol spectrum disorder	32 (6.4%)
Migraine headaches	146 (29.2%)
History of head injury with resultant Knock out or at least dizziness, confusion, or disorientation	318 (63.6%)
Consequences of a stroke	13 (2.6%)

## 87 Chronic Physical Health Conditions Among Homeless

Nikoo et al.

Other and not specified	21 (4.2%)
<b><u>Sensory</u></b>	<b>92 (18.4%)</b>
Glaucoma	5 (1.0%)
Cataracts	16 (3.2%)
Hearing problems	67 (13.4%)
<b><u>Long-term conditions</u></b>	<b>114 (22.8%)</b>
Cancer	27 (5.4%)
Diabetes	17 (3.4%)
Anemia (poor blood, low iron)	52 (10.4%)
Skin disease (for- example, eczema or psoriasis)	44 (8.8%)
Other	18 (3.6%)
Specified as Thyroid problems	4 (0.8%)
Specified as Hypoglycemia	3 (0.6%)
Specified as Allergy	3 (0.6%)
Not specified	8 (1.6%)

\*More than one response to questions in the same category (major organ system) was counted once in calculating the prevalence of the reported physical health condition in each major organ category of questions

### Comparing prevalence of chronic physical health conditions for age, gender, ethnicity, education and housing categories (Table 3):

Eighty Nine percent of participants younger than 24 years of age (67/75) reported at least one chronic health condition. However, none of these self-reported categories was more prevalent compared to participants older than 24 years. Comparing for gender and education level, there was no statistically significant difference in the prevalence of reported categories of chronic health conditions. Self-reported neurologic disease and the category of long-term conditions inclusive of Diabetes Mellitus and Anemia were significantly more reported amongst White and Aboriginal ethnicities. Ninety Five percent (189/199) of aboriginal participants reported at least one chronic condition; 17.1 % (34) had one, 22.6% (45) had two and 50.3% (100) had 3 or more chronic health conditions. Also, aboriginal participants had higher frequency of self-reported infectious disease compared to other ethnicities (P-value = 0.03). Participants, who had reported street as their current housing, reported a higher prevalence of neurologic, sensory problems, musculoskeletal, cardiovascular diseases, gastrointestinal, and some other long-term conditions compared to shelter dwellers.

Table-3- Prevalence of categories of chronic health conditions compared for age, gender, ethnicity, education level and housing status.

		Neurologic	Musculoskeletal	Infection	Respiratory	Long-term	Gastrointestinal	Cardiovascular	Sensory
	Number	Number of self reported chronic health condition (%)							
<b>Age</b>									
≤24 (75)	75	53 (70.7)	37 (49.3)	26 (34.7)	27 (36)	9 (12.0)	10 (13.3)	17 (22.7)	15 (20.0)
>24 (425)	425	310 (72.9)	224 (52.7)	179(42.1)	132 (31)	105 (24.7)	99 (23.3)	80 (18.8)	77 (18.1)
<b>P value*</b>		0.68	0.62	0.25	0.42	<b>0.02**</b>	0.07	0.43	0.75
<b>Gender</b>									
<b>Male</b>	300	221 (73.9)	164 (54.8)	123 (41.1)	100 (33.4)	69 (23.1)	71 (23.7)	59 (19.7)	61 (20.4)
<b>Female</b>	200	141 (70.5)	96 (48.0)	81 (40.5)	59 (29.5)	44 (22.0)	37 (18.5)	38 (19)	30 (15.0)
<b>P value*</b>		0.41	0.14	0.93	0.38	0.83	0.18	0.91	0.16
<b>Ethnicity</b>									
<b>White</b>	280	212 (75.7)	149 (53.2)	103 (36.8)	86 (30.7)	60 (21.4)	58 (20.7)	57 (20.4)	53 (18.9)
<b>Aboriginal</b>	199	142 (71.4)	103 (51.8)	94 (47.2)	67 (33.7)	54 (27.1)	47 (23.6)	39 (19.6)	35 (17.6)
<b>Other</b>	21	9 (42.9)	9 (42.9)	8 (38.1)	6 (28.6)	0 (0.0)	4 (19)	1 (4.8)	4 (19.0)
<b>P value<sup>¥</sup></b>		<0.01	0.65	0.07	0.75	0.01	0.71	0.22	0.93
<b>Education</b>									
<b>Less than high school</b>	318	239 (75.2)	169 (53.1)	124 (39.0)	107(33.6)	76 (23.9)	67 (21.1)	64 (20.1)	58 (18.2)
<b>High school or higher</b>	182	124 (68.1)	92 (50.5)	81 (44.5)	52 (31.8)	38 (20.9)	42 (23.1)	33 (18.1)	34 (18.7)
<b>P value*</b>		0.10	0.58	0.26	0.27	0.51	0.65	0.64	0.91
<b>Housing</b>									
<b>Shelter</b>	250	113 (45.2)	103 (41.2)	103 (41.2)	70 (28.0)	46 (18.4)	44 (17.6)	31 (12.4)	27 (10.8)
<b>Street</b>	250	250 (100)	158 (63.2)	102 (40.8)	89 (35.6)	68 (27.2)	65 (26.0)	66 (26.4)	65 (26.0)
<b>P value*</b>		<b>&lt;0.01**</b>	<b>&lt;0.01**</b>	1.00	0.08	<b>0.03**</b>	<b>0.03**</b>	<b>&lt;0.01**</b>	<b>&lt;0.01**</b>

