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What We (Don't) Know About the Infectious Disease Burden Among Youth Experiencing Homelessness in the United States and Canada

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Abstract

Youth experiencing homelessness (YEH) and sexual and gender minority (SGM) YEH may be at increased risk for infectious diseases due to living arrangements, risk behaviors, and barriers to health care access that are dissimilar to those of housed youth and older adults experiencing homelessness. Here, we synthesize findings from 12 peer-reviewed articles published between 2012 and 2020 that enumerate YEH or SGM YEH infectious disease burden in locations across the United States or Canada. Pathogens presented in the reviewed studies were limited to sexually transmitted infections (STIs) and bloodborne infections (BBI). Only 3 studies enumerated infectious diseases among SGM YEH. There was a dearth of comparison data by housing status or SGM identity. We also introduce 3 publicly available surveillance datasets from the United States or Canada that quantify certain STIs, BBIs, and tuberculosis among YEH to support future analyses. Our review calls for more comprehensive YEH-centered research and surveillance to improve estimates of infectious diseases among this vulnerable population.

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Supplementary Data

Supplementary materials are available at *The Journal of Infectious Diseases* online (<http://jid.oxfordjournals.org/>). Supplementary materials consist of data provided by the author that are published to benefit the reader. The posted materials are not copyedited. The contents of all supplementary data are the sole responsibility of the authors. Questions or messages regarding errors should be addressed to the author.

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Keywords

communicable diseases; homeless youth; housing instability; sexual and gender minorities; sexually transmitted diseases; blood-borne pathogens

WHO ARE HOMELESS YOUTH?

Youth comprise the fastest growing segment of people experiencing homelessness (PEH) in the United States (US) and Canada [1]. An estimated 4.2 million adolescents (aged 13–17 years) and young adults (aged 18–25 years) experience homelessness in the US each year, of which 700,000 experience homelessness as unaccompanied minors [2]. In Canada, 35,000–40,000 youth aged 13–24 years are estimated to experience homelessness or housing instability over the course of a year [3]. Pathways to youth homelessness emerge from individual and structural pressures, including histories of family conflict, abuse, economic stress, and involvement with child welfare or juvenile justice systems [2–4].

Among YEH populations, youth identifying as sexual or gender minorities (SGM), including lesbian, gay, bisexual, transgender, and queer identities, are overrepresented, and have a higher risk of experiencing homelessness in both the US and Canada [2, 3, 5]. For SGM youth in the US, the risk of homelessness is more than double that of their heterosexual and cisgender peers [5]. In Canada, SGM youth constitute an estimated 25%–40% of YEH, compared to only 5%–10% of the general population [6]. SGM youth face heightened risks of homelessness due to family rejection, eviction, or violence [7], and experience homelessness for longer durations compared to their heterosexual and cisgender peers [8].

DEFINITIONS OF HOMELESSNESS AND YOUTH

YEH are more likely to intermingle with their housed peers, more likely to couch surf, and less likely to use homeless services [2–4]. These fluid and frequently changing living and sleeping arrangements make it challenging to characterize youth homelessness. The US Department of Housing and Urban Development (HUD) defines unsheltered homelessness as having a nighttime residence not designated for sleeping (eg, street, vehicle, or park), while sheltered homelessness includes staying in emergency shelters, transitional housing, and safe havens [9]. Federal US statutes like the McKinney-Vento Homelessness Assistance Act also include couch-surfing and doubling-up in the definition of homelessness, which are not mentioned in the HUD definition [10]. In Canada, YEH are defined as young people who live without parents or guardians and lack stable housing, and frequently described using terminology like, “homeless youth,” “street youth,” and “runaway youth” [3]. Variable definitions of “youth” by national agencies and other organizations further complicate defining YEH. The United Nations defines youth as people between the ages of 15 and 24 years [11], the National Conference of State Legislatures defines youth homelessness for individuals aged 13 to 25 years [12], and Canadian definitions of homeless youth include people between ages 13 and 24 years [13].

RISK FACTORS FOR INFECTIOUS DISEASE AMONG YEH

YEH face numerous challenges to their health, including from infectious disease. Sexually transmitted infections (STIs), bloodborne infections (BBIs), respiratory infections, gastrointestinal diseases, and vector-borne diseases are commonly diagnosed among PEH [14, 15]. Yet, as the risk factors of YEH may be dissimilar to both housed youth and older adults experiencing homelessness, so might be their infectious disease burden [1]. Youth that rely on couch-hopping, who sleep outdoors, or who access services in congregate shelters have different disease exposure profiles than their housed counterparts [1, 16]. For example, sleeping in crowded, poorly ventilated shelters increases the risk of respiratory diseases and other disease outbreaks [16]. Peer pressure among youth also substantially influences risk behaviors, like harmful drug and alcohol use, in ways that may not influence adults [17]. YEH are more likely to inject drugs, smoke cigarettes, and consume alcohol compared to housed youth, increasing potential exposure pathways for pathogens directly, such as through sharing or using discarded drugs or paraphernalia, or indirectly due to impaired decisions that influence other risk behaviors, like unprotected sex [17, 18]. YEH are more likely to have multiple sexual partners and engage in unprotected and transactional sex compared to their housed counterparts, increasing risks for STIs and BBIs [1, 19]. Furthermore, YEH face unique structural and social barriers to seeking or receiving clinical care, including difficulty finding appropriate services, limited transportation, and perceived stigma from providers [20]. Access barriers can result in more severe disease outcomes and potentially prolonged durations of homelessness, as illness and homelessness have a reciprocal effect on each other [20, 21].

