

**Estimation of Key Population Size of People who Use Injection Drugs (PWID),
Men who Have Sex with Men (MSM) and Sex Workers (SW)
who are At Risk of Acquiring HIV and Hepatitis C
in the Five Health Regions of the Province of British Columbia**

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EXECUTIVE SUMMARY

In order to design comprehensive, effective and adaptive HIV prevention and control programs, public health practitioners must understand their local epidemic in terms of the predominate modes of HIV transmission, populations that are most at risk of acquiring HIV and within which new infections are occurring, and the size of these populations. Although HIV prevalence is low in Canada, based on the latest 2014 estimates from Public Health Agency of Canada, new HIV infections continue to be predominately attributed to the risk exposure category of men who have sex with men (MSM), followed by acquisition through heterosexual contact, and injection drug use. At the same time as Canada has seen a steady decline in the number of new HIV cases reported annually, the HCV epidemic is also demonstrating a similar downward trend. The local HIV and HCV epidemics in the province of British Columbia closely mirror the national epidemic scenario.

Various efforts have been made to estimate the population size of MSM, people who use injection drugs (PWID) and sex workers (SW; inclusive of female, male and transgender individuals who engage in sex work) in BC. To gain a clear picture on the state of the population size estimation of these key populations in the five health authorities in BC, the BC Centre for Disease Control (BCCDC) has partnered with a number of provincial stakeholders — including the Pacific AIDS Network (PAN) and the BC Centre for Excellence in HIV/AIDS (BC-CfE) — and has contracted the Centre for Global Public Health (CGPH) at the University of Manitoba to:

- Objective 1: Review the work conducted on estimating the size of key populations at risk for acquiring HIV and HCV, including PWID, MSM and SW in BC;
- Objective 2: Based on the review, develop size estimates for the key populations at risk for acquiring HIV and HCV in the five health authorities in BC;
- Objective 3: Conduct critical analysis of the size estimation approaches used in BC to date, and highlight the limitations of the key population size estimates;
- Objective 4: Provide recommendations for approaches with primary data collection to develop more robust size estimates for key populations in BC.

This project was divided into two phases. In Phase I, a literature search was performed to identify published peer-reviewed scientific journal articles containing information on size estimations of the three key populations. As well, key informants suggested by the BCCDC/PAN team were contacted to solicit other materials (i.e., unpublished works and grey literature such as internal reports, memos, and presentations etc.) that may contain the information of interest. Phase I activities also informed an interview guide to be used in Phase II with select key informants from health authorities and community-based organizations (CBOs) serving the three key populations.

Of over 80 items reviewed,

- 6 peer-reviewed scientific journal articles;
- 7 unpublished data, manuscripts, research theses and conference abstracts, poster and presentations; and
- 8 articles from grey literature

were found to contain information on size estimations of the three key populations.

While much of the identified information on population size estimates pertains to PWID and MSM, there is a lack of reliable information on the population size of SW in all regions of BC. The table below summarizes the PWID and MSM population size estimates that were generated based on the BC Hepatitis Testers Cohort and the 2013-2014 Canadian Community Health Survey, respectively. Because of the inherent limitations of these data sources, these estimates likely represent the lower limits of the true population size. Refer to page 9 of the full report for details.

Geographic Area	2015 Total Population Size (≥ 15 years)			Estimated Population Size of:			
	Total	Male	Female	PWID			MSM
				Total	Male	Female	
British Columbia	4,000,845	1,972,170	2,028,675	42,200	25,200	17,000	50,900
Vancouver Coastal HA	1,013,719	494,171	519,548	12,900	8,300	4,600	26,100
Vancouver	-	-	-	-	-	-	20,700
Fraser HA	1,455,534	719,930	735,604	13,300	8,200	5,100	11,800
Vancouver Island HA	666,343	325,016	341,327	6,800	3,800	3,000	5,500
Interior HA	636,297	314,677	321,620	5,600	3,000	2,600	5,300
Northern HA	228,952	118,376	110,576	3,300	1,700	1,600	2,200

For Phase II, key informants from the five health authorities, First Nations Health Authority and 18 CBOs were interviewed to understand how they currently plan and evaluate programs in the absence of readily available size estimates for key populations. This exercise also explored what other complementary information would be helpful for program planning, delivery and evaluation.

Overall, many key informants reported that while the targets for the HIV prevention, treatment and care program in each region are in line with the provincial goals set out in “From Hope to Health”, program evaluation is largely based on service outputs with limited understanding of program impact on key populations. Aside from a lack of information about the size of key populations, evaluating program coverage and impact is further hindered by the paucity of reliable information on the number of unique individuals of a key population who are accessing particular services consistently and regularly. Depending on the nature of services provided by a program, clients of targeted interventions are tracked to varying degrees. Even if a client registry exists, information regarding the clients’ HIV/HCV exposure categories (regardless of the infection status of the individuals) is likely incomplete or lacking. This is because CBO service providers found collecting information on exposure categories to be difficult and stigmatizing, counterproductive to providing safe services and could be detrimental to their relationships with community members. The collection of this additional information also put

extra reporting burden on the organizations. As a result, many CBOs feel strongly against collecting data in this line of questioning.

The majority of health authority and CBO informants agreed that size estimates for key populations from a trusted source would be helpful to their work in areas related to program planning, implementation and evaluation, research, and advocacy and proposal writing for program resources and funding. Other information that would also be useful includes:

WHO / WHAT: Establishing a clear definition of whom a key population entails that is based on the type, intensity, frequency and context of certain risk behaviour (e.g., drug use pattern, injection practices, condomless sex). Understanding how different risks cluster within a key population (e.g., structural drivers and individual behavioural factors that contribute to risk and service access barriers) to help prioritize resources and diversify programs to improve intervention mix and uptake.

WHEN: Understanding how temporal changes on a population-level (e.g., large sporting event, migration of workers from natural resource industries) and triggers or tipping points on an individual-level (e.g., migration from small communities to urban centres) promote transition from practicing low risk behaviour to higher risk behaviour.

WHERE: Fine details about the geographical distribution of key population beyond health region- or health service delivery area-level information to determine the most appropriate intervention strategies and mechanism for service delivery. In addition to the place of residence, knowing the locations where risk behaviours take place (e.g., congregation points for drug use) can facilitate the design and implementation of venue-based interventions.

HOW: Understanding how to connect with hard-to-reach populations and how service providers could help change the socio-political norm in rural conservative communities.

WHY: Delineating how structural drivers and other factors interact to promote vulnerability to HIV/HCV infection and identifying modifiable determinants that programs could address to contribute to a more comprehensive HIV/HCV prevention strategy.

Based on findings from this project, some recommendations for consideration include:

1. The definition of the key population of interest must be clearly articulated, recognizing that risk for acquiring HIV/HCV is not homogeneous across a key population. Understanding the behaviour and context of risk would be more informative for establishing the definition of a key population and for programming purposes than broadly ascribing risk to an entire population. Therefore, attempts to improve data collection among clients of HIV or HCV prevention, treatment and care services and harm reduction programs, and among non-clients where possible, with a focus on the type and frequency of risk behaviours, rather than identity as part of a key population, would be important for evaluating program coverage and impact.

2. Size estimation methodologies based on the BC Hepatitis Testers Cohort and the Canadian Community Health Survey for the PWID and MSM populations, respectively, are readily available resources and can be accessed regularly to provide high-level information on key population sizes in BC and their changes over time. Limitations resulting from PWID who have never been tested for HCV (therefore not captured in the BC Hepatitis Testers Cohort) and under-reporting of same sex or bisexual orientation among men in the Canadian Community Health Survey can be adjusted to some extent. Depending on the data sources used by these two methods, a breakdown of geographic distribution (i.e., place of residence) by health service delivery area or local health area may be possible.
3. The use of PWID and MSM population size estimates should be incorporated in the planning and evaluation of HIV and HCV prevention, treatment and care programs. Practical guidelines on the application of this information should be developed to ensure consistent usage across BC and to strengthen program planning and evaluation standards at the provincial, regional health authority and sub-regional levels.
4. Mapping and enumeration is an alternate method of key population size estimation that can be considered. Mapping and enumeration is a method that can be tailored in scope depending on the needs of programs. Rather than place of residence, locations where individuals congregate and where risk behaviours take place in groups are mapped. This information can be used for planning HIV/HCV service delivery to persons who may be hard-to-reach otherwise. Depending on the key population, a location of interest may be a place where individuals congregate to use drugs or seek sex partners. However, additional resources and technical expertise would be needed to implement this method.
5. We were unable to identify any reliable estimates for SW for any health authorities in BC. However, sex work is becoming an increasingly rare reported risk factor among both men and women newly diagnosed with HIV. Although this suggests that male and female SW without other risk exposures may not be a priority population for HIV and HCV prevention, knowing the size of these populations could help inform planning of programs to address structural barriers and other issues that affect health (e.g., social and community services, services addressing legal and human rights issues). Therefore, efforts to understand the population size and geographic distribution of SW should be renewed and done in partnership with community-based organizations from across the province.

INTRODUCTION

Based on the latest surveillance report from Public Health Agency of Canada (PHAC), new HIV adult diagnoses reported in 2014 continued to be predominately attributed to the exposure category of men who have sex with men (MSM) (48.8%), followed by acquisition through heterosexual contact (29.2%), and injection drug use (13.1%). The local HIV epidemic in the province of BC closely mirrors the national epidemic scenario. Despite regional variations, 57.5%, 24.9% and 9.6% of the new reported HIV cases in BC in 2014 were attributed to the exposure category of MSM, heterosexual contact and injection drug use, respectively.

In terms of the national HCV epidemic, Canada has experienced a steady decrease in the number of new reported cases since 2003. The same is true for the province of BC albeit with a much more rapid decline. According to the latest report from PHAC, although BC had the second largest number of reported HCV cases after Ontario in 2012, its rate was the third highest at 41.1 per 100,000 population among all provinces and territories. The national HCV diagnosis rate for the same period was 29.3 per 100,000 population. Recent surveillance data from BCCDC has shown a slight decrease in the provincial HCV rate from 44.9 per 100,000 population in 2013 to 42.9 per 100,000 population in 2014. Regionally, Fraser East and Northern Interiors had the highest HCV rates in 2014 at 71.8 and 70.5 per 100,000 population, while Richmond and North Shore/Coast Garibaldi had the lowest rates at 17.1 and 19.1 per 100,000 population.

In addition to understanding the predominate modes of transmission of local HIV and HCV epidemics, there is recognition globally that knowing the underlying population size of individuals who are at increased risk of contracting HIV or HCV is pivotal to accurately measure the impact of HIV and HCV prevention, treatment and care programs. To design comprehensive, effective and adaptive HIV and HCV prevention and control programs, public health practitioners must know which populations are most at risk of acquiring HIV and HCV and the size of these populations. Population size estimate will ensure allocation of resources that are appropriate to the HIV and HCV prevention, treatment and care needs of a key population. It will also contribute to a more specific assessment of HIV and HCV prevalence for program evaluation targeted to key populations and facilitate prediction of the future trajectory of the HIV and HCV epidemics.

There are several widely used methods for estimating population size. The *capture-recapture* method utilizes two independent data sources (e.g., STI clinic registry, survey) and estimates population size based on the number of unique individuals who are “captured” in both data sources and those who were captured only once in either data source. Although a simple capture-recapture method is not computationally demanding, it stipulates assumptions that are difficult to satisfy. One assumption is that the population of interest must be closed (i.e., no in- or out-migration). Given the mobility of many key populations, sophisticated statistical methods have been developed for use in conjunction with capture-recapture to relax the closure assumption. Similarly, the *multiplier* method also relies on two independent data sources – the first should consist of a count or listing of individuals who belong to a program

and the second should be a representative survey of the key population of interest containing information about the proportion of respondents who reported membership in the selected program. The multiplier method is straightforward to apply. However, it could generate vastly different population estimates if data sources define the population of interest differently. The *population survey* method, as the name suggests, uses reported data from general population surveys on risk behaviours (e.g., injection drug use) or sexual orientation to estimate the size of specific groups within the general population. Because general population surveys are prone to social desirability bias, under-reporting of certain stigmatizing behaviours can lead to underestimation of the true population size by this method. Furthermore, if certain risk behaviour is rare, the sample size used in the general population is usually not large enough to generate a reliable size estimate for a subgroup.

Unlike the other methods, in addition to producing a size estimate for a population of interest, *mapping and enumeration* is the only method that also provides the critical information on locations where a population can be found for purposes of macro-level resource allocation and micro-level program planning, delivery, monitoring and evaluation. There are different versions of the mapping and enumeration method. The one extensively used by the Centre for Global Public Health (CGPH) at University of Manitoba is based on the collective knowledge of a community and involves engaging community members in systematically identifying all hotspots in a defined geographic area where members of a key population congregate. Estimation of hotspot-level population size takes place on location via interview with members of the key population. Finally, all hotspot-level estimates are summed to generate a region-wide population size estimate. One disadvantage of this method is that it likely underestimates the true population size due partly to the method's limitation to account for members of key populations who congregate in private locations. While mobility of a key population could conversely inflate an estimate (i.e., members of a key population visiting multiple hotspots), statistical methods have been developed to adjust for this confounding.

Various efforts have been made to estimate the population size of MSM, people who use injection drugs (PWID) and sex workers (SW) in BC. To gain a clear picture on the state of the population size estimation of these key populations in the five health authorities in BC, the BC Centre for Disease Control (BCCDC) has partnered with a number of provincial stakeholders — including the Pacific AIDS Network (PAN) and the BC Centre for Excellence in HIV/AIDS (BC-CfE) — and has contracted CGPH to:

- Objective 1:** Review the work conducted on estimating the size of key populations at risk for acquiring HIV and HCV, including PWID, MSM and SW in BC;
- Objective 2:** Based on the review, develop size estimates for the key populations at risk for acquiring HIV and HCV in the five health authorities in BC;
- Objective 3:** Conduct critical analysis of the size estimation approaches used in BC to date, and highlight the limitations of the key population size estimates;
- Objective 4:** Provide recommendations for approaches with primary data collection to develop more robust size estimates for key populations in BC.