\* Fisher's exact test ¥ Chi-square test \*\* P value ≤0.05 is considered significant

## DISCUSSION

### Socio-demographic characteristics



The current homeless population in Vancouver includes sizable number of young adults and women compared to the previously reported populations of single adult males with alcohol and/or substance use (Turnbull, et al., 2007). Hence, a recruitment of 40% women through purposive sampling combined with the reported mean age of 37.9 years ( $\pm 11.0$ ) having 15 % younger than 24 years makes this study more comparable to this population. Subsequently it makes it possible to have a better understanding of the specific needs of the usually underrepresented homeless women and youth (Begin, Casavant, & Chenier, 1999; Goldberg & Planning, 2005; Montgomery, Brown, & Forchuk, 2011; Quantz, 2002; Woodward, Eberle, Kraus, & Graves, 2002). Our purposive sampling method recruited 40% aboriginal participants, which concurs with studies indicating high percentage of reported aboriginal ethnicity amongst most Canadian homeless communities (Cardinal & Adin, 2005; Gaetz, et al., 2013; Goldberg & Planning, 2005; Hanselmann, 2001; Stephen W. Hwang, 2001; Quantz, 2002). 63.6% of the participants did not complete high school. Lower formal education has been suggested to be a contributory factor to homelessness (Frankish, et al., 2005; Josephson, 2004).

#### Physical health conditions

A history of head injury was the most prevalent neurological condition, and the most prevalent overall health condition among this population. Topolovec-Vranic, et al. 2012 systematic review found a higher frequency of traumatic head/brain injury (TBI) ranging from 8%-53% in homeless individuals, as compared to the general population. Two studies assessing the temporal relationship between homelessness and TBI showed the first incidence of TBI occurring before the onset of homelessness for the majority of participants, suggesting that TBI may be a contributory factor for homelessness. It was also suggested that homeless individuals with a history of TBI are more susceptible to subsequent injuries, causing cumulative impacts on cognitive and/or executive function with subsequent cognitive impairment, which in turn may contribute to the chronicity of homelessness (Backer & Howard, 2007; Stephen W Hwang et al., 2008; Oddy, Moir, Fortescue, & Chadwick, 2012; Topolovec-Vranic, et al., 2012). While our study finding is supporting the result of a high prevalence rate for TBI, causal relationship or the timely sequence of homelessness and TBI was not retrievable from the questionnaire used in our sample.

Migraine headaches were the second most prevalent reported neurological condition, congruent with Lee, et al. 2007 (D. F. Lee et al., 2007). History of head or neck injury, stressful life events, low socioeconomic status and depression are among the proposed risk factors for chronic migraine, which are all higher in frequency in the homeless population and therefore can be contributory to the high rate of migraine headaches in the homeless population (Cevoli et al., 2006; Couch, Lipton, Stewart, & Scher, 2007; Scher, Stewart, Ricci, & Lipton, 2003).

Finding musculoskeletal diseases as the second most prevalent reported category with back problems -excluding fibromyalgia and arthritis- as the most common health conditions is congruent with two previous reports (U. Beijer & Andreasson, 2009; van Laere, de Wit, & Klazinga, 2009). A systematic review showed a high prevalence of cognitive deficit, smoking, low education, low income, excessive alcohol consumption, depression and anxiety, as reported risk factors for musculoskeletal complaints in homeless population (Miranda, Vivielle, Machado, & Dias, 2012).