YEH with multiple marginalized identities like SGM YEH experience heightened health inequities. SGM youth in general face increased infectious disease prevalence, namely from STIs, compared to non-SGM youth [22]. SGM YEH are more likely than cisgender and heterosexual YEH to report harmful substance use [23] and engage in risky sexual behaviors [24]. On average, SGM YEH are more likely than heterosexual and cisgender YEH to engage in sex with strangers [24], engage in unprotected sex [24], engage in survival sex [25], be a victim of sexual violence [24, 25], and use harmful drugs [26], increasing the risk of infectious disease exposure. All YEH—and especially SGM YEH—underutilize preventative health care services due to compounding structural and social barriers, including limited access to SGM-affirming care, negative perceptions of safety in service settings, and stigmatization of their SGM identity by health service providers [7, 27].

NARRATIVE REVIEW SCOPE AND AIMS

Previous reviews of infectious diseases among YEH published in the last decade to date describe burden from STIs and risk factors for STI exposure and acquisition [19, 28]. Several other reviews published prior to the last decade provide more comprehensive coverage of clinical concerns among YEH beyond STIs. These include reports of YEH's disproportionate disease burden from STIs, respiratory infections like tuberculosis, and dermatologic infections and infestations like tinea, lice, and scabies, described further in Supplementary Material A [1, 29, 30]. However, these reviews may not provide a timely account of the infectious disease burden currently experienced by YEH. Thus, our

narrative review aims to describe the landscape of available research and surveillance data enumerating infectious disease burden for YEH populations over approximately the last decade to date, while elevating existing gaps.

We present findings from peer-reviewed literature published between 2012 and 2020 that enumerate infectious diseases among YEH and SGM YEH in the United States or Canada (Table 1 and Table 2). The literature review followed a systematic search and screening process using keyword search strings, detailed in Supplementary Material B and C, and Supplementary Figure 1. We also introduce 3 national-level, publicly available surveillance datasets that quantify infectious diseases among YEH in the US or Canada (Table 3 and Supplementary Material D), and that may be leveraged in future analyses and surveillance of disease burden among YEH populations.

LITERATURE ON INFECTIOUS DISEASE BURDEN AMONG YEH, 2012–2020

We conducted a literature search to identify peer-reviewed literature published in the United States or Canada over approximately the last decade to date that enumerate infectious diseases among YEH populations (Supplementary Material B and C). We identified 12 studies published between 2012 and 2020 covering locations across the United States and Canada (Supplementary Figure 1 and Table 1) that met our inclusion criteria (Supplementary Material B). Participant recruitment spanned different location types such as parks, neighborhoods, street outreach, and youth activity or resource centers. Housing terminology included “homeless” [32, 33, 40, 41], “street-involved youth” [31, 35–37], “street youth” [31, 34], “unstable housing” [39, 41], “transient youth” [38], and “runaway youth” [42]. The definition of youth also varied, with the lowest age for inclusion being 12 years, and the most common youngest age for inclusion being 14 years ($n = 5$). Conversely, the maximum age limit for inclusion ranged from 24 to 30 (Table 1). Most studies reported findings from both interview or survey data (eg, sociodemographic variables, risk behaviors), and biological testing data for disease detection [32–40].

Pathogens reported in the studies included human immunodeficiency virus (HIV; $n = 7$), hepatitis C virus (HCV; $n = 5$), hepatitis B virus (HBV; $n = 1$), *Chlamydia trachomatis* and *Neisseria gonorrhoeae* ($n = 4$), syphilis ($n = 1$), and unspecified STIs ($n = 4$) (Table 2). Prevalence was the most common measure of burden reported ($n = 10$). We found an even split between studies that assessed infectious disease burden as a primary outcome of their research [31, 34, 36, 37, 39, 42] and those that reported infectious diseases secondarily to behavioral outcomes, or in combination with risk behaviors (eg, sexual behaviors, drug use behaviors), socioeconomic status, or health care utilization [32, 35, 38, 40–42] (Table 2). Four studies reported a relationship between housing instability and STI and BBI detection [34, 38, 39, 42]. Others found that unstable housing operates through behaviors that increase risk for disease, like injection drug use and sexual risk behaviors [32, 33, 35, 37, 38, 40, 42]. Three studies enumerated infectious diseases among youth by both SGM identity and housing status [32, 34, 39]. One other study looked at the relationship between SGM identity to infectious disease risk among YEH but did not quantify disease burden [41]. Comparisons of infectious disease burden for youth by housing status (eg, sheltered vs

unsheltered homelessness, or housed vs unhoused youth), or by SGM identity were missing in most of the reviewed studies.