For the purpose of this project, SW include any female, male and transgender individuals who engage in sex work.

This project is divided into two phases. In Phase I, a literature search was performed to identify published peer-reviewed scientific journal articles containing information on size estimations of the three key populations. As well, key informants suggested by the BCCDC/PAN team were contacted to solicit other materials (i.e., unpublished works and grey literature such as internal reports, memos, and presentations etc.) that may contain the information of interest. Phase I activities also informed an interview guide to be used in Phase II with select key informants from health authorities and community-based organizations (CBOs) serving the three key populations.

PHASE I LITERATURE REVIEW

Phase I literature review of the project sets the stage for what is currently known about the estimated size of key populations in BC who are at risk of acquiring HIV and HCV.

Methods Overview

The CGPH team connected with 42 key informants to complete Phase I activities. Key informants included members of the Project Advisory Committee, researchers and public health practitioners from BCCDC, BC-CfE, BC Ministry of Health, the five health authorities, First Nations Health Authority and representatives from a number of community-based organizations. See **Appendix A** for a list of key informants contacted for Project Phase I.

From both the literature search performed by the CGPH team and materials collected from key informants,

- 25 peer-reviewed scientific journal articles;
- 10 unpublished data, manuscripts, research theses and conference abstracts, poster and presentations; and
- 47 articles from grey literature

were reviewed. See **Appendix B** for a complete list of literature reviewed for the Project Phase I.

Of the reviewed articles,

- 6 peer-reviewed scientific journal articles;
- 7 unpublished data, manuscripts, research theses and conference abstracts, poster and presentations; and
- 8 articles from grey literature

were found to contain the relevant information of interest, and thus were included in the population size estimate summary table (**Appendix C**).

Population Estimates for PWID, MSM and SW in BC

Based on work conducted in the past 10 years, the size estimates for the three key populations in the health regions of BC are shown in the table below. While much of the identified information on population size estimates pertains to PWID and MSM, there is a general lack of information on the population size of SW in all regions of BC. Only a single published estimate was identified for the female sex worker population in Vancouver for the province of BC.

Geographic Area	2015 Total Population Size ^a (≥ 15 years)			Estimated Population Size of:						
	Total	Male	Female	PWID ^b			MSM ^d	SW		
				Total	Male	Female		Female	Male	Transgender
British Columbia	4,000,845	1,972,170	2,028,675	42,200 ^c	25,200	17,000	50,900	-	-	-
Vancouver Coastal HA	1,013,719	494,171	519,548	12,900	8,300	4,600	26,100	-	-	-
Vancouver	-	-	-	-	-	-	20,700	1,500 ^f	-	-
Fraser HA	1,455,534	719,930	735,604	13,300	8,200	5,100	11,800	-	-	-
Vancouver Island HA	666,343	325,016	341,327	6,800	3,800	3,000	5,500 ^e	-	-	-
Interior HA	636,297	314,677	321,620	5,600	3,000	2,600	5,300 ^e	-	-	-
Northern HA	228,952	118,376	110,576	3,300	1,700	1,600	2,200 ^e	-	-	-

^a Source: BC Stats Website

<http://www.bcstats.gov.bc.ca/StatisticsBySubject/Demography/PopulationEstimates.aspx>

[Accessed on August 22, 2016]

^b Based on recommendations of the PSE Project Advisory Committee, findings from the 2016 BC Hepatitis Testers Cohort study by Janjua *et al.* were used as the lower limits for the PWID population size estimates for each RHA. The figures in the table were adjusted for 10% under-testing. This was based on results from the latest I-Track Phase 3 (2010-2012) which reported that only about 90% of clients of sentinel harm reduction distribution sites have ever tested for HCV, therefore PWID population size estimates that used HCV testing as a data source likely underestimate the true population size by at least 10%.

^c The PWID population size estimate for the province of BC includes individuals with unknown RHA residence.

^d Based on recommendations of the PSE Project Advisory Committee, unpublished data from the 2013-2014 Canadian Community Health Survey (CCHS) were used as the lower limits for the MSM population size estimate for each RHA. The figures in the table were adjusted for 30% under-reporting (non-response or mis-reporting), typical of self-reported sexual orientation from broad population-based government-initiated questionnaires. According to Hottes *et al.* (2015) and Berg *et al.* (2006), MSM population size estimates derived from such questionnaires could underestimate the true population size by 30% – 40%.

^e The MSM population size estimates for Vancouver Island, Interior and Northern Health Authorities were calculated by apportioning the adjusted aggregate MSM population size estimate for these three regions derived from CCHS 2013-2014 (9,140 + 30% under-reporting)

based on the distribution of the general population size of males in 2013 (VIHA: 370,658; IH: 357,687; NH: 146,381).

^f Only a single estimate for the population size of sex workers was found. According to the 2009 paper by McInnes *et al.*, the population size of *female* sex workers in *Vancouver* was 1,500 (range 1,000-2,000). Most of our key informants, including both researchers and community groups felt that this figure lacked face validity and is likely a significant underestimate of the true population size of FSW in Vancouver. No information on the population size estimates of male and transgender sex workers could be identified.

Refer to **Appendix C** for individual estimates and critique of the population size methodology used in each reference article.

In addition to providing reference articles, many key informants also suggested potential data sources that may be used for population size estimations. These data sources are listed in **Appendix D**.

PHASE II KEY INFORMANT INTERVIEWS

The goal of the Phase II key informant interviews was to understand how health authorities and CBOs currently plan and evaluate programs in the absence of key population size estimates. This exercise also explored what other complementary information would be helpful for program planning, delivery and evaluation.

Methods Overview

The STOP HIV Program Coordinators of all five health authorities and the STBBI/Harm Reduction lead from First Nations Health Authority were contacted and asked to assemble a team to take part in the Phase II key informant interviews. A list of Phase II health authority participants can be found in **Appendix E**. The population size estimates from Phase I literature review along with a semi-structured interview guide (see **Appendix F**) were provided to participants in advance of the interview. Notes were taken during each interview. The collected data were analyzed by interpretive thematic analysis.

As a part of this Phase II exercise, CBOs were also interviewed to gather input about their information needs for HIV/HCV prevention programming. To protect the identities of CBO key informants, the names of participants and their organizations are kept confidential. However, a list of organizations that consented to be named in this report can be found in **Appendix E**. Interviews were conducted with representatives from 18 CBOs from across the province:

- 5 CBOs from Vancouver Coastal Health
- 4 from Fraser Health Authority
- 3 from Interior Health Authority
- 2 from Vancouver Island Health Authority

- 2 from Northern Health Authority
- 3 organizations with a provincial mandate.

These 18 CBOs cover diverse mandates:

- 11 were AIDS Service Organizations (ASOs)
- 4 sex worker organizations
- 1 provincial HCV organization
- 1 provincial sexual health organization
- 1 drug users organization
- 1 gay men's health organization.

Despite classification of some of these CBOs based on the priority population they serve, most organizations indeed have a diverse clientele whose members intersect multiple key populations and require comprehensive HIV/HCV and other health services.

Findings from Thematic Analysis

A summary of findings on *Key Populations in BC, Current HIV/HCV Programs for Key Populations, and Key Population Program Planning, Delivery and Evaluation* can be found in **Appendix G**.

Feedback from Key Informants on Phase I Key Population Size Estimates

Majority of key informants had difficulty verifying the accuracy of the key population size estimates generated in Phase I of the project. However, based on the generally accepted percent composition by general population of each key population (1% PWID, 2% MSM), many key informants agreed that these estimates appeared correct.

Several health authority and CBO key informants expected a higher proportion of male PWID in their health regions. However, this may be the result of gender bias among responders of I-Track or the observation of a higher proportion of males accessing harm reduction services rather than a truly higher representation of males among PWID.

Another key informant postulated that the PWID population size estimate for her health region is likely an underestimate. She reasoned that the use of the BC Hepatitis Testers Cohort for estimating the population size of PWID likely missed individuals who have had no access to HCV testing. *[Note: The PWID estimates in the above table were adjusted for 10% under-testing. This was based on results from the latest I-Track Phase 3 (2010-2012) which reported that only about 90% of clients of sentinel harm reduction distribution sites have ever tested for HCV.]*

With regard to the population size of sex workers, one key informant suggested that public health should also strengthen its effort to understanding internet-based sex work. Sex workers who exclusively seek clients via the internet are difficult to reach by services.

Complementary Information for Program Planning, Delivery and Evaluation

Majority of health authority and CBO informants agreed that size estimates for key populations from a trusted source would be helpful to their work in areas related to program planning,

implementation and evaluation, research, and advocacy and proposal writing for program resources and funding. Other information that would also be useful includes:

WHO / WHAT: While conventional characteristics such as age, gender and ethnicity (including consistent reporting of Aboriginal status that complies with Government Standard for Aboriginal Administrative Data) continue to be important for HIV/HCV programming, there is increasing recognition among health authority and CBO informants that risk for acquiring HIV and HCV is not homogeneous across a key population. Therefore, understanding how different risks cluster within a key population (e.g., structural drivers and individual behavioural factors that contribute to risk and service access barriers) would be essential for prioritizing resources and diversifying programs to improve intervention mix and uptake. Integral to program planning is establishing in advance a clear definition of whom a key population entails that is based on the type, intensity, frequency and context of certain risk behaviour (e.g., drug use pattern, injection practices, condomless sex).

WHEN: On a macro-level, while changes within a key population brought about by an influx of people into an area (e.g., large sporting event, migration of workers from natural resource industries) may only have a transient effect on the local HIV/HCV prevention program, these changes could have long lasting impact on the local epidemic. On a micro-level, individuals might experience triggers or tipping points (e.g., migration from small communities to urban centres) that cause them to transition from practicing low risk behaviour to higher risk behaviour. Understanding how these temporal changes affect members of key population will help programs plan and adjust in response to anticipated consequences.

WHERE: Fine details about the geographical distribution of key population beyond health region- or health service delivery area-level information will help determine the most appropriate intervention strategies and mechanism for service delivery. In addition to the place of residence, knowing the locations where risk behaviours take place (e.g., congregation points for drug use) can facilitate the design and implementation of venue-based interventions.

HOW: Particularly in rural conservative communities where a large proportion of key populations remain hidden, engaging and reaching these individuals continue to be a challenge for service providers. Understanding how to connect with hard-to-reach populations and how service providers could help change the socio-political norm in these communities is important for creating a safe environment in which key populations can receive the services they need.

WHY: Aside from individual behavioural factors, underlying structural drivers (e.g., historical trauma, violence, stigma, poverty, homelessness) and other factors (e.g., mental health issues) often promote vulnerability to HIV/HCV infection. Understanding how these factors interact and identifying modifiable determinants that programs could address would contribute to a more comprehensive HIV/HCV prevention strategy.

CAUTIONARY NOTE: While knowing the population size of SW is believed to be helpful for HIV/HCV programming, a key informant remarked that “counting” SW may perpetuate the

stigma and discrimination faced by SW as being more impacted by HIV than the general population. It was noted that risk for HIV infection is not inherent in sex work. Sex work is different from other social-sexual behaviours, because for the most part, sex work is performed in the context of employment for income generation. In fact, a SW study conducted in Victoria (n=201 adult SW aged ≥ 18 years, including 160 female, 36 male and 5 transgender individuals) has shown that condom use with clients among SW exceeds 90%, indicating that professional sexual services are performed safely in an occupational setting. However, there are individuals engaging in survival sex work or transactional sex in informal settings who may not identify as sex workers. These individuals may be faced with other issues such as poverty, violence (including intimate partner violence) and drug addiction that increase their risk for HIV/HCV acquisition. Therefore, for the purpose of HIV/HCV programming, a clear definition of a priority population based on behaviour and context that impose risk, rather than a general identification with a group, is needed.

SUPPLEMENTARY INFORMATION ON SEX WORK AS A POTENTIAL RISK FACTOR FOR HIV ACQUISITION

Historically, it has been assumed that sex work plays an important role in the heterosexual and same-sex transmission of HIV. However, this assumption has not been formally examined in the BC context. In order to inform this discussion, the project team requested the BCCDC Surveillance Team to perform an analysis on new HIV diagnoses among men and women in BC from 2006-2015 to determine what proportion of these cases reported sex work as a potential risk factor. We found that the number of women diagnosed with HIV and who reported sex work declined from 22 and 26 individuals in 2006 and 2007 to only 2 and 1 individual in 2014 and 2015. Injection drug use was also reported by 33% – 100% of these women over the same period. Women engaged in sex work accounted for approximately 30% of all HIV diagnoses in women in 2006 but only 3% of female diagnoses in 2015. Although such declining trend is not observed among male SW, male SW did not comprise a large proportion of new diagnoses among men overall, which hovered between 0% – 4% over the same period. Other risk factors reported by newly diagnosed male SW included exposures related to having sex with men and injection drug use. These analyses are included as **Appendix H**.

Moreover, among the MSM participants of the Momentum study, 6.6% reported having engaged in sex work in the previous 6 months and that sex work was not associated with an increased risk of HIV infection in this cohort. Together, these corroborating findings suggest that male and female SW with no exposure to other risk factors may not be a priority population for HIV and HCV prevention.

RECOMMENDATIONS

Findings from this project have clearly indicated the availability of some information on the estimated population size of PWID and MSM in most health authorities in BC; however, current understanding of the population size of SW is lacking. Taken into account the other information needs reported by public health and CBO informants, here are a few issues that should be considered when generating a population size estimate for SW and updating those for PWID and MSM.

