

Defining intervention location from social network geographic data of
people who inject drugs in Winnipeg, Canada

Amanda Shane

Thesis submitted to the Faculty of Graduate and Postdoctoral Studies

In partial fulfillment of the requirements

For the M.Sc. degree program in Epidemiology and Community Medicine

Department of Epidemiology and Community Medicine

Faculty of Medicine

University of Ottawa

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Acknowledgements

I would like to offer interminable gratitude to my supervisor, Dr. Ann Jolly, for her guidance, support, enthusiasm, and most importantly, patience, throughout the course of this project. I would also like to acknowledge the contribution of my co-supervisors, Dr. John Wylie and Dr. Yue Chen, for their time and valuable input during the review process. For their help and advice navigating the vast world (pun intended) of GIS, I would like to recognize Janelle Hippe and Philip AbdelMalik. Thanks are also extended to Margaret Ormond for her help with validation of the intersection data. Finally, thank you to my family and friends for learning (very quickly) to pretend we lived in a world where I was *not* still writing my MSc thesis.

Abstract

Background: Sharing and inappropriate discarding of drug use equipment and syringes can lead to the transmission of certain bloodborne pathogens and decreased sense of community safety. To reduce these risks, appropriate interventions, such as the installation of syringe and equipment drop boxes, are often implemented. However, little consideration has been made to the social and geographic networks of the injection drug use (IDU) populations in the selection of the syringe and equipment drop box locations.

Methods: A sample of IDU was obtained through respondent driven sampling in Winnipeg, Canada from January to December, 2009. Characteristics of the overall sample and distribution of these characteristics through the social network were assessed. A spatial network was constructed which focused on the connections between IDU and specific geographic locations: place of residence, place of injection and hangout location. Measures of centrality were calculated using Pajek network analysis software. The social geographic network was mapped using ArcGIS software to locate, in real space, the nodes with high degree and betweenness centrality.

Results: The mean age of participants was 37 years, and there was equal representation of males and females. The vast majority of the IDU sample was Aboriginal (77%), did not complete secondary school, and reported government support as the main source of income. Analysis of the network based on known correlates of drug use revealed distinct subcomponents for which targeted interventions could be applied. Spatial analysis revealed geographic clustering quantified through network centrality measures. There was congruence between locations identified with high degree through the spatial network and current drop box locations in Winnipeg.

Conclusions This research illustrates the benefit of combining social network and spatial data from IDU in order to inform evidence-based municipal policies and programs, resources are limited, in order to strategically place public health interventions.

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List of Abbreviations

GIS	Geographic Information System
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HIV	Human immunodeficiency virus
IDU	Injection drug use/user
RDS	Respondent-driven sampling
STI	Sexually transmitted infection

1.0 Introduction

1.1 Social networks

Social networks are the complex web of relationships that exist between people, who are joined together by a defined behaviour or interaction¹. They form naturally. These networks can be composed of various interdependencies, such as friends, family members, sexual partners, drug partners, financial supporters, emotional supporters and resource providers.

1.2 Social network analysis

Social network analysis is a method used to analyze groups of people (or networks) and their interactions². The history of the development of social network analysis is complex. In the early 20th century, sociometric analysts made advancements with graph theory; Harvard researchers investigated interpersonal relations and the formation of “cliques”; and from these developments, Manchester anthropologists began the investigation of the structure of ‘community’ relations in tribal villages³. This collective work was brought together by Cartwright and Harary⁴ who developed mathematical models of group cohesion, social pressure, cooperation, power and leadership. The central development of their framework was the representation of social groups as nodes (or points) connected by edges (or lines), which would thus depict the network of interpersonal relations. These graphs, then, could be analyzed using mathematical concepts of graph theory.

Graph theory consists of a variety of mathematical formulae which can be used to describe and characterize the properties and patterns formed by network nodes³. An important component of graph theory in the analysis of social networks is the ability to apply a “direction” and a “sign” to each of the edges, which would specify whether individuals have a positive or negative relationship (as defined by the study) and in which direction the relationship is (*e.g.* whether person A provides support to person B, or whether person B and person A provide support to each other). When Cartwright and Harary applied these properties to the nodes and edges of the subjects within the social network, they were then able to analyze group structure from the stance of each of the members simultaneously, instead of from the stance of a focal individual.

Concepts and theories of social network analysis have continued to develop. White,⁵ from Harvard, explored the use of algebraic methods to conceptualize the concept of 'role' in social structure. Also out of Harvard came the development of multi-dimensional scaling used to translate relationships into 'social distances' which would allow these relationships to be mapped in social space³. With these methods, they were able to translate concepts from the social sciences into mathematical form, which allowed them to be measured and modeled.

The methods of social network analysis can be applied to a range of disciplines. They are predominantly used in fields such as psychology and sociology in order to describe the relational context in which behaviour takes place or to investigate the structure of individual life histories⁶. Network analysis has expanded into other fields, such as transmission of communicable diseases and distribution of non-communicable health outcomes (*e.g.* obesity) and behaviours⁷. Irrespective of the discipline, social networks can be analyzed in terms of function and structure. Functional qualities refer to the type of support provided by the network members, whereas structural qualities include network size and network density⁸. Klovdahl's analysis of the spread of human immunodeficiency virus (HIV) across North America in the 1980s made use of social network analysis to describe the transmission dynamics of this virus.⁹ From this, social network analysis continued to be used in the investigation of other sexually transmitted infections (STI) and bloodborne pathogens¹⁰.

1.3 Social network analysis in the study of injection drug users

Social network analysis has been increasingly used in the study of STI transmission dynamics among injection drug users (IDU)¹¹⁻¹⁸. It has been shown that drug network characteristics are associated with specific risk behaviours. For example, injection-related HIV risk behaviours have been found to be predicted by size of drug network¹⁹, while multiple sex partners has been associated with network size and density²⁰.

1.4 Social network analysis, injection drug use and geographic place

1.4.1 General uses

Previous work on the transmission of gonorrhoea showed that the prevalence of infection was disproportionately high among core groups of the population²¹. A core group is a small subset of a

network who are very effective transmitters of STIs due to several factors, including having a large number of sexual partners²². As core groups are often found in close geographic proximity, early attempts were made to define these groups based on geography²³. Geographic proximity is an important factor associated with the adoption of high risk behaviours such as syringe-sharing, and this behavior also has a social component. It has been found that social venues such as hotels and street corners are key factors associated with engaging in equipment sharing, and thus exposure to bloodborne pathogens²⁴. As part of Wylie *et al.*'s 2006 study²⁵, the social network analysis of IDU data demonstrated that hotels served as important bridge points for different groups of IDU which otherwise would not be in contact. The data suggested that IDU living at home would frequent the high risk environment of a hotel, and be exposed to common risk behaviours at that geographic location, and thus also be exposed to bloodborne pathogens.

Another important characteristic of geographic place when studying the social networks of IDUs is that a disproportionately high number of people will centre on a small number of locations²⁵. This structure reflects a small-world network. A small-world network is one in which the network shows a power law degree distribution. This means that certain nodes will show a large number of connections, whereas the majority will have a few connections. Therefore, incorporating geographic place into the social network analysis of IDU can facilitate the strategic implementation of structural interventions, such as syringe and drug equipment drop boxes, automatic needle dispensers, mobile needle exchange programs, education, public health programs and primary care because it is likely that there will be a low number of geographic locations that link the members of the social network²⁵.

1.4.2 The use of Geographic Information System applications in health-related research

Geographic Information Systems (GIS) applications serve a wide range of purposes in the field of public health, from policy development to disease surveillance. In 2008, the University of Alberta School of Public Health released a comprehensive review summarizing the extent to which GIS applications have been used in health-related research²⁶. The authors found that the public health uses of GIS could be summarized into four themes: disease surveillance, risk analysis, community profiling and health access and planning.

Use of GIS in disease surveillance is the most common and established domain. These applications have been used for both disease mapping (*e.g.*, identifying geographic areas with increased incidence or mortality due to a condition, or monitoring the spread of a communicable disease²⁷) and disease modeling (*e.g.*, to project disease transmission and to anticipate areas at increased risk

for transmission²⁶). Use of GIS in risk analysis is related to increasing the spatial understanding of hazards (*e.g.* pollution) and health. Community health profiling incorporates spatial information related to health, the environment and community infrastructure in order to better understand the interaction between people and their environment²⁶. The final theme identified - health access and planning - relies heavily on network analysis in order to quantify who requires access to a service, and how the services are accessed (*e.g.*, planning of health care delivery²⁶).

1.5 Harm reduction programs

The transmission of bloodborne pathogens does not occur randomly within a population; it occurs, instead, as a function of complex behaviours within social networks²⁸. In addition, syringe and equipment sharing is a well-established mechanism of transmission of the bloodborne pathogens HIV and hepatitis C virus (HCV). It was recently reported that IDU was the mode of transmission in approximately 17% of HIV diagnoses in adolescents and young adults aged 13-24 years through 2003 in the United States²⁹.

Therefore, an important area of research has been the investigation of interventions to reduce transmission of bloodborne pathogens via used syringe and equipment exposure. Research has shown that when HIV enters a community of IDUs, the infection can rapidly progress to the rest of the population if appropriate responses are not implemented^{30,31}. Examples of appropriate responses include the introduction of syringe exchange programs, and the implementation of syringe and equipment drop boxes. These interventions are considered harm reduction strategies; programs and policies aimed at reducing drug-related harm.

There are barriers to safe disposal of used syringes. Fear of being witnessed by police with used syringes and other paraphernalia, and fear of being identified as a drug user, causes IDU to dispose of their syringe quickly following injection³².

Studies have shown, however, that drug users take the community's safety into consideration when disposing of used injection equipment. Neale³³ studied 124 IDU, in which 25% reported that they took care to dispose of their used equipment safely when children were near, and that they often removed others' equipment from public places out of concern for the safety of the community. Research also indicates that IDU would utilize syringe and equipment drop boxes, provided they were "located next to street markets and known drug 'hot spots' in order to facility quick and safe

disposal”³⁴. These interventions are important, not only for reasons of public health, but also to maintain the public’s perception of community safety.

1.6 The state of harm reduction programs in Winnipeg, Manitoba, Canada

From the results of the Public Health Agency of Canada’s I-Track Phase I Report, the prevalence of HIV and HCV among IDU was 13.1% and 61.8% respectively, in Winnipeg in 2005³⁵. These data are in line with the average prevalence obtained from the seven cities that participated in the I-Track study (13.2% and 65.7% respectively). Most participants cited their own house/apartment (48.8%) or a friend’s house/apartment (27.2%) as the most frequent location for injection³⁵. Sixteen percent listed hotel, on the street or rooming house as the most frequent venue for injecting drugs. In addition, when asked about all types of injection venues used at any point in the previous six months, those numbers increased to 32.4% who injected in a hotel, 39.6% who injected in a public place and 26.8% who injected in a rooming house. These are public locations in which appropriate disposal of used syringes and equipment is essential.

There are several initiatives and organizations within the Winnipeg Regional Health Authority that aim to reduce the harms associated with IDU. Street Connections is a mobile van service that was established over 20 years ago. Its goal is to prevent the spread of STI and bloodborne pathogens among Winnipeg’s most vulnerable populations, through mobile distribution of IDU supplies and crack kits on the streets of Winnipeg. From Wylie’s 2005 report², most IDU obtained new syringes from Street Connections (32.6%) followed by pharmacy/drugstore (29.1%), friend/partners/family (21.7%) and needle exchanges other than Street Connections (14.5%).

The Methadone Intervention and Needle Exchange (M.I.N.E.) Program consists of both a methadone maintenance program for those dependent on opiates, and a harm reduction program to reduce the harmful consequences of drug use. M.I.N.E. has several services including: counseling and support; health promotion; disease prevention education including a needle exchange; and assisting clients to link with other community based supports and services³⁶. New syringes can also be acquired from Nine Circles Community Health Centre, Sage House and Sunshine House. Nine Circles Community Health Centre is a community-based, non-profit centre that specializes in HIV/STI prevention and care. They provide education, needle distribution, free condoms and practical supports to reduce harm and risk. This centre is only open during the week, from 9:00 a.m. to 5:00 p.m., and until 7:00 p.m. on Wednesdays. Sage House is a community service program of Mount

Carmel Clinic that targets their outreach programs to street-involved females and transgender people, and is open in the afternoons from Monday to Thursday, and until 10:00 p.m. on Fridays.

Most recently, in May of 2010, Winnipeg's first six syringe drop boxes were introduced³⁷. The boxes are blue with biohazard symbols affixed, and are attached to hydro poles at six intersections (Figure 1). The Manitoba Harm Reduction Network chose these six locations based on where they had found high numbers of inappropriately discarded syringes. Street Connections has the responsibility of checking and emptying the boxes on a weekly basis.



Figure 1. Geographical location of the first six needle drop boxes in Winnipeg, Manitoba, Canada as of June 2010 in A) downtown Winnipeg and B) south Winnipeg.

This initiative is important and similar ones have shown success in other Canadian cities³⁸: Vancouver initiated its syringe drop box program in July of 2006, and since has installed 27 drop boxes in the downtown core³⁹; as of April 2013, the City of Ottawa has over 40 syringe drop boxes located through the downtown core as well as in localized areas where there is increased drug use⁴⁰; and as a final example, the City of Montreal has installed 17 drop boxes from 1997-2005³⁸.

1.7 Defining intervention location from social network geographic data

A major question is how to strategically place these interventions in order to reduce inappropriate syringe and equipment disposal. It is known that these behaviours are concentrated in specific “hot spots” in Winnipeg²⁵. Therefore, because social networks form around common geographic locations, it is proposed that the social network geographic structure be analyzed in order to define intervention locations. These interventions can include, regular stops by the Street Connections van, condom and clean needle “vending” machines and containers for safe needle disposal.

1.8 Objectives

1. The first object of the study was to obtain a detailed epidemiologic overview of the IDU population in Winnipeg based on data from study participants who were identified through respondent-driven sampling from July to December, 2009 through:
 - a. description of the social networks and basic social network measures of the study sample; and
 - b. construction of components of individuals linked directly through social connections by sociodemographic and drug use characteristics.
2. The second objective of the study was to identify and map locations represented within the top degree quartile of respondents through social network and spatial analysis, in order to:
 - a. validate this analysis method with the opportunistic syringe drop box placement method occurring presently in Winnipeg; and
 - b. suggest, if applicable, additional locations for structure interventions that are central to the IDU network in Winnipeg.

1.9 Hypothesis

It was hypothesized that sociodemographic and drug use behaviours differ between components (a component is a subgroup of the larger network in which all nodes are joined to each other through one or more connections³). It was also expected that a small number of locations be named by a large number of participants, and the result would provide guidance as to how to effectively implement structural interventions in Winnipeg, Canada.

1.10 Thesis presentation

This thesis is presented in a manuscript-based format. It consists of two separate manuscripts that each centre around one specific objective listed above. Manuscript 1, entitled “The social networks of injection drug users in Winnipeg, Canada” describes social structure of Winnipeg IDU. Manuscript 2, entitled “The spatial epidemiology of injection drug users in Winnipeg, Canada” describes the geographic structure of Winnipeg IDU.

A detailed description of the methodology used throughout these studies is provided in Section 2.0. This section goes into more detail than that provided in each of the manuscripts. Section 5.0 provides a global summary and discussion of the completed work.

2.0 Methods

2.1 Overall and study samples

The study sample came from the research project entitled “The behavioural, social and cultural factors affecting the epidemiology of sexually transmitted and bloodborne pathogens in high-risk populations: Determining risk space in Canada’s vulnerable populations” (see Appendix 8.1 Statement of Contribution of the thesis author). In addition to IDU, this study targeted members of three other risk groups: men who have sex with men, women who have sex with women and street youth. Participants were enrolled through respondent-driven sampling, which is a methodology based on the chain-referral sampling method⁴¹ and participants were given a \$40.00 cash honorarium. Seeds (n=22) identified by the research coordinator and seeds that self-initiated (n=118) composed wave 0 of the sample. These seeds were given three laminated coupons, each with a unique ID that they distributed to members of their social network. Participants were instructed to recruit people who engaged in similar risk behaviours that they had been asked about in the study questionnaire (*e.g.* use of injection drugs). People who returned a coupon to the study centre, and enrolled in the study, composed wave 1 of the sample. This process was repeated until the desired sample size was reached (n=600). Recruitment took place from January to December 2009.

Eligibility criteria for inclusion in the study were: age greater than 14 years and informed consent. In total, 600 participants were enrolled in the study (henceforth referred to as the overall sample). Of these, 297 participants reported that they had injected non-prescribed drugs at least once in their

lives. However, analysis for the thesis was limited to the 113 participants who self-reported injection drug use within the previous 6 months, in order to focus the analysis on individuals with recent drug use history (henceforth referred to as the study sample). Injection drug use information was missing for four participants (Figure 2). The study was approved by the Health Research Ethics Board of the University of Manitoba and the Winnipeg Regional Health Authority Research Review committee.

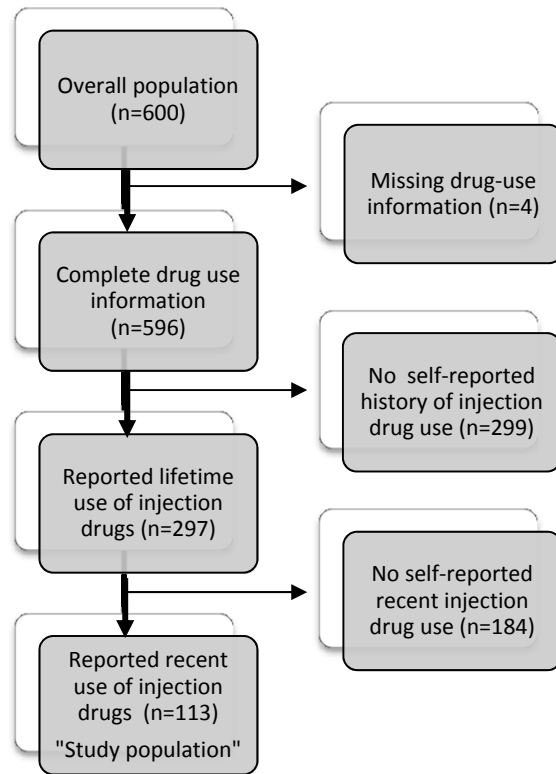


Figure 2. Schematic representation of the derivation of the study sample.

The participants completed an interview-administered questionnaire, which collected both individual-level data and egocentric social network data anonymously. The individual-level data were categorized into twelve sections: demographics; access to services and other community areas; neighbourhood characteristics; health-self assessment; alcohol use; sniffing and solvent use; crack smoking; other non-injection drug use; injection drug use; condom use and access; substance abuse; and perception of risk and previous diagnostic testing. Three key geographic variables were

included in the analysis: nearest intersection to place of residence, nearest intersection to injection location and nearest intersection to hangout location.

2.2 Characteristics of the social network of drug users in Winnipeg

Of interest were the characteristics of drug users in Winnipeg and how these characteristics differed throughout the social network. The variables included for analysis were an individual's demographic and drug use behaviours. Demographic information included age, gender, ethnicity, income and education. Drug use behavior information included age at first use, number of drugs used, most frequently used drug, frequency of use/number of injections per day and location of drug use.