Key Findings in Canadian Studies

Three studies [34–36] utilized data from the At-Risk Youth Study (ARYS)—a prospective cohort of illicit drug-using, street-involved youth from Vancouver, Canada. Hadland et al (2014) reported high prevalence of HCV seropositivity among the street youth cohort, with more than 1 in 10 youth testing positive for HCV [34]. Street youth reporting recent homelessness had significantly higher odds of testing positive for HCV at baseline (odds ratio [OR], 2.18; 95% confidence interval [CI], 1.44–3.31; $P < .001$). An additional 10.9% ($n = 56$) HCV seroconversions were detected among YEH who tested negative at baseline and retested after follow-up ($n = 512$), resulting in an incidence density of 6.5 per 100 person-years. Almost a quarter of HCV-positive street youth at baseline in this study identified as gay, lesbian, or bisexual (22%; OR, 0.64; 95% CI, .39 to 1.07) [34]. Puri et al (2014) explored gender differences in HCV incidence among the street youth cohort and found that female youth had twice the incidence of HCV seroconversion compared to male street youth [35], with similar risk factors in gender stratified analyses related to injection drug use. Exploring the health and social harms of crystal methamphetamine use among the ARYS cohort, Uhlmann et al (2014) found HCV was significantly more prevalent among crystal methamphetamine using street youth compared to those who did not use [36].

Two studies conducted secondary analyses of data from Canada's Enhanced Street Youth Survey (formerly E-SYS, now called Y-Track) [43]. While they did not report disease burden from specific pathogens, Jayaraman et al (2012) described disparate STI rates between street youth and youth in the general population, finding 5 times more street youth reporting an STI diagnosis than the general population (23.5% vs 4.6%) [31]. Kumar et al (2015) also sought to identify the association between housing stability, adult supervision, and STI and BBI prevalence among Canadian street-involved youth [37]. However, they found no statistically significant association with current or recent STI or BBI diagnoses among youth with unstable and unsupervised housing compared to stable and supervised, and stable but unsupervised groups.

Using data from a prospective cohort study called the Cedar Project, Jongbloed et al (2015) explored the relationship between residential transience and HCV and HIV vulnerability among aboriginal youth who use drugs in 2 Canadian settings [38]. They found a statistically significant difference in the proportion of highly transient (defined as sleeping in 6 or more different places in the past 6 months) aboriginal youth ($n = 48$) who tested positive for HCV antibodies ($n = 22$, 54%; $P < .05$), compared to the proportion of low to medium transient youth (defined as sleeping in 1 to 5 different places in the past 6 months; $n = 63$, 32.5%). HIV status for highly transient youth was also reported at 13% ($n = 6$). However, similar prevalence was reported among low and medium transient youth. Overall, a significant association between residential transience and participating in STI risk behaviors (eg, injecting drugs and sex work) was observed [38].

Key Findings in US Studies

Myles et al (2020) leveraged survey data collected from the 2015 Atlanta Youth Count and Needs Assessment to assess factors influencing HIV testing among homeless and runaway youth (aged 14–25 years) in Atlanta, Georgia [42]. While participant's HIV test status was not reported, they found an 8.5% prevalence of ever having an STI that is not HIV (n = 57 of 669) among YEH respondents (Table 2).

In their prospective cohort study, Keizur et al (2020) explored the efficacy of same-day *C. trachomatis* or *N. gonorrhoeae* treatment, and tested study participants for both [40]. They found that of the 235 youth who tested positive for either or both, 48.1% had experienced homelessness in their lifetime and 30.9% had experienced homelessness in the last 30 days [40]. However, no further statistical analyses or comparisons were conducted between *C. trachomatis* and *N. gonorrhoeae* test status and housing status among the study sample.

Valente and Auerswald (2013) also tested for *C. trachomatis* and *N. gonorrhoeae* as part of the longitudinal study of YEH in San Francisco, California. In their assessment of gender-based differences in YEH social networks and their influences on sexual risk behaviors and STIs [33], the researchers found an 11.0% (n = 10) prevalence for either *C. trachomatis* or *N. gonorrhoeae* among female YEH, and 4.8% (n = 8, $P < .1$) prevalence for male YEH (n = 258). They also found that female YEH have higher sexual risk behaviors and trend toward higher STI rates compared to male YEH in their study, the latter of whom had more stably housed contacts and same-sex friends. The study suggested social networks, such as those consisting of same-sex friends and stably housed contacts, may be protective against some STI risks [33], a finding supported by a previous review of STI risk behaviors among YEH [28].

In their secondary analysis of a multisite study, Dowshen et al (2016) reported sexual behaviors and health outcomes of young transgender women (YTW) with HIV compared to other behaviorally infected youth (BIY) [39]. Among the YTW cohort with HIV, 25% reported being unstably housed or homeless. While the likelihood of a detectable HIV viral load did not significantly differ between YTW and other BIY, unstable housing significantly increased the predicted probability of viral detection among YTW ($P < .001$).

Logan et al (2013) surveyed HIV risk behaviors among young adults experiencing homelessness in Portland, Oregon, before offering HIV testing [32]. Six participants had positive HIV screening results, 2 of whom were newly identified (2.9% seropositivity rate). All 6 participants with HIV identified as nonheterosexual [32].

Finally, while they did not quantify disease burden, Santa Maria et al (2020) categorized patterns of HIV risk behaviors among YEH and found that YEH participating in higher-risk sexual behaviors linked to STI exposure were more likely to identify as SGM, with 10 out of the 11 participants who self-reported a positive HIV status belonging to the higher risk sexual behavior group [41].