1. The definition of the key population of interest must be clearly articulated, recognizing that risk for acquiring HIV/HCV is not homogeneous across a key population. Understanding the behaviour and context of risk would be more informative for establishing the definition of a key population and for programming purposes than broadly ascribing risk to an entire population. This is particularly relevant to sex work where sexual services, for the most part, take place in an occupational setting where risk for HIV acquisition via sexual transmission is minimized. For individuals engaging in sex work in informal settings (i.e., survival sex work, transactional sex) or in less safe environments (i.e., street-based or outdoor sex work), structural interventions addressing other risk factors (e.g., violence, drug use) that are likely also at play are an integral part of a comprehensive HIV/HCV prevention strategy. Therefore, attempts to improve data collection among clients of HIV or HCV prevention, treatment and care services and harm reduction programs, and among non-clients where possible, with a focus on the type and frequency of risk behaviours, rather than identity as part of a key population, would be important for evaluating program coverage and impact.
2. Size estimation methodologies based on the BC Hepatitis Testers Cohort and the Canadian Community Health Survey for the PWID and MSM populations, respectively, are readily available resources and can be accessed regularly to provide high-level information on key population sizes in BC and their changes over time. Limitations resulting from PWID who have never been tested for HCV (therefore not captured in the BC Hepatitis Testers Cohort) and under-reporting of same sex or bisexual orientation among men in the Canadian Community Health Survey can be adjusted to some extent. Depending on the data sources used by these two methods, a breakdown of geographic distribution (i.e., place of residence) by health service delivery area or local health area may be possible.
3. The use of PWID and MSM population size estimates should be incorporated in the planning and evaluation of HIV and HCV prevention, treatment and care programs. Practical guidelines on the application of this information should be developed to ensure consistent usage across BC and to strengthen program planning and evaluation standards at the provincial, regional health authority and sub-regional levels.

4. Mapping and enumeration is an alternate method of key population size estimation that can be considered. Mapping and enumeration is a method that can be tailored in scope depending on the needs of programs. Rather than place of residence, locations where individuals congregate and where risk behaviours take place in groups are mapped. This information can be used for planning HIV/HCV service delivery to persons who may be hard-to-reach otherwise. Depending on the key population, a location of interest may be a place where individuals congregate to use drugs or seek sex partners. However, additional resources and technical expertise would be needed to implement this method.
5. We were unable to identify any reliable estimates for SW for any health authorities in BC. However, sex work is becoming an increasingly rare reported risk factor among both men and women newly diagnosed with HIV. Although this suggests that male and female SW without other risk exposures may not be priority populations for HIV and HCV prevention, knowing the size of these populations could help inform planning of programs to address structural barriers and other issues that affect health (e.g., social and community services, services addressing legal and human rights issues). Therefore, efforts to understand the population size and geographic distribution of SW should be renewed and done in partnership with community-based organizations from across the province.

APPENDIX A. Key Informants for Population Size Estimate Project Phase I

Population Size Estimate Project Advisory Committee

Organization	Name	Position
BC Centre for Disease Control	Jane Buxton	Epidemiologist, Harm Reduction Lead
	David Moore	Physician Lead, Provincial Health Services Agency HIV Program
	Naveed Janjua	Senior Scientist Hepatitis Program, Clinical Prevention Services
	Meaghan Thumath	Senior Practice Lead STOP HIV
	Mark Tyndall	Executive Medical Director
	Jason Wong	Physician Epidemiologist, Clinical Prevention Services
BC Centre for Excellence in HIV/AIDS	Kanna Hayashi	Research Scientist, Urban Health Research Initiative
	M-J Milloy	Research Scientist, Urban Health Research Initiative
BC Ministry of Health	Kenneth Tupper	Director, Problematic Substance Use Prevention
	Gina McGowan	Director, Blood Borne Pathogens
Pacific AIDS Network	Janice Duddy	Manager of Evaluation
	Andrea Langlois	Director of Community Based Research
The Centre for Global Public Health, University of Manitoba	Marissa Becker	Associate Professor
	Jamie Blanchard	Director and Professor
	Faran Emmanuel	Research Associate
	Robert Lorway	Associate Professor

Key Contacts from Health Authorities

Organization	Name	Position
Fraser Health Authority	Erin Gibson	Regional Harm Reduction Coordinator
	Sonya Ishiguro	Epidemiologist
	Salman Klar	Epidemiologist
	Shannon Krell	HIV Program Coordinator
	Heather Winnichuk	Communicable Disease Nurse Coordinator, STOP HIV/AIDS
Interior Health Authority	Lorena Hiscoe	Operations Director, Communicable Disease
	Maja Karlsson	Program Coordinator, STOP HIV/AIDS
	Jennifer May-Hadford	Epidemiologist
	Jeff Walsh	Harm Reduction Program Coordinator
Northern Health Authority	Sandra Allison	Medical Health Officer
	Lesley Cerny	Regional Coordinator, Blood Borne Pathogens
	James Haggerstone	Regional Manager, Health Information Analysis
	Kari Harder	Public Health Epidemiologist
	Linda Keefe	Program Coordinator, AIDS Prevention Program / Needle Exchange
	Ciro Panessa	Regional Director, Chronic Diseases

Vancouver Coastal Health Authority	Miranda Compton	Manager, HIV/AIDS Services
	Ellen Demlow	Regional Epidemiologist
	Jat Sandhu	Regional Director, Public Health Surveillance Unit
	Sara Young	Harm Reduction Program Coordinator
Vancouver Island Health Authority	Sophie Bannar-Martin	Program Coordinator, STOP HIV/AIDS
	Russell Griffin	Harm Reduction Program Coordinator
	Kendra Jones	Analyst, STOP HIV/AIDS
	Melanie Rusch	Regional Epidemiologist

Key Contacts from First Nations Health Authority

Name	Position
Evan Adams	Chief Medical Officer
Andrea Derban	Communicable Disease Control Nurse Specialist, HIV/Hepatitis C
Janine Stevenson	CDC Nurse Specialist, STBBIs/Harm Reduction, Health Protection

Other Key Contacts

Organization	Name	Position
BC Centre for Disease Control	Theodora Consolacion	Epidemiologist, Clinical Prevention Services
Community-Based Research Centre for Gay Men's Health	Travis Hottes	Epidemiologist
Health Initiative for Men	Jody Jollimore	Director, Research
Ontario HIV Treatment Network	Mark Gilbert	Director, Applied Epidemiology
University of British Columbia	Paul Gustafson	Professor, Department of Statistics
	Victoria Bungay	Associate Professor, School of Nursing
University of Victoria	Cecilia Benoit	Professor, Department of Sociology

APPENDIX B. Literature Reviewed for Population Size Estimate Project Phase I

People Who Inject Drugs (PWID)

Peer-Reviewed Scientific Journal Articles

A drug use survey among clients of harm reduction sites across British Columbia, Canada, 2012. M Kuo, A Shamsian, D Tzemis, and JA Buxton. *Harm Reduction Journal*. 2014; 11:13-23.

Applying open population capture-recapture models to estimate the abundance of injection drug users in Victoria, Canada. P van Dam-Bates, M Fyfe, and LLE Cowen. *Journal of Substance Use*. Published online: 14 Jan 2015. DOI: 10.3109/14659891.2014.998732

Assessing hepatitis C burden and treatment effectiveness through the British Columbia Hepatitis Testers Cohort (BC-HTC): Design and characteristics of linked and unlinked participants. NZ Janjua, M Kuo, M Chong, A Yu, M Alvarez, D Cook, R Armour, C Aiken, K Li, SAM Rizi, R Woods, D Godfrey, J Wong, M Gilbert, MW Tynall, M Kraiden. *PLOS ONE*. 2016 Mar 8;11(3):e0150176. doi: 10.1371/journal.pone.0150176.

Estimating the number of injection drug users in greater Victoria, Canada using capture-recapture methods. Y Xu, M Fyfe, L Walker, and LLE Cowen. *Harm Reduction Journal*. 2014; 11:9-15.

Estimating the size of an injecting drug user population. Y Zhao. *World Journal of AIDS*. 2011; 1:88-93.

Harm reduction product distribution in British Columbia. SS Harvard, WD Hill and JA Buxton. *Canadian Journal of Public Health*. 2008; 99(6): 446-450.

How many HIV infections are prevented by Vancouver Canada's supervised injection facility? SD Pinkerton. *International Journal of Drug Policy*. 2011; 22(3):179-183.

Increasing prevalence of cocaine as the primary detoxification diagnosis among admissions presenting with current intravenous drug use: a review of detoxification records from northern British Columbia, 1999-2005. RC Callaghan, C Strike, T Kerr, B Fischer, J Buxton, E Stevens, L Taylor, and JC Victor. *Canadian Journal of Public Health*. 2008; 99(3):178-181.

Missed opportunities: Injection drug use and HIV/AIDS in Victoria, Canada. KI Stajduhar, L Poffenroth, E Wong, CP Archibald, D Sutherland, and M Rekart. *International Journal of Drug Policy*. 2004; 15:171-181.

Mobility patterns of aboriginal injection drug users between on- and off-reserve settings in northern British Columbia, Canada. RC Callaghan, J Tavares, and L Taylor. *International Journal of Circumpolar Health*. 2007; 66(3):241-247.

Reducing the adverse impact of IDU in Canada. KB Laupland and JM Embil. *The Canadian Journal of Infectious Diseases and Medical Microbiology*. 2012 Autumn; 23(3): 106–107.

Street outreach with no streets. B Self and H Peters. *The Canadian Nurse*. 2005; 101(1):20-24

The Cedar Project: Prevalence and correlates of HIV infection among young Aboriginal people who use drugs in two Canadian cities. PM Spittal, KJP Craib, M Teegee, C Baylis, WM Christian, AKM Moniruzzaman, and MT Schechter. *International Journal of Circumpolar Health*. 2007; 66(3):226-240.

Unpublished Data, Manuscripts, Research Theses and Conference Abstracts/Posters/Presentations

Assessment Injection Drug Use Based on Diagnostic Code in Administrative Datasets. Unpublished report by N Janjua. British Columbia Centre for Disease Control. 2015.

Assessing the comprehensiveness of HIV prevention, treatment and care services for people who inject drugs in Northern BC. J Reschny. Draft PhD thesis outline. 2015.

Health status of people who use illicit drugs in British Columbia. Presentation at VANDU Pacific Summit on Drug User Health 2009.

The Cedar Project Overview. Presentations at the Annual Canadian Public Health Association Conference 2010.

Grey Literature

A proposed Abbotsford harm reduction service plan. DM Portesi. Fraser Health. Version 1 – April 30, 2012.

BC opioid substitution treatment system. Performance Measures 2013/2014. Office of the Provincial Health Officer. July 2015.

British Columbia drug overdose and alert partnership report. BC drug epidemiology. Z Tanner, M Matsukura, V Ivkov, A Amlani, and J Buxton. British Columbia Centre for Disease Control. September 2014.

Canadian Addiction Survey. A national survey of Canadians' use of alcohol and other drugs. Prevalence of use and related harms. Highlights. Canadian Centre on Substance Abuse. November 2004.

Canadian Addiction Survey. A national survey of Canadians' use of alcohol and other drugs. Prevalence of use and related harms. Detailed Report. Canadian Centre on Substance Abuse. March 2005.

Canadian Addiction Survey. A national survey of Canadians' use of alcohol and other drugs. Prevalence of use and related harms. Focus on gender. Health Canada. 2008.

CATIE factsheet: The epidemiology of HIV in people who inject drugs in Canada. L Challacombe. Canadian AIDS Treatment Information Exchange (CATIE).2015

Decreasing HIV infections among people who use drugs by injection in British Columbia: potential explanations and recommendations for further action. Report from the Office of the Provincial Health Officer PRW Kendall. March 2011.

Demographics and known comorbidities for persons intersecting with HIV and HCV services. Northern BC 1995 – 2007. Presentation prepared by James Haggerstone. Northern Health Authority. Spring 2007.

Drug situation in Vancouver. BC Centre for Excellence in HIV/AIDS. Urban Health Research Initiative of the British Columbia Centre for Excellence in HIV/AIDS. Second edition June 2013.

Drug use trends in Victoria and Vancouver, and changes in injection drug use after the closure of Victoria's fixed site needle exchange. A Ivsins, C Chow, D Marsh, S Macdonald, T Stockwell, and K Vallance. Centre for Addictions Research of BC (CARBC) Statistical Bulletin #6, 2010.

Economic fact sheet: Facts and figures relating to illegal drugs. Compiled by Mark Haden, Vancouver Coastal Health. December 2008.

Estimating the IDU population in Fraser Health. Handout prepared by J Fang, G Maxedon, A Neufelt, and C Turo. Fraser Health Authority. July 21, 2014.

Estimating the size of the injection drug community within Fraser Health. C Turo, G Maxedon, A Neufelt, and J Fang. Fraser Health Authority. August 2014.

Frequent flyers supplementary handout. B Wai, C Yuan, H Kim, and L Li. Fraser Health Authority.

Frequent flyers – Identifying frequent ED users: their characteristics and needs. Presentation prepared by B Wai, C Yuan, H Kim, and L Li. Fraser Health Authority.

From the Inside Out: Harm Reduction in Northern Health. Presentation prepared by D Bowering, T Healy, S Lorenz, K MacDonald and the Front Line Warriors of the Positive Prevention Project. Northern Health Authority. February 24, 2009.

HIV, hepatitis, and injection drug use in British Columbia – Pay now or pay later? JS Millar, Provincial Health Officer. June 1998.

How to start a conversation about HIV /AIDS in Northern BC. Presentation prepared by James Haggerstone. Northern Health Authority. February 7, 2005.

I-Track behavioral study of injection drug users in Prince George – Preliminary results. Presentation prepared by James Haggerstone. Northern Health Authority. February 2009.

I-Track Prince George user survey 2008 preliminary results. Poster. Northern Health Authority. December 2008.

I-Track survey: Enhanced surveillance of risk behaviours and prevalence of HIV and hepatitis C among people who inject drugs. Epidemiology and Disease Control and Population Health Surveillance Unit. Vancouver Island Health Authority. June 1, 2006.