Characteristics of the study sample were assessed using frequency distribution. Depending on distributional assumptions, statistical significance was determined by use of t-test or Wilcoxon Rank Sum for continuous variables and by chi-square or Fisher's exact test for discrete variables. All statistical analyses were conducted with Statistical Analysis Software Enterprise Guide 4.2®.

2.3 Social network analysis

Pajek networking software was used to generate the egocentric social network⁴². The analysis of the social networks focused on the connections between people and the geographic locations each identified. Participants were linked to other participants through the respondent driven sampling coupon unique identification number.

The network analyzed consisted of the 113 participants that formed the study sample and the key geographic locations identified through the questionnaire process. These geographic locations were obtained through three distinct questions, and refer to the intersections of the location of residence, the place of injection, and the hangout location. The purpose of including these three geographic variables is: 1) to identify geographic "hotspots" in which Winnipeg IDU centralized; and 2) to examine social network characteristics of people frequenting these "hotspots" in order to identify key locations in which interventions should be placed.

Therefore, geographic locations were considered the nodes in the network. If a participant reported an injection or hangout intersection that differed from his place of residence, this would create a linkage between place of residence and place of injection (dyad 1) and place of residence and

hangout location (dyad 2). A dyad refers to two nodes and their ties³. An edgelist, or a list of all connections between nodes, was then created in Microsoft Excel and converted to a .net file using Pajek's Excel2Pajek converter⁴³. This .net file was imported into Pajek for analysis and visualization.

2.4 Network structure and visualization

Pajek software was used to generate network characteristics. Two measures of centrality, degree and betweenness, were calculated for each node in the network. Degree is a measure of how well connected a node is. For example, a degree of four indicates that the node is connected to four other nodes. Betweenness is a measure of the extent to which a node is situated between other nodes³. Therefore, a node with a low degree and high betweenness can still play an important role in the network in that this point lies on the path between two or more well connected points.

Networks were visualized in Pajek using an automatic layout generation method called Kamada-Kawai Free⁴⁴. This graph drawing algorithm is based on the tendency for attraction between adjacent nodes and repulsion between non-adjacent nodes, in two-dimensional space.

2.5 Spatial analysis

Because the world is a 3-dimensional sphere, projecting maps onto a 2-dimensional sheet of paper results in distortion of the image (*e.g.* distortion of shape, distance, size of areas). Therefore, an important consideration when conducting spatial analysis is the selection of a map projection. In the present study, a conformal projection was selected (specifically, the Canada Lambert Conformal Conic projection) because it preserves shape and directional relationships at small scales (*i.e.* the city of Winnipeg) and it is the most widely used map projection at Statistics Canada⁴⁵.

A second consideration is the selection of the coordinate system. Coordinate systems enable the integration of various geographic features and allow these real-world locations to be displayed within one map projection⁴⁶. In the present study, the coordinate systems of each layer were synchronized using World Geodetic System (WGS 1984).

Standardized intersections were geocoded using Google Maps "LatLng Marker" add-on. The geocoding process is required in order to convert address information (in this case, intersection) into an x, y coordinate system format for spatial display. At the time of analysis, ArcGIS did not provide an integrated solution for geocoding locations based on intersection. However, Geocoding

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Services allows the conversion of addresses or other identifiers (postal code) into the x, y coordinate system⁴⁷.

ESRI ArcGIS version 10.1⁴⁸ was used to spatially distribute the geoepidemiological variables. The 2012 Census Subdivision Boundary File produced by Statistics Canada⁴⁹ was used as the base layer, with the Road Network file⁵⁰ (contains street names, types, direction and address ranges) for the same year used as a secondary layer. The BING aerial basemap was applied for presentation purposes. Nodes were sized proportionally to degree.

3.0 Manuscript 1

The social networks of injection drug users in Winnipeg, Canada

3.1 Introduction

Social networks are the complex web of relationships which form naturally and exist between people who are joined together by a defined behaviour or interaction¹. These networks can be composed of various interdependencies, such as friends, family members, sexual partners, drug using partners, financial supporters, emotional supporters and resource providers. The social networks of injection drug users (IDU) have an important influence on their behaviour as the connections that join IDU allow for the transmission of many things, including information and health behaviours^{1,51}.

Social network analysis is a method used to analyze groups of people (or networks) and their interactions⁶ which has been used to reveal drug network characteristics associated with specific risk behaviours¹⁹. For example, injection-related HIV risk behaviours have been found to be predicted by the size of drug network, while STI risk and type of STI have been associated with network size and density⁵². Other researchers found that respondents were more likely to share syringes with those who were close to them (*e.g.* sexual partners)²⁹.

A major challenge faced in the study of IDUs is the collection of a representative study sample. Respondent-driven sampling (RDS) is a chain-referral sampling method that is a modification of snowball sampling, but which incorporates statistical weights to account for differences in network size³¹. It has been increasingly used in the study of marginalized populations, such as men who have sex with men⁵³⁻⁵⁵, female sex workers^{56,57}, and IDUs⁵⁸⁻⁶⁰.

Homophily within a social network recruited through RDS results when a participant's recruits shared similar demographic and/or behavioural characteristics⁵⁸. However, as long as the RDS sample includes a sufficient number of waves to achieve equilibrium (usually 4-6 waves), the sample's characteristics will differ from those of the initial set of seeds⁶¹. Equilibrium refers to the state in which any bias introduced by nonrandom selection of seeds has been overcome within the sample, as recruitment progresses. It occurs when there is less than 2% change in composition of the sample specific to a given variable (*e.g.* gender), between the current and previous waves⁶². If equilibrium is reached, this composition becomes independent of the characteristics of the seeds⁶³⁻⁶⁵.

Several studies of IDU have demonstrated heterogeneity within the samples and between components of the network^{66,67}. One such study applied cluster analysis methods to empirically derive IDU clusters or types in order to help explain some of the variation observed within the IDU population of Winnipeg, Canada⁶⁶. One key finding of that study was the discovery of a cluster of

young female crystal methamphetamines users that were HIV and HBV negative, but frequently engaged in high risk syringe behaviour. A second study highlighted the importance of understanding variation in risk behaviour by type of drug injected. Cocaine injectors in Montréal, Canada, were more likely to attend shooting galleries than heroin injectors⁶⁷. Characterization of IDU clusters by their demographic and drug use characteristics can lead to the application of targeted, efficient and effective interventions.

The purpose of this study was to describe the distribution of demographic and key drug use characteristics throughout the social networks of Winnipeg in order to identify groups of high risk IDU for which to target structural interventions, such as syringe and equipment drop boxes, automatic needle dispensers and mobile needle exchange programs. The methodology was based on previous work conducted and knowledge gained regarding this hidden population in Winnipeg^{25,28,66}.

3.2 Methods

3.2.1 Study sample

A total of 600 people (460 recruits and 140 seeds) were recruited through RDS between January to December, 2009 in Winnipeg, Canada into a cross-sectional study of the behavioural, social and cultural factors affecting the epidemiology of sexually transmitted and bloodborne pathogens in high risk populations. To be eligible for inclusion, participants had to be greater than 14 years of age, provided informed consent.

Initial key respondents (seeds), who were members of the target community, were recruited through various methods which had been successfully employed by the investigators' past IDU studies in Winnipeg, including: personal knowledge of appropriate members of study sample based on the study coordinators' past experience; suggestions by population members of other people they knew who thought would be appropriate and who could be put in touch with study staff; and suggestions offered by staff or community agencies. In addition, any person who self-initiated contact with the study staff (*e.g.* did not present with a coupon) and met the inclusion criteria was admitted into the study and was then able to enroll other participants.

The seeds were characterized as Wave 0. Following completion of the interview-administered questionnaire by the research nurse, each seed in wave 0 was given three laminated, uniquely

identified referral cards, which they were asked to hand out to people in their social network in order to recruit the next waves of participants. Each individual who subsequently presented a referral card to study interviewers that met the eligibility criteria, completed the interview-administered questionnaire, and in turn, was given three referral cards. In this way, the sample was generated through waves or generations of friends of recruiters. Each participant was given a \$40 CAD cash honorarium.

Of the 600 participants recruited (overall sample), IDU information was available for 596 participants. Of these, 297 participants reported that they had injected non-prescribed drugs at least once in their lives. However, the primary analysis was limited to the 113 participants who self-reported injection drug use within the previous 6 months (study sample) in order to focus on individuals with recent injection drug use history, and current behaviours for interventions.

3.2.2 Survey instrument

All participants completed a two-part interview-administered questionnaire. Part 1 was designed to capture individual level data and was divided into twelve sections, two of which were used in this study: demographics and injection drug use. The specific demographic, injection drug use and diagnostic testing variables were restricted to well understood correlates of clusters in the Winnipeg IDU population identified by previous cross-sectional studies⁶⁶.

Study sample

The study sample was derived based on responses from two questions. The first was, "Have you ever injected any non-prescribed drugs?" with possible responses of No, Yes, Unsure and Refused. Those participants who responded with Yes, Unsure or Refused were then asked, "Which of the following drugs have you ever injected and which ones have you injected in the last 6 months. Of the drugs injected in the last 6 months, indicate which is the most frequently injected." The study sample was derived from participants who reported having injected at least one of the fourteen listed drugs on the questionnaire, within the last 6 months.

Demographic information

Demographic information analyzed included age, gender, ethnicity, level of education, main source of income, and residence type. Individuals that identified as "First Nations" or "Métis" were classified as Aboriginal while those who identified as "Caucasian" or "Other" (n=1) were classified as non-Aboriginal. Level of education was coded as those who completed grade 12 or higher compared to those that did not. Responses of "Unknown" and "Refused" were coded as

unknown. The frequency of unknown varied by demographic variable, from 0.9% to 5.3% (Table 2).

Injection drug use and diagnostic testing

The following variables related to drug use behaviour were summarized: age at first injection; type of drug(s) injected in past 6 months; most frequently injected drug in past 6 months; frequency of injection; location of injection; access to syringes; and history of syringe sharing.

The type of drug(s) injected in the past 6 months was coded as binomial variables. The following drugs were listed: cocaine; Talwin (pentazocine) and Ritalin (methylphenidate); heroin; morphine; crystal methamphetamine; oxycodone; and other opiates, which includes Dilaudid and Percocet. Crack cocaine, fentanyl and ketamine were coded as “Other” due to low prevalence. To assess location of injection, participants were asked whether, in the last 6 months, they had injected in any of the following locations: private residence; bars/strip bars; bathhouses; hotel(s); shooting gallery/crack house; outdoor public place (*e.g.* parks, on the street); indoor public place (*e.g.* washrooms, shopping malls); jail; InSite Vancouver; and/or school. Syringe access was ascertained through the survey question, “In the last 6 months, how easy or difficult was it for you to obtain brand new, unused needle/syringe when you needed one?” with possible responses coded as 0 for very easy, 1 for somewhat easy, 2 for somewhat difficult and 3 for very difficult. Syringe sharing behaviour was based on the binomial response to the question, “In the last 6 months, have you injected drugs with a needle after someone else had already injected with it?”

Detailed methods for venous blood specimen collection and hepatitis C (HCV), hepatitis B (HBV) and human immunodeficiency virus (HIV) serological testing have been described previously²⁴. Briefly, specimens were tested at Cadham Provincial Laboratory (Winnipeg, MB) and presumptive HCV and HIV positives were confirmed with Chiron HCV 3.0 RIBA and western blot, respectively. Positive HBV cases were those with specimens positive against HBV core protein.

3.2.3 Characteristics of the social network and network structure

Pajek⁴² networking software was used to generate the egocentric social network; the network reported by each participant, together with the sociometric links derived from the received cards⁴². The network analyzed included the subset of 113 study participants with history of drug use in the past 6 months. Components within the IDU study sample were compared to components from the overall population in order to demonstrate how the IDU were dispersed within the larger network.

To determine whether the demographic and drug use characteristics were associated with position within the social network, each component of ≥ 4 participants was further characterized and compared to participants outside of that component. Finally, participants without an identified connection (*i.e.* components of $n=1$) were compared to participants with at least 1 RDS connection. Differences in epidemiological characteristics between components were assessed with χ^2 or Fisher's exact test for dichotomous variables, and *t*-test for continuous variables. All statistical analyses were conducted with Statistical Analysis Software Enterprise Guide 4.2 for Windows⁶⁸.

3.3 Results

3.3.1 RDS sampling

From 140 seeds, a total of 600 participants were enrolled in the study through 9 waves of recruitment. The largest component consisted of 46 people (Figure 3).

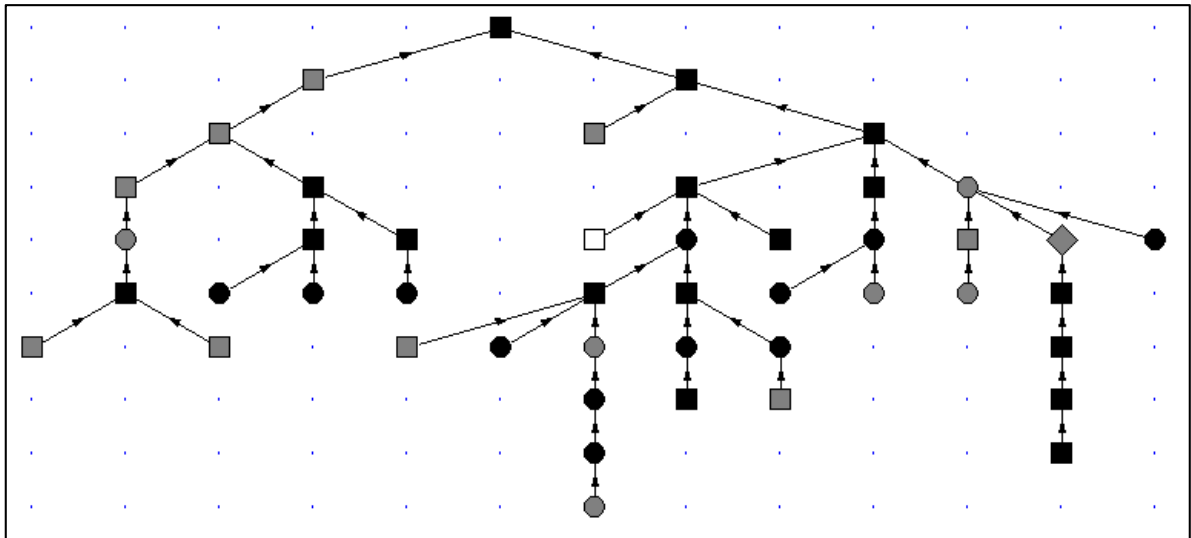


Figure 3. Schematic of Component 8 ($n=46$) of the overall sample. Circles represent females, squares represent males and diamonds represent unknown gender. The colour is related to IDU history: black represents no history of IDU; gray represents past history of IDU (no reported drug use in the last 6 months); and white represents participants with recent IDU (last 6 months). Arrows refer to the direction of recruitment, pointing from recruitee to recruiter.

Of the recent IDU study sample, 8 (7.1%) participants were seeds while 84 (74.3%) participants were RDS recruits. The remaining 21 (18.6%) participants self-initiated contact with the research staff without a RDS coupon. Of the participants recruited through the RDS method, the majority

(41.6%) were friends, 21.3% were family members or spouses and only 10.6% were acquaintances. Gender was not significantly associated with initiation type or RDS recruiting relationship (Table 1).

Table 1. Respondent-driven sampling characteristics.

<i>Indicator</i>	<i>Total</i>	<i>Male</i>	<i>Female</i>
	<i># (%)</i>	<i># (%)</i>	<i># (%)</i>
Study initiation type			
Self-initiated	21 (18.6)	8 (7.1)	13 (11.5)
Seed	8 (7.1)	5 (4.4)	3 (2.7)
Recruit	84 (74.3)	46 (40.7)	37 (32.7)
RDS relationship			
Friend	47 (42.0)	28 (24.8)	19 (16.8)
Family, spouse	24 (21.2)	10 (8.9)	13 (11.5)
Acquaintance	12 (10.6)	7 (6.2)	5 (4.4)
Stranger	0 (-)	0 (-)	0 (-)
Unknown	1 (0.9)	1 (0.9)	0 (-)

3.3.2 Characteristics of the study sample

Baseline summary distributions are found in Table 2 and Table 3. Of the 113 participants in the study sample, gender distribution was equal, $\chi^2(1, N=108)=0.04$, $p=0.85$. Participants ranged in age from 19 to 62 years (median age of males was 38; females, 35) (Table 2). Seventy-seven percent ($n=87$) identified as Aboriginal, the majority did not finish high school (73.5%) and obtained income from some form of government support (67.3%). Residence type was more varied: 38.1% reported living in their own home, and the remaining participants reporting living in friends (9.7%) or family's (15.0%), shelter/hostel (12.4%), or hotel/rooming houses (16.8%) (Table 2).

Table 2. Demographic characteristics of the social network of the study sample.

Indicator	Total	Male	Female
	# (%)	# (%)	# (%)
Total subjects	113	59 (52.2)	53 (46.9)
Age, mean (SD)	37.1 (9.8)	38.7 (10.0)	35.6 (9.4)
Age, median (range)	37 (19 – 62)	38 (21 – 62)	35 (19 – 57)
Ethnicity			
Aboriginal (includes First Nations and Métis)	87 (77.0)	42 (71.2)	45 (84.9)
Non-Aboriginal	25 (22.1)	16 (27.1)	8 (15.1)
Unknown	1 (0.9)	1 (1.7)	0 (0.0)
Income			
Regular work	14 (12.4)	10 (17.0)	4 (7.6)
Welfare, EI, pension, other government support	76 (67.3)	37 (62.7)	38 (71.7)
money from family/friends	5 (4.4)	1 (1.7)	4 (7.6)
Other	18 (15.9)	11 (18.6)	7 (13.2)
Education			
Graduated grade 12 or higher	29 (25.7)	17 (28.8)	11 (20.8)
Did not graduate grade 12	83 (73.5)	42 (71.2)	41 (77.4)
Unknown	1 (0.9)	1 (1.7)	0 (0.0)
Residence type			
Own house	43 (38.1)	18 (30.5)	25 (47.2)
Family's house	17 (15.0)	7 (11.9)	10 (18.8)
Friend's house	11 (9.7)	5 (8.5)	5 (9.4)
Shelter/hostel	14 (12.4)	9 (15.3)	5 (9.4)
Rooming house or hotel/motel	19 (16.8)	15 (25.4)	4 (7.6)
Outside on the street or park	4 (3.5)	1 (1.7)	3 (5.7)
Jail	3 (2.7)	3 (5.1)	0 (0.0)
Unknown	2 (1.8)	1 (1.7)	1 (1.9)

Median age at first use of injection drugs was 21 years (range: 12 to 44 years). During the past 6 months, the median number of injection drug types used was 1 (range: 1 to 10) and the median frequency of use was 4 injections per day (range: 1 to 100). The most frequently reported injection drugs were Talwin and Ritalin (42.5%) followed by morphine (23.0%) (Figure 4). Primary heroin injectors who used heroin most frequently tended to be younger (median age = 21.5 years), while

participants primarily injecting with other opiates were the oldest, at 51 years. With respect to risk behaviours, eighty-one percent (n=92) of IDU had injected drugs in their private residence, but a large proportion had also reported injecting in indoor and outdoor public places, as well as in hotels. Most IDU reported that accessing new, unused syringes was “very easy” (72.3%), while one third of participants reported having a history of injection with a used syringe (Table 3).