SURVEILLANCE DATA ENUMERATING INFECTIOUS DISEASES AMONG YEH

As peer-reviewed literature enumerating the infectious disease burden for YEH over approximately the last decade remains limited, surveillance data may help fill this critical gap. The US Centers for Disease Control and Prevention (CDC) recommends integration of health and medical records with housing surveillance systems that enumerate PEH (eg, the United States or Canada's Point-In-Time Counts) as a best practice for assessing infectious disease burden, as described in Mosites et al (2021) [46]. In addition, we identified 3 publicly available, national-level disease surveillance datasets that already stratify infectious disease rates by housing status and relevant youth age groups. These datasets include the CDC Online Tuberculosis Information System [44], which reports the incidence of tuberculosis cases for homeless US youth, the CDC Medical Monitoring Project [45], which includes HIV infection data among homeless US youth aged 18–24 years, and Canada's Y-Track (formerly the E-SYS) [43], which includes STI and BBI prevalence among Canadian street youth. Currently, none of the surveillance systems identified here stratify infectious disease burden by both housing status and SGM identity, emphasizing a persistent dearth of data that characterizes infectious diseases among SGM YEH. These datasets are summarized in Table 3 and Supplementary Material D.

GAPS AND THE FUTURE OF YEH INFECTIOUS DISEASE RESEARCH

Overall, the studies describing infectious diseases among United States and Canadian YEH were too few to synthesize across and did not reflect the full range of infectious diseases this vulnerable population faces, emphasizing a major gap and need for further study. The overwhelming focus on BBIs and STIs aligns with previous findings that YEH experience disproportionate risk for diseases like HIV, HBV, HCV, *C. trachomatis*, and *N. gonorrhoeae* [1, 19, 29, 30] compared to the general youth population. However, there is a dearth of research exploring rates of other infectious diseases in this group. For example, little is known about respiratory diseases among YEH, although it is well known that adult PEH are at a higher risk of experiencing respiratory disease outbreaks, such as tuberculosis and COVID-19 [47, 48], from exposure in congregate settings and living in highly transient environments [1, 17]. Other diseases of concern among PEH in congregate settings include dermatologic infections, rhinoviruses, meningococcal disease, and rare infections like *Bartonella quintana* (for which homelessness is a primary risk factor) [16], but these remain understudied among YEH.

There also remains a lack of data enumerating infectious diseases among SGM YEH, even though SGM youth are overrepresented among YEH and experience heightened infectious disease risk factors compared to non-SGM YEH [2, 5, 8, 25–27]. Furthermore, small sample sizes, narrow geographic scope, and insufficient comparison data on infectious disease burden among counterfactual youth populations hindered us from assessing differential vulnerability or exposure to infectious diseases among YEH and SGM YEH. Small sample sizes and lack of counterfactual data in the studies constrained our ability to explore relationships between infectious disease burden and other salient demographic variables,

like race and ethnicity. Overlapping marginalization, such as those based on one's SGM identity, housing status, race, or ethnicity can independently influence access to homeless services and care-seeking behaviors [20], and together may have a modifying effect on infectious disease risk among YEH [21]. Thus, our review emphasizes the need for additional studies examining infectious disease rates among YEH along sociodemographic lines. Finally, findings were limited by the predominantly urban settings of the studies covered in this review (Table 2). Homelessness research is overwhelmingly conducted in urban locations, which may not adequately represent the demographics, living situations, and health conditions of YEH in rural and nonurban areas [2].

Most study types were limited to secondary analyses of cohort studies (Table 1) [31, 34, 35, 36, 38, 39, 41, 42], which employ outreach at youth centers, housing service sites, and other community locations where YEH reside. Secondary analyses are valuable when quantifying the health outcomes of people who may not be easily identifiable. However, YEH often underutilize shelters, are transient, and sleep in locations different from those occupied by adult PEH [2–4], so these approaches may miss substantial portions of YEH populations. Diversified mechanisms of primary data collection across urban and rural settings are needed, leveraging both survey data and biological sample testing to provide a more representative understanding of infectious disease burden among YEH.

Finally, inconsistent housing status definitions limited our ability to compare or aggregate rates of infectious diseases among YEH across studies. For example, the terms “street youth” and “street-involved youth” carry different connotations for housing stability and are not well-defined. “Homelessness” is also widely used but carries a broad range of definitions, even within social service and public health research. This is compounded by the inclusion of both Canadian and US study locations, across which standard housing status descriptors are not employed.

While current literature may fall short of enumerating infectious disease rates among YEH, surveillance data can be used to assess burden from certain infectious diseases (Table 3). However, housing status is often inconsistently collected or reported in health surveillance and electronic health record systems [46], despite being a major social determinant of health, adding to the challenge of enumerating diseases among YEH. Where it is reported, careful consideration of definitions of homelessness and youth used by the surveillance systems should be taken when calculating and reporting measures of disease burden [46, 49]. Our review echoes the call for more standardized collection of housing status and sociodemographic variables (eg, SGM identity) in public health surveillance data, which would facilitate effective outbreak assessment and tailored interventions that prevent adverse health outcomes from infectious diseases among YEH.

Limitations of our review methodology include the possibility that our search terms missed some of the literature relevant to this topic, population, geography, and time (Supplementary Material E). Additionally, there may be local-level surveillance systems that enumerate infectious disease burden among YEH at smaller geographic scales that we did not identify for this review.