I-Track special study: Monitoring trends in the prevalence of HIV and hepatitis C and associated risk behaviours Among People Who Inject Drugs in Victoria, BC. Summary report prepared by Public Health, Vancouver Island Health Authority. December 2010.

I-Track survey: Monitoring trends in the prevalence of HIV, hepatitis C, and associated risk behaviours among people who inject drugs in Central and North Vancouver Island. Summary report prepared by the Public and Population Health Observatory, Vancouver Island Health Authority. March 2010.

Injection drug users in FH. Presentation prepared by J Fang, G Maxedon, A Neufelt, and C Turo. Fraser Health Authority. July 21, 2014.

Life History Calendar in a population of chronic opioid users: An evaluation of methodological utility and identifying patterns of drug use and addiction treatment. Presentation prepared by Jill Fikowski (School of Population & Public Health, University of British Columbia) for the Annual Canadian Public Health Association Conference. May 2010.

Needle Exchange Programs FAQs. Canadian Centre for Substance Abuse. ISBN 1-896323-30-8

Northern Aboriginal HIV/AIDS Task Force Map. Northern Health Authority.

Northern Aboriginal HIV/AIDS Task Force Pamphlet. Carrier Sekani Family Services.

Overdose events in British Columbia: trends in substance involved, contexts and responses. K Vallance, G Martin, T Stockwell, S Macdonald, C Chow, A Ivsins, J Buxton, A Tu, J Sandhu, T Chu, and B Fair. Centre for Addictions Research of BC (CARBC) Statistical Bulletin #8, 2012.

Pilot project report: Survey on drug use among harm reduction clients, BC, 2012. M Kuo and J Buxton. Harm Reduction Strategies and Services and the BC Centre for Disease Control. September 2012.

Prince George I-Track results: Findings and discussion. Centre for Addiction and Mental Health. May 2009.

Study sees trends in violence, sex abuse. Frank Peebles. April 14, 2015. Prince George Citizen. Retrieved from: <http://www.princegeorgecitizen.com/>

Summary of Longitudinal Research on Admissions to detoxification services in northern BC. Presentation prepared by James Haggerstone. Northern Health Authority. January 2008.

Substance use trends in BC: A survey of harm reduction clients. Overall Results for British Columbia 2014. Prepared by J Sorge, J Buxton, A Amlani, S Ishiguro. British Columbia Centre for Disease Control. March 2015.

The Cedar Project Overview. Presentations at the Annual Canadian Public Health Association. May 2010.

Men Who Have Sex With Men (MSM)

Peer-Reviewed Scientific Journal Articles

A demographic and health profile of gay and bisexual men in a large Canadian urban setting. S Low-Bear, K Bartholomew, AE Weber, K Chan, M Landolt, D Oram, A Schilder, and R Hogg. *AIDS Care: Psychological and Socio-Medical Aspects of AIDS/HIV*. 2002; 14(1):111-115.

Impact of statistical adjustment for frequency of venue attendance in venue-based survey of MSM. P Gustafson, M Gilbert, M Xia, W Michelow, W Robert, T Trussler, M McGuire, D Paquette, DM Moore, and R Gustafson. *American Journal of Epidemiology*. 2013 May 15; 177(10):1157-64.

Missed classification and undersampling of sexual minorities in population surveys. TS Hottes, O Ferlatte, M Gilbert. *American Journal of Public Health*. 2015 January; 105(1):e5. doi: 10.2105/AJPH.2014.302408

Prevalence and patterns of same-gender sexual contact among men. RE Fay, CF Turner, AD Klassen, and JH Gagnon. *Science*. 1989 January 20; 243(4889):338-348.

Same-sex sexual behaviour: US frequency estimates from survey data with simultaneous misreporting and non-response. N Berg and D Lien. *Applied Economics*. 2006; 38:1-13.

Unpublished Data, Manuscripts, Research Theses and Conference Abstracts/Posters/Presentations

Estimating the size of a men-who-have-sex-with men population via the extended multiplier method, with adjustments for migration, sampling scheme, and mismatched information from multiple sources. Unpublished manuscript provided by Paul Gustafson and Mark Gilbert.

Estimating the size of the MSM population using multiple methods and data sources in Vancouver, British Columbia. NJ Lachowsky, A Rich, N Oliveira, G Colley, P Sereda, J Wong, S Wong, A Lal, J Jollimore, EA Roth, RS Hogg, and DM Moore. IAS 2015 abstract and poster.

Number of males who self-identify as gay/homosexual and bisexual in British Columbia by geography and age group, CCHS 2011-2012. Unpublished data derived from Canadian Community Health Survey (CCHS), 2011-2012, Statistics Canada. Provided by David Moore. 2015.

Number of males who self-identify as gay/homosexual and bisexual in British Columbia by geography and age group, CCHS 2013-2014. Unpublished data derived from Canadian Community Health Survey (CCHS), 2013-2014, Statistics Canada. Provided by David Moore. 2016.

Grey Literature

Infectious syphilis among gay, bisexual and other men who have sex with men in British Columbia 2003-2012. TS Hottes, M Lindegger, T Consolacion, S Wong, R Lester, C Montgomery, G Doupe, M Morshed, G Ogilvie, and M Gilbert. *Epidemiology and Surveillance*, Clinical Prevention Services Division, BC Centre for Disease Control. June 2013.

M-Track Victoria: Monitoring trends in the prevalence of HIV, viral hepatitis, other sexually transmitted infections, and associated risk behaviours among gay, bisexual, transgendered and other men who have sex with men. Phase 1 - Final Report. Prepared by the Public and Population Health Observatory
Vancouver Island Health Authority. May 1, 2008.

Sex Now Across Canada: Highlights from the Sex Now survey by province. J Dulai, D Le, O Ferlatte, R Marchand, and T Trussler. Community-Based Research Centre for Gay Men's Health. June 2014.

Peer-Reviewed Scientific Journal Articles

Regulating sex work: Heterogeneity in Legal Strategies. B McCarthy, C Benoit, M Jansson, and Kat Kolar. *Annual Review of Law and Social Science*. 2012; 8:15.1-15.17.

Sporting girls, streetwalkers, and inmates of houses of ill repute: Media narratives and the historical mutability of prostitution stigmas. HK Hallgrímsdóttir, R Phillips, C Benoit, and K Walby. *Sociological Perspectives*. 2008; 51(1):119-138.

Successes and gaps in uptake of regular, voluntary HIV testing for hidden street- and off-street sex workers in Vancouver, Canada. KN Deering, JS Montaner, J Chettiar, J Jia, G Ogilvie, C Buchner, C Feng, SA Strathdee, and K Shannon. *AIDS Care*. 2014; 27(4):499-506.

Unpublished Data, Manuscripts, Research Theses and Conference Abstracts/Posters/Presentations

% of Momentum participants (gay, bisexual and other men who have sex with men in the Greater Vancouver area) who reported engaging in sex work in the past 6 months. Unpublished data derived from cross-sectional surveys of the Momentum Study administered over a 2-year study period from 2012-2014. Provided by David Moore. 2016.

Grey Literature

Dispelling myths and understanding realities. Working conditions, health status, and exiting experience of sex workers. C Benoit and A Millar. October 2001.

PWID, MSM and SW

Peer-Reviewed Scientific Journal Articles

Estimating the size of hard-to-reach populations: a novel method using HIV testing data compared to other methods. CP Archibald, GC Jayaraman, C Major, DM Patrick, SM Houston, and D Sutherland. *AIDS*. 2001; 15(suppl 3):S41-S48.

HIV prevalence among Aboriginal British Columbians. RS Hogg, S Strathdee, T Kerr, E Wood, and R Remis. *Harm Reduction Journal*. 2005; 2:26-31.

HIV/AIDS in Vancouver, British Columbia: A growing epidemic. CW McInnes, E Druyts, SS Harvard, M Gilbert, MW Tyndall, VD Lima, E Wood, JSG Montaner, and RS Hogg. *Harm Reduction Journal*. 2009; 6:5-9.

Rates of new infections in British Columbia continue to decline at a faster rate than in other Canadian regions. RS Hogg, B Nosyk, PR Harrigan, VD Lima, K Chan, K Heath, E Wood, T Kerr and JSG Montaner. *HIV Medicine*. 2013; 14:581-582.

Unpublished Data, Manuscripts, Research Theses and Conference Abstracts/Posters/Presentations

Proportion of MSM and IDU in BC. Unpublished data from the Canadian Community Health Survey (CCHS). Provided by the Public Health Agency of Canada.

Strategies for estimating the size and distribution of hard-to-reach populations with adaptive sampling. PhD thesis. KS Vincent. Spring 2012.

Grey Literature

Closing the gap: Integrated HIV/AIDS and hepatitis C. Strategic directions for Vancouver Island Health Authority. 2006/07 – 2008/09.

Counting subpopulations of public health importance. A report to BCCDC. Prepared by RC James. March 31, 2008.

From hope to health: Towards an AIDS-free generation. BC Ministry of Health. December 2012.

From Hastings Street to Haida Gwaii – Provincial results of the 2013 BC Adolescent Health Survey. McCreary Centre Society. 2014.

HIV-Specific Research in Northern Canada. Environmental Scan. Prepared by S Jackson and J Reschny for the Moving Mountains HIV/AIDS Community Based Research Conference. June 2014.

HIV update. Northern Health Authority. Winter 2013.

Meeting the challenge. A blood borne disease update for Northern communities. Northern Health Authority. December 2008.

APPENDIX C. Summary Table of Estimated population Size of PWID, MSM and SW in British Columbia

The Province of British Columbia

PEOPLE WHO USE INJECTION DRUGS											
Population Size Estimate	Study Location (Defined Geographic Area)	Year of Study	Author(s)	Publication Type	Publication Citation	Methodology	Data Source	Eligibility Criteria	Case Definition	Sample Size	Limitations
37,955 Male=22,666 Female=15,289	British Columbia	2016	Janjua N and team	Unpublished data	Assessment injection drug use based on diagnostic code in administrative datasets	BC Hepatitis Testers Cohort: Algorithm based on linkage of public health laboratory HepC testing data with medical visit and hospitalization data with ICD codes associated with substance use from administrative databases	1990-2013 HepC testing results from public health laboratory database; medical visit and hospitalization data from administrative database	People who are registered with the Medical Services Plan of BC, and who were tested for HCV, HIV, or were a reported case of HBV, HCV, HIV or active TB between 1990 and 2013	Positive HepC test between 2010 and 2012; indication of injection drug use based on at least 1 medical visit or hospitalization with ICD code associated with substance use, including codes for opioid substitution therapy	N=1.5 million	The BC Hepatitis Testers Cohort does not include PWID who have not been tested for HepC and those whose past healthcare interactions did not report the use of injection drugs and/or the prescription of opioid substitution therapy. Mobility of people cannot be fully accounted for (i.e., individuals are grouped into RHA based of their address of residence even though their service providers may be in a different RHA.).
23,315	British Columbia	2008	Harvard SS, Hill WD, Buxton JA	Peer-reviewed article in scientific journal	Harm reduction product distribution in British Columbia. Canadian Journal of Public Health 2008, 99(6): 446-450.	Survey	Canadian Centre on Substance Abuse: Canadian Addiction Survey (CAS) (2004), census data	Persons aged 15-64 years	CAS 2004: People who injected cocaine, opiates and other drugs in the past year	CAS 2004: N=3,000 respondents in BC	The sample size of the population survey used to provide data for the survey method may be inadequate for estimating rare injection drug use behaviours. Other limitations of the survey method include the reluctance of participants to admit to sensitive behaviours, and the relative inability of such surveys to access hard-to-reach population. The latter is particularly true for PWID as many of them may not have a permanent place of residence and/or a telephone. Therefore, the population size estimate generated by this method is likely an underestimate.

24,000	British Columbia	2002	British Columbia Vital Statistics Agency, Ministry of Health Planning, Province of British Columbia and First Nations and Inuit Health Branch, Health Canada	Grey literature	Regional analysis of health statistics for status Indians in British Columbia 1991-2001. In Birth related and mortality summaries for British Columbia and 16 health service delivery areas. Victoria: British Columbia Vital Statistics Agency, Ministry of Health Planning, Province of British Columbia and First Nations and Inuit Health Branch, Health Canada.	-	-	-	-	-	-
15,000	British Columbia	1998	Millar J. Vancouver: Ministry of Health.	Grey literature	HIV, hepatitis and injection drug use in British Columbia—Pay now or later.	-	-	-	-	-	The validity and accuracy of the estimate cannot be assessed.

MEN WHO HAVE SEX WITH MEN

Population Size Estimate	Study Location (Defined Geographic Area)	Year of Study	Author(s)	Publication Type	Publication Citation	Methodology	Data Source	Eligibility Criteria	Case Definition	Sample Size	Limitations
35,650	British Columbia	2016	Statistics Canada contract with Moore D and Hogg R	Unpublished data	Number of males who self-identify as gay/homosexual and bisexual in	Population survey	Canadian Community Health Survey (2013-2014)	Persons aged ≥12 years living in the 10 provinces and the 3 territories;	Self-identifying as gay/homosexual or bisexual in CCHS	-	The estimate derived from the CCHS relies on respondents' disclosure about their gender and sexual identity, thus the generated population size estimate is likely an underestimate.

					British Columbia by geography and age group, CCHS 2013-2014			but excluding those living on reserves and other Aboriginal settlements in the provinces, those who are full-time members of the Canadian Forces, and those who are institutionalized			
33,820	British Columbia	2015	Statistics Canada contract with Moore D and Hogg R	Unpublished data	Number of males who self-identify as gay/homosexual and bisexual in British Columbia by geography and age group, CCHS 2011-2012	Population survey	Canadian Community Health Survey (2011-2012)	As above	As above	-	The estimate derived from the CCHS relies on respondents' disclosure about their gender and sexual identity, thus the generated population size estimate is likely an underestimate.