Table 3. Injection drug use characteristics of the social network.

Indicator	Total # (%)	Male # (%)	Female # (%)
Median number of injection drugs used (range), in last 6 months	1 (1-10)	2 (1-8)	1 (1-10)
Median number of injections per day, last 6 months (range)	4 (1-100)	4 (1-100)	5 (1-50)
Median age at first injection drug use (range)	21 (12-44)	21 (13-42)	21 (12-44)
Most frequently injected drug (last 6 months)			
Talwin and Ritalin	48 (42.5)	24 (40.7)	23 (43.4)
Morphine	26 (23.0)	16 (27.1)	10 (18.9)
Cocaine	18 (15.9)	6 (10.2)	12 (22.6)
Heroin	4 (3.5)	2 (3.4)	2 (3.8)
Oxycodone	3 (2.7)	2 (3.4)	1 (1.9)
Other opiates (includes Dilaudid and Percocet)	3 (2.7)	2 (3.4)	1 (1.9)
Crystal methamphetamine	2 (1.8)	2 (3.4)	0 (0.0)
Ketamine	2 (1.8)	1 (1.7)	1 (1.9)
Fentanyl and other patches	1 (0.9)	1 (1.7)	0 (0.0)
Unknown	5 (4.4)	2 (3.4)	2 (3.8)
Frequency of injection drug use			
Everyday	38 (33.6)	21 (35.6)	17 (32.1)
Regularly, 3+ times per week	15 (13.3)	8 (13.6)	7 (13.2)
Regularly, 1+ times per week	18 (15.9)	10 (17.0)	8 (15.1)
Once in a while, not every week	39 (34.5)	19 (32.2)	19 (15.9)
Location of injection drug use			
Private residence	92 (81.4)	46 (77.8)	45 (84.9)
Outdoor public place	33 (29.2)	17 (28.8)	16 (30.2)
Indoor public place	14 (12.4)	7 (11.9)	7 (11.9)
Hotel	16 (14.2)	10 (17.0)	6 (11.3)
Ease of access to new syringes			
Very easy	81 (72.3)	43 (72.9)	37 (69.8)
Somewhat easy	16 (14.3)	10 (17.0)	6 (11.3)

Indicator	Total	Male	Female
Somewhat difficult	9 (8.0)	2 (3.4)	7 (13.2)
Very difficult	5 (4.5)	3 (5.1)	2 (3.8)
History of injection with used syringe	37 (32.7)	17 (28.8)	19 (35.9)
Injected with used syringe in last 6 months	24 (21.2)	12 (20.3)	12 (22.6)

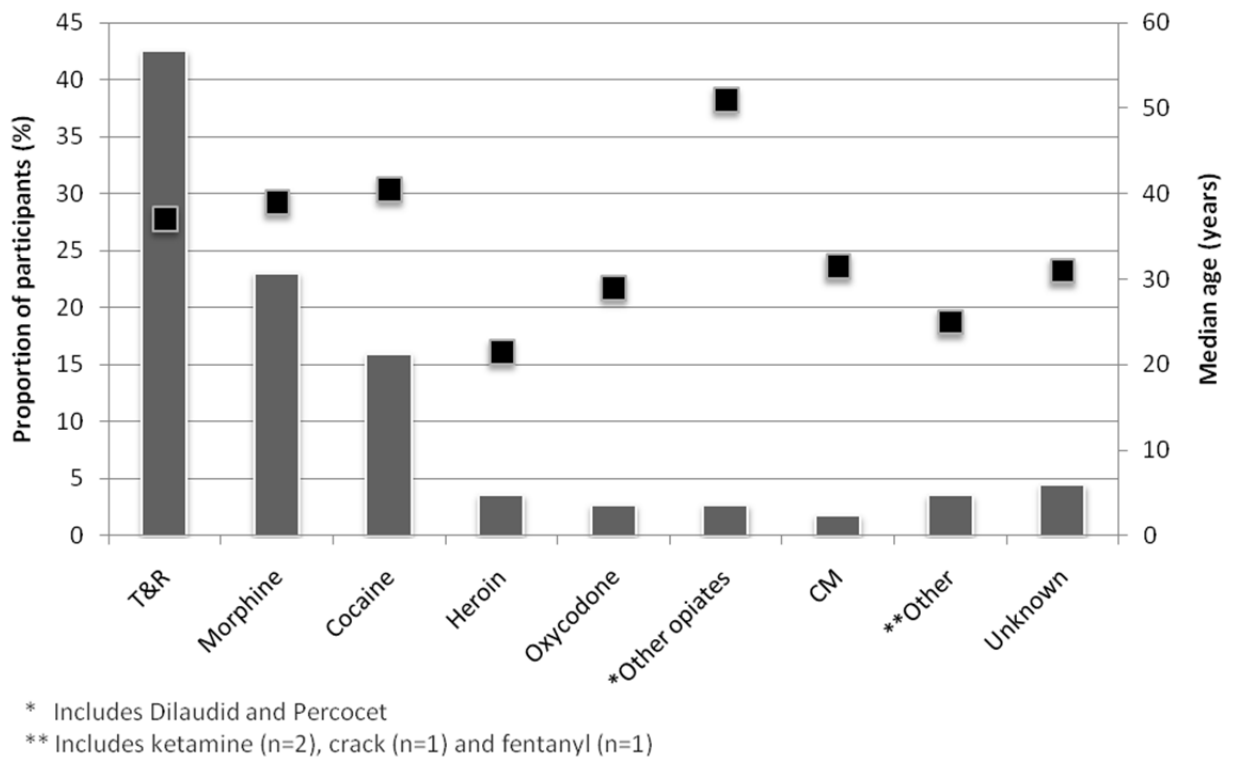


Figure 4. Most frequently injected drug reported and median age of study participants.

3.3.3 Characteristics of the social network

Several large components were identified through analysis in Pajek. A component is a subgroup of the larger network in which all nodes are joined to each other through one or more connections³. The overall sample is included for reference only. It consisted of 81 components ranging in size from 2 to 46 connected participants and 66 participants without an RDS recruit. There were 13 components of at least 10 people (Table 4). The study sample of recent IDU was less connected (Table 4 and Table 5) with 17 connected components and only 1 component greater than 10 people. The largest component (n=14) of the IDU study sample is found in Figure 5. Participants not part of an RDS recruitment chain represented 74.6% of the study sample (Table 5), compared to only 44.9% of the full network (Table 4).

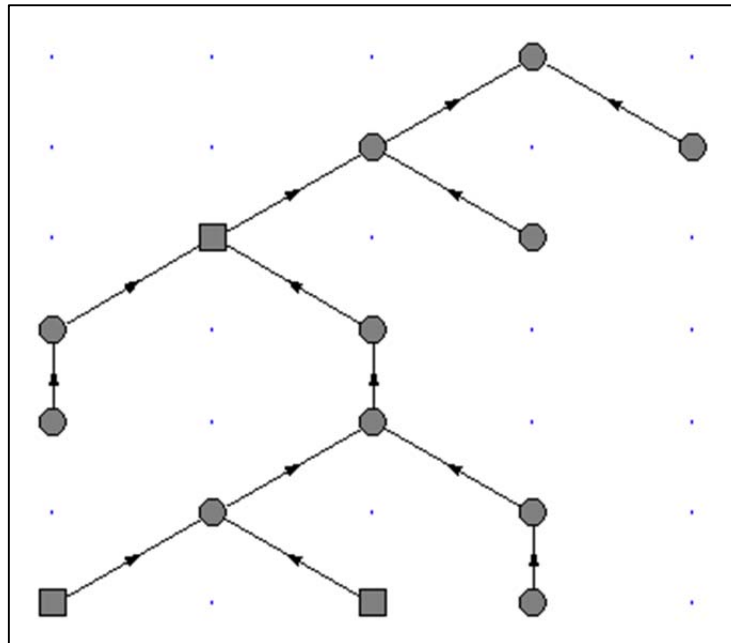


Figure 5. Schematic representation of the largest component of the IDU subsample (n=14). Circles represent females and squares represent males. Arrows refer to the direction of recruitment, pointing from recruitee to recruiter.

Table 4. Summary of the number of components of size n identified within the overall sample and the distribution of IDU within the components.

Overall sample (n=600)			Study sample (n=113)	
No. of individuals	No. of components	% of components	No. of IDU within component	% IDU
1	66	44.9	15	22.7
2	24	16.3	9	18.8
3	17	11.6	10	19.6
4	11	7.5	9	20.5
5	7	4.8	3	8.6
6	3	2.0	2	11.1
7	2	1.4	1	7.1
8	2	1.4	1	6.3
9	2	1.4	1	5.6
10	2	1.4	4	20.0
11	1	0.7	2	18.2
13	1	0.7	10	76.9
15	1	0.7	14	93.3
17	1	0.7	2	11.8
21	2	1.4	7	16.7
22	1	0.7	3	13.6
30	1	0.7	9	30.0
35	1	0.7	7	20.0
39	1	0.7	3	7.7
46	1	0.7	1	2.2
Total	147	100.0	113	-

Table 5. Summary of the number of components of exclusively IDU of size n identified within the study sample.

Study sample (n=113)		
No. of individuals	No. of components	% of components
1	50	74.6
2	10	14.9
3	3	4.5
4	1	1.5
7	1	1.5
9	1	1.5
14	1	1.5
Total	67	100.0

A further examination of the four largest components within the study sample of recent IDU revealed variation between them. The components were differentiated by type of drug(s) injected. The two most frequently injected drugs were listed unless the most frequent was named by $\geq 90\%$ of participants. The following groups were identified: morphine; exclusively Talwin and Ritalin; Talwin and Ritalin, and fentanyl; and Talwin and Ritalin, and cocaine. Respondents with missing values were excluded.

The Morphine Group (n=14) was largely composed of men (75%) and had the lowest median age compared to the other components, although this difference was not significant. Being a member of this component was significantly associated with increased use of cocaine, crack, crystal methamphetamine, fentanyl and morphine (Table 6). Interestingly, there was significantly less Talwin and Ritalin use among members of this component, compared to non-members. Talwin and Ritalin was the most widely reported drug by the study sample, with nearly half the respondents (42.5%) reported it as the drug most often injected. Further, there were significantly fewer Aboriginal peoples and participants positive for HCV. Finally, while not statistically significant, this group has a lower mean age than non-members.

Table 6. Summary of demographic and drug use characteristics for the Morphine Group.

	Morphine Group	Others	<i>p value</i>
Total (n)	14	99	
Complete reporting	12	96	
<i>Dichotomous variables</i>			
Male, n (%)	9 (75.0)	46 (47.9)	0.0768
Drug sharing, n (%)	4 (33.3)	20 (20.8)	0.4595
Aboriginal, n (%)	5 (41.7)	80 (83.3)	0.0033
Cocaine, n (%)	7 (58.3)	25 (23.2)	0.0390
Crack, n (%)	4 (33.3)	6 (6.3)	0.0132
Methamphetamine, n (%)	4 (33.3)	6 (6.3)	0.0132
Morphine, n (%)	11 (91.7)	29 (30.2)	<.0001
TR, n (%)	0 (-)	56 (56.3)	<.0001
Fentanyl, n (%)	4 (33.3)	5 (5.2)	0.0084
Sharing of injection equipment, n (%)	5 (41.7)	26 (27.1)	0.3196
Injection in private residence, n (%)	12 (100.0)	76 (79.2)	0.1177
Injection in hotel, n (%)	0 (-)	16 (16.7)	0.2068
Injection in street, n (%)	2 (16.7)	30 (31.3)	0.5035
<i>Continuous variable</i>			

Age (years), mean (SD)	32.7 (12.7)	37.6 (9.4)	0.1018
Laboratory data (n)	8	82	
HCV infection, n (%)	2 (25.0)	61 (74.4)	0.0082
HIV infection, n (%)	1 (12.5)	16 (19.5)	1.0000
HBV infection, n (%)	1 (12.5)	28 (34.2)	0.4287

The exclusively Talwin and Ritalin group (n=7) was comprised of 67% males, all members identified as Aboriginal, and was the only component without an HBV positive participant (Appendix 8.3). There were no variables significantly associated with being a member of this small network. The Talwin and Ritalin, and Fentanyl Group (n=4) was a small component in which all members were HCV positive, and the majority (75%) were Aboriginal. There were no variables significantly associated with being a member of this small network (Appendix 8.3).

The final component, Talwin and Ritalin, and Cocaine Group (n=9) was composed exclusively of Aboriginal peoples, did not have any members reporting syringe sharing, injected largely in a private residence, had high proportions of HCV and HBV members, but was the only component to have no HIV positive members (Table 7). Members of this group were significantly more likely to inject Talwin and Ritalin, compared to respondents not in this group.

Table 7. Summary of demographic and drug use characteristics for the Talwin and Ritalin, and Cocaine Group.

	TR Cocaine Group	Others	<i>p</i> value
Total (n)	9	104	
Complete reporting	9	99	
<i>Dichotomous variables</i>			
Male, n (%)	5 (55.6)	50 (50.5)	1.0000
Drug sharing, n (%)	0 (-)	24 (24.2)	0.2026
Aboriginal, n (%)	9 (100.0)	76 (76.8)	0.1997
Cocaine, n (%)	2 (22.2)	30 (30.3)	1.0000
Crack, n (%)	0 (-)	10 (10.1)	1.0000
CM, n (%)	1 (11.1)	9 (9.1)	1.0000
Morphine, n (%)	1 (11.1)	39 (39.4)	0.1496
TR, n (%)	9 (100.0)	45 (45.5)	0.0027
Fentanyl, n (%)	0 (-)	9 (9.1)	1.0000
Sharing of injection equipment, n (%)	1 (11.1)	30 (30.3)	0.4416
Injection in private residence, n (%)	9 (100.0)	79 (79.8)	0.2050
Injection in hotel, n (%)	1 (11.1)	15 (15.2)	1.0000
Injection in street, n (%)	1 (11.1)	31 (31.1)	0.2757
<i>Continuous variable</i>			
Age (years), mean (SD)	9	99	<i>p</i>
	41.7 (5.6)	36.6 (10.0)	0.1415
<i>Laboratory data (n)</i>			
HCV infection, n (%)	9	81	
	8 (88.9)	55 (67.9)	0.269
HIV infection, n (%)	0 (-)	17 (21.0)	0.1988
HBV infection, n (%)	5 (55.6)	24 (29.6)	0.1409

To determine whether position within the social network was associated with demographic or drug use variables, participants not part of an RDS recruitment chain (n=47) were compared with those participants who did have documented links to other study participants (n=61) (five participants were excluded from this analysis due to missing information). There were a significantly increased proportion of Aboriginal participants who were unconnected within this sub network. The use of morphine was significantly higher among those within a recruitment chain, compared to those who were not part of a chain (Table 8). The proportion of participants who were male, reported sharing drug equipment (36.1 vs. 19.2%), and injected crystal methamphetamine (13.1 vs. 4.3%) was higher among components than individuals, but these differences were not significant. use of Talwin and Ritalin (59.6 vs. 42.6%), injection in hotel (17.0 vs. 13.1%), and injection in the street (36.2 vs. 24.6) were not significantly different between participants within components, and isolated individuals.

Table 8. Summary of demographic, drug use and laboratory information for participants with and without recruitment chains.

	Individuals	Components	<i>p</i> value
Total (n)	50	63	
<i>Dichotomous variables (n)</i>	47	61	
Male, n (%)	21 (44.7)	34 (55.7)	0.3319
Drug sharing, n (%)	10 (21.3)	14 (23.0)	1.0000
Aboriginal, n (%)	42 (89.4)	43 (70.5)	0.0192
Cocaine, n (%)	15 (31.9)	17 (27.9)	0.6756
Crack, n (%)	4 (8.5)	6 (9.8)	1.0000
Crystal methamphetamine, n (%)	2 (4.3)	8 (13.1)	0.1812
Morphine, n (%)	11 (23.4)	29 (47.5)	0.0154
Talwin and Ritalin, n (%)	28 (59.6)	26 (42.6)	0.1201
Fentanyl, n (%)	1 (2.1)	8 (13.1)	0.0745
Sharing of injection equipment, n (%)	9 (19.2)	22 (36.1)	0.0852
Injection in private residence, n (%)	38 (80.9)	50 (82.0)	1.0000
Injection in hotel, n (%)	8 (17.0)	8 (13.1)	0.5955
Injection in street, n (%)	17 (36.2)	15 (24.6)	0.2088
<i>Continuous variable</i>			
Age (years), mean (SD)	36.8 (9.8)	37.2 (10.0)	0.8261
<i>Laboratory data (n)</i>	44	46	
HCV infection, n (%)	32 (72.7)	31 (67.4)	0.6491
HIV infection, n (%)	10 (22.7)	7 (15.22)	0.4259
HBV infection, n (%)	16 (36.4)	13 (27.7)	0.4999

3.4 Discussion

This study aimed to characterize the IDU population in Winnipeg, using social network methods, in order to identify potential variation in drug risk behaviours, and therefore the possibility of identifying different interventions to apply among subgroups of this network. The methodology was based on previous work conducted and knowledge gained regarding this hidden population in Winnipeg^{25,28,66}.

The proportion of Talwin and Ritalin use throughout the network was high, consistent with previous Winnipeg IDU studies^{24,66}. Nearly half the study sample reported it as the most frequently injected drug in the past 6 months, while lifetime use was reported among 77% of participants. Understanding the association between drug choice and risk is important. Using agglomerative hierarchical cluster analysis on a non-random, cross-sectional sample of 414 IDU recruited between

December 2003 to September 2004, Shaw *et al.* identified that prevalence of HBV and HCV in clusters characterized with Talwin and Ritalin use was high⁶⁶. This trend was observed in the current study, in which 89% and 56% of the participants in the exclusively Talwin and Ritalin component were HCV and HBV positive, respectively. It was hypothesized that this was due to drug preparation procedures (sharing filters) as this association was observed regardless of syringe sharing behaviour. Further, the high prevalence may be historical as those who started injecting younger would have had more years of cumulative exposure, and in the early years would have been less likely to know about the risks of drug equipment sharing⁶⁶.

A group of primarily morphine injectors (92.9%) was identified. This group also had reported use of oxycodone and fentanyl. This is an important finding because morphine users also tend to be older, have injected for longer periods of time, and have lower treatment rates than non-morphine injectors⁶⁹. Further, there have been associations between increases in morphine injection with ecological decreases in heroin injection, possibly due to decreases in availability^{69,70}. Therefore, knowledge of this subgroup and their differential risk factors can help guide targeted interventions.