CONCLUSION

While YEH and SGM YEH may face increased risk for infectious diseases due to living circumstances and behaviors that differ from those of housed youth and older adults experiencing homelessness, their infectious disease burden remains understudied. Existing research suggests STIs and BBIs are of important concern among all YEH, but there is a dearth of literature on other types of infectious disease burden and risk. Surveillance data can aid in calculating and assessing burden from certain infectious diseases like STIs, BBIs, and tuberculosis among YEH. However, for enumerating other pathogens or diseases, integration of multiple data systems is recommended due to ongoing limitations in housing data completeness in health surveillance data. Standardized documentation of housing status and other demographic variables, like SGM identity, in disease surveillance systems, and more diversified sampling methods that include survey data and biological sample testing with a geographic catchment beyond urban areas will improve our understanding of infectious disease burden among YEH. Future infectious disease research should prioritize YEH and SGM YEH populations with better inclusivity of demographic variables in their disease burden assessment. Improved estimates of infectious disease burden among all YEH will support evidence-based interventions that protect the health of these vulnerable populations.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Metadata of Peer-Reviewed Studies Enumerating Infectious Disease Burden Among Youth Experiencing Homelessness in the United States and Canada, 2012–2020

Table 1.

Author, Year	Title	Study Design	Location or Setting
Jayaraman et al., 2012 [31]	Sexual health disparities between street-involved youth and peers in the general population highlight the need for targeted, early intervention among at-risk youth	Secondary data analysis	7 urban centers across Vancouver, Edmonton, Saskatoon, Winnipeg, Toronto, Ottawa, and Halifax, Canada
Logan et al., 2013 [32]	Correlates of HIV risk behaviors among homeless and unstably housed young adults	Cross-sectional survey	Portland, Oregon, United States
Valente and Auerwald, 2013 [33]	Gender differences in sexual risk and sexually transmitted infections correlate with gender differences in social networks among San Francisco homeless youth	Secondary analysis of longitudinal study data	San Francisco, California, United States
Hadland et al., 2014 [34]	Prescription opioid injection and risk of hepatitis C in relation to traditional drugs of misuse in a prospective cohort of street youth	Prospective cohort study	Vancouver, British Columbia, Canada
Puri et al., 2014 [35]	Gender influences on hepatitis C incidence among street youth in a Canadian setting	Prospective cohort study	Vancouver, British Columbia, Canada
Uhlmann et al., 2014 [36]	Health and social harms associated with crystal methamphetamine use among street-involved youth in a Canadian setting	Prospective cohort study	Vancouver, British Columbia, Canada
Kumar et al., 2015 [37]	Housing and sexual health among street-involved youth	Cross-sectional study	Toronto, Ontario, Canada
Jongbloed et al., 2015 [38]	The Cedar Project: residential transience and HIV vulnerability among young Aboriginal people who use drugs	Prospective cohort study	Vancouver and Prince George, British Columbia, Canada
Dowshen et al., 2016 [39]	Behavioral and health outcomes for young transgender women with HIV linked to and engaged in medical care	Secondary data analysis of multisite study	15 cities across all geographic regions of the United States and Puerto Rico
Keizur et al., 2020 [40]	Safety and effectiveness of same-day <i>Chlamydia trachomatis</i> and <i>Neisseria gonorrhoeae</i> screening and treatment among gay, bisexual, transgender, and homeless youth in Los Angeles, California and New Orleans, Louisiana	Prospective cohort study	Los Angeles, California and New Orleans, Louisiana, United States
Santa Maria et al., 2020 [41]	Sexual risk classes among youth experiencing homelessness: relation to childhood adversities, current mental symptoms, substance use, and HIV testing	Secondary data analysis	Harris County, Texas, United States
Myles et al., 2020 [42]	Factors associated with HIV testing among Atlanta's homeless youth	Secondary data analysis (original survey used capture-recapture field-based sampling methods)	Atlanta, Georgia, United States

Table 2.

Data Extracted From Literature Including Terminology and Definition(s) of Homelessness, Demographic Characteristics of Study Participants, the Primary Purpose of the Study, and the Infectious Disease(s) Assessed and Quantified