*** No information was found on the population size of sex workers in the Province of BC.**

Vancouver Coastal Health Authority

PEOPLE WHO USE INJECTION DRUGS											
Population Size Estimate	Study Location (Defined Geographic Area)	Year of Study	Author(s)	Publication Type	Publication Citation	Methodology	Data Source	Eligibility Criteria	Case Definition	Sample Size	Limitations
11,576 Male=7,474 Female=4,102	Vancouver Coastal HA	2016	Janjua N and team	Unpublished data	Assessment injection drug use based on diagnostic code in administrative datasets	BC Hepatitis Testers Cohort: Algorithm based on linkage of public health laboratory HepC testing data with	1990-2013 HepC testing results from public health laboratory database; medical visit	People who are registered with the Medical Services Plan of BC, and who were tested for HCV, HIV, or	Positive HepC test between 2010 and 2012; indication of injection drug use based on at least 1 medical	N=1.5 million	The BC Hepatitis Testers Cohort does not include PWID who have not been tested for HepC and whose past healthcare interactions did not report the use of injection drugs. Mobility of people cannot be fully accounted for (i.e., individuals are grouped into RHA

						medical visit and hospitalization data with ICD codes associated with substance use from administrative databases	and hospitalization data from administrative database	were a reported case of HBV, HCV, HIV or active TB between 1990 and 2013	visit or hospitalization with ICD code associated with substance use, including codes for opioid substitution therapy		based of their address of residence even though their service providers may be in a different RHA.).
13,500 (12,000-15,000)	Vancouver (geographic area definition not stated)	2009	McInnes CW, Druyts E, Harvard SS, Gilbert M, Tyndall MW, Lima VD, Wood E, Montaner JSG, Hogg RS	Peer-reviewed article in scientific journal	HIV/AIDS in Vancouver, British Columbia: a growing epidemic. Harm Reduction Journal 2009, 6:5.	Consolidated estimates based on published findings	Remis RS (1998), Archibald CP (2001), British Columbia Vital Statistics Agency (2002)	-	-	-	Accuracy of consolidated estimates is dependent on availability and accuracy of data.
8,000	Vancouver (geographic area definition not stated)	2008	Harvard SS, Hill WD, Buxton JA	Peer-reviewed article in scientific journal	Harm reduction product distribution in British Columbia. Canadian Journal of Public Health 2008, 99(6): 446-450.	-	Data from Vancouver Coastal Health	-	-	-	-
12,000 (10,000-15,000)	Vancouver	2002	British Columbia Vital Statistics Agency, Ministry of Health Planning, Province of British Columbia and First Nations and Inuit Health Branch, Health Canada	Grey literature	Regional analysis of health statistics for status Indians in British Columbia 1991-2001. In Birth related and mortality summaries for British Columbia and 16 health service delivery areas. Victoria: British Columbia Vital Statistics Agency, Ministry	-	-	-	-	-	-

					of Health Planning, Province of British Columbia and First Nations and Inuit Health Branch, Health Canada.						
17,500 (13,900-23,100)	Vancouver (included 6 health regions in 1996; population = ~ 1.8 million)	2001	Archibald CP, Jayaraman GC, Major C, Patrick DM, Houston SM, Sutherland D	Peer-reviewed article in scientific journal	Estimating the size of hard-to-reach populations: a novel method using HIV testing data compared to other methods. AIDS 2001, 15 (suppl 3): S41-S48.	Multiplier	HIV serodiagnostic databases; Canadian Health Monitor telephone surveys (CHM) (1995-6 and 1997); PWID epidemiol. studies	Persons aged ≥ 15 years	CHM (1995-6): Injecting non-prescription drugs since 1978 CHM (1997): Injecting in the past year Other epidemiol. studies: Injecting in the past 1 month to injecting in the past 6 months	CHMs: N=3,000	Information on duplicate tests and risk categories in the HIV serodiagnostic databases is incomplete. Statistical methods to adjust for missing data increase uncertainty in the final population size estimates. HIV testing behaviour reported in the CHM and other epidemiological studies are likely discrepant depending on where respondents were recruited. Respondents in the epidemiological studies were from urban areas whereas the CHM were conducted among the general population, both urban and rural. HIV testing in urban centres (especially in inner city areas where HIV testing is readily available to target populations) is more common than in rural areas.
6,400 (1,100-28,800)	Vancouver (included 6 health regions in 1996; population = ~ 1.8 million)	2001	Archibald CP, Jayaraman GC, Major C, Patrick DM, Houston SM, Sutherland D	Peer-reviewed article in scientific journal	Estimating the size of hard-to-reach populations: a novel method using HIV testing data compared to other methods. AIDS 2001, 15 (suppl 3): S41-S48.	Survey	Health Monitor telephone surveys (CHM) (1997), a similar survey (1994), census data	Persons aged ≥ 15 years	1994 survey: Injecting in the past year CHM (1997): Injecting in the past year; injection drug use in lifetime	CHMs: N=3,000	The sample size of the population survey used to provide data for the survey method may be inadequate for estimating rare injection drug use behaviours. Other limitations of the survey method include the lack of an adequate sampling frame, inconsistent wording of questions between surveys, the reluctance of participants to admit to sensitive behaviours, and the relative inability of such surveys to access hard-to-reach population. The latter is particularly true for PWID as many of them may not have a permanent place of residence and/or a telephone.

												Therefore, the population size estimate generated by this method is likely an underestimate.
10,500 (8,000-13,000)	Vancouver (included 6 health regions in 1996; population = ~ 1.8 million)	2001	Archibald CP, Jayaraman GC, Major C, Patrick DM, Houston SM, Sutherland D	Peer-reviewed article in scientific journal	Estimating the size of hard-to-reach populations: a novel method using HIV testing data compared to other methods. AIDS 2001, 15 (suppl 3): S41-S48.	Modified Delphi technique	3 experts in the field of drug use in Vancouver	-	-	-	-	Estimates derived from consensus are difficult to validate.
11,670 (10,300-13,420)	Vancouver (included 6 health regions in 1996; population = ~ 1.8 million)	1998	Remis RS, Millson P, Strathdee SA, et al.	Grey literature	Consortium to characterize injection drug users in Canada. Final report submitted to Division of HIV Epidemiology, LCDC. Ottawa: Health Canada.	Capture-Recapture	-	-	Injecting in the past year	-	-	It is difficult to ascertain that the databases used for this capture-recapture method were truly independent. An over-representation of matched individuals between the different databases will generate an underestimate of the population of interest. The reverse is true if there are few matched individuals between databases.
12,000 ?	Vancouver Downtown Eastside	2006	Vancouver Coastal Health	Grey literature	Saving lives: Vancouver's supervised injection site: Vancouver Coastal Health, 2006.	-	-	-	-	-	-	-
8,000	Vancouver Downtown Eastside	2003	Vancouver Coastal Health	Grey literature	Injection drug use in the DTES, Vancouver, BC: Vancouver Coastal Health, 2003.	-	-	-	-	-	-	-
4,700	Vancouver Downtown Eastside	1999	Schechter M, O'Shaughnessy M	Grey literature	Distribution of injection drug users in the Lower Mainland. A brief report for	-	-	-	-	-	-	-

					the Vancouver/ Richmond Health Board. Vancouver; 1999:6						
4,700	Vancouver Downtown Eastside	1999	Vancouver/ Richmond Health Board	Grey literature	Report on the health of the population of Vancouver/ Richmond. Vancouver; 1999:22.	-	-	-	-	-	-

MEN WHO HAVE SEX WITH MEN

Population Size Estimate	Study Location (Defined Geographic Area)	Year of Study	Author(s)	Publication Type	Publication Citation	Methodology	Data Source	Eligibility Criteria	Case Definition	Sample Size	Limitations
18,270	Vancouver Coastal HA	2016	Statistics Canada contract with Moore D and Hogg R	Unpublished data	Number of males who self-identify as gay/homosexual and bisexual in British Columbia by geography and age group, CCHS 2013-2014	Population survey	Canadian Community Health Survey (2013-2014)	Persons aged ≥12 years living in the 10 provinces and the 3 territories; but excluding those living on reserves and other Aboriginal settlements in the provinces, those who are full-time members of the Canadian Forces, and those who are institutionalized	Self-identifying as gay/homosexual or bisexual in CCHS	-	The estimate derived from the CCHS relies on respondents' disclosure about their gender and sexual identity, thus the generated population size estimate is likely an underestimate.
16,900	Vancouver Coastal HA	2015	Statistics Canada contract with Moore D and Hogg R	Unpublished data	Number of males who self-identify as gay/homosexual and bisexual in	Population survey	Canadian Community Health Survey (2011-2012)	<i>As above</i>	<i>As above</i>	-	The estimate derived from the CCHS relies on respondents' disclosure about their gender and sexual identity, thus the generated population size estimate is likely an underestimate.

					British Columbia by geography and age group, CCHS 2011-2012						
14,520	Metro Vancouver	2016	Statistics Canada contract with Moore D and Hogg R	Unpublished data	Number of males who self-identify as gay/homosexual and bisexual in British Columbia by geography and age group, CCHS 2013-2014	Population survey	Canadian Community Health Survey (2013-2014)	<i>As above</i>	<i>As above</i>	-	The estimate derived from the CCHS relies on respondents' disclosure about their gender and sexual identity, thus the generated population size estimate is likely an underestimate.
13,110	Metro Vancouver	2015	Lachowsky N, Rich A, Oliveira N, Colley G, Sereda P, Wong J, Wong S, Lal A, Jollimore J, Roth EA, Hogg RS, Moore DM	Conference abstract	Estimating the size of the MSM population using multiple methods and data sources in Vancouver, British Columbia	Population survey	Canadian Community Health Survey (2011-2012)	<i>As above</i>	<i>As above</i>	-	The estimate derived from the CCHS relies on respondents' disclosure about their sexual orientation, thus the generated population size estimate is likely an underestimate.
44,300	Metro Vancouver (geographic area definition not stated)	2015	Lachowsky N, Rich A, Oliveira N, Colley G, Sereda P, Wong J, Wong S, Lal A, Jollimore J, Roth EA, Hogg RS, Moore DM	Conference abstract	Estimating the size of the MSM population using multiple methods and data sources in Vancouver, British Columbia	Multiplier	Momentum Health Study participants who (Feb 2012-Feb 2014) who reported testing at one of BCCDC's (Feb 2012-Feb 2014) 3 MSM sexual health clinics	Gay, bisexual and other men who have sex with men (GBMSM) aged > 15 years recruited into the Momentum Health Study from February 2012 – February 2014 using respondent-driven sampling	Self-identifying as GBMSM in Momentum and at STI clinics in Vancouver	-	The Momentum Health Study relies on respondent-driven sampling, not a random sample from the general population.
23,700	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	Multiplier	Momentum Health Study (Feb 2012-Feb 2014), Facebook members who	Gay, bisexual and other men who have sex with men (GBMSM) aged > 15 years	Self-identifying as GBMSM in Momentum and as a man looking to meet other men on	-	The Momentum Health Study relies on respondent-driven sampling not a random sample from the general population. The population size estimate generated is likely an underestimate. As well, Facebook data regarding gender

							identify themselves as men seeking other men	recruited into the Momentum Health Study from February 2012 – February 2014 using respondent-driven sampling	Facebook in Vancouver		and sexual identity are based on the users' optional disclosure.
45,800 (200-75,000)	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	Wisdom of the crowds	Momentum Health Study participants who (Feb 2012-Feb 2014)	Gay, bisexual and other men who have sex with men (GBMSM) aged > 15 years recruited into the Momentum Health Study from February 2012 – February 2014 using respondent-driven sampling	-	-	Point estimate is based on the opinion of peers about the size of the MSM population in Vancouver. Estimates derived from this process are difficult to validate.
26,318 (12,283-55,598)	Greater Vancouver Regional District (geographic area definition not stated)	2014	Gustafson P and team	Unpublished manuscript	Estimating the size of a men-who-have-sex-with-men population via the extended multiplier method, with adjustments for migration, sampling scheme, and mismatched information from multiple sources	Multi-trait multiplier method (with adjustment for venue-based sampling and migration)	ManCount survey, BCCDC HIV and syphilis surveillance data	Self-identified MSM aged ≥ 19 years living in the Greater Vancouver Regional District at the end of 2008	ManCount participant with an HIV diagnosis between 2004 and 2008 and/or a syphilis diagnosis in 2008 Cases of HIV and syphilis are based on provincial surveillance case definitions.	N=917	While the adjustment method used in this study could to some extent account for the selection bias associated with venue-based sampling used for the ManCount survey, it may not be able to account for MSM who never attend venues. As well, triangulation of data sources relies on reporting of risk exposure categories associated with each reported new case of HIV and syphilis in the surveillance data. Incomplete risk exposure reporting with the surveillance data will result in an underestimation of population size.
20,000 (15,000-25,000)	Vancouver (geographic area definition)	2009	McInnes CW, Druyts E, Harvard SS, Gilbert M,	Peer-reviewed article in scientific	HIV/AIDS in Vancouver, British Columbia: a growing	Consolidated estimates based on published findings	Low-Beer S (2002), Archibald CP (2001), Fay RE	-	-	-	Accuracy of consolidated estimates is dependent on availability and accuracy of data.

	not stated)		Tyndall MW, Lima VD, Wood E, Montaner JSG, Hogg RS	journal	epidemic. Harm Reduction Journal 2009, 6:5.		(2002)*				
15,900 (11,500-22,100)	Vancouver (included 6 health regions in 1996; population = ~ 1.8 million)	2001	Archibald CP, Jayaraman GC, Major C, Patrick DM, Houston SM, Sutherland D	Peer-reviewed article in scientific journal	Estimating the size of hard-to-reach populations: a novel method using HIV testing data compared to other methods. AIDS 2001, 15 (suppl 3): S41-S48.	Multiplier	HIV serodiagnostic databases; Canadian Health Monitor telephone surveys (CHM) (1995-6 and 1997); other MSM epidemiol. studies	Males aged ≥ 15 years	CHM (1995-6): Having had oral or anal intercourse with other men since 1978 CHM (1997): Having had anal intercourse with other men in the past year Other epidemiol. studies: self-identification as gay to self-identification as having affective and/or sexual relations with other men	CHMs: N=3,000	Information on duplicate tests and risk categories in the HIV serodiagnostic databases is incomplete. Statistical methods to adjust for missing data increase uncertainty in the final population size estimates. HIV testing behaviour reported in the CHM and other epidemiological studies are likely discrepant depending on where respondents were recruited. Respondents in the epidemiological studies were from urban areas whereas the CHM were conducted among the general population, both urban and rural. HIV testing in urban centres (especially in inner city areas where HIV testing is readily available to target populations) is more common than in rural areas.
7,000 (1,000-24,200)	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	Survey	Health Monitor telephone surveys (CHM) (1997), a similar survey (1994), census data	Males aged ≥ 15 years	1994 survey: Having had oral or anal intercourse with another man in the past year CHM (1997): MSM behaviour in lifetime	CHMs: N=3,000	The sample size of the population survey used to provide data for the survey method may be inadequate for estimating rare MSM behaviours. Other limitations of the survey method include the lack of an adequate sampling frame, inconsistent wording of questions between surveys, the reluctance of participants to admit to sensitive behaviours, and the relative inability of such surveys to access hard-to-reach population. Therefore, the population size estimate generated by this method is likely an underestimate.