Other frequently reported conditions in our sample were Hepatitis B/C infection, HIV-infection/AIDS, 'Tuberculosis (TB) exposure and/or a positive TB test', in decreasing order of frequency. These findings are in line with a systematic review that reported the prevalence of HCV (3.9-36.2%), HIV (0.3-21.1%), TB (0.2-7.7%) and with the existing evidence on the

prevalence of HBV (3.3%- 34.7%) in homeless population (Ulla Beijer, Wolf, & Fazel, 2012; Brito, Parra, Facchini, & Buchalla, 2007; Moses, Mestery, Kaita, & Minuk, 2002; Vahdani, et al., 2009). Homelessness can be a predisposing factor for both latent and active forms of TB infection. Over-crowding, inappropriate ventilation in shelters and contact throughout large transient populations expose homeless individuals to Mycobacterium Tuberculosis, while malnutrition, alcohol use disorders and – although rare in BC - untreated HIV-infection accelerate progression of latent infection into the active form of the disease (Agustí & Barnes, 2012; Clark, Riben, & Nowgesic, 2002; Tan de Bibiana, et al., 2011). Injection drug use, multiple sexual partners, sex work and inconsistent use of condoms are suggested risk factors for blood born infections-HIV, HBV and HCV (Ulla Beijer, et al., 2012; Brito, et al., 2007; Vahdani, et al., 2009).

Asthma and obstructive lung diseases (COPD) were the main reported respiratory illnesses, congruent with Snyder & Eisner's (2004) study which determined the frequency of COPD to be 15% in the homeless population of San Francisco, California, USA, more than twice in the general US population in 2002 (Snyder & Eisner, 2004). High prevalence rates of smoking, poor nutrition and adverse environmental exposure in the homeless population can contribute to their increased rate of COPD (Agustí & Barnes, 2012; Itoh, Tsuji, Nemoto, Nakamura, & Aoshiba, 2013).

The high rate of asthma agrees with findings of two previous reports showing high prevalence of asthma in adult homeless people in Dublin, 2005, and homeless children in US (Cutuli, Herbers, Rinaldi, Masten, & Oberg, 2010; McLean et al., 2004; O'Carroll & O'Reilly, 2008). This could be the result of a possibly higher rate of respiratory infections, smoking or exposure to second-hand smoke pollution in unfavorable housing condition, all amongst proposed risk factors for asthma (Jie, Isa, Jie, Ju, & Ismail, 2013; Vernon, Wiklund, Bell, Dale, & Chapman, 2012).

Finally, cardiovascular disease, one of the leading causes of mortality in the homeless community, was reported in about 1/5 of surveyed people in this study (Stephen W Hwang, et al., 2009; Page, et al., 2012). Although high prevalence of hypertension in the homeless population has not been a consistent finding, poorly controlled hypertension is a common finding (Kim et al., 2008; T. C. Lee et al., 2005; Oliveira, Pereira, Azevedo, & Lunet, 2012). While emotional stress increases the risk of cardiovascular disease, high frequency of smoking in the homeless population can also augment their cardiovascular-related mortality (Kim, et al., 2008; Kubisová et al., 2007; Oliveira, et al., 2012).

This study evaluated the self-reported frequency of a comprehensive list of chronic physical health conditions in a unique sample of homeless individuals including a significant proportion of women, Aboriginal people, and youth subpopulations of homeless individuals that could often be underrepresented in surveys. Additionally, this unique sample consists of subpopulations of homeless people living in shelter as well as those living on the streets, which add to the generalizability of the reported findings to physical health condition of all the homeless population in general.

Compared to current prevalence of physical health conditions in general population, our survey revealed 2 times more arthritis and back pain, 3.5 times more migraine headaches, 3 times more asthma, 4 times more chronic obstructive pulmonary disease, 38 times more HIV infection, 70 times more chronic hepatitis B or C, 1000 times more Tuberculosis exposure (Bath, Trask, McCrosky, & Lawson, 2014; "Estimates of HIV Prevalence and Incidence in Canada, 2011," 2012; "Health Fact Sheets – Arthritis, 2013," 2014; "Health Fact Sheets – Asthma, 2013," 2014;

"Health Fact Sheets – Chronic obstructive pulmonary disease in Canadians, 2009 to 2011," 2012; Rotermann, Langlois, Andonov, & Trubnikov, 2013; "Tuberculosis in Canada 2012 - Pre-Release," 2014). These findings of high prevalence of treatable chronic health conditions has very strong implications for advocacy, policy making and healthcare provision priority setting as well as service delivery to homeless population regardless of the severity of their homelessness.

Interestingly, reported Diabetes Mellitus (DM) in our survey was half of the reported DM in general population. As well, Cancer was reported one eighth as common as its prevalence in general population in Canada. Meanwhile, the prevalence of hypertension was similar to its prevalence in general population ("Health Fact Sheets – Diabetes, 2013," 2014; "Canadian Cancer Statistics publication," 2013; "Health Fact Sheets – High blood pressure, 2013," 2014). These revealed low prevalence chronic physical health conditions could be a result of lower prevalence of obesity and its metabolic, carcinogenic and atherosclerotic consequences in homeless population. The irony of food instability after all has played some role that is in favor of the vulnerable homeless population.