Author, Year	Study Population	Total No. Included in Analysis	Housing Terminology	Definition of Homelessness	Age	Sexual Orientation	Sex or Gender	Race	Primary Study Purpose	Infectious Disease(s) Assessed	Quantification of Disease Burden
Jayaraman et al., 2012 [31]	Youth aged 15 to 24 y who took part in the Enhanced Street Youth Surveillance 2009–2010	1246	Street Youth	Not reported ^a	No mean or median provided, but 48% were between 15 and 19 y ^b	Straight or heterosexual, 74.6% ^b	Male, 60.4% ^b	Aboriginal ancestry, 37.6% ^b	To describe disparities in sexual health between street youth and their peers in the general population	Prevalence of STIs (not specified)	The proportion of participants reporting a previous STI diagnosis was almost 5 times higher among street youth than stably housed peers (23.5% vs 4.6%, respectively)
Logan et al., 2013 [32]	Young adults aged 18 to 25 y who accessed homeless youth services from January to May 2010	208	Homeless	Not reported ^c	Not reported, but study population limited to people aged 18–25 y	Straight or heterosexual, 128 (64.3%) Bisexual, 47 (23.6%) Gay or lesbian, 13 (6.5%) Pansexual, 11 (5.5%)	Male, 127 (61.4%) Female, 71 (34.3%) Transgender or other gender, 9 (4.4%)	White, 111 (54.2%) Native American or Alaska Native, 28 (13.7%) Black or African American, 19 (9.3%) Other race, 34 (16.6%) Hispanic ethnicity, 13 (6.3%)	To identify HIV risk behaviors and their correlates among homeless young adults in Portland, Oregon	Incidence and prevalence of HIV	6 participants had preliminary positive HIV screening tests, including 2 newly identified positive cases and 4 who reported knowing their positive status prior to study participation (2.9% seropositivity rate) All 6 participants with HIV identified as nonheterosexual
Valente and Auerswald, 2013 [33]	Youth experiencing homelessness aged 15 to 24 y	258	Homeless youth	Having to stay 2 nights or more in a place that is not your home because you could not stay in your home or you did not	Median age for: males 21 y females 20 y	History of: MSM, 69 (41.6%) WSW, 32 (34.8%)	Female, 92 (35.7%) Male, 155 (64.3%)	Black/African-American, 57 (22.1%) White/European-American, 141 (54.7%)	To explore whether social networks influence gender differences in sexual risk behaviors and STIs among homeless youth	Prevalence of HIV, <i>Chlamydia trachomatis</i> , <i>Neisseria gonorrhoeae</i>	18 participants tested positive for either <i>C. trachomatis</i> or <i>N. gonorrhoeae</i> , including 10 females (11.0%) and 8 males (4.8%)

Author, Year	Study Population	Total No. Included in Analysis	Housing Terminology	Definition of Homelessness	Age	Sexual Orientation	Sex or Gender	Race	Primary Study Purpose	Infectious Disease(s) Assessed	Quantification of Disease Burden
Hadland et al., 2014 [34]	Youth aged 14 to 26 y using an illicit drug other than marijuana during the month before study enrollment	940	Street youth	Youth who spend all or part of their time working or living on the street ^d	Mean, 21.7 y	Gay, lesbian, or bisexual, 151 (16.1%)	Male, 654 (69.6%)	Native American/Alaskan, 13 (5%) Latino/Hispanic, 13 (5.0%) Pacific Islander/Polynesian, 3 (1.1%) Mixed, 22 (8.5%) Do not know, 4 (1.6%) Refused, 5 (1.9%)	To compare risk of HCV acquisition from injection of prescription opioids to that from other street drugs among high-risk street youth	Prevalence and incidence of HCV	At baseline, 100 (10.6%) street youth were HCV positive. Among them, 54 (54.0%) of youth positive for HCV experienced recent homelessness (OR, 2.18; CI, 1.44–3.31, <i>P</i> value <.001), and 22 (22%) of youth positive for HCV at baseline identified as gay, lesbian, or bisexual (OR 0.64; CI .39–1.07, <i>P</i> value = .087). Of the 840 street youth who were HCV antibody negative at baseline, 512 (60.9%) had at least 1 follow-up visit and

Author, Year	Study Population	Total No. Included in Analysis	Housing Terminology	Definition of Homelessness	Age	Sexual Orientation	Sex or Gender	Race	Primary Study Purpose	Infectious Disease(s) Assessed	Quantification of Disease Burden
Puri et al., 2014 [35]	Youth aged 14 to 26 y who use illicit drugs and engage in street-based outreach	512	Street-involved youth	Street-involved having been homeless in the past 6 months or recently having used a service for street-involved youth (eg, housing or nutrition support)	Median, 22 y	Not reported	Male, 361, Female, 151	White, 328 (64.1%)	To estimate the rates of HCV infection among male and female street-involved youth in a Canadian setting	Incidence of HCV	provided blood samples for HCV antibody testing, and there were 56 (10.9%) HCV seroconversions (incidence density of 6.5/100 person-years).
Uhlmann et al., 2014 [36]	Street-involved youth aged 14 to 26 y who used illicit drugs other than marijuana in the past 30 days	1019	Street-involved youth	Street-involved defined as being absolutely or temporarily without stable housing, or having accessed street-based youth services in past 6 months	Median, 22 y	Not reported	Female, 320 (31.4%)	White, 686 (67.3%)	To describe the health and social outcomes of crystal methamphetamine use among street-involved youth	Prevalence of HIV and HCV	HCV seroconversion was observed in 56 (10.9%) participants, for an incidence density of 6.5 per 100 person-years (CI, 7.98–12.58). Incidence density was higher among female participants (10.9 per 100 person-years) compared to male participants (5.1 per 100 person-years). 10.2% (n = 104) of total study participants tested positive for HCV while 0.98% (n = 10) tested positive for HIV