Use of unclean syringes was low throughout the four largest components. This is not unexpected as these were relatively small sub-networks, the largest being 14 people. Network size has been associated with needle sharing in that larger networks can lead to increased social pressure to engage in this type of risky behaviour⁵¹. The Morphine Group reported the highest prevalence of unclean syringe use (28.6%) and was also the youngest group. Younger IDU have been found to be more likely to engage in risky syringe and equipment sharing behaviour⁵¹, possibly due to inexperience; lack of knowledge and less established drug use network members who have safe behavior. The youth of component members and their risky behaviours may also partly explain the tendency of IDU to contract HCV early on, within the first 3-4 years of injecting^{71,72}.

Another finding from this study was the limited amount of drug injection that occurred outside of the private residence. A previous study of the geographic social networks of Winnipeg IDU revealed that 40.7% of the sample had injected in a hotel at least once in the past 6 months²⁵, compared to only 14.2% reported in the current IDU population. It is possible that some participants reside in a hotel, reducing this prevalence, but this would arguably not account for the large discrepancy. One of the hotels in the previous study was bought by the Winnipeg Regional Health Authority and converted into social housing⁷³. It is also possible that this was a spurious result in that the present sample consisted of a different group of people than that of the previous study. Injecting within the private residence has been associated with safer practices than injecting in public places, in terms of

public health risk⁷³. Conversely, when IDU are documented to frequent public places such as hotels, this provides an opportunity for the placement of structural interventions such as automatic needle dispensers and condom distribution.

While demographic and drug use behaviours appeared to vary by position within the social network, limited significant associations were observed. Participants who were unconnected were significantly more likely to be Aboriginal, compared to participants with at least one RDS connection. This suggests that Aboriginal peoples either did not recruit via RDS, or recruited non-IDU contacts. Further analysis is required to determine the extent of the relationship, but regardless, this provides evidence that components of Aboriginal IDU were lacking in this network. . Conversely, connected members were significantly more likely to inject morphine, compared to non-connected members suggesting that interventions related to morphine use could be dispersed through this social network.

Several limitations in this study were identified. First, social desirability bias is a concern, as the data were self-reported and may have led to over- or under-estimations of drug use behaviour. Second, as with any epidemiological study design, cross-sectional studies have their advantages and disadvantages. They are relatively inexpensive, can be completed relatively quickly but they do not allow for the investigation of causal or temporal associations. In the current study, we were not able to assess how the spatial or drug use behaviours changed over time, but instead were only able to determine the current state of the social networks of Winnipeg's IDU population. Third, as this was a RDS sample, the results cannot be generalized to other IDU populations. However generalization may not be appropriate where interventions are tailored to meet the specific needs of the populations at risk.

A strength of this study is the established typology of drug users; which retains some consistency in this later Winnipeg sample, which can be of use to further develop interventions. Additionally, the equal proportion of women and men T&R users calls attention to the need for tailored interventions for First Nations women who inject.

3.5 Conclusions

This study provided a summary of the sociobehavioural and drug use characteristics of a network of 113 IDU in Winnipeg, with the aim to describe distinct subgroups in order to suggest targeted interventions⁶⁵. As geographic settings have been shown to be a useful means to construct social

Defining intervention location from social network geographic data

networks²⁴, further work could be done to incorporate location in order to more specifically describe patterns of heterogeneity within this marginalized population.

4.0 Manuscript 2

The spatial epidemiology of injection drug users in Winnipeg, Canada

4.1 Introduction

The significance of incorporating geographic analysis into the study of epidemiology and public health has been evident as early as the 1850s, when John Snow identified the cause of a cholera outbreak through mapping the cases in space⁷⁵. The role of place in health has continued to be explored, not only in the traditional context of communicable disease outbreak investigation and management⁷⁶⁻⁷⁹, but also in terms of understanding how the physical environment defines the way information and infection is transmitted and how interventions should be implemented⁸⁰.

The importance of geography in the study of injection drug users (IDU) has been recognized^{29,81-89}, but the extent to which the impact of geographic setting has on acquisition, preparation and injection of drugs, has yet to be determined⁹⁰. Geographic location is an important factor associated with the adoption of high risk behaviours such as syringe sharing⁹¹. It has been found that social venues such as hotels and street corners are key factors associated with engaging in equipment sharing, and thus exposure to harms such as bloodborne pathogens²³. In addition to the geographic component, adoption of high risk behaviour has a social component, which has led to the increasing use of social network analysis in the study of IDU in combination with geographical analysis^{10,11,19,28,50,66,92-99}. As part of Wylie *et al.*'s 2007 study²⁴, the social network analysis of IDU data demonstrated that hotels served as important bridge points for different groups of IDU which otherwise would not be in contact. The data suggested that an IDU living at home would frequent the high risk environment of a hotel, and be exposed to common risk behaviours at that geographic location.

A social network that takes on a small world distribution is one in which the probability of a particular node, whether a person or a place, establishing new connections is a function of its degree. Those which already have a large number of connections attract more connections than those with fewer¹⁰⁰. Therefore, a large number of members of an IDU's social network would centralize on a small number of locations, as evidenced through Wylie's work²⁴. Rothenberg *et al.*¹⁰ also highlighted the relationship between social distance and geographic distance in the context of risk behaviours. In his study, dyads that engaged in both syringe sharing and sexual behaviour were situated in closer geographic proximity than dyads that engaged solely in sexual behaviour. A benefit of social clustering is that it permits efficient allocation of resources to areas in most need.

Structural interventions, such as syringe and equipment drop boxes, are public health harm reduction programs that have been associated with decreased transmission of bloodborne

pathogens¹⁰¹. Furthermore, syringe and equipment drop boxes can reduce inappropriate discarding of drug injection equipment, and maintain the community's sense of safety³⁷.

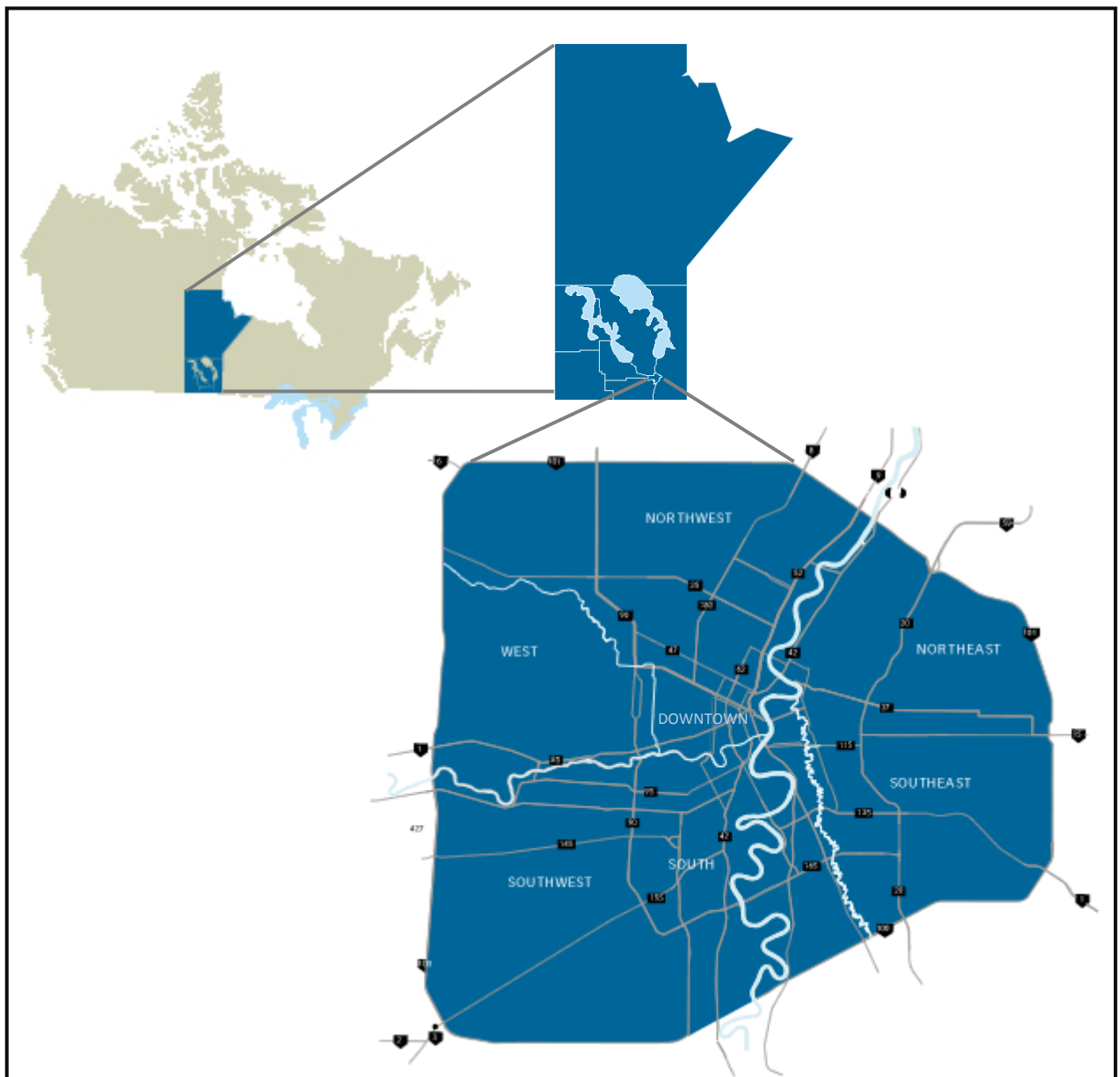
In order to efficiently and effectively implement interventions with limited public health resources, it is essential to apply evidence-based, targeted harm reduction initiatives. This requires a clear understanding of the characteristics of individual IDU, but also of the IDU's social network, and how it is geographically dispersed^{37,89,102,103}.

It is hypothesized that through use of social network and spatial analytical methods to characterize Winnipeg's IDU, a small number of locations will be represented by a large number of IDU. Therefore, a small number of interventions can be implemented which will impact a large component of Winnipeg's IDU population.

4.2 Methods

4.2.1 Study area

Winnipeg is the most populated city within the province of Manitoba, and the eighth most populated in Canada (Figure 6). It is located at 49°53'58"N 97°08'21"W. The city occupies a land area of 464.08 square kilometers and was home to 663,617 people in 2011¹⁰⁴. Ten percent of Winnipeg's population identifies as Aboriginal; the highest number of Aboriginal peoples in a Canadian census metropolitan area¹⁰⁵. In this study, downtown Winnipeg is defined by the City of Winnipeg Downtown Community Area. This is larger than the Downtown area defined by the *Downtown Winnipeg Zoning By-Law*, but was selected because it was "...defined through collaboration between the Winnipeg Regional Health Authority, the City's Community Services department, and various community groups...[and] used by the Health Authority to assess population data and facilitate health planning and service delivery"¹⁰⁶. It will henceforth be referred to as "downtown Winnipeg" in this paper. It is bordered by the Assiniboine River and Red River on the south and east, respectively. The north is bordered by Higgins Avenue and the west is bordered by St. James and Strathcona Streets¹⁰⁷. The population of downtown Winnipeg was 64,860 in 2006 and represented a land area of 16.3 square kilometers¹⁰⁸.



Source: Travel Manitoba¹⁰⁹

Figure 6. Map of Canada (A), Manitoba (B) and Winnipeg (C).

4.2.2 Study design and population

A detailed description of the study design has been described elsewhere (Manuscript 1). Briefly, 600 people were recruited through respondent-driven sampling from January to December, 2009 in Winnipeg, Canada. To be eligible, participants were required to be at least 14 years of age and to provide informed consent. Of interest in this study were the 113 participants with recent (within the past 6 months of study entry) injection drug use.

4.2.3 Survey instrument

All participants completed a two-part interview-administered questionnaire; the first captured individual level data while the second captured data on the participants' egocentric social network; that is, the network resulting from a study participant being asked about the connections (*i.e.* geographic locations) within his or her own network³.

Demographic information

Demographic information analyzed included age, gender, ethnicity, level of education, main source of income and residence type. Individuals that identified as "First Nations" or "Métis" were classified as Aboriginal while those who identified as "Caucasian" or "Other" (n=1) were classified as non-Aboriginal. Level of education was coded as those who completed grade 12 or higher compared to those that did not. Responses of "Unknown" and "Refused" were coded as unknown. The frequency of unknown varied by demographic variable, from 0.9% to 5.3% (data not shown).

Geoepidemiological variables

Three key geoepidemiological variables were captured through the following survey questions: "What is the nearest intersection to the place you most frequently lived in the most over the last 6 months?"; "Thinking of the places...where you have injected most frequently – what is the nearest intersection to that place?"; and "Do you regularly make use of, or hang out at, any community/public gathering places? If yes, please specify...the approximate location (nearest intersection)". These georeferenced survey data were used to identify locations in which the members of the injection drug use network were likely to frequent. These are considered the nodes, and together with the relationships that exist between them are the units of analysis in the network.

The responses to the free text intersection fields were standardized for frequency analysis using LinkageWiz¹⁰.

4.2.4 Characteristics of the overall sample with respect to geography

A descriptive epidemiological summary was conducted on the demographic and geographic data obtained for the sample through frequency distribution using Statistical Analysis Software Enterprise Guide 4.2 for Windows⁶⁷.

4.2.5 Social network analysis

The analysis of the social networks focused on the connections between people and the geographic locations each identified. The study collected egocentric network data; therefore the geographic social network generated for this paper involves only connections between an individual IDU and specific geographic locations. The analysis does not present connections between different IDUs, unless the IDU are connected through locations listed.

The network analyzed consisted of the 113 participants and the key geographic locations identified through the questionnaire process. Nodes were summarized based on their degree and betweenness centrality, in order to isolate geographic locations central to the network and thus primary targets for the implementation of structural interventions. Degree centrality is a measure of how well connected a node (*i.e.* a location) is³. For example, a degree of four indicates that that particular hangout location was reported by four participants. Betweenness centrality is a measure of the extent to which a location is situated between other key locations within the network³. Therefore, an intervention with a low degree but high betweenness can still play an important role in the network in that this point lies on the path between two or more well connected locations.

Networks were visualized in Pajek⁴¹ using an automatic layout generation method called Kamada-Kawai Free, in which every position in the plane is possible but which attempts to minimize overlap of lines and nodes.

4.2.6 Spatial analysis

Standardized intersections were geocoded using Google Maps “LatLng Marker” add-on. ESRI ArcGIS version 10.1⁴⁷ was used to spatially distribute the geoepidemiological variables. The 2012 Census Subdivision Boundary File produced by Statistics Canada⁴⁸ was used as the base layer, with the Road Network file (contains street names, types, direction and address ranges) for the same year was¹¹¹ used as a secondary. The Canada Lambert Conformal Conic projection was selected and the coordinate systems were synchronized using World Geodetic System (WGS 1984). The BING aerial basemap was applied for presentation purposes. Nodes were sized proportionate to degree.

4.3 Results

4.3.1 Characteristics of the overall sample

The demographic and drug use characteristics of this IDU social network have been previously described (Table 2 and Table 3). Briefly, gender distribution was equal, participants ranged in age from 19 to 62 years, the majority identified as Aboriginal (77%), did not finish high school (73.5%) and obtained income from some form of government support (67.3%). Residence type varied: 38.1% reported living in their own home, and the remaining participants reported living with friends (9.7%) or family (15.0%), in shelters/hostels (12.4%), or hotels/rooming houses (16.8%). Talwin and Ritalin was the most frequently injected drug, with 42.5% of participants citing it as most frequently injected in the previous 6 months, followed by morphine and cocaine. While injection in a private residence was the most common injection location (81.4%), in the previous 6 months, nearly one third of respondents reported having injected in an outdoor public place.

4.3.2 Summary of geographic data

Data Completeness

Residence location was missing for five respondents. There were sixteen people who refused to list an injection location, and forty respondents did not list a hangout location. All 113 participants were kept in the analysis. These variables should be interpreted as a list of 3 potential geographic locations in which the participants spend time and have contact with each other (Table 9). Forty-six percent (n=52) of respondents listed the same intersection to describe both their place of residence and the location in which they inject drugs most often.

Table 9. Completeness of key geographic variables (n=113).

	Complete n (%)	Unknown n (%)
Place of residence	108 (95.6)	5 (4.4)
Injection location	97 (85.8)	16 (14.2)
Hangout	71 (62.8)	42 (37.2)

4.3.3 Frequency distribution of key geographic variables

In order to target the possible implementation of structural interventions efficiently (*e.g.* focus resource on locations that are visited by many people), the reported geographic locations that fell within the top quartile of the frequency distribution were highlighted.

Of those who provided a valid residence intersection (n=108), six locations (5.6%) were reported by twenty-five percent of respondents. Of those who provided a valid intersection to place nearest the site of most frequent injection (n=97), six locations (6.2%) were reported by twenty-five percent of respondents. Of those who provided a valid intersection to nearest place of hangout (n=71), four locations (5.6%) were reported by twenty-five percent of respondents (Figure 7).

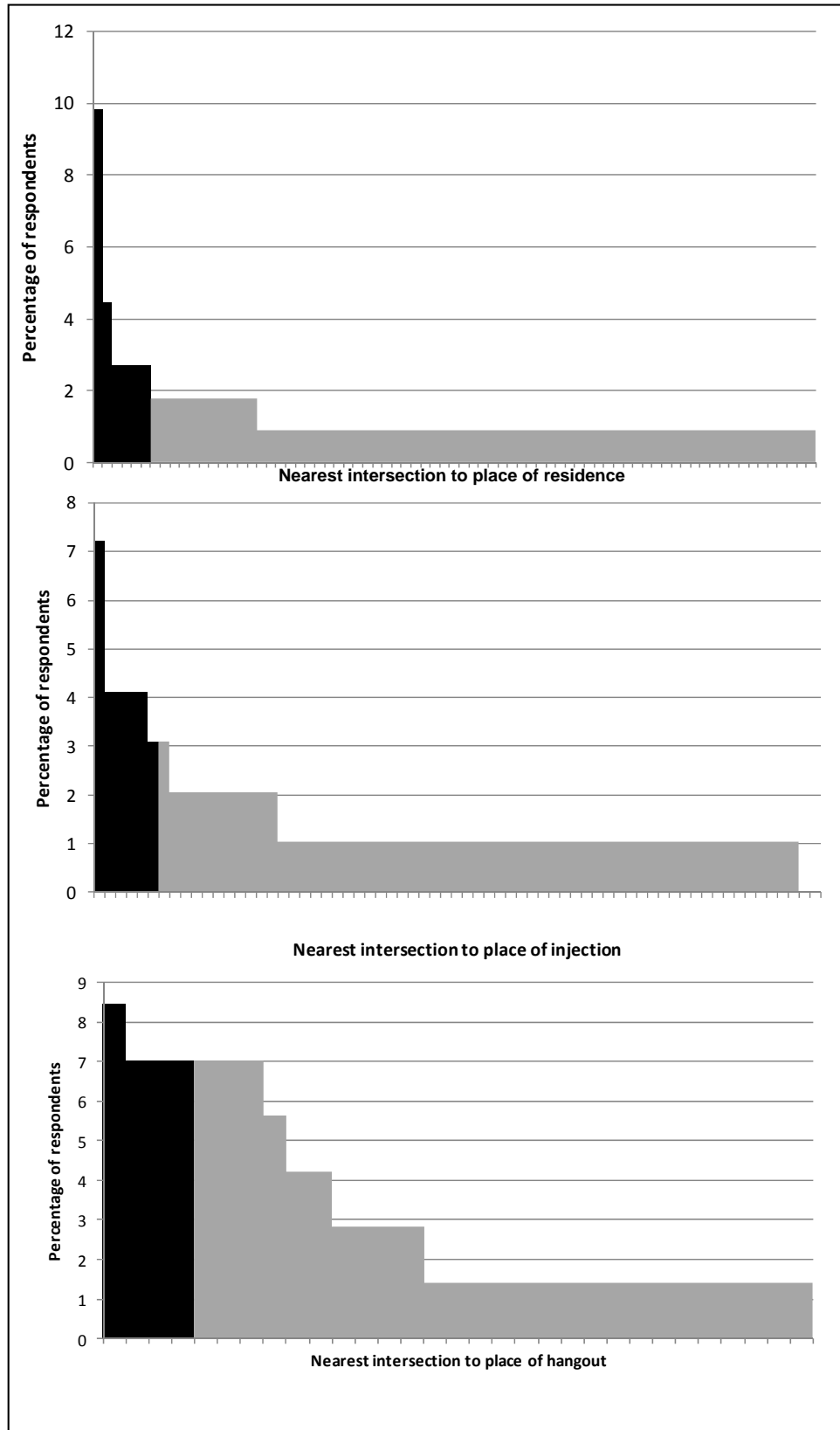


Figure 7. Frequency distribution of nearest intersection to place of hangout reported by study participants. Intersections in black fell into the top quartile of responses.