Factors associated with increased frequency of self-reported chronic health conditions:

A high proportion of youth in our sample (89.3%) reported having one or more chronic health conditions. This is in line with the reported 74% prevalence of one or more chronic medical condition in homeless youth of British Columbia (Goldberg & Planning, 2005). This highlights the significant healthcare needs of homeless youth, which is the fastest growing homeless subpopulation in Canada (Boivin, Roy, Haley, & Galbaud du Fort, 2005; Edidin, Ganim, Hunter, & Karnik, 2012; Frankish, Hwang, & Quantz, 2005).

Comparing for gender, or education level, this study could not find any difference in prevalence of various categories of chronic health conditions. This finding is supported with the study from Los Angeles about 385 male and 144 female homeless participants (L. Gelberg & Linn, 1992). On the other hand, the study of 1,704 homeless from Stockholm; 1,364 males (80%) and 340 female, reported higher risk of diseases of blood, genitourinary system, eye, skin, as well as neoplasm and infections in homeless women. However women were reported to be at lower risk of injury/poisoning, diseases of the circulatory, digestive, respiratory system and ear (Beijer & Andreasson, 2009). This suggests the possibility of finding gender difference in chronic health conditions in a larger population of homeless people.

In this study, 95 % (189) of aboriginal participants reported at least one chronic condition; 17.1 % (34) had one, 22.6% (45) had two and 50.3% (100) had 3 or more chronic health conditions. This shows a significantly higher prevalence of chronic health conditions compared to previous studies on health status of different aboriginal subpopulations in Canada ("Inuit health: Selected findings from the 2012 Aboriginal Peoples Survey," 2014, "Aboriginal Peoples Survey, 2006: An overview of the health of the Métis population," 2006, Aboriginal Peoples Survey 2001 - Initial Findings: Well-being of the Non-reserve Aboriginal Population, 2001). This indicates the association of homelessness with multiple chronic health conditions.

The three most common chronic health condition categories in aboriginal subpopulation in our study were neurologic (71.4%), musculoskeletal (51.8%) and infectious disease (47.2%). Also, compared to white and non-aboriginal ethnicities, participants with reported aboriginal ethnicity had a significantly higher prevalence of infectious disease. This could be explained by higher vulnerability to infectious disease reported in previous studies in aboriginal population. (Reading, 2009; Ryan, 2008).

Living on streets was associated with increased frequency of all categories of chronic health conditions except infectious and respiratory tract conditions. This is in agreement with

previous studies demonstrating poorer physical health as well as less medical service use by the people living on streets compared to their sheltered counterparts (Lillian Gelberg & Linn, 1989; Nyamathi, Leake, & Gelberg, 2000). Poorer hygiene, more severe malnourishment, more engagement in risky sexual behavior and drug use are possible factors in increasing frequency of chronic health conditions among homeless people living on streets compared to sheltered homeless individuals. Supportive housing programs could play a significant role in improving physical health of homeless population (Stephen W Hwang, Tolomiczenko, Kouyoumdjian, & Garner, 2005).

Limitations:

While including three cities strengthens the reliability of results by not narrowing our scope to only one location, it may limit the generalizability of the findings to homeless populations from other Canadian provinces or countries. Secondly, the self-reported nature of this data introduces reporting bias and recall bias, calling for an objective assessment of the physical health status of the homeless in future studies. Thirdly, selecting a representative sample of the homeless population is always difficult to achieve and possible resultant bias should be considered while interpreting results considering our purposive sampling. Finally, because the aim of this study was to determine the prevalence of all possible self-reported, chronic, physical health conditions in one survey, the questionnaire covered a broadly categorized, all-inclusive but non-exhaustive list of chronic physical conditions. This led to the inevitable formation of categories of physical health conditions, lacking in adequate details and accuracy of diagnosis for the self-reported health conditions. Hence, we suggest that future studies evaluate a more detailed, objective and specific questionnaire, to detect common medical conditions of concern within the homeless population.

**CONCLUSION**

Neurological, musculoskeletal, infectious and respiratory diseases were frequent self-reported physical conditions among homeless people surveyed. There was a notable prevalence of neurological conditions, especially migraine headache, and also musculoskeletal disorders, in those surveyed. These findings, call for awareness on the part of primary healthcare physicians who are in the first line of treatment. Additionally, the risk factors for many of these conditions, such as precarious living conditions, poor nutrition, psychosocial stress, smoking and substance use, can be addressed towards improving the health status of this population within different levels of the healthcare system.