Author, Year	Study Population	Total No. Included in Analysis	Housing Terminology	Definition of Homelessness	Age	Sexual Orientation	Sex or Gender	Race	Primary Study Purpose	Infectious Disease(s) Assessed	Quantification of Disease Burden
Kumar et al., 2015 [37]	Street-involved youth aged 15 to 24 y living in inner-city Toronto	184	Street-involved youth	Youth that had spent at least 3 consecutive nights in the previous 6 months away from their place of residence or without a fixed address	Mean, 21.0 y	Not reported	Male, 60.7%	Not reported	To explore the association between housing stability, adult supervision, and STI burden and risk	Prevalence of <i>C. trachomatis</i> , <i>N. gonorrhoeae</i> , syphilis, HIV, hepatitis B and C viruses	10 of 76 (13.2%) youth living in unstable and unsupervised housing were positive for <i>C. trachomatis</i> , 2 (3.3%) were positive for syphilis, and 26 (34.2%) had any STI within the last 3 months. The study team found no significant association with current or recent STI among unstable and unsupervised housing (AOR = 1.01; 95% CI, .35–2.92).
Jongbloed et al., 2015 [38]	People aged 14 to 30 y having used illicit drugs other than marijuana in the 30 d before study enrollment	260	Transient youth	Highly transient: reporting having slept in 6 or more different places in the past 6 months Less transient: slept in 1 to 5 different places in the past 6 months	Median, 24.5 y	Gay, lesbian, bisexual or 2-spirited, 33 (12.7%)	Female, 140 (53.8%)	Aboriginal ancestry, 100%	To examine how residential transience shapes vulnerability to HIV infection among young Aboriginal people who use illicit drugs in British Columbia	Prevalence of HIV and HCV	22 (52.4%) of highly transient participants were positive for HCV and 63 (32.5%) of low to medium transient participants were positive for HCV. 6 (13%) highly transient participants were positive for HIV, and 26 (13%) of low to medium transient participants were positive for HIV.

Author, Year	Study Population	Total No. Included in Analysis	Housing Terminology	Definition of Homelessness	Age	Sexual Orientation	Sex or Gender	Race	Primary Study Purpose	Infectious Disease(s) Assessed	Quantification of Disease Burden
Dowshen et al., 2016 ^e [39]	Youth aged 12 to 24 y with HIV	1584	Unstable housing	Not reported	Mean, 21.07 y ^b	Not reported	Transgender women, 66 (4%)	Black or African American, 51% ^b	To describe the health and psychosocial outcomes of young transgender women with HIV engaged in medical care	Predicted probability of having HIV	There was a 20% increase in probability of having a detectable HIV viral load for young transgender women with unstable housing compared to only a 10% increase among other youth ($P < .01$).
Keizur et al., 2020 [40]	Gay, bisexual, transgender, and homeless adolescents	235	Homeless	Not reported ^c	Not reported, but study population limited to adolescents aged 14–24 y	MSM, 129 (54.9%) ^b ; Straight or heterosexual, 63 (26.8%) ^b ; Nonheterosexual female, 19 (8.1%) ^b	Assigned male at birth, 190 (46.4%) ^b ; Assigned female at birth, 45 (19.1%) ^b ; Transgender or gender nonconforming, 24 (10.2%) ^b	Black or African American, 151 (64.3%) ^b ; Asian American or Pacific Islander, 13 (5.5%) ^b ; White, 19 (8.1%) ^b ; Other race, 4 (1.7%) ^b ; Latino ethnicity, 48 (20.4%) ^b	To evaluate the feasibility and effectiveness of same-day <i>C. trachomatis</i> and <i>N. gonorrhoeae</i> treatment on the proportion of youth participants who are gay, bisexual, transgender, or homeless receiving timely treatment	Prevalence of <i>C. trachomatis</i> , <i>N. gonorrhoeae</i>	113 youth (48.1%) who tested positive for either <i>C. trachomatis</i> or <i>N. gonorrhoeae</i> reported experiencing homelessness in their lifetime and 72 (30.9%) reported experiencing homelessness within the past 30 days.
Santa Maria et al., 2020 [41]	Youth aged 13 to 24 y and either homeless or unstably housed	416	Sheltered, homeless, and unstably housed	Housing categories: sheltered (including transitional living); literally homeless (ie, staying on the streets); or unstably housed (ie, doubled up or	Mean, 20 y	Lesbian, gay, bisexual, or questioning, 22%	Male, 53.4%; Female, 42.4%; Transgender or nonbinary, 22.4%	Black or African American, 54%; White, 13%; Multiple races, 16.1%; Other race, 5.3%; Hispanic	To categorize YEH by sexual behavior patterns and determine the difference in risk for HIV by sexual behavior category compared to other risk variables	Prevalence of HIV	There was a higher percentage of youth who were cisgender female LGBQ, transgender, and nonbinary in the higher risk sexual behavior group than there was in lower risk

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Mytles et al., 2020 [42]	Homeless and runaway youth aged 14–25 y	693	Homeless, runaway	couch surfing) If youth reported staying with a friend or relative the prior night but were unsure of where they could stay in the next 30 d, they were categorized as unstably housed	Age groups: 15–19 y, 202 (29.1%) 20–25 y, 491 (70.9%)	n = 689 Heterosexual, 504 (73.1%) Sexual minority (lesbian, gay, or bisexual), 170 (24.7%) Other (youth who responded, “something else” or “still undecided/questioning”), 15 (2.2%)	n = 683 Female, 229 (33.5%) 454 (66.5%)	n = 691 Non-Hispanic Black, 484 (70.0%) Hispanic, 56 (8.1%) Non-Hispanic White, 37 (5.4%) Non-Hispanic other, 114 (16.5%)	To assess factors associated with HIV testing among homeless youth using the 2015 Atlanta Youth Count and Needs Assessment	Prevalence of STI (non-HIV)	sexual behavior group. 11 YEH self-reported testing positive for HIV across the entire study population, and nearly all (10 out of 11) were in the higher risk sexual behavior group.