4.3.4 Analysis of the geographic social network

The geographic social network is graphically represented in Figure 8. The participants are represented by circles, and the residence, injection and hangout locations that each participant reported is represented by a square.

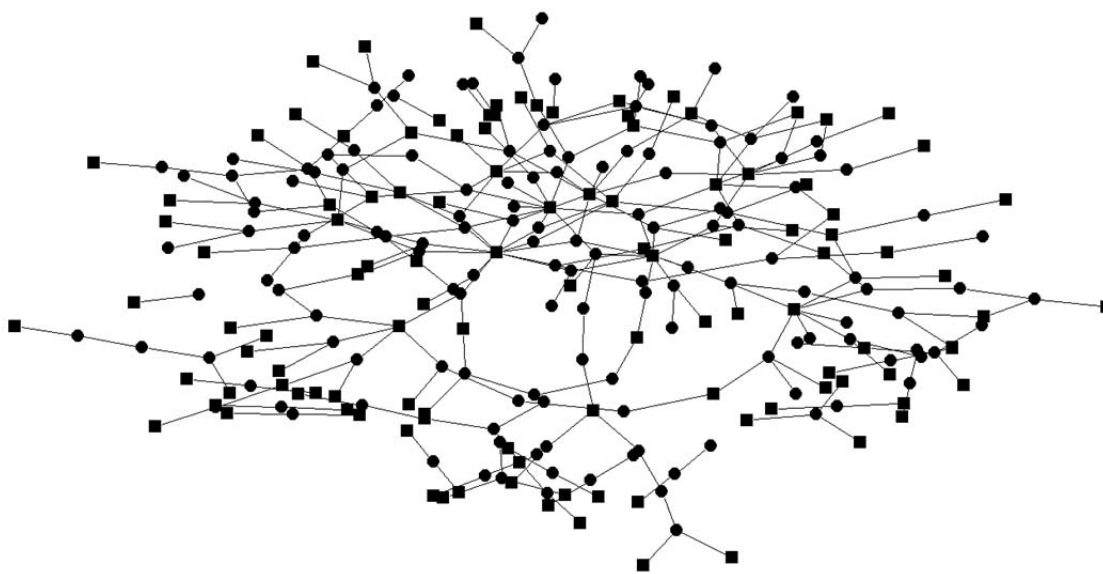


Figure 8. Geographic social network of Winnipeg IDU. Circles represent the study participants and squares represent the geopidemiological variables (location of residence, location of injection and location of hangout).

This network illustrates some clustering. Extracting subcomponents of the network by degree allows for visual representation of the most connected parts of the network (Figure 9). The most frequently reported location had degree centrality of 12. This is also seen quantitatively through analysis by degree centrality of the intersections (Figure 10).

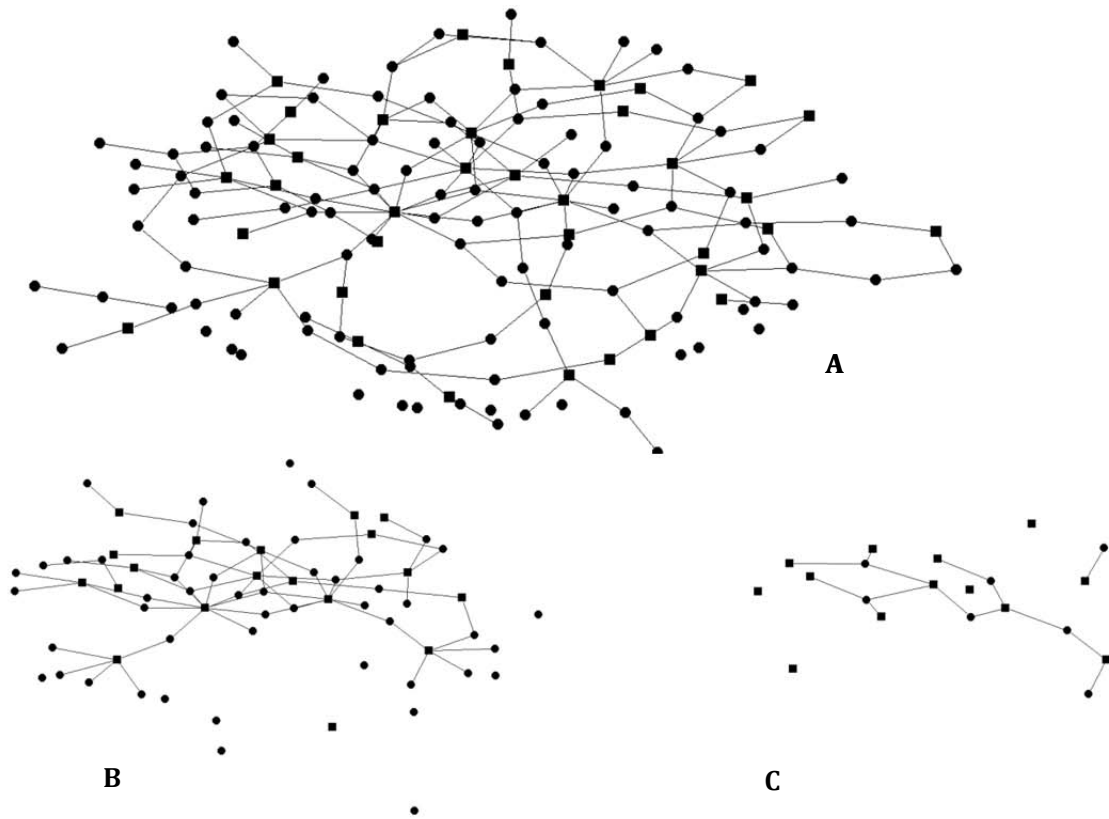


Figure 9. Geographical social network of Winnipeg IDU, separated by subcomponents of A) nodes with degree >1 , B) nodes with degree >2 and C) nodes with degree >3 .

An analysis of the betweenness centrality illustrates that there are key intersections situated near central locations (Figure 11). However, when comparing those with high degree and high betweenness centrality, there is 100% overlap among the locations representing the top quartile (Table 10). When betweenness is extended to the top 2 quartiles, an additional location, Forks, is identified as having high betweenness.

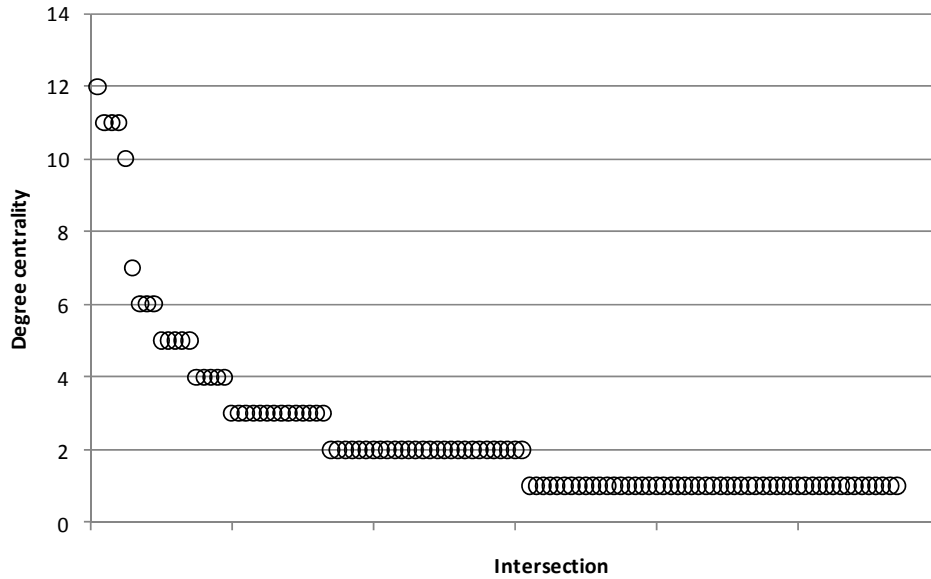


Figure 10. Degree centrality of each reported geographic location.

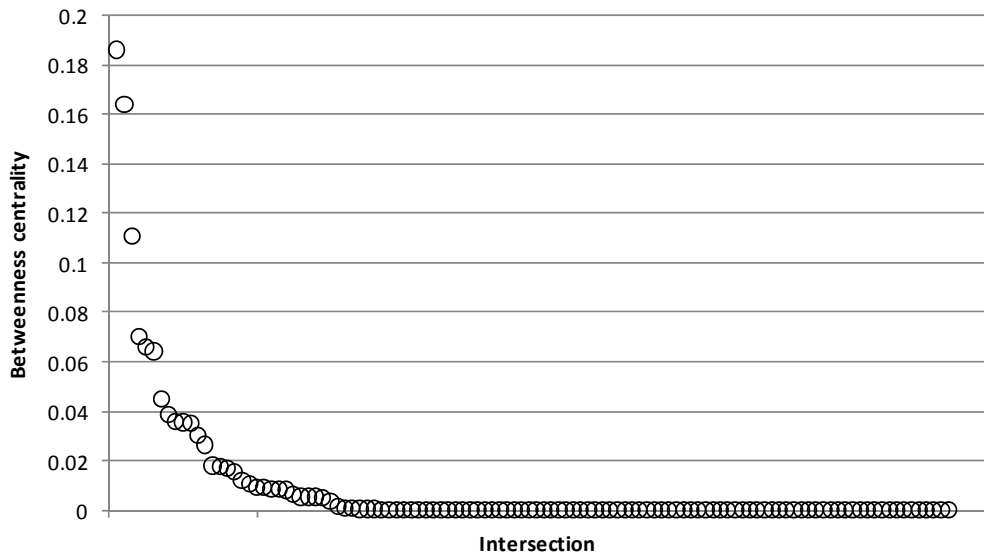


Figure 11. Betweenness centrality of each reported geographic location.

Table 10. Summary of degree and betweenness among the top quartile and 50 percentile, respectively.

Location	Degree Centrality		Betweenness Centrality	
	Rank	Cumulative %	Rank	Cumulative %
Intersection A	1	4.35	1	17.30
Intersection B	2	8.33	2	32.52
Intersection C	3	12.32	3	42.81
Intersection D	4	16.30	4	49.34
Intersection E	5	19.93	6	61.44
Intersection F	6	22.46	15	87.57
Intersection G	14	38.04	5	55.48

4.3.5 Mapping the geographic locations

The spatial distribution of the key geoepidemiological variables is found in Figure 12. Fifty-seven (50.9%) of the locations were located within the downtown area, while the rest were dispersed throughout the city, with notable clusters southwest and north of downtown. The designation of a particular location as a place of residence, injection and/or hangout varied by participants (*e.g.* Intersection X could be an injection location to participant A but a hangout location to participant B). Among participants, a large proportion (n=53, or 46.9%) reported injecting in the same location as their reported residence (data not shown). Among remaining combinations of variables there was low overlap (less than 8% in all cases).



Figure 12. Key geographic locations mapped to Winnipeg, Canada. Black dots represent place of residence, red dots represent places where injection occurred, and green dots represent hangout locations. White hashed line encompasses a portion of the downtown Winnipeg Community Area.

The locations with the highest degree centrality, as obtained through the analysis of the social network, are those that were named by many people within the IDU network (Figure 13). Locations with the highest degree were located at the north east area of downtown, and the south, central area of downtown. The locations of Winnipeg's six current syringe and equipment drop boxes were plotted to assess congruence between the quantitative method described herein and the method used by the City of Winnipeg in the placement of their boxes (locations selected on the basis of volume of discarded syringes observed).

Winnipeg's current syringe and equipment drop boxes generally coincide with the locations of highest degree. Specifically, there are four boxes placed in the north eastern point of downtown where 4/6 of the locations in the top degree quartile were located. Conversely, the second area of high degree (downtown south), only has one syringe and equipment drop box while the final syringe and equipment drop box is located south of the Assiniboine River where only one location

was identified. Based on this visual assessment, syringe and equipment drop boxes could have been distributed more proportionally (*i.e.* move one box from north to west of downtown), or additional boxes could have been placed in areas of increased activity.

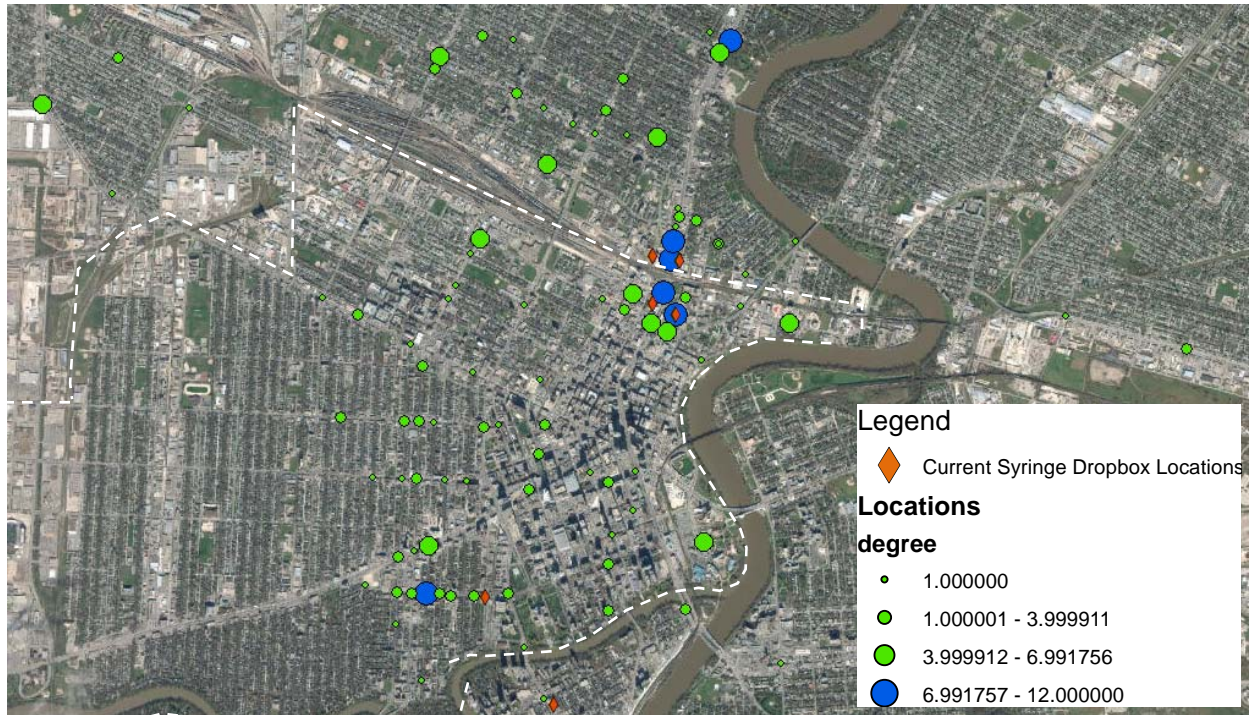


Figure 13. Key geographic locations sized proportionally by degree quartile. Blue circles are locations in the top quartile for degree. White hashed line encompasses a portion of the downtown Winnipeg Community Area.

4.4 Discussion

Based on this exploratory analysis, it appears that the quantitative method described herein is useful in targeting specific locations with increased need for structural interventions for harm reduction. Spatial analysis of the social network of the IDU sample revealed congruence between areas of high density and locations in which public health officials have already placed syringe and equipment drop boxes in the city.

The distribution of reported locations appears to follow a small world distribution. This was seen through frequency distribution of each of the three geoepidemiological variables, in which a small number of locations were named by a large proportion of respondents. This was further characterized through degree centrality of the social network, in which the 5.4% ($n=6/112$) of all named locations (residence, injection and hangout combined) fell within the top quartile of degree.

A limitation of this method is the cross-sectional data collection, which does not allow adequate consideration of the transient nature of IDU¹¹². Many factors contribute towards displacement of IDU, including police presence. A study investigating the effects of a large enforcement operation conducted in Vancouver's Downtown Eastside not only revealed a lack of impact on price or frequency of drug use following the raid, but also led to some relocation of IDU into adjacent areas of the city¹¹³. A possible solution would be to conduct repeat sampling at defined intervals, with corresponding repeat analysis or to design the study as a prospective cohort with defined follow-up intervals, as a means of surveillance and evaluation of the program. Some important considerations with this approach would be respondent fatigue (there is a finite IDU population that, over time, may be less inclined to participate) and resource implications.

A second limitation was the self-reported nature of the data. Given the sensitive nature of the questions, it is possible that some participants responded to questions in a way that would be perceived as favourable by others, but not necessarily true. This is known as social desirability bias. There is no way to know what proportion of respondents provided false information, however; the congruence between the reported locations and the Street Connections' syringe and equipment drop boxes suggest that the information was generally accurate.

A third limitation identified was the generalizability to other cities. While the results of this study are specific to the IDU population under investigation in Winnipeg, the methods presented are generalizable to other local public health units across Canada and elsewhere. The software is accessible: Pajek⁴¹ is freely available for download, and there are some open source alternatives to ArcGIS such as Quantum GIS¹¹⁴.

There were also some strengths identified. The importance of evidence-based decision making cannot be overstated. It provides a neutral and timely view of the current status of the population under study, and provides information about how it behaves, instead of assumptions about how policy makers think they should / do behave. Therefore, whether or not this proposed approach is feasible given financial and human resource constraints, it does provide some impetus to continue with the current methodology. An alternative interpretation is that the findings suggest that the simple and inexpensive method employed by the Winnipeg Regional Health Authority (knowledge of areas with high volume of discards without requiring a dedicated study) is valid and reliable when resources are limited.

4.5 Conclusions

This study described a method for incorporating social network and spatial analyses in order to generate an evidence base for implementation of harm reduction interventions targeted at IDU in a small metropolitan setting and provides validation for the current method used by local public health which takes advantage of field staff's knowledge of Winnipeg's IDU population.