15,000 (10,000-20,000)	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	Modified Delphi technique	3 experts in the field of MSM sexual behaviour in Vancouver	-	-	-	Estimates derived from consensus are difficult to validate.
26,500	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	Method based on the proportion of never-married men aged ≥ 45 years	Census data	-	-	-	Population size estimates generated by this method are likely overestimates of the actual population size. The impact of bias resulting from the inclusion of never-married heterosexual men in the proportion of never-married men aged ≥ 45 years is greater than excluding married MSM.
5,100 (4,700-5,400)	Vancouver West End (geographic area as defined by 1996 census)	2002	Low-Ber S, Bartholomew K, Weber AE, Chan K, Landolt M, Oram D, Schilder A, Hogg R	Peer-reviewed article in scientific journal	A demographic and health profile of gay and bisexual men in a large Canadian urban setting. AIDS Care: Psychological and Socio-Medical Aspects of AIDS/HIV. 2002, 14(1):111-115.	Survey	Random digit dial telephone survey, census data	Males aged ≥ 20 years	Self-identifying as gay or bisexual	1,176	The sample size of the population survey used to provide data for the survey method may be inadequate for estimating rare MSM behaviours. Other limitations of the survey method include the reluctance of participants to admit to sensitive behaviours and the inability of such surveys to reach men who do not have a fixed address or a telephone number. Therefore, the population size estimate generated by this method is likely an underestimate.

SEX WORKERS

Population Size Estimate	Study Location (Defined Geographic Area)	Year of Study	Author(s)	Publication Type	Publication Citation	Methodology	Data Source	Eligibility Criteria	Case Definition	Sample Size	Limitations
1,500 (1,000-2,000)	Vancouver (geographic area definition not stated)	2009	McInnes CW, Druyts E, Harvard SS, Gilbert M, Tyndall MW, Lima VD, Wood E,	Peer-reviewed article in scientific journal	HIV/AIDS in Vancouver, British Columbia: a growing epidemic. Harm Reduction Journal 2009,	Peer-based discussions	FSW	-	-	-	Estimates derived from peer-based discussions are difficult to validate.

			Montaner JSG, Hogg RS		6:5.						
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Vancouver Island Health Authority

PEOPLE WHO USE INJECTION DRUGS											
Population Size Estimate	Study Location (Defined Geographic Area)	Year of Study	Author(s)	Publication Type	Publication Citation	Methodology	Data Source	Eligibility Criteria	Case Definition	Sample Size	Limitations
6,088 Male=3,389 Female=2,699	Vancouver Island HA	2016	Janjua N and team	Unpublished data	Assessment injection drug use based on diagnostic code in administrative datasets	BC Hepatitis Testers Cohort: Algorithm based on linkage of public health laboratory HepC testing data with medical visit and hospitalization data with ICD codes associated with substance use from administrative databases	1990-2013 HepC testing results from public health laboratory database; medical visit and hospitalization data from administrative database	People who are registered with the Medical Services Plan of BC, and who were tested for HCV, HIV, or were a reported case of HBV, HCV, HIV or active TB between 1990 and 2013	Positive HepC test between 2010 and 2012; indication of injection drug use based on at least 1 medical visit or hospitalization with ICD code associated with substance use, including codes for opioid substitution therapy	N=1.5 million	The BC Hepatitis Testers Cohort does not include PWID who have not been tested for HepC and whose past healthcare interactions did not report the use of injection drugs. Mobility of people cannot be fully accounted for (i.e., individuals are grouped into RHA based of their address of residence even though their service providers may be in a different RHA.).
Phase I 2003: 2,606 (1,272-3,940) Phase II 2005: 2,585 (1,322-3,848) Phase III 2009: 2,607 (1,257-3,957)	Greater Victoria area, including Oak Bay, Esquimalt, Saanich and the Westshore communities	2015	van Dam-Bates P, Fyfe M, Cowen LLE.	Peer-reviewed article in scientific journal	Applying open population capture-recapture models to estimate the abundance of injection drug users in Victoria, Canada. Journal of Substance Use. Published online: 14 Jan	Open population capture-recapture using a Jolly-Seber model; population size in each phase of I-Track was estimated	I-Track Phase I 2003, Phase II 2005 and Phase III 2009 completed in Victoria	Persons aged ≥ 15 years; being capable of informed consent; having an understanding of English or French; having injected non-therapeutic drugs in the past 6 months;	-	Phase I 2003: n=254 Phase II 2005: N=250 Phase III 2009: N=256	The Jolly-Seber model relies on the following assumptions which may be difficult to meet in real life: 1) every individual in the population has the same probability of recapture and survival at any given time period; 2) an individual's name, birthday and gender remains the same at recapture (e.g., a person's name change through marriage will be "tagged" as a new individual); 3) emigration is permanent (no re-entry into the population); 4) sampling occurs instantaneously (thus fluctuation within

					2015. DOI: 10.3109/146598 91.2014.998732			participation only once per phase			a population cannot be taken into account); and 5) individuals are recaptured and survive independently of others.
LP: 3,329 (2,246 – 5,078) H: 3,342 (2,254 – 5,098) P: 3,330 (2,246 – 5,078)	Greater Victoria (geographic area definition not found)	2014	Xu Y, Fyfe M, Walker L, Cowen LLE.	Peer- reviewed article in scientific journal	Estimating the number of injection drug users in greater Victoria, Canada using capture- recapture methods. Harm Reduction Journal 2014, 11:9.	Capture- Recapture (Lincoln-Petersen estimator [LP], Huggins' model [H], Pledger's model [P])	I-Track Phase I 2003 and Phase II 2005 completed in Victoria	Persons aged ≥ 15 years; being capable of informed consent; having an understanding of English or French; having injected non- therapeutic drugs in the past 6 months; participation only once per phase	To establish that respondents were injection drug users, subjects were recruited only after an exchange of needles had taken place at the needle exchange. In other locations, screening questions were used (e.g., Where on your body do you inject? Where do you get your rigs? What size needle do you use? When do you last inject?). If during the interview the subjects' response suggested a lack of familiarity with terms, their eligibility would be questioned.	Phase I 2003: n=254 Phase II 2005: N=250	The assumptions of the capture- recapture method are difficult to satisfy. Given the mobility of PWID, it is questionable that the PWID population in Victoria is closed (no in- or out- migration). It is also questionable that the samples for I-Track Phases I and II were truly random and independent as recruitment of participants was done through convenience sampling of harm reduction service clients. Ideally, multiple different data sources should be used for triangulation. Accuracy of estimates could be improved by increasing sample size of source surveys.
1,500 – 2,000	Victoria	2000	Capital Health Region	Grey literature	Victoria Capital Health Region Strategic Plan for HIV/AIDS.	-	-	-	-	-	-

MEN WHO HAVE SEX WITH MEN											
Population Size Estimate	Study Location (Defined Geographic Area)	Year of Study	Author(s)	Publication Type	Publication Citation	Methodology	Data Source	Eligibility Criteria	Case Definition	Sample Size	Limitations
5,533	Vancouver Island HA	2016	Statistics Canada contract with Moore D and Hogg R	Unpublished data	Number of males who self-identify as gay/homosexual and bisexual in British Columbia by geography and age group, CCHS 2013-2014	Population survey method, and then apportioning the aggregate MSM population size estimate for VIHA, IH and NH to each HA based on the distribution of the general population size of males in 2013	Canadian Community Health Survey (2013-2014)	Persons aged ≥12 years living in the 10 provinces and the 3 territories; but excluding those living on reserves and other Aboriginal settlements in the provinces, those who are full-time members of the Canadian Forces, and those who are institutionalized	Self-identifying as gay/homosexual or bisexual in CCHS	-	The estimate derived from the CCHS relies on respondents' disclosure about their gender and sexual identity, thus the generated population size estimate is likely an underestimate.
5,850	Vancouver Island HA	2015	Statistics Canada contract with Moore D and Hogg R	Unpublished data	Number of males who self-identify as gay/homosexual and bisexual in British Columbia by geography and age group, CCHS 2011-2012	Population survey	Canadian Community Health Survey (2011-2012)	<i>As above</i>	<i>As above</i>	-	The estimate derived from the CCHS relies on respondents' disclosure about their gender and sexual identity, thus the generated population size estimate is likely an underestimate.
5,530	South Vancouver Island	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>	<i>As above</i>

*** No information was found on the population size of sex workers in the Vancouver Island Health Authority.**

PEOPLE WHO USE INJECTION DRUGS											
Population Size Estimate	Study Location (Defined Geographic Area)	Year of Study	Author(s)	Publication Type	Publication Citation	Methodology	Data Source	Eligibility Criteria	Case Definition	Sample Size	Limitations
11,999 Male=7,408 Female=4,582	Fraser Health Authority	2016	Janjua N and team	Unpublished data	Assessment injection drug use based on diagnostic code in administrative datasets	BC Hepatitis Testers Cohort: Algorithm based on linkage of public health laboratory HepC testing data with medical visit and hospitalization data with ICD codes associated with substance use from administrative databases	1990-2013 HepC testing results from public health laboratory database; medical visit and hospitalization data from administrative database	People who are registered with the Medical Services Plan of BC, and who were tested for HCV, HIV, or were a reported case of HBV, HCV, HIV or active TB between 1990 and 2013	Positive HepC test between 2010 and 2012; indication of injection drug use based on at least 1 medical visit or hospitalization with ICD code associated with substance use, including codes for opioid substitution therapy	N=1.5 million	The BC Hepatitis Testers Cohort does not include PWID who have not been tested for HepC and whose past healthcare interactions did not report the use of injection drugs. Mobility of people cannot be fully accounted for (i.e., individuals are grouped into RHA based of their address of residence even though their service providers may be in a different RHA.).
(Geographic area definition not stated.) Fraser Health Authority Total OM: [12,029-24,474] H: [4,995-8,270] Fraser North OM: [3,218-6,540] H: [865-1,432] Fraser South OM: [6,054-12,322] H: [1,894-3,135]		2014	Turo C, Maxedon G, Neufelt A, Fang J.	Commissioned technical report	Estimating the size of the injection drug community within Fraser Health	Multiplier method using 2 data sources: Overdose Mortality [OM] and positive HCV tests [H]	Rate of mortality attributable to illicit drugs in each LHA from 2002-2011 (Centre for Addictions Research BC); # positive HCV test results in each LHC from 2000-2013 (Fraser Health); local population in each LHA (BC	-	-	-	The estimates are based on data related to overdose mortality and health region-wide positive HCV diagnosis. Although models were calibrated using different known literature estimates from Vancouver DTES, the Greater Victoria area and other countries, the transferability of the various contexts underpinning these known estimates to Fraser Health is unclear. Perhaps because of this, the projected trend of the PWID population size from the two models showed opposite results (OM model projected an increase of PWID population over time, while the H model projected a decrease in population). As well, the ranges for most of (sub-

Fraser East OM: [2,758-5,611] H: [2,236-3,703]							Stats)				regional) Fraser Health estimates from the two models do not overlap, thus further raising concerns about the validity of the models.
280 – 470	Abbotsford (geographic area definition not stated)	2012	Portesi DM	Grey literature	A proposed Abbotsford harm reduction service plan. Version 1 – April 30, 2012	Applying national percentages of 0.3%-0.5% on Abbotsford's population (15-64 age group; n=94,462)	Single E. A socio-demographic profile of drug users in Canada. HIV/AIDS prevention and community action programs of Health Canada. 2000.	Persons aged between 15 and 64 years	-	-	Very crude estimate

MEN WHO HAVE SEX WITH MEN

Population Size Estimate	Study Location (Defined Geographic Area)	Year of Study	Author(s)	Publication Type	Publication Citation	Methodology	Data Source	Eligibility Criteria	Case Definition	Sample Size	Limitations
8,240	Fraser Health Authority	2016	Statistics Canada contract with Moore D and Hogg R	Unpublished data	Number of males who self-identify as gay/homosexual and bisexual in British Columbia by geography and age group, CCHS 2013-2014	Population survey	Canadian Community Health Survey (2013-2014)	Persons aged ≥12 years living in the 10 provinces and the 3 territories; but excluding those living on reserves and other Aboriginal settlements in the provinces, those who are full-time members of the Canadian Forces, and those who are	Self-identifying as gay/homosexual or bisexual in CCHS	-	The estimate derived from the CCHS relies on respondents' disclosure about their gender and sexual identity, thus the generated population size estimate is likely an underestimate.

								institutionalized			
5,220	Fraser Health Authority	2015	Statistics Canada contract with Moore D and Hogg R	Unpublished data	Number of males who self-identify as gay/homosexual and bisexual in British Columbia by geography and age group, CCHS 2011-2012	Population survey	Canadian Community Health Survey (2011-2012)	As above	As above	-	The estimate derived from the CCHS relies on respondents' disclosure about their gender and sexual identity, thus the generated population size estimate is likely an underestimate.