**ACKNOWLEDGEMENTS**

We would also like to thank the interviewers and participants from three cities in British Columbia, Canada: Vancouver, Victoria, and Prince George.

**REFERENCES**

Aboriginal Peoples Survey 2001 - Initial Findings: Well-being of the Non-reserve Aboriginal Population. (2001). Ottawa: authority of the Minister responsible for Statistics Canada Retrieved from <http://www5.statcan.gc.ca/olc-cel/olc.action?objId=89-589-X&objType=2&lang=en&limit=1>.

Aboriginal Peoples Survey, 2006: An overview of the health of the Métis population. (2006, 09/12/2013) Retrieved 10/10/2014, from <http://www.statcan.gc.ca/pub/89-637-x/89-637-x2009004-eng.htm>

- Agustí, A., & Barnes, P. J. (2012). Update in Chronic Obstructive Pulmonary Disease 2011. *American Journal of Respiratory and Critical Care Medicine*, 185(11), 1171-1176. doi: 10.1164/rccm.201203-0505UP
- Backer, T. E., & Howard, E. A. (2007). Cognitive impairments and the prevention of homelessness: Research and practice review. *The journal of primary prevention*, 28(3-4), 375-388.
- Bath, B., Trask, C., McCrosky, J., & Lawson, J. (2014). A Biopsychosocial Profile of Adult Canadians with and without Chronic Back Disorders: A Population-Based Analysis of the 2009-2010 Canadian Community Health Surveys. *BioMed Research International*, 2014, 11. doi: 10.1155/2014/919621
- Begin, P., Casavant, L., & Chenier, N. M. (1999). *Homelessness*. Ottawa: Library of Parliament Retrieved from <http://www.parl.gc.ca/content/lop/researchpublications/prb991-e.htm#Three-txt>
- Beijer, U., & Andreasson, S. (2009). Physical diseases among homeless people: gender differences and comparisons with the general population. *Scand J Public Health*, 37(1), 93-100. doi: 10.1177/1403494808099972
- Beijer, U., Wolf, A., & Fazel, S. (2012). Prevalence of tuberculosis, hepatitis C virus, and HIV in homeless people: a systematic review and meta-analysis. *The Lancet Infectious Diseases*, 12(11), 859-870.
- Boivin, J. F., Roy, E., Haley, N., & Galbaud du Fort, G. (2005). The health of street youth: a Canadian perspective. *Can J Public Health*, 96(6), 432-437.
- Brito, V. O., Parra, D., Facchini, R., & Buchalla, C. M. (2007). HIV infection, hepatitis B and C and syphilis in homeless people, in the city of São Paulo, Brazil. *Revista de Saúde Pública*, 41, 47-56.
- Brown, R. T., Kiely, D. K., Bharel, M., & Mitchell, S. L. (2013). Factors associated with geriatric syndromes in older homeless adults. *J Health Care Poor Underserved*, 24(2), 456-468. doi: 10.1353/hpu.2013.0077
- Burt, M. R. (1999). *Homelessness: Programs and the People They Serve Findings of the National Survey of Homeless Assistance Providers and Clients*. Canadian Cancer Statistics publication. (2013). Retrieved 2014-07-06, from Canadian Cancer Society. <http://www.cancer.ca/en/cancer-information/cancer-101/canadian-cancer-statistics-publication/?region=bc>
- Cardinal, N., & Adin, E. (2005). An urban Aboriginal life: The 2005 indicators report on the quality of life of Aboriginal people in the Greater Vancouver region.
- Cevoli, S., Sancisi, E., Pierangeli, G., Grimaldi, D., Zanigni, S., Nicodemo, M., . . . Montagna, P. (2006). Chronic daily headache: risk factors and pathogenetic considerations. *Neurological sciences*, 27(2), s168-s173.
- Clark, M., Riben, P., & Nowgesic, E. (2002). The association of housing density, isolation and tuberculosis in Canadian First Nations communities. *International journal of epidemiology*, 31(5), 940-945.
- Couch, J. R., Lipton, R. B., Stewart, W. F., & Scher, A. I. (2007). Head or neck injury increases the risk of chronic daily headache A population-based study. *Neurology*, 69(11), 1169-1177.
- Crowe, C., & Hardill, K. (1993). Nursing research and political change: the street health report. *The Canadian Nurse*, 89(1), 21.