5.0 Discussion

5.1 Summary

The objectives of this thesis were twofold: the first to characterize the IDU population in Winnipeg using social network methods, and the second to identify intervention locations for Winnipeg IDU using social network and spatial analysis methods.

Through recruitment via respondent driven sampling, this study expanded on previous work²⁷ and distinguished components of the Winnipeg IDU social network based on well understood correlates of drug use. Because there has been documented associations between drug choice and risk^{65,87,115}, it is useful to identify subgroups within the larger social network so that public health interventions can be targeted specifically and efficiently. Knowing that Talwin and Ritalin use has been associated with HBV and HCV infection, and that Talwin and Ritalin use among the sample was high, this could guide local public health action (*e.g.* educational material highlighting the risks of sharing filters, targeted bloodborne pathogen testing). The identification of a component of young IDU with high reported use of unclean syringes offers the opportunity to target educational and other interventions to relatively newer injectors in order to prevent risks associated with syringe sharing.

The spatial analysis also suggested that the geographic dispersal of Winnipeg IDU follows a small-world distribution, evidenced by the result that only 6.1% of all locations named fell within the top degree quartile of the three combined geoepidemiological variables. Further, spatial analysis of the social network revealed congruence with the locations in which syringe and equipment drop box are presently located in Winnipeg.

5.2 Policy implications

In 2007, the federal government announced a \$500 million investment towards the National Anti-Drug Strategy¹¹⁶, led by Justice Canada. The funds were allocated to several federal departments, including Health Canada and the Royal Canadian Mounted Police and focused on three themes: prevention of illicit drug use, treatment of people with drug dependencies, and enforcement of illegal drug production and distribution.

Funding for this 5-year plan expired in the spring of 2012. A draft plan for the next five years has been submitted to the Treasury Board of Canada and suggests shifting priorities by the government, with less emphasis on prevention and treatment to more emphasis on law enforcement. A recent Maclean's article highlighted that Health Canada's new five-year budget will decrease by 15% while the RCMP's share will increase by 22%, compared to the previous iteration of the strategy¹¹⁷. While speculation about the final allocation at this point would be irresponsible, it does emphasize the benefit of making cost effective policy decisions in order to reduce the impact of changing funding schemes from year to year.

5.3 Significance

This work provides original insight as to whether the methods described herein are appropriate to inform municipal IDU harm reduction policy. It is an interdisciplinary project that incorporates concepts of epidemiology, geography and social science, which offers a more comprehensive understanding of the behaviours of the marginalized IDU population in Winnipeg. These methods can be applied in other Canadian cities with marginalized populations exhibiting small-world distributions.

5.4 Future directions

While outside of the scope for this thesis, further analyses have been identified that could be applied in future work. The first relates to an alternative method to displaying the social network in space. Instead of displaying the geographic social network with emphasis on locations with high degree centrality, the social network could be mapped with emphasis on the ties between nodes. At the time of writing, ArcGIS did not offer an interface allowing for the overlay of a social network onto a map. However, a recent draft manuscript¹¹⁸ from Princeton PhD student Manish Nag summarized two alternatives: one using Pajek⁴¹ and the second using Generic Mapping Tools (GMT)¹¹⁹. Both are

open source programs. Application of this method would enable visualization of the interaction between geographic place and the social networks, and would enable analysis beyond simply the effect of distance on social outcomes. This method would allow the concurrent analysis of social and geographic proximity.

A second analytic approach to consider would be the application of an optimization method to determine the best, or list of the best (best referring to the lowest average path distance¹²⁰) locations to place an intervention, based on the distribution of geocoded locations previously identified. Specific to this thesis, a program could be created using ArcGIS Spatial Analyst toolbox that would calculate the path distances from each intersection within a defined area (*e.g.* downtown Winnipeg), to each hot spot identified through social network analysis. Those locations with the lowest average path distance could be targeted for implementation of an intervention.

A third option would be the investigation of the point pattern(s) of the Winnipeg hot spots in order to determine whether they are statistically clustered. Moore and Carpenter¹²¹ summarized several methods that can be used to identify clusters in spatial data, including average nearest neighbor and quadrat analysis. A criticism of average nearest neighbour is that the results are strongly influenced by the size of the area analyzed, and the fact that it does not distinguish between homogeneous and random distribution of points. Quadrat analysis involves the separation of the geographic area of analysis into a grid with equally sized cells, and then counting the number of points within each cell. A chi-square test is used to compare the observed number of points to the expected number, assuming the points follow a Poisson distribution.

An extension of point pattern analysis would be an investigation of spatial autocorrelation. This refers to the phenomenon that occurs when observations at specific locations assume values (*e.g.* use of morphine as preferred injection drug) that are more similar or less similar than expected if the observations were randomly distributed in space¹²². If spatial autocorrelation is present, adjustment methods for the standard error of parameter estimates have been developed in order to employ traditional statistical methods such as linear regression¹²³, multiple regressions and *t* tests¹²⁴, and one-way analysis of variance^{125,126}. Scribner *et al.*¹²⁷ examined spatial autocorrelation in order to generate maps containing information on the local indices of spatial autocorrelation (LISA). LISA maps identify clusters of census tracts with either high rates of HIV that were proximal to other high HIV-rate census tracks, and low-rate census tracks that are proximal to other low-rate census tracks. The authors used the LISA maps to identify neighbourhoods where bridging between different risk groups occurred, and where common risk behaviours occurred in order to focus public

health interventions in those neighbourhoods. A similar approach could be taken with the present study; LISA maps could be used to characterize predictors of outcomes of interest (*e.g.* use of unclean syringes, diagnosed bloodborne pathogens) in order to identify areas within Winnipeg in most need of targeted interventions.

6.0 Conclusion

This research has illustrated the benefit of combining social network and geoepidemiologic data from IDU in order to strategically place public health interventions. The application of these methods can expand beyond the implementation of syringe and equipment drop boxes, and can be used to establish point-of-care infection testing, targeted immunization campaigns and tailored educational programs, among others. Open source social network and spatial analysis software are available, enabling accessibility to resource-limited local public health units. While time and financial investments for development of these skills are required, increased emphasis on these analytical methods in graduate epidemiology and public health programs would contribute towards creation of adequate public health capacity for applied use in the field.

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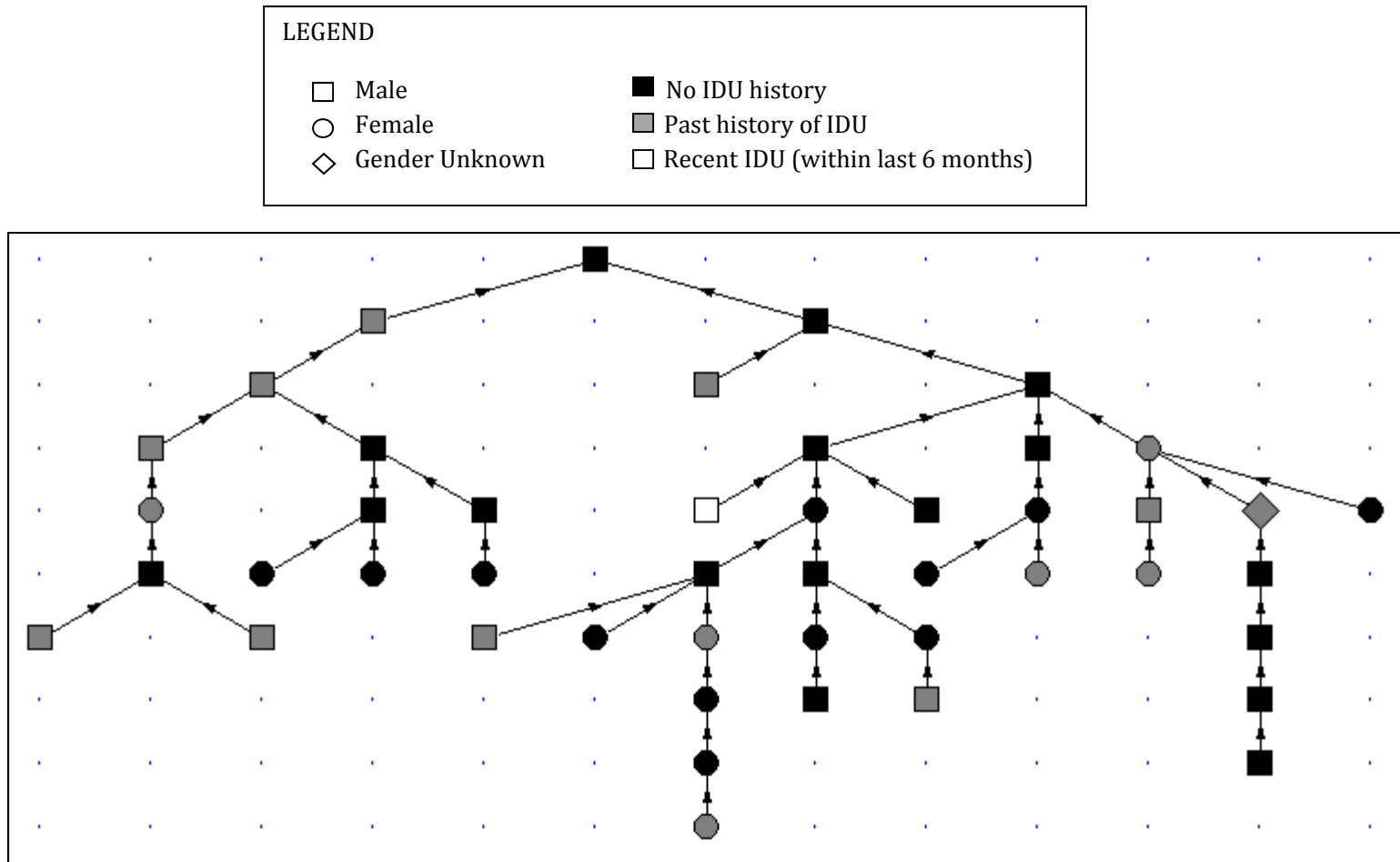
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8.0 Appendices

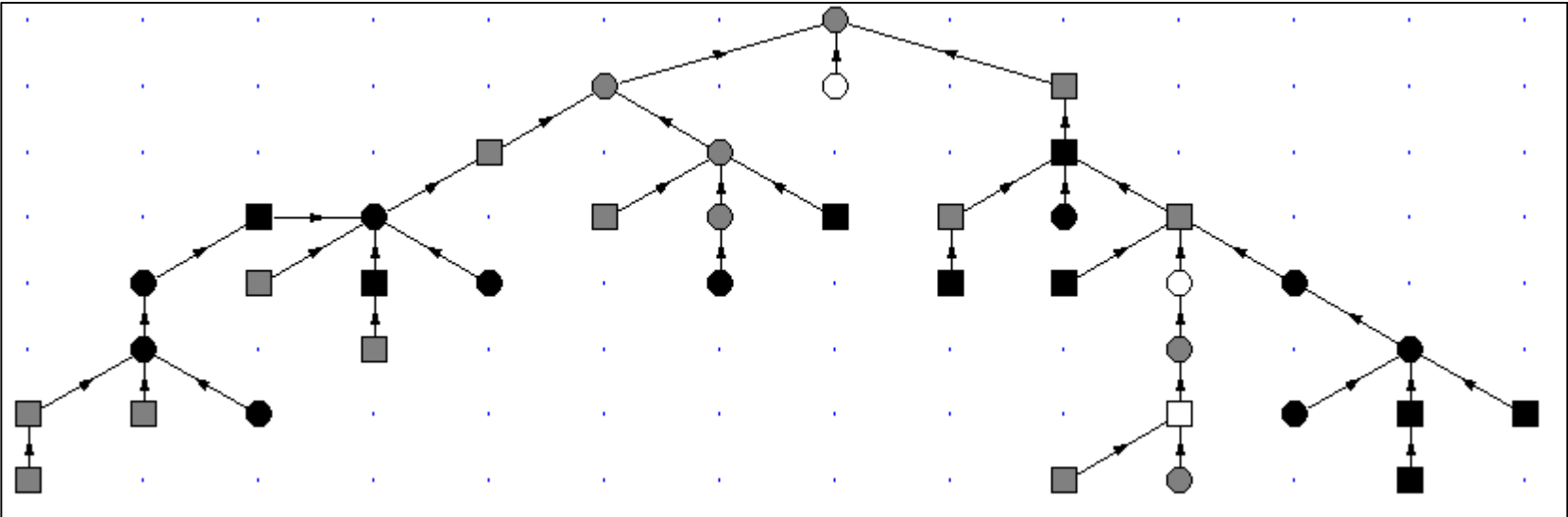
8.1 Statement of contribution

All analyses, interpretation and discussion described herein were completed by the author of this thesis. The author was not involved in the design or implementation of the survey upon which this thesis was based.

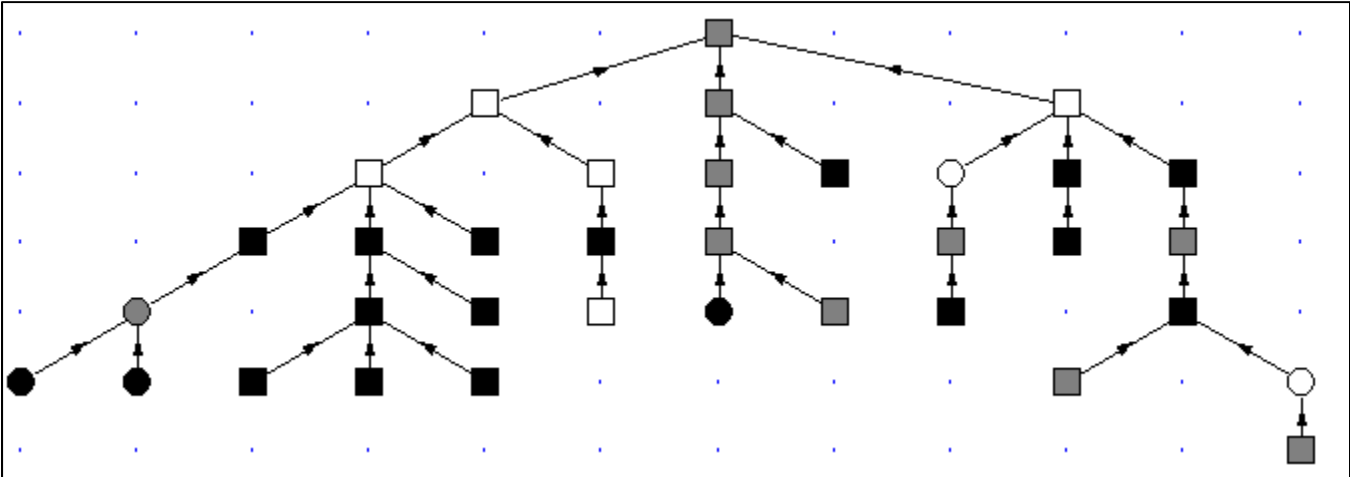
8.2 Schematic representations of components ≥ 2 within the overall sample



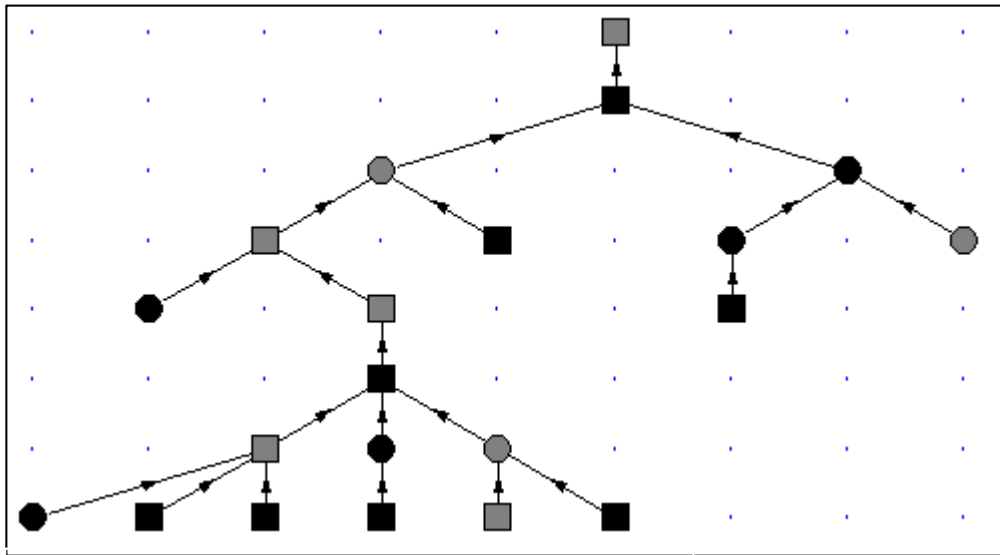
A. Component 1 (n=46)



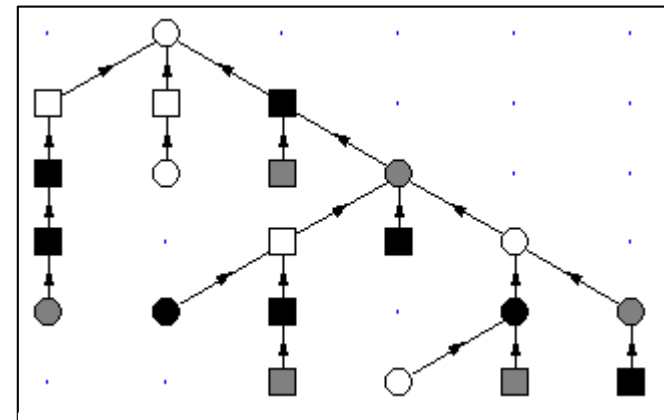
B. Component 2 (n=39)



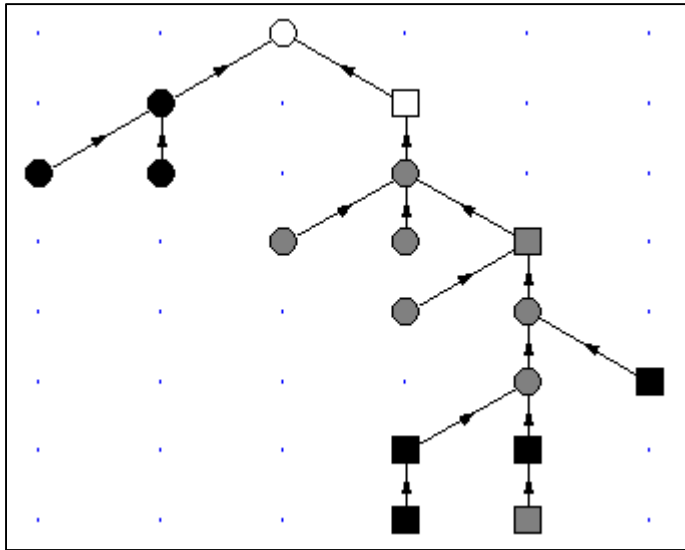
C. Component 3 (n=35)