** No information was found on the population size of sex workers in the Fraser Health Authority.*

Interior Health Authority

PEOPLE WHO USE INJECTION DRUGS											
Population Size Estimate	Study Location (Defined Geographic Area)	Year of Study	Author(s)	Publication Type	Publication Citation	Methodology	Data Source	Eligibility Criteria	Case Definition	Sample Size	Limitations
5,042 Male=2,703 Female=2,339	Interior HA	2016	Janjua N and team	Unpublished data	Assessment injection drug use based on diagnostic code in administrative datasets	BC Hepatitis Testers Cohort: Algorithm based on linkage of public health laboratory HepC testing data with medical visit and hospitalization data with ICD codes associated with substance use from administrative databases	1990-2013 HepC testing results from public health laboratory database; medical visit and hospitalization data from administrative database	People who are registered with the Medical Services Plan of BC, and who were tested for HCV, HIV, or were a reported case of HBV, HCV, HIV or active TB between 1990 and 2013	Positive HepC test between 2010 and 2012; indication of injection drug use based on at least 1 medical visit or hospitalization with ICD code associated with substance use, including codes for opioid substitution therapy	N=1.5 million	The BC Hepatitis Testers Cohort does not include PWID who have not been tested for HepC and whose past healthcare interactions did not report the use of injection drugs. Mobility of people cannot be fully accounted for (i.e., individuals are grouped into RHA based of their address of residence even though their service providers may be in a different RHA.).

MEN WHO HAVE SEX WITH MEN											
Population Size Estimate	Study Location (Defined Geographic Area)	Year of Study	Author(s)	Publication Type	Publication Citation	Methodology	Data Source	Eligibility Criteria	Case Definition	Sample Size	Limitations
5,339	Interior Health Authority	2016	Statistics Canada contract with Moore D and Hogg R	Unpublished data	Number of males who self-identify as gay/homosexual and bisexual in British Columbia by geography and age group, CCHS 2013-2014	Population survey method, and then apportioning the aggregate MSM population size estimate for VIHA, IH and NH to each HA based on the distribution of the general population size of males in 2013	Canadian Community Health Survey (2013-2014)	Persons aged ≥12 years living in the 10 provinces and the 3 territories; but excluding those living on reserves and other Aboriginal settlements in the provinces, those who are full-time members of the Canadian Forces, and those who are institutionalized	Self-identifying as gay/homosexual or bisexual in CCHS	-	The estimate derived from the CCHS relies on respondents' disclosure about their gender and sexual identity, thus the generated population size estimate is likely an underestimate.
4,160	Interior Health Authority	2015	Statistics Canada contract with Moore D and Hogg R	Unpublished data	Number of males who self-identify as gay/homosexual and bisexual in British Columbia by geography and age group, CCHS 2011-2012	Population survey method, and then subtracting the estimated number of MSM for VCH, FHA and VIHA from the estimated total for the province and apportioning the difference to IHA and NHA based on the distribution of the general population size of males in 2011	Canadian Community Health Survey (2011-2012)	<i>As above</i>	<i>As above</i>	-	The estimate derived from the CCHS relies on respondents' disclosure about their gender and sexual identity, thus the generated population size estimate is likely an underestimate.

* No information was found on the population size of sex workers in the Interior Health Authority.

Northern Health Authority

PEOPLE WHO USE INJECTION DRUGS											
Population Size Estimate	Study Location (Defined Geographic Area)	Year of Study	Author(s)	Publication Type	Publication Citation	Methodology	Data Source	Eligibility Criteria	Case Definition	Sample Size	Limitations
2,955 Male=1,505 Female=1,450	Northern HA	2016	Janjua N and team	Unpublished data	Assessment injection drug use based on diagnostic code in administrative datasets	BC Hepatitis Testers Cohort: Algorithm based on linkage of public health laboratory HepC testing data with medical visit and hospitalization data with ICD codes associated with substance use from administrative databases	1990-2013 HepC testing results from public health laboratory database; medical visit and hospitalization data from administrative database	People who are registered with the Medical Services Plan of BC, and who were tested for HCV, HIV, or were a reported case of HBV, HCV, HIV or active TB between 1990 and 2013	Positive HepC test between 2010 and 2012; indication of injection drug use based on at least 1 medical visit or hospitalization with ICD code associated with substance use, including codes for opioid substitution therapy	N=1.5 million	The BC Hepatitis Testers Cohort does not include PWID who have not been tested for HepC and whose past healthcare interactions did not report the use of injection drugs. Mobility of people cannot be fully accounted for (i.e., individuals are grouped into RHA based of their address of residence even though their service providers may be in a different RHA.).
982	Northern Health Authority as defined by the 3 health service district areas (Northern Interior, Northwest, Northeast)	2014	Reschny J	PhD proposal	Assessing the comprehensiveness of HIV prevention, treatment and care services for people who inject drugs in Northern BC	-	-	-	-	-	-

MEN WHO HAVE SEX WITH MEN

Population Size Estimate	Study Location (Defined Geographic Area)	Year of Study	Author(s)	Publication Type	Publication Citation	Methodology	Data Source	Eligibility Criteria	Case Definition	Sample Size	Limitations
2,185	Northern Health Authority	2016	Statistics Canada contract with Moore D and Hogg R	Unpublished data	Number of males who self-identify as gay/homosexual and bisexual in British Columbia by geography and age group, CCHS 2013-2014	Population survey method, and then apportioning the aggregate MSM population size estimate for VIHA, IH and NH to each HA based on the distribution of the general population size of males in 2013	Canadian Community Health Survey (2013-2014)	Persons aged ≥12 years living in the 10 provinces and the 3 territories; but excluding those living on reserves and other Aboriginal settlements in the provinces, those who are full-time members of the Canadian Forces, and those who are institutionalized	Self-identifying as gay/homosexual or bisexual in CCHS	-	The estimate derived from the CCHS relies on respondents' disclosure about their gender and sexual identity, thus the generated population size estimate is likely an underestimate.
1,690	Northern Health Authority	2015	Statistics Canada contract with Moore D and Hogg R	Unpublished data	Number of males who self-identify as gay/homosexual and bisexual in British Columbia by geography and age group, CCHS 2011-2012	Population survey method, and then subtracting the estimated number of MSM for VCH, FHA and VIHA from the estimated total for the province and apportioning the difference to IHA and NHA based on the distribution of the general population size in 2011	Canadian Community Health Survey (2011-2012)	<i>As above</i>	<i>As above</i>	-	The estimate derived from the CCHS relies on respondents' disclosure about their gender and sexual identity, thus the generated population size estimate is likely an underestimate.

** No information was found on the population size of sex workers in the Northern Health Authority.*

APPENDIX D. Potential Data Sources for Population Size Estimates

Study Cohorts

AESHA (An Evaluation of Sex Worker's Health Access) is a longitudinal cohort study initiated in January 2010. The AESHA cohort has a rolling sample of 700 women aged ≥ 14 years and is trans inclusive. Participants who exchanged sex for money were recruited from outdoor and indoor sex work locations in Vancouver as well as included those who self-advertise. Participants were administered a baseline survey at their first study visit and were followed every 6 months.

The **Momentum** Health Study is a 5-year sexual health study (2011-2016) that uses respondent-driven sampling to recruit gay, bisexual and other men who have sex with men (GBMSM) in the Greater Vancouver area. A cross-sectional surveys was administered over a 2-year study period from 2012-2014 to elicit information about HIV risk behaviour, HIV sero-status, antiretroviral therapy use and viral load among participants who are aged ≥ 15 years. After this initial survey, a subset of eligible participants are invited back to take part in a 4-year cohort with follow-up every 6 months. A second cross-sectional survey is planned for 2016-2017.

The Cedar Project is a prospective cohort study involving at risk Aboriginal youth who reside in the Greater Vancouver and Prince George regions. The working definition of "at risk youth" is young people aged between 14 and 30 years who either smoke or inject illicit drugs (i.e., crystal methamphetamine, crack-cocaine, heroin or cocaine). To be eligible, a participant must have had smoked illicit drug in the last week or injected illicit drugs in the last month prior to enrolment. Between October 2003 and April 2005, 512 participants (277 from Vancouver and 235 from Prince George) were recruited by word-of-mouth or by outreach staff for the study. At enrolment, participants were administered a baseline survey. As well, participants were offered HIV and hepatitis C testing, pre- and post-test counselling, and linkage to access to traditional healing support, addiction treatments and secure housing.

VIDUS (Vancouver Injection Drug User Study) is a prospective cohort under the Urban Health Research Initiative, a program within the BC-CfE. Since its inception in 1996, VIDUS has recruited 1,500 participants based in the Greater Vancouver area who are followed every 6 months. At each follow-up visit, participants are offered HIV and hepatitis C testing. They are also interviewed about their drug use patterns and practices, health status and access to health and social services, and interactions with the criminal justice system. The original VIDUS cohort has recently been divided into two – VIDUS and **ACCESS**. VIDUS will continue to follow individuals who are HIV-negative. The new ACCESS (AIDS Care Cohort to Evaluate Access to Survival Services) cohort follows participants who are HIV-positive. A VIDUS-affiliated cohort called **ARYS** (At-Risk Youth Study) was established in 2005. It focuses on at-risk youth in Vancouver aged 14-26 years.

I-Track is an enhanced surveillance system sponsored by the Public Health Agency of Canada. It involves a series of cross-sectional behavioural and biological surveys among people who use injection drugs to monitor at the national and regional level the changing patterns of drug use, injecting and sexual behaviour; the trend in the prevalence of HIV and hepatitis C; and the trend in testing, care and treatment of HIV and hepatitis C. There have been 4 rounds of I-Track: pilot (2002), Phase 1 (2003-2005), Phase 2 (2005-2008) and Phase 3 (2010-2012). Three cities/regions in the province of British Columbia have participated in I-Track over the years. Victoria took part in the pilot, Phase 1 and 2; Prince George took part in Phase 2 and 3; Central and North Vancouver Island took part only in Phase 2. Each site used a variation of convenience and snowball sampling strategies (e.g., venue-based, word-of-mouth) for recruiting participants. To be eligible, participants must be ≥ 17 years (or ≥ 16 years for Prince George participants), have injected drugs within the past 6 months, and appear capable of understanding information about the survey and therefore be able to provide informed consent. In addition to completing an interview, consenting participants also provided dried blood spot samples for HIV and hepatitis C testing. (Dried blood spots samples from Prince George participants were only tested for HIV.) In I-Track Phase 2, 220, 249 and 156 participants enrolled in Central and North Vancouver Island, Victoria and Prince George, respectively. As of March 2016, some preliminary results from I-Track Phase 3 have been released.

Harm Reduction Client Survey is a pilot survey study that was implemented in 2012 at 28 harm reduction supply distribution sites across the 5 health authorities of BC. The survey focused on drug use behaviours and trends. It was administered to harm reduction clients by site staff and peers. Harm reduction clients were eligible to participate if they were current clients of the site, aged ≥ 19 years, capable of giving verbal informed consent and had used drugs in the 7 days prior. A total of 698 clients completed the full survey.

M-Track is a cross-sectional behavioural and biological survey sponsored by the Public Health Agency of Canada conducted among GBMSM. Phase 1 of M-Track was implemented between 2005 and 2007 in Victoria, Winnipeg, Toronto, Ottawa and Montréal. In Victoria, in addition to recruitment from venues and special events in the community, potential participants were also contacted through telephone appointments and personal networks of the research team. To be eligible, Victoria participants must live or have a residence in southern Vancouver Island or the southern Gulf Islands; be a biological or self-identifying man who has ever had sex with a biological male or self-identified man; and be 18 years of age or older. Results of M-Track Victoria were based on 224 completed questionnaires and 184 dried blood spot samples. Phase 2 of M-Track was initiated in 2008 in Vancouver and Montréal. **ManCount** was the 2008 Vancouver site of M-Track Phase 2 where 1,139 GBMSM completed the questionnaire and provided dried blood spots.

Sex Now is a national cross-sectional survey of gay, bisexual and other men who have sex with men. The first Sex Now survey was conducted in 2002 and there have been multiple rounds since. Data for the last round was collected between September 2011 and February 2012, with 8,607 GBMSM from across the country who completed an online questionnaire that solicited information about their experience with prejudice, mental health, social support, sexual health, physical health and internet use. 1,804 men from British Columbia participated in the 2011 round of Sex Now.

The **2013 BC Adolescent Health Survey** was conducted by the McCreary Centre Society and was the fifth one in its series since 1992. Nearly 30,000 English-speaking Grade 7-12 students attending public schools in 56 (of 59) BC school districts across the 5 health authorities participated in the 2013 survey round. The survey covered diverse areas related to youth health, including sexual behaviour and alcohol and drug use.

CCHS (Canadian Community Health Survey) is a national cross-sectional survey sponsored by the Canadian Institute for Health Information, Statistics Canada and Health Canada that examines and tracks the health status, health care utilization and health determinants of Canadians. Beginning in 2001, CCHS was originally conducted every 2 years with the participation of 130,000 Canadians. Since 2007, data for CCHS are collected annually from 65,000 Canadians. Eligible participants include those individuals who are aged ≥ 12 years and who live in the 10 provinces and the 3 territories. Excluded from participation are those individuals who live on reserves and other Aboriginal settlements in the provinces, are full-time members of the Canadian Forces, are institutionalized, or live in the Quebec health regions of Région du Nunavik and Région des Terres-Cries-de-la-Baie-James.