- Cutuli, J., Herbers, J. E., Rinaldi, M., Masten, A. S., & Oberg, C. N. (2010). Asthma and behavior in homeless 4-to 7-year-olds. *Pediatrics*, 125(1), 145-151.
- Eddidin, J., Ganim, Z., Hunter, S., & Karnik, N. (2012). The Mental and Physical Health of Homeless Youth: A Literature Review. *Child Psychiatry & Human Development*, 43(3), 354-375. doi: 10.1007/s10578-011-0270-1
- Estimates of HIV Prevalence and Incidence in Canada, 2011. (2012). Retrieved 2014-07-05, from Government of Canada, Public Health Agency of Canada <http://www.phac-aspc.gc.ca/aids-sida/publication/survreport/estim2011-eng.php>
- Frankish, C. J., Hwang, S. W., & Quantz, D. (2005). Homelessness and health in Canada. *Canadian Journal of Public Health*, 96(2), 23-29.
- Gaetz, S., Donaldson, J., Richter, T., & Gulliver, T. (2013). The State of Homelessness in Canada 2013. Retrieved on June, 23, 2013.
- Gelberg, L., & Linn, L. S. (1989). Assessing the physical health of homeless adults. *JAMA*, 262(14), 1973-1979.
- Gelberg, L., & Linn, L. S. (1992). Demographic differences in health status of homeless adults. *Journal of General Internal Medicine*, 7(6), 601-608.
- Goldberg, M., & Planning, S. (2005). On Our Streets and in Our Shelters--: Results of the 2005 Greater Vancouver Homeless Count: Social Planning and Research Council of BC.
- Grangeiro, A., Holcman, M. M., Onaga, E. T., Alencar, H. D., Placco, A. L., & Teixeira, P. R. (2012). [Prevalence and vulnerability of homeless people to HIV infection in Sao Paulo, Brazil]. *Rev Saude Publica*, 46(4), 674-684.
- Hanselmann, C. (2001). Urban aboriginal people in western Canada. Calgary: CanadaWest Foundation.
- Health Fact Sheets – Arthritis, 2013. (2014). Retrieved 7/16/2014, from Statistics Canada <http://www5.statcan.gc.ca/olc-cel/olc.action?ObjId=82-625-X201400114014&ObjType=47&lang=en>
- Health Fact Sheets – Asthma, 2013. (2014). Retrieved 7/16/2014, from Statistics Canada <http://www5.statcan.gc.ca/olc-cel/olc.action?ObjId=82-625-X201400114015&ObjType=47&lang=en>
- Health Fact Sheets – Chronic obstructive pulmonary disease in Canadians, 2009 to 2011. (2012). Retrieved 7/16/2014, from Statistics Canada <http://www5.statcan.gc.ca/olc-cel/olc.action?ObjId=82-625-X201200111709&ObjType=47&lang=en>
- Health Fact Sheets – Diabetes, 2013. (2014). Retrieved 7/16/2014, from Statistics Canada <http://www5.statcan.gc.ca/olc-cel/olc.action?ObjId=82-625-X201400114016&ObjType=47&lang=en>
- Health Fact Sheets – High blood pressure, 2013. (2014). Retrieved 7/16/2014, from Statistics Canada <http://www5.statcan.gc.ca/olc-cel/olc.action?ObjId=82-625-X201400114020&ObjType=47&lang=en>
- Hwang, S. W. (2001). Homelessness and health. *Canadian Medical Association Journal*, 164(2), 229-233.
- Hwang, S. W., Tolomiczenko, G., Kouyoumdjian, F. G., & Garner, R. E. (2005). Interventions to improve the health of the homeless: a systematic review. *American journal of preventive medicine*, 29(4), 311-311. e375.
- Hwang, S. W., Colantonio, A., Chiu, S., Tolomiczenko, G., Kiss, A., Cowan, L., . . . Levinson, W. (2008). The effect of traumatic brain injury on the health of homeless people. *Canadian Medical Association Journal*, 179(8), 779-784.