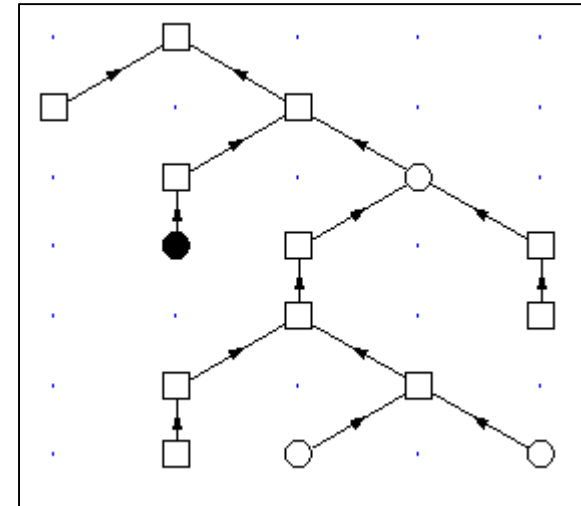
F. Component 6 (n=21)



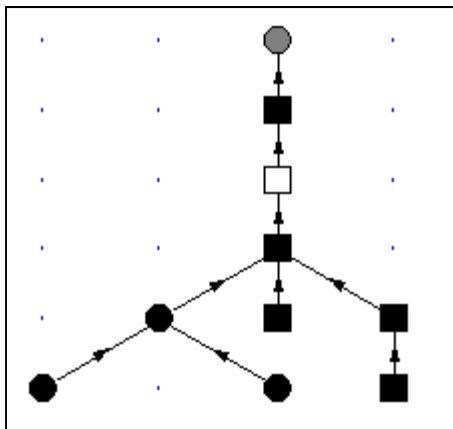
G. Component 7 (n=21)



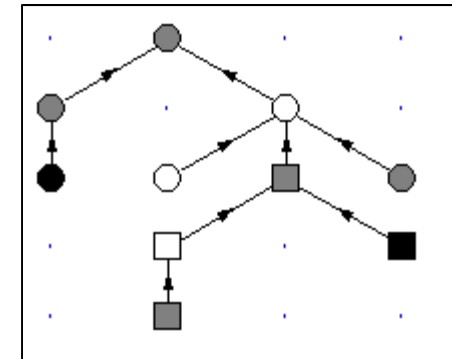
H. Component 8 (n=17)



I. Component 9 (n=15)

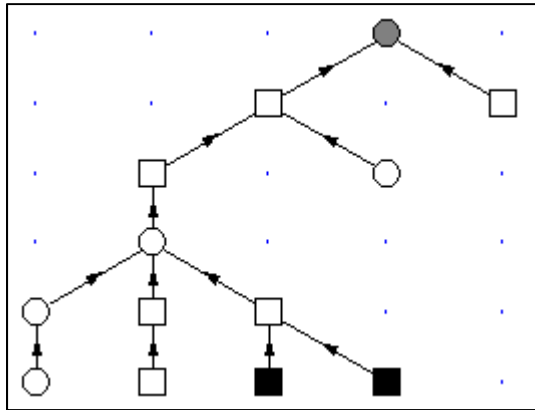


J. Component 10 (n=13)

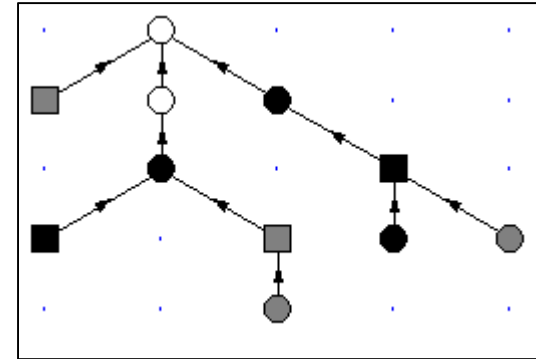


K. Component 11 (n=11)

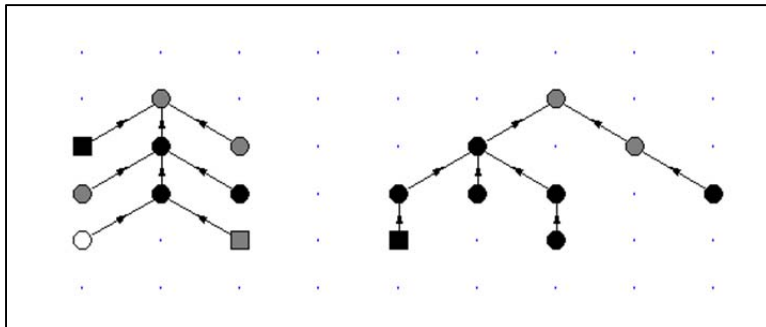
Defining intervention location from social network geographic data



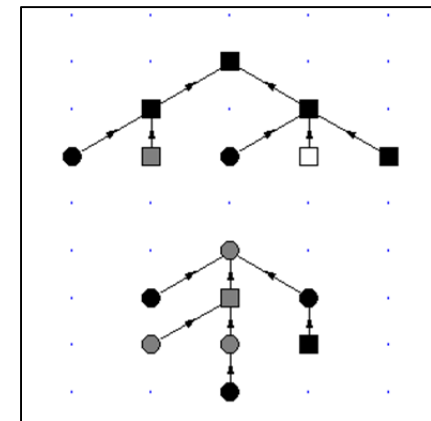
L. Component 12 (n=10)



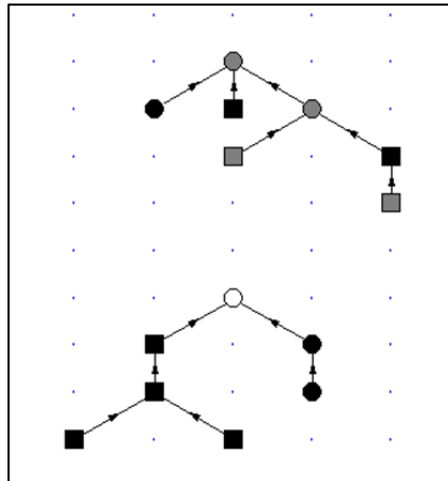
M. Component 13 (n=10)



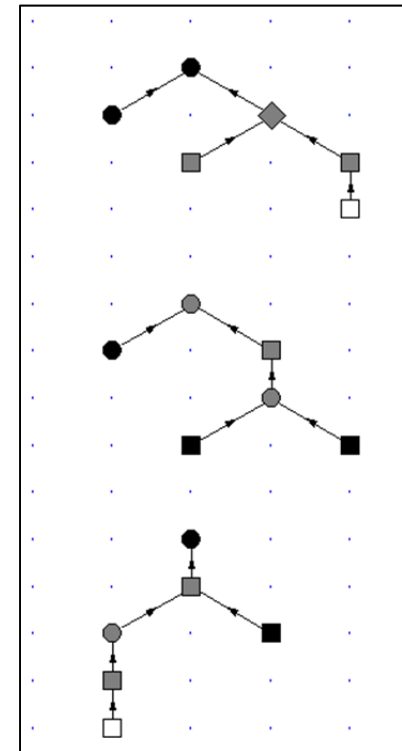
N. Components 14 and 15 (n=9)



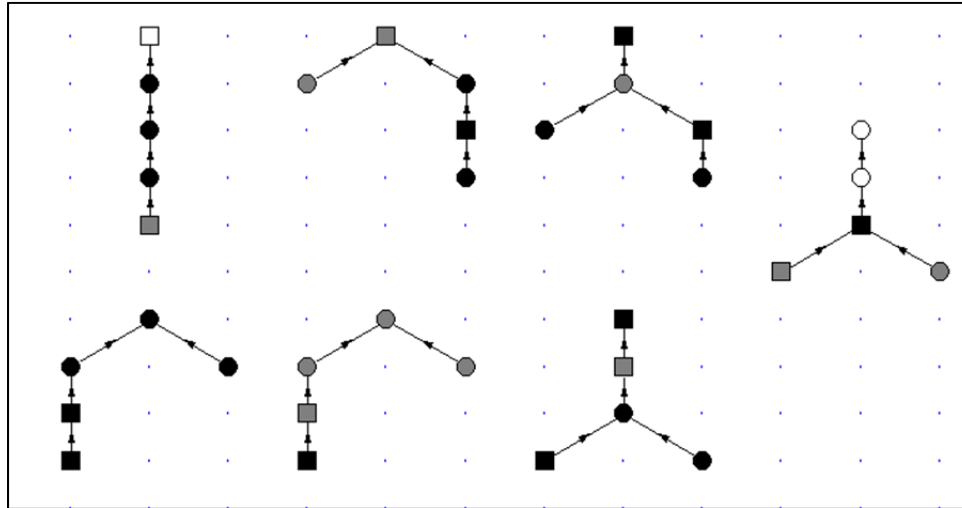
O. Components 16 and 17 (n=8)



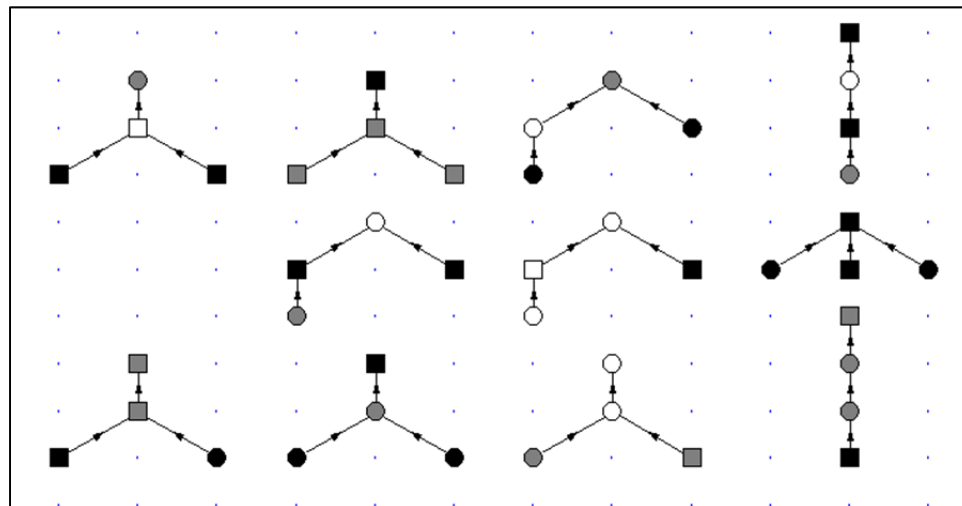
P. Components 18 and 19 (n=7)



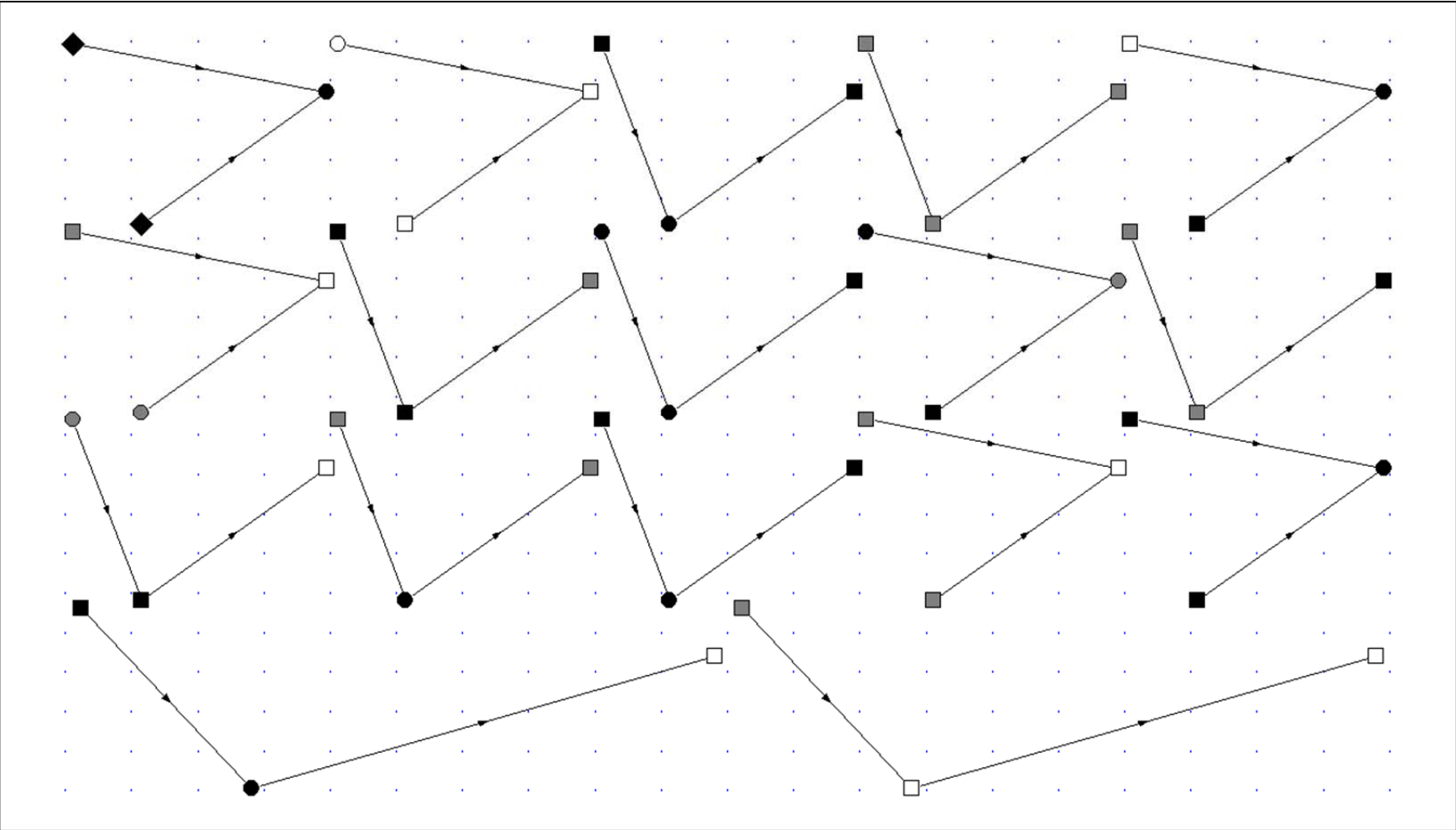
Q. Components 20-22 (n=6)



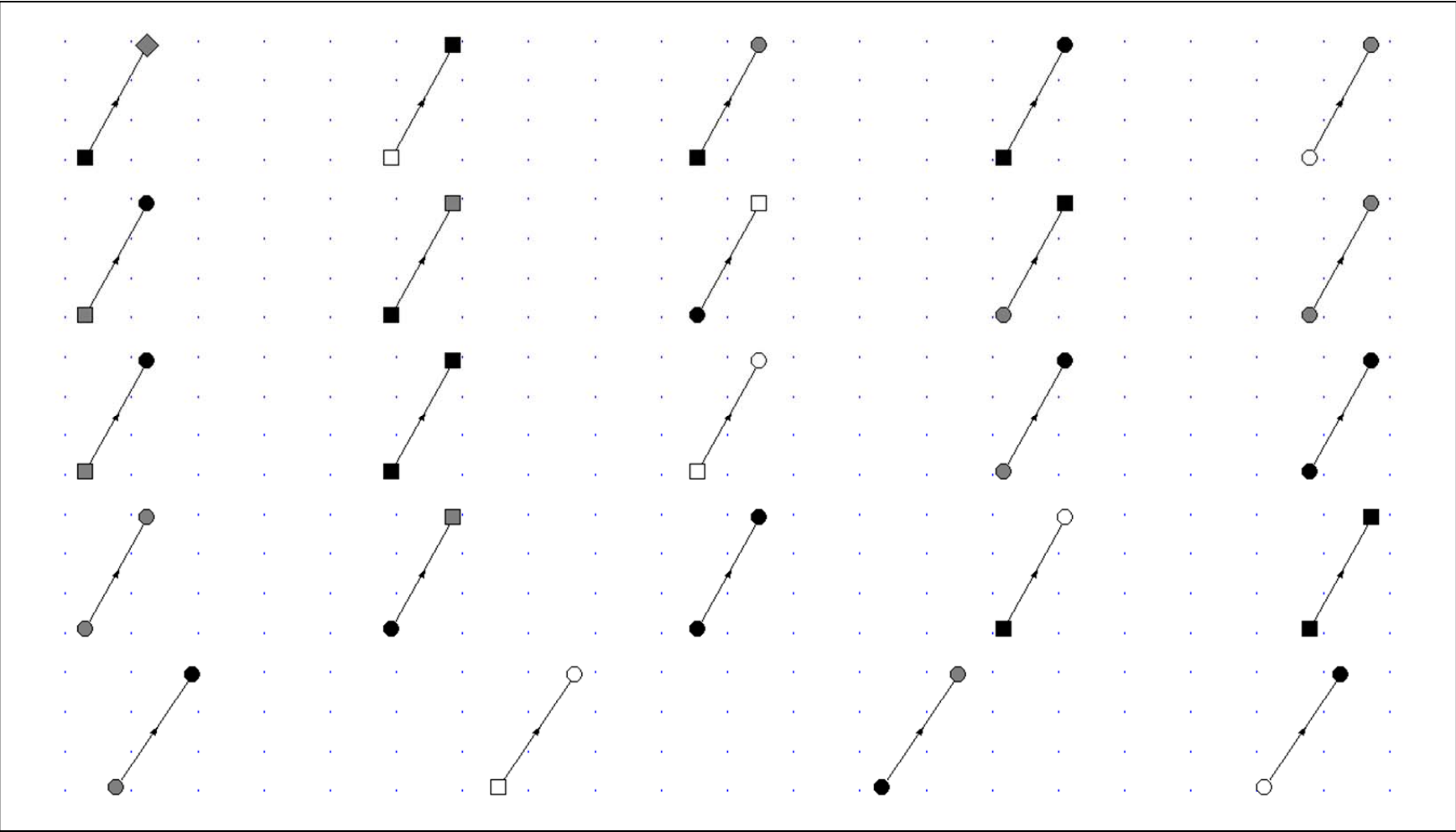
R. Components 23-29 (n=5)



S. Components 30-40 (n=4)



T. Components 41-57 (n=3)



U. Components 58-81 (n=2)

8.3 Data not shown from Manuscript 1.

Table 11. Summary of demographic and drug use characteristics for the Exclusively Talwin and Ritalin Group.

	Exclusively TR Group	Others	<i>p value</i>
Total (n)	7	106	
Complete reporting	6	102	
<i>Dichotomous variables</i>			
Male, n (%)	4 (66.7)	51 (50.0)	0.6788
Drug sharing, n (%)	2 (33.3)	22 (21.6)	0.6128
Aboriginal, n (%)	6 (100.0)	79 (77.5)	0.3380
Cocaine, n (%)	0 (-)	32 (31.4)	0.1763
Crack, n (%)	0 (-)	10 (9.8)	1.0000
CM, n (%)	0 (-)	10 (9.8)	1.0000
Morphine, n (%)	0 (-)	40 (39.2)	0.0826
TR, n (%)	5 (83.3)	49 (48.0)	0.2055
Fentanyl, n (%)	0 (-)	9 (8.8)	1.0000
Sharing of injection equipment, n (%)	2 (33.3)	29 (28.4)	1.0000
Injection in private residence, n (%)	6 (100.0)	82 (80.4)	0.5905
Injection in hotel, n (%)	0 (-)	16 (15.7)	0.5888
Injection in street, n (%)	2 (33.3)	30 (29.4)	1.0000
<i>Continuous variable</i>			
Age (years), mean (SD)	33.0 (5.1)	37.3 (10.0)	0.3016
<i>Laboratory data (n)</i>			
HCV infection, n (%)	5	85	
HCV infection, n (%)	4 (80.0)	59 (69.4)	1.0000
HIV infection, n (%)	1 (20.0)	16 (18.8)	1.0000
HBV infection, n (%)	0 (-)	29 (34.1)	0.1710

Table 12. Summary of demographic and drug use characteristics for the Talwin and Ritalin, and Fentanyl Group.