Databases

Emergency department patient data

Opioid substitution treatment

APPENDIX E. Key Informants for Phase II Interviews

Health Authority Key Informants

Organization	Name	Position
First Nations Health Authority	Janine Stevenson	CDC Nurse Specialist, STBBIs/Harm Reduction, Health Protection
Fraser Health Authority	Shannon Krell	HIV Program Coordinator
Interior Health Authority	Jennifer Frost	Public Health Epidemiologist
	Maja Karlsson	Program Coordinator, STOP HIV/AIDS
	Jennifer May-Hadford	Epidemiologist
Northern Health Authority	Fiann Crane	Regional Director, Preventive Public Health
	Kari Harder	Public Health Epidemiologist
	Ciro Panessa	Regional Director, Chronic Diseases
Vancouver Coastal Health Authority	Miranda Compton	Manager, HIV/AIDS Services
	Ellen Demlow	Regional Epidemiologist
	Glenn Doupe	HIV Nurse Educator
	Kassie Juneke	Communicable Disease Nurse
	Sarah Levine	HIV Nurse Educator for First Nations Communities
	Afshan Nathoo	Regional Clinical Practice Leader
	Sara Young	Harm Reduction Program Coordinator
Vancouver Island Health Authority	Sophie Bannar-Martin	Program Coordinator, STOP HIV/AIDS
	Elizabeth Colangelo	Analyst, STOP HIV/AIDS
	Melanie Rusch	Regional Epidemiologist

Participating Community-Based Organizations *(that consented to be listed)*

Afro-Canadian Positive Network of BC
 AIDS Vancouver Island
 ANKORS
 Health Initiative for Men
 McLaren Housing Society of BC
 Northern HIV and Health Education Society
 Options for Sexual Health
 PACE Society
 Pacific Hepatitis C Network
 PEERS
 Positive Living Fraser Valley
 Prince George New Hope Society
 Surrey Area Network of Substance Users (SANSU)
 Velvet Steele, Community Activist
 YouthCo

APPENDIX F. Phase II Key Informant Interviews – Interview Guide

1. Can you tell us whether your organization has specific programs that are tailored to MSM, PWID and/or sex workers? What kind of programs or support does your organization provide them and how?
2. Can you tell us a little bit about these populations in your area/region?
3. If you work with sex workers: Do you think that sex worker populations are at greater risk of contracting HIV and HCV compared to women in the general population? Is there any overlap with sex worker populations with other key populations? What do you think is the extent of the overlap?
4. How many people are consistently accessing your services? For example, do you use a member or client database to keep track of members/clients?
5. To the best of your knowledge, how many people are there from the key population who are not currently using your services? How do you know?
6. Please take a look at our first set of estimates for this project (these were drawn from published literature, grey literature and other data sets). Do these estimates seem high, low, or accurate given your knowledge? Why?
7. How are you setting targets for your services? What tools are you using?
8. How are you currently evaluating services to make sure that you are meeting the needs of your clients? What tools are you using?
9. First of all, would you find PSE helpful to your work? Are there any risks? Let's say that we now know that there are X number of [key population] in your region. Is there any other information that would be helpful to you for planning, implementing or evaluating services?
10. Anything else you would like to add?

APPENDIX G. Summary of Findings from Phase II Key Informant Interviews

Key Populations in BC

Across all health regions of BC, key populations generally concentrate in city centres. In urban cores where there are well-established networks of advocacy groups and CBOs and other social infrastructure, a sense of safety and inclusiveness in the environment fosters individuals from a key population to be open and helps facilitate access to the services they need. However, in some smaller rural city centres with more conservative ideologies, key populations are mostly hidden and little is known about them. Specific to PWID, there are bylaws in some cities that limit the extent of harm reduction programming. Some cities also have “red zones” demarcating downtown areas where repeat drug offenders cannot encroach. Not only do these regulations and the overall socio-political norm drive PWIDS underground, they also prevent PWIDS from accessing essential services (that are located within the red zones). In remote natural resources-rich areas, mobility of some key populations is great. For example, mobility of sex workers in the north is apparent and is associated with the migration of transient industrial workers in and out of work camps.

Although injection drug use continues to be a risk factor for HIV/HCV acquisition, stimulant use has increasingly become an important contributing factor to HIV vulnerability. All key informants noted an overlap between the PWID and SW populations, particularly among individuals (especially youths) who engage in survival sex work to sustain injection drug and stimulant (e.g., crystal) use. Individuals may exchange sex for a variety of needed resources and they may not self-identify as sex workers. There is also overlap between the PWID and MSM populations. While some of this overlap may stem from one’s need to support drug use by engaging in sex work, stimulant use among gay men and other MSM in the setting of “party and play” has been reported in some urban cores. However, data are lacking regarding the true extent of the overlap between all three key populations.

A recurring caution raised by the key informants was the need to establish the definition of PWID, MSM and SW populations for the purpose HIV/HCV prevention and care programming, recognizing that risk for infection is not homogeneous across a key population. Along the same stream, focusing on the type and context of behaviours that promote risk for HIV/HCV infection would be more informative for understanding the differential risk within a key population rather than identity as part of a key population alone.

Current HIV/HCV Programs for Key Populations

Many programs specific for PWID, MSM and SW are provided by CBOs and ASOs through service contracts with health authorities. Across all health regions, however, harm reduction services addressing drug use related issues are the most developed. Depending on the resources available to the health authorities and their arrangements with CBOs, these harm reduction programs are founded on an extensive network of needle exchange and distribution sites and may consist of other service components such as mobile outreach to street-involved

populations, specialized addictions clinic providing comprehensive health services (sexual health, mental health, infectious diseases, primary health and palliative care) to PWID, supervised injection sites, peer-based support and education groups. In health regions with rural conservative communities, improving acceptance of harm reduction among the general public, reducing stigma and lowering service access barriers among key populations are an important ancillary goal of their programs. Many health authorities also provide harm reduction outreach to First Nations communities within their jurisdiction. Supply distribution through existing harm reduction sites in a respectful and cultural-sensitive manner is an important focus of many PWID programs.

Programs tailored to MSM and SW are well-established within urban cores whereas such targeted programs are generally limited outside large city centres in much of the province. In urban centres, gay men and other MSM have access to sexual health information, referrals, support and HIV/STBBI testing at stationary clinics as well as mobile clinics and satellite clinics in bathhouses. These urban cores often have resources to support auxiliary health services including primary health care provided by nurse practitioners and specialized case management for HIV-positive MSM which also link their clients to local resources and support for food, shelter, income, housing, financial health, legal issues and psycho-social assistance. For two-spirited, gay men and other MSM, there are also programs focusing on community education and HIV awareness and prevention that are conveyed through language, culture and ceremony.

Programs specific for SW in urban centres are much more varied because of the need to provide services to a diverse population of female, male and transgender individuals who may work indoor and outdoor. Some individuals may also work within gang-associated organizations. Nevertheless, the central approach of these programs revolves around linkage through outreach. Outreach link SW to services such as HIV and HCV education, prevention, treatment and care; physical health; sexual health; social health; mental health; drop-in meal programs; and assistance with housing, pre-employment readiness and legal issues.

In more remote areas within certain health regions, the specificity and array of service options are limited for MSM and SW. Because of the lower population density in smaller communities, the level of outreach saturation is not the same compared to more highly populated urban cores. Nonetheless, outreach by public health nursing teams, and particularly outreach through the peer networks of local CBOs, continues to be an integral part of the HIV/HCV prevention strategy in remote regions of the province where key populations are hidden and marginalized. The strong working relationship between public health and the local CBOs make reciprocal referrals possible and this ultimately benefits those individuals who are being served.

Despite limited targeted services for MSM and SW in some regions of BC, segments of these key populations who use injection drug are reached through service provisions to PWID and may be linked to other services they require. Furthermore, although harm reduction service contracts usually have a restricted set of deliverables, many contractor organizations have broad and variable mandates to serve all three priority populations and it is within their discretion to diversify services. As well, because some contractor CBOs also receive resources

from other funders (e.g., PHAC) to provide services that are not directly linked to health authority contracts, these parallel services may provide additional benefits complementary to the goals of PWID programs.

Key Population Program Planning, Delivery and Evaluation

The targets for the HIV prevention, treatment and care program in each health authority are in line with the provincial goals set out in “From Hope to Health”. In terms of program microplanning, service delivery follows the principle of equitable access. With little information about the size of key populations overall and in some places about the locations where key populations can be found, operationalizing equitable access usually means making available services in scope and magnitude that are commensurate with the general population size of a community (i.e., number of service types or sites per population size). Specific to provision of harm reduction supplies, programs have traditionally responded to perceived demands based on counts of harm reduction supplies distributed, how quickly supply inventories are being depleted and incidence of overdose events and overdose deaths. More recently, as a result of the declared provincial public health emergency related to opioid overdose deaths, evidence-informed program adjustments about where services should be provided within some health authorities was based on mapping of naloxone programs, overlaid with location of illicit drug overdose deaths. Among contractor CBOs, program target setting is variable. Some CBOs strive to achieve targets set by their funders. Other CBOs do not set advance targets but make program adjustments on an ongoing basis by collaboratively identifying service needs with their clients/members. Yet some other CBOs set service targets based on maximizing the use of allowable budget and resources.

In achieving “Reach and Engagement” of individuals who are at higher risk of acquiring HIV and HCV, “Community Involvement” in service programming is made possible through BC’s decentralized model of service delivery which enables program reach and connection with key populations in the local community context. However, this also creates challenges in evaluating contract services provided by CBOs. Although some CBOs are required to regularly report on indicators set out in their service contracts, these contracts do not employ a common set of indicators and measurements across the province. Program evaluation is largely based on service outputs (e.g., number of units of harm reduction supplies distributed, number of condoms distributed, number of people using a service, etc.) with limited understanding of program impact on key populations. This is common across all health authorities in the province.

Aside from a lack of information about the size of key populations, evaluating program coverage and impact is further hindered by the paucity of reliable information on the number of unique individuals of a key population who are accessing particular services consistently and regularly. Depending on the nature of services provided by a program, clients of targeted interventions are tracked to varying degrees. Registries of clients of health outreach nursing teams or clinics are likely the most complete, with information on HIV/HCV diagnosis and exposure categories tracked in electronic medical records. On the other hand, while clients of some CBOs are tracked in the membership registry, clients of other CBOs may not be tracked at

all (no registry). Even if a client database exists, information regarding the clients' HIV/HCV exposure categories (regardless of the infection status of the individuals) is likely incomplete or lacking. This is because CBOs found collecting information on exposure categories to be difficult and stigmatizing, counterproductive to providing safe services and could be detrimental to their relationships with community members. The collection of this additional information also put extra reporting burden on the organizations. As a result, many CBOs feel strongly against collecting data in this line of questioning.

There are also logistical challenges in program evaluation. In the current fiscally-constrained environment, some health authorities are under pressure to redirect program resources to respond to local infectious disease outbreaks and other public health emergencies. As a result, programs may be unable to achieve preset targets. Evaluation modules are not well integrated into programs and are often ad hoc in nature.

APPENDIX H. New HIV Diagnoses Among Females and Males in BC from 2006 to 2015 who Reported Sex Work as a Potential Risk Factor

Table H1. Female sex workers who were newly diagnosed with HIV between 2006 and 2015, and their reported risk factors.

Year of Diagnosis	Total # of New Diagnoses among FSW	Newly Diagnosed FSW ¹ with:				% Total New Female Diagnoses who were FSW	% Total New Diagnoses (Males and Females) who were FSW
		Reported IDU Exposure ²		NO Reported IDU Exposure ²			
		n	%	n	%		
2006	22	22	100%	0	0%	30%	6%
2007	26	25	96%	1	4%	31%	7%
2008	10	8	80%	2	20%	17%	3%
2009	13	9	69%	4	31%	18%	4%
2010	12	8	67%	4	33%	19%	4%
2011	6	2	33%	4	67%	14%	2%
2012	5	4	80%	1	20%	17%	2%
2013	2	0	0%	2	100%	6%	1%
2014	2	1	50%	1	50%	5%	1%
2015	1	1	100%	0	0%	3%	0%

¹ FSW = female sex worker

² Irrespective of the determined likely route of HIV transmission

Table H2. Male sex workers who were newly diagnosed with HIV between 2006 and 2015, and their reported risk factors.

Year of Dx ¹	Total # of New Dx among MSW	Newly Diagnosed MSW ² with:										% Total New Male Dx who were MSW	% Total New Dx (Males and Females) who were MSW
		Reported MSM and IDU Exposures ³		Reported MSM Exposure Only ³		Reported IDU Exposure Only ³		Reported Heterosexual Contact Exposure ³		NO Identified Risk or Unknown Exposure ³			
		n	%	n	%	n	%	n	%	n	%		
2006	7	4	57%	3	43%	0	0%	0	0%	0	0%	2%	2%
2007	5	2	40%	1	20%	0	0%	2	40%	0	0%	2%	1%
2008	1	1	100%	0	0%	0	0%	0	0%	0	0%	0%	0%
2009	7	2	29%	4	57%	0	0%	1	14%	0	0%	3%	2%
2010	0	0	-	0	-	0	-	0	-	0	-	0%	0%
2011	4	2	50%	2	50%	0	0%	0	0%	0	0%	2%	1%
2012	6	2	33%	4	67%	0	0%	0	0%	0	0%	3%	3%
2013	9	0	0%	3	33%	0	0%	5	56%	1	11%	4%	3%
2014	5	0	0%	2	40%	0	0%	3	60%	0	0%	2%	2%
2015	9	0	0%	6	67%	1	11%	2	22%	0	0%	4%	4%

¹ Dx = diagnosis

² MSW = male sex worker

³ Irrespective of the determined likely route of HIV transmission