- Hwang, S. W., Wilkins, R., Tjepkema, M., O'Campo, P. J., & Dunn, J. R. (2009). Mortality among residents of shelters, rooming houses, and hotels in Canada: 11 year follow-up study. *BMJ: British Medical Journal*, 339.
- Inuit health: Selected findings from the 2012 Aboriginal Peoples Survey. (2014, 26/08/2014) Retrieved 10/05/2014, from <http://www.statcan.gc.ca/pub/89-653-x/89-653-x2014003-eng.htm#a2>
- Itoh, M., Tsuji, T., Nemoto, K., Nakamura, H., & Aoshiba, K. (2013). Undernutrition in Patients with COPD and Its Treatment. *Nutrients*, 5(4), 1316-1335.
- Jie, Y., Isa, Z. M., Jie, X., Ju, Z. L., & Ismail, N. H. (2013). Urban vs. Rural Factors That Affect Adult Asthma Reviews of Environmental Contamination and Toxicology Volume 226 (pp. 33-63): Springer.
- Josephson, G. J. (2004). Relating Homelessness to Education, Employment and Income Support A Review of Canadian Literature. *Horizons*, 7(2).
- Kaldmae, M., Zilmer, M., Viigimaa, M., Zemtovskaja, G., Tomberg, K., Kaart, T., & Annuk, M. (2011). Cardiovascular disease risk factors in homeless people. *Ups J Med Sci*, 116(3), 200-207. doi: 10.3109/03009734.2011.586737
- Khandor, E., Mason, K., Chambers, C., Rossiter, K., Cowan, L., & Hwang, S. W. (2011). Access to primary health care among homeless adults in Toronto, Canada: results from the Street Health survey. *Open Med*, 5(2), e94-e103.
- Kim, D. H., Daskalakis, C., Plumb, J. D., Adams, S., Brawer, R., Orr, N., . . . Whellan, D. J. (2008). Modifiable cardiovascular risk factors among individuals in low socioeconomic communities and homeless shelters. *Family & Community Health*, 31(4), 269-280.
- Kubisová, D., Adámková, V., Lánská, V., Dlouhý, P., Rambousková, J., & And I, M. (2007). Higher prevalence of smoking and lower BMI, waist circumference, cholesterol and triacylglyceride levels in Prague's homeless compared to a majority of the Czech population. *BMC Public Health*, 7(1), 51.
- Lee, D. F., Lindshield, C. J., Kuribayashi, T., Kleinschmidt, C. K., Lee, E. K., & Omori, J. S. (2007). Health Problems of Micronesian Patients at a Student-Run Free Homeless Clinic. *provider*, 12, 13.16.
- Lee, T. C., Hanlon, J. G., Ben-David, J., Booth, G. L., Cantor, W. J., Connelly, P. W., & Hwang, S. W. (2005). Risk factors for cardiovascular disease in homeless adults. *Circulation*, 111(20), 2629-2635.
- McLean, D. E., Bowen, S., Drezner, K., Rowe, A., Sherman, P., Schroeder, S., . . . Redlener, I. (2004). Asthma among homeless children: undercounting and undertreating the underserved. *Archives of pediatrics & adolescent medicine*, 158(3), 244.
- Miranda, V. S., Vivielle, B., Machado, L. A., & Dias, J. M. D. (2012). Prevalence of chronic musculoskeletal disorders in elderly Brazilians: a systematic review of the literature. *BMC Musculoskeletal Disorders*, 13(1), 82.
- Montgomery, P., Brown, S., & Forchuk, C. (2011). A Comparison of Individual and Social Vulnerabilities, Health, and Quality of Life Among Canadian Women With Mental Diagnoses and Young Children. *Women's Health Issues*, 21(1), 48-56. doi: <http://dx.doi.org/10.1016/j.whi.2010.07.008>
- Moses, S., Mestery, K., Kaita, K., & Minuk, G. (2002). Viral hepatitis in a Canadian street-involved population. *Revue canadienne de santé publique*, 93(2).