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; HCV, hepatitis C virus; HIV, human immunodeficiency virus; LGBQ, lesbian, gay, bisexual, or questioning; MSM, men who have sex with men; OR, odds ratio; STI, sexually transmitted infection; WSW, women who have sex with women; y, years; YEH, youth experiencing homelessness.

^a This article used STI data from Canada’s Enhanced Street Youth Survey (E-SYS), which describes street youth as being, “as diverse as Canada’s population. However, they all face unstable living conditions and have been subjected to complex social factors in their daily lives, such as poverty and family violence.”

^b These data were not stratified by housing status.

^c Although no explicit definition of homelessness was provided, the study surveyed youth who accessed homeless youth services.

^d According to the study, “no inclusion criterion explicitly required a minimum amount of time on the street to qualify for this study, [but] in practice the street-based recruitment resulted in a sample of youth who spent substantial time on the street, a large proportion of whom were homeless.”

^e The entire study population comprised young transgender women with HIV.

Publicly Available Surveillance Datasets With National Coverage That Quantify Infectious Diseases for YEH in Either the United States or Canada

Data Source	Geography	Years Available	Collection Method(s)	Dataset Summary	Limitations	Data Access Link
Y-Track (formerly E-SYS) [43]	Canada	2009–2012 (older E-SYS available 1998–2006)	Cross-sectional surveys conducted periodically at sentinel sites across Canada ^a	Monitors STI and BBI prevalence and associated risk behaviors among Canadian street youth populations. ^b Includes prevalence of HIV, HCV, HSV-1, HSV-2, HBV, <i>Chlamydia trachoma</i> , <i>Neisseria gonorrhoeae</i> , syphilis	Survey used nonrandom sampling; findings may not be representative of all street-involved youth in Canada. Findings based on self-reported data may be over- or underreported. Data not regularly updated; last year of data released in 2012	https://www.canada.ca/en/public-health/services/publications/diseases-conditions/summary-key-findings-y-track-phase-6-2009-2012.html
CDC Online Tuberculosis Information System (OTIS) [44]	United States	1993–2022	Verified tuberculosis cases reported to the CDC by state health departments, the District of Columbia, and Puerto Rico	Reports incidence of tuberculosis cases. Data are available for 27 additional variables, including HIV status. Tuberculosis incidence can be stratified by homelessness status ^c and age. Stratifications by age categories include individuals aged 15–24 y. Housing status reported using survey question, “Homeless in the past year?”	Data on patient HIV status for tuberculosis cases is incomplete and should be interpreted with caution	https://wonder.cdc.gov/TB-v2022.html
CDC Medical Monitoring Project (MMP) [45]	United States	2005–2021 ^d	16 state and 6 local health departments, ^e and Puerto Rico Department of Health	Cross-sectional, nationally representative, complex sample survey that assesses the behavioral and clinical characteristics of adults with diagnosed HIV infection in the United States. HIV data can be explored as rates or cases by the “unstable housing or homelessness” ^f indicator, and can be stratified by age group “13–24 y.” Data available nationally and for all 17 participating states/territories	Because MMP data are only available for persons with diagnosed HIV aged ≥18y, estimates among youths are only presented for persons with diagnosed HIV aged 18–24 y. Data collection for unstable housing or homelessness began during the 2018 MMP data cycle	https://gis.cdc.gov/grasp/nchhspatlas/charts.html

Abbreviations: BBI, bloodborne infection; CDC, Centers for Disease Control and Prevention; E-SYS, Enhanced Surveillance of Canadian Street Youth; HBV, hepatitis B virus; HCV, hepatitis C virus; HIV, human immunodeficiency virus; HSV, herpes simplex virus; STI, sexually transmitted infection; YEH, youth experiencing homelessness.

^a Sentinel sites across Canada for the 2009–2012 phase of Y-Track data collection included Vancouver (British Columbia), Edmonton (Alberta), Saskatoon (Saskatchewan), Winnipeg (Manitoba), Toronto (Ontario), Ottawa (Ontario), Montréal (Quebec), and Halifax (Nova Scotia).

^b Street youth are defined in the Y-Track as youth between 15 and 24 y old who have not lived at home for at least 3 consecutive days in the 6 mo preceding the survey.

^c In OTIS, homelessness status indicates whether the patient experienced homelessness at any time within the 12 mo prior to diagnosis.

^d From 2005 to 2014, only people receiving HIV medical care were sampled for the project. In 2015, the sampling methodology was expanded to include all adults with diagnosed HIV, regardless of whether they are in HIV medical care.

^e Since 2015, local and state health departments participating in the MMP project include California, Chicago, Delaware, Florida, Georgia, Houston, Illinois, Indiana, Los Angeles County, Michigan, Mississippi, New Jersey, New York, New York City, North Carolina, Oregon, Pennsylvania, Philadelphia, Puerto Rico, San Francisco, Texas, Virginia, and Washington.

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Unstable housing or homelessness is defined as experiencing unstable housing (ie, moving in with others due to financial issues, moving 2 or more times, or being evicted at any time) or homelessness (living on the street, in a shelter, in a single-room–occupancy hotel, or in a car at any time) during the past 12 mo.