- Nyamathi, A. M., Leake, B., & Gelberg, L. (2000). Sheltered Versus Nonsheltered Homeless Women. *Journal of General Internal Medicine*, 15(8), 565-572. doi: 10.1046/j.1525-1497.2000.07007.x
- O'Carroll, A., & O'Reilly, F. (2008). Health of the homeless in Dublin: has anything changed in the context of Ireland's economic boom? *Eur J Public Health*, 18(5), 448-453. doi: 10.1093/eurpub/ckn038
- O'Connell, J. J. (2005). *Premature mortality in homeless populations: A review of the literature*. Nashville, TN: National Health Care for the Homeless Council.
- Oddy, M., Moir, J. F., Fortescue, D., & Chadwick, S. (2012). The prevalence of traumatic brain injury in the homeless community in a UK city. *Brain injury*, 26(9), 1058-1064.
- Oliveira, L. d. P., Pereira, M. L., Azevedo, A., & Lunet, N. (2012). Risk factors for cardiovascular disease among the homeless and in the general population of the city of Porto, Portugal. *Cadernos de Saúde Pública*, 28(8), 1517-1529.
- Page, S. A., Thurston, W. E., & Mahoney, C. E. (2012). Causes of death among an urban homeless population considered by the medical examiner. *J Soc Work End Life Palliat Care*, 8(3), 265-271. doi: 10.1080/15524256.2012.708111
- Patterson, M., Somers, J., McIntosh, K., Shiell, A., & Frankish, C. J. (2008). *Housing and support for adults with severe addictions and/or mental illness in British Columbia*.
- Plevneshi, A., Svoboda, T., Armstrong, I., Tyrrell, G. J., Miranda, A., Green, K., . . . McGeer, A. (2009). Population-based surveillance for invasive pneumococcal disease in homeless adults in Toronto. *PLoS One*, 4(9), e7255. doi: 10.1371/journal.pone.0007255
- Quantz, D. (2002). *Homelessness research in the Greater Vancouver Regional District: An agenda for moving forward*: Institute of Health Promotion Research, University of British Columbia.
- Reading, J. (2009). *The crisis of chronic disease among Aboriginal Peoples: A challenge for public health, population health and social policy*: Centre for Aboriginal Health Research.
- Rotermann, M., Langlois, K., Andonov, A., & Trubnikov, M. (2013). Seroprevalence of hepatitis B and C virus infections: Results from the 2007 to 2009 and 2009 to 2011 Canadian Health Measures Survey. *Health reports/Statistics Canada, Canadian Centre for Health Information= Rapports sur la sante/Statistique Canada, Centre canadien d'information sur la sante*, 24(11), 3-13.
- Ryan, T. A. (2008). Infectious disease in the homeless. *Md Med*, 9(4), 26-27, 30.
- Scher, A., Stewart, W., Ricci, J., & Lipton, R. (2003). Factors associated with the onset and remission of chronic daily headache in a population-based study. *Pain*, 106(1), 81-89.
- Snyder, L. D., & Eisner, M. D. (2004). Obstructive lung disease among the urban homeless. *Chest*, 125(5), 1719-1725.
- Tan de Bibiana, J., Rossi, C., Rivest, P., Zwering, A., Thibert, L., McIntosh, F., . . . Schwartzman, K. (2011). Tuberculosis and homelessness in Montreal: a retrospective cohort study. *BMC Public Health*, 11, 833. doi: 10.1186/1471-2458-11-833
- Topolovec-Vranic, J., Ennis, N., Colantonio, A., Cusimano, M. D., Hwang, S. W., Kontos, P., . . . Stergiopoulos, V. (2012). Traumatic brain injury among people who are homeless: a systematic review. *BMC Public Health*, 12, 1059. doi: 10.1186/1471-2458-12-1059
- Torchalla, I., Strehlau, V., Okoli, C. T., Li, K., Schuetz, C., & Krausz, M. (2011). Smoking and predictors of nicotine dependence in a homeless population. *Nicotine & Tobacco Research*, 13(10), 934-942.



- Tuberculosis in Canada 2012 - Pre-Release. (2014). Retrieved 2014-07-05, from Government of Canada, Public Health Agency  
<http://www.phac-aspc.gc.ca/tbpc-latb/pubs/tbcan12pre/index-eng.php>
- Turnbull, J., Muckle, W., & Masters, C. (2007). Homelessness and health. *Canadian Medical Association Journal*, 177(9), 1065-1066. doi: 10.1503/cmaj.071294
- Tyler, D., Nyamathi, A., Stein, J. A., Koniak-Griffin, D., Hodge, F., & Gelberg, L. (2013). Increasing Hepatitis C Knowledge Among Homeless Adults: Results of a Community-Based, Interdisciplinary Intervention. *J Behav Health Serv Res*. doi: 10.1007/s11414-013-9333-3
- Vahdani, P., Hosseini-Moghaddam, S. M., Family, A., & Moheb-Dezfouli, R. (2009). Prevalence of HBV, HCV, HIV and syphilis among homeless subjects older than fifteen years in Tehran. *Arch Iran Med*, 12(5), 483-487.
- van Laere, I., de Wit, M., & Klazinga, N. (2009). Shelter-based convalescence for homeless adults in Amsterdam: a descriptive study. *BMC health services research*, 9(1), 208.
- Vernon, M. K., Wiklund, I., Bell, J. A., Dale, P., & Chapman, K. R. (2012). What Do We Know about Asthma Triggers? A Review of the Literature. *Journal of Asthma*, 49(10), 991-998.
- Wiersma, P., Epperson, S., Terp, S., Lacourse, S., Finton, B., Drenzek, C., . . . Finelli, L. (2010). Episodic illness, chronic disease, and health care use among homeless persons in Metropolitan Atlanta, Georgia, 2007. *South Med J*, 103(1), 18-24. doi: 10.1097/SMJ.0b013e3181c46f79
- Woodward, J., Eberle, M., Kraus, D., & Graves, J. (2002). Research project on homelessness in Greater Vancouver: Vancouver: Greater Vancouver Regional District.