	TR and Fentanyl Group	Others	<i>p value</i>
Total (n)	4	109	
Complete reporting	4	104	
<i>Dichotomous variables</i>			
Male, n (%)	2 (50.0)	53 (51.0)	1.0000
Drug sharing, n (%)	2 (50.0)	22 (21.2)	0.2132
Aboriginal, n (%)	3 (75.0)	82 (78.9)	1.0000
Cocaine, n (%)	0 (-)	32 (30.8)	0.3165
Crack, n (%)	0 (-)	10 (9.6)	1.0000
CM, n (%)	0 (-)	10 (9.6)	1.0000
Morphine, n (%)	1 (25.0)	39 (37.5)	1.0000
TR, n (%)	3 (75.0)	51 (49.0)	0.6179
Fentanyl, n (%)	1 (25.0)	8 (7.7)	0.2976
Sharing of injection equipment, n (%)	2 (50.0)	29 (27.9)	0.5769
Injection in private residence, n (%)	3 (75.0)	85 (81.7)	0.5649
Injection in hotel, n (%)	0 (-)	16 (15.4)	1.0000
Injection in street, n (%)	2 (50.0)	30 (28.9)	0.5802
<i>Continuous variable</i>			
Age (years), mean (SD)	39.8 (7.1)	36.9 (9.9)	0.5775
<i>Laboratory data (n)</i>			
HCV infection, n (%)	3 (100.0)	60 (69.0)	0.5511
HIV infection, n (%)	1 (33.3)	16 (18.4)	0.4706
HBV infection, n (%)	1 (33.3)	28 (32.2)	1.0000

8.4 Survey instrument

FIRST INTERVIEW – RECRUITMENT DETAILS

R1. Study code number assigned _____ (3 digits)

R2. If person presents with RDS coupon: study code number on coupon ____ / ____

R3. RDS coupons accepted by study participant

0. No

1. Yes

99. coupons not offered - specify why _____

R4. Person entered study as:

0. **Self-initiated contact** (e.g. contacted research staff without an RDS coupon)

1. **RDS seed** (i.e. selected as one of the initial seeds by study staff)

2. **RDS recruit** (presents with RDS coupon)

If entered as “**RDS recruit**”, inquire as to the study participant’s relationship to the person who gave them the card (choose one only)?

0. Friend

1. family member, spouse

2. acquaintance

3. stranger

Other _____

R5. Place of interview _____

R6. Date _____ (yyyy/mm/dd).

R7. Interviewer (initials) _____

PART 1. INDIVIDUAL LEVEL DATA

SECTION 1.1. DEMOGRAPHICS

DE1. What is the highest level of education you have completed?

- 0. Graduated grade 12
- 1. In grade school now (grade _____)
- 2. Dropped out before grade 12 (grade_____)
- 3. Attended or graduate trade school, University, or college
- 4. other _____
- 77. unsure
- 99. refused

DE2. What is your main source of income?

- 0. Regular work (full-, part-time, contract, self-employed)
- 1. Welfare, EI, pension or other government support
- 2. Money from family/friends
- 3. Other, specify: _____
- 77. Unsure
- 99. Refused

DE3. In the past 12 months have you lived in or visited frequently (2 or more times) a place outside of Winnipeg, but within North America?

- 0. No *If No, go to question DE4*
- 1. Yes
- 77. Unsure
- 99. Refused



DE3A. If yes, where? _____ *(if more than one place, list a maximum of two more places where they have spent the most time)*

DE3B. Over the last 12 months, what month(s) or parts of months were you in a place other than Winnipeg (circle all that apply)?

0. January	7. August
1. February	8. September
2. March	9. October
3. April	10. November
4. May	11. December
5. June	77. Unsure
6. July	99. Refused

DE4. Where were you born?

- 0. In Canada → *If “in Canada” go to question DE4D*
- 1. Outside Canada
- 77. Unsure
- 99. Refused

If “outside Canada”:

DE4A: What country were you born in? (*interviewer – if a continent is indicated, inquire as to the specific country*)

_____ 77. unsure 99. refused

DE4B: What country were you living in just before moving to Canada?

_____ 77. unsure 99. refused

DE4C: When did you move to Canada?

____/____/____ (yyyy/mm/dd) 77. unsure 99. refused

If born “in Canada”

DE4D. In what community were you born (city/town/reserve, etc.) (does not include mother having to travel to another community to give birth – here the answer would be the community where the mother was living just prior to giving birth)

_____ 77. unsure 99. refused

If in Winnipeg, go to question DE5
If outside Winnipeg, go to the next question.

DE4E. In the past year, how many times have you visited the community where you were born?

_____ 77. Unsure 99. refused

DE5. Over the past 6 months, what type(s) of place(s) have you lived in?
(circle all that apply)

- 0. My own house or apartment (does not include living in parent’s house)
- 1. At a family member’s house or apartment (includes living with parents)
- 2. At a friend’s house or apartment
- 3. Shelter or hostel
- 4. Rooming/boarding house
- 5. Hotel or motel
- 6. Car/other type of vehicle
- 7. Abandoned building
- 8. A place of business (restaurant, 24 hour laundromat)
- 9. Outside on the street or in a park
- 10. other (*specify*) _____
- 77. unsure
- 99. refused

DE6. Over the past 6 months, what type of place did you live in the most?

(circle one only)

- | | |
|---|---|
| 0. My own house or apartment (does not include living in parent's house) | 6. Car/other type of vehicle |
| 1. At a family member's house or apartment (includes living with parents) | 7. Abandoned building |
| 2. At a friend's house or apartment | 8. A place of business (restaurant, 24 hour laundromat) |
| 3. Shelter or hostel | 9. Outside on the street or in a park |
| 4. Rooming/boarded house | 10. other (specify): _____ |
| 5. Hotel or motel | 77. unsure |
| | 99. refused |

DE7. What is the nearest intersection to the place you most frequently lived in the most over the last 6 months? - study participant can use neighbourhood name if they are uncomfortable giving intersection - If outside Winnipeg, use community name or region

_____ 77. Unsure 99. Refused

DE8. What is your age? _____

If between the ages of 14-24, ask the following (otherwise go to DE9):



DE8A: Have you ever run away from your home and stayed away at least three nights (consecutively)?
(Interviewer – “run away” can be defined as a youth feeling they were forced out of their home by a parent or guardian or a youth feeling they needed to leave home for safety reasons – i.e. they felt that staying there was no longer an option).

0. No **If No, go to DE9**
 1. Yes
 77. Unsure
 99. Refused

DE8B: If yes to DE8A, how old were you when you first ran away from home?

 77. Unsure
 99. Refused

DE8C: If yes to DE8A, During the times that you've run away, what is the longest period of time (days, weeks, years) that you've spent away from your parent's or guardian's home?

 77. Unsure
 99. Refused

DE9. What gender do you identify yourself as? (based on biological characteristics)

- | | |
|------------------------------------|--|
| 0. Male | 4. Intersex (biological characteristics of both male and female) |
| 1. Female | 5. Other _____ |
| 2. Transgender - biological female | 77. Unsure |
| 3. Transgender - biological male | 99. Refused |

DE10. What is your sexual orientation?

- | | |
|--------------------------|-----------------|
| 0. Heterosexual/straight | 5. Transexual |
| 1. Gay | 6. Other: _____ |
| 2. Lesbian | 77. Unsure |
| 3. Bisexual | 99. Refused |
| 4. Two-spirit | |

DE11. What ethnic group or family background do you most identify yourself with:

- | | |
|--|-----------------------------------|
| 0. Caucasian/White | 10. Latin American |
| 1. First Nations (status) | 11. Middle Eastern |
| 2. First Nations (non-status) | 12. Black-African |
| 3. Metis | 13. Black-Caribbean |
| 4. Inuit | 14. Other Black |
| 5. Aboriginal (other) | 15. Other (<i>specify</i> _____) |
| 6. Chinese | 77. Unsure |
| 7. Filipino | 99. Refused |
| 8. South-Asian (e.g. Indian, Pakistani) | |
| 9. Other Asian (e.g. Vietnamese, Japanese) | |

DE12. If yes to First Nation, Metis, Inuit, or other aboriginal – What First Nation do you most identify with:

- 0. Ojibway
- 1. Cree
- 2. Oji-Cree
- 3. Dakota
- 4. Dene
- 5. Other – specify _____
- 77. Unsure
- 99. Refused

DE13. Have you ever experienced discrimination, been prevented from doing something or been hassled or made to feel inferior because of your:

	0. No	1. Yes	77. Unsure	99. Refused
A. Race or colour				
B. Gender				
C. Sexual orientation				
D. Life style				

DE13A. If yes to any of above, where did this occur (circle all that apply):

	A. Race	B. Gender	C. Sexual orientation	D. Life style
0. At school				
1. getting a job				
2. at work				
3. getting housing				
4. getting medical care				
5. in a public setting				
6. from the police or courts				
7. family/friends				

77. Unsure				
99. Refused				

SECTION 1.2: ACCESS TO SERVICES AND OTHER COMMUNITY AREAS

ACC1. Have you accessed as a client any of the following clinics or community health centers in the past 12 months for any medical attention, health information or to take part in a program (Indicate all that apply):

- 0. Nine Circles Community Health Clinic
- 1. Mount Carmel Clinic
- 2. Klinik Community Health Centre
- 3. Aboriginal Health and Wellness Centre
- 4. Centre de Sante St. Boniface
- 5. Health Action Centre
- 6. Hope Centre
- 7. Nor' West Community Health Clinic
- 8. Women's Health Clinic
- 9. Youville clinic
- 10. WRHA Health Access Centre: River East
- 11. WRHA Health Access Centre: 601 Aikins
- 12. Sage House
- 13. Cari Clinic
- 14. Sunshine House
- 15. Kali Shiva AIDS Services
- 16. Resource Assistance for Youth
- 17. Sexuality Education Resource Centre
- 18. Women's Hospital Out-patient service
- 19. M.I.N.E. clinic
- 20. Four rivers – Broadway and Main
- 21. Walk-in clinics
- 77. Unsure
- 99. Refused

ACC2. In the past 12 months, have you accessed any health information on-line?

ACC3. Do you regularly make use of, or hang out at, any community/public gathering places (e.g. shopping malls, public parks, skateboard parks, churches).

- 0. No
- 1. Yes
- 77. Unsure
- 99. Refused

ACC4A. If yes, please specify types or names of places and approximate location (nearest intersection). If more than one, list the most commonly used places to a maximum of three:

- if outside Winnipeg, use community name or region

SECTION 1.3: NEIGHBORHOOD CHARACTERISTICS

	NC1. How big a problem are each of the following issues in your neighbourhood?					NC2. For each item, is the situation better, worse or same than approximately one year ago?			
	Not at all	Somewhat	Big	Unsure		Better	Worse	Same	Unsure
a) Vandalism									
b) Vacant housing									
c) Litter or trash on the street									
d) Burglary									
e) Drug selling									
f) Robbery or assault									
g) Car theft									
h) Gangs									

How strongly do you agree or disagree with the following two statements:

NC3. People in my neighbourhood are willing to help their neighbors

- 0. strongly agree
- 1. somewhat agree
- 2. neutral
- 3. somewhat disagree
- 4. strongly disagree
- 77. Unsure
- 99. Refused

NC4 . People in this neighborhood can be trusted

- 0. strongly agree
- 1. somewhat agree
- 2. neutral
- 3. somewhat disagree
- 4. strongly disagree
- 77. Unsure
- 99. Refused

NC5. In the past 6 months, have you volunteered or helped organize any type of community event (e.g. health events, church, organized sports)?

- 0. No
- 1. Yes If yes, specify: _____
- 77. Unsure
- 99. Refused

NC6. In the past 6 months, have you attended any community event?

- 0. No
- 1. Yes If yes, specify: _____
- 77. Unsure
- 99. Refused

SECTION 1.4: HEALTH SELF-ASSESSMENT

HSA1. In general, would you say your physical health is:

- | | |
|--------------|-------------|
| 0. Excellent | 4. poor |
| 1. very good | 77. Unsure |
| 2. good | 99. Refused |
| 3. fair | |

HSA2. In general, would you say your mental health (emotional well-being) is:

- | | |
|--------------|-------------|
| 0. Excellent | 4. poor |
| 1. very good | 77. Unsure |
| 2. good | 99. Refused |
| 3. fair | |

HSA3. Have you ever experienced serious depression? (“serious” means a period of depression lasting two weeks or longer when nearly every day you were depressed):

- | | | | |
|-------|--------|------------|-------------|
| 0. No | 1. Yes | 77. Unsure | 99. Refused |
|-------|--------|------------|-------------|

If No, go to HSA5

HSA4. Have you experienced serious depression in the last 6 months?

- | | | | |
|-------|--------|------------|-------------|
| 0. No | 1. Yes | 77. Unsure | 99. Refused |
|-------|--------|------------|-------------|

HSA5. Have you ever experienced serious anxiety or tension? (same definition of “serious” as above)

- | | | | |
|-------|--------|------------|-------------|
| 0. No | 1. Yes | 77. Unsure | 99. Refused |
|-------|--------|------------|-------------|

If No, go to HSA7

HSA6. Have you experienced serious anxiety in the last 6 months?

- | | | | |
|-------|--------|------------|-------------|
| 0. No | 1. Yes | 77. Unsure | 99. Refused |
|-------|--------|------------|-------------|

HSA7: Have you ever talked to any friends, family or co-workers about any of the following:

HSA7A) Your emotions or mental health

- | | | | |
|-------|--------|------------|-------------|
| 0. No | 1. Yes | 77. Unsure | 99. Refused |
|-------|--------|------------|-------------|

HSA7B) Your use of or dependence on alcohol

- | | | | |
|-------|--------|------------|-------------|
| 0. No | 1. Yes | 77. Unsure | 99. Refused |
|-------|--------|------------|-------------|

HSA7C) Your use of or dependence on other substances (i.e. other than alcohol)

- | | | | |
|-------|--------|------------|-------------|
| 0. No | 1. Yes | 77. Unsure | 99. Refused |
|-------|--------|------------|-------------|

HSA8. Have you ever used an internet support group or chat room to get help with any of the following:

HSA8A) Your emotions or mental health

- | | | | |
|-------|--------|------------|-------------|
| 0. No | 1. Yes | 77. Unsure | 99. Refused |
|-------|--------|------------|-------------|

HSA8B) Your use of or dependence on alcohol

- | | | | |
|-------|--------|------------|-------------|
| 0. No | 1. Yes | 77. Unsure | 99. Refused |
|-------|--------|------------|-------------|

HSA8C) Your use of or dependence on other substances (i.e. other than alcohol)

- | | | | |
|-------|--------|------------|-------------|
| 0. No | 1. Yes | 77. Unsure | 99. Refused |
|-------|--------|------------|-------------|

HSA9: Have you ever seen or talked on the telephone to any of the following professionals about:

- a) Your emotions or mental health
- b) Your use of or dependence on alcohol
- c) Your use of or dependence on other substances (i.e. other than alcohol)

Check here if question refused: _____

	Emotions or Mental Health	Alcohol dependence	Other substance dependence
0. Family doctor in private practice			
1. Psychiatrist in private practice			
2. Psychologist in private practice			
3. Other medical doctor in private practice (e.g. cardiologist, gynaecologist)			
4. Specialist mental health service (such as out-patient psychiatry, in-patient psychiatric unit, PACT, CODI team)			
5. Crisis services (e.g. mobile crisis unit, crisis stabilization unit, crisis telephone service)			
6. Community health centre worker			
7. Addictions treatment worker			
8. Religious or spiritual adviser such as a priest, elder, or rabbi			
77. Unsure			

If No to any of the above, go to HSA11.

HSA10. If yes to any of the above - How old were you when you first talked to a professional about any of the above problems?

(no need to differentiate between the three issues above – the earliest date for any one of the three is sufficient).

Age: _____ 77. Unsure 99. Refused

HSA11 . Was there a time in the last 6 months when you felt you needed professional help with any of the following:

a) Your emotions or mental health

0. No 1. Yes 77. Unsure 99. Refused

b) Your use of or dependence on alcohol

0. No 1. Yes 77. Unsure 99. Refused

c) Your use of or dependence on other substances (i.e. other than alcohol)

0. No 1. Yes 77. Unsure 99. Refused

Check here if question refused: _____

If No to a), b) or c), go to HSA14

HSA12 . If yes to any of a), b), or c) above – did you feel you received the professional help that you needed?

(no need to differentiate between the three issues for this question)

0. No 1. Yes 77. Unsure 99. Refused

If Yes, go to HSA14

HSA13 . Why did you feel you did not receive the professional help that you needed? (check all that apply)

0. Help not available in my area
1. Help was not available at the time I needed it (e.g. inconvenient hours or wait time too long)
2. Felt the help available would not do any good
3. Too busy
4. Didn't get around to it/didn't bother
5. Didn't know where to go or how to find help
6. Transportation problems
7. Language problems
8. Personal or family responsibilities
9. Don't like or are afraid of doctors
10. Decided not to seek care
11. I'm on a waiting list or am still waiting for my appointment
12. Other: specify _____

-
77. Unsure
99. Refused

HSA14 . Have you ever been given a diagnosis of a mental health condition? (i.e. told by a doctor, psychiatrist, or psychologist that you have a mental health condition)

0. No 1. Yes 77. Unsure 99. Refused

If No, go to HSA16

HSA15 . If yes - What was the diagnosis?

- | | |
|--|--------------------------------------|
| 0. Depression | 9. Obsessive-compulsive disorder |
| 1. Schizophrenia | 10. Panic disorder |
| 2. Post traumatic stress disorder | 11. Cognitive impairment |
| 3. Anxiety | 12. Phobia |
| 4. Manic Depressive disorder (bipolar) | 13. Addiction to alcohol |
| 5. Manic disorder | 14. Addiction to drugs (not alcohol) |
| 6. Multiple personality disorder | 15. Other: _____ |
| 7. Borderline personality disorder | _____ |
| 8. Antisocial/sociopathic personality disorder | 77. Unsure |
| | 99. Refused |

HSA16. Have you ever been prescribed a drug to help you deal with a mental health problem?

0. No 1. Yes 77. Unsure 99. Refused

If No, go to HSA18

HSA17. If yes to HSA16, what prescription drugs have you used (or are currently using) for your mental health issue?

HSA18. Have you ever used alcohol or non-prescription drugs to help you deal with a mental health problem?

0. No 1. Yes 77. Unsure 99. Refused

If No, go to next section

HSA19. If yes to HAS18, what type of non-prescription drugs (including alcohol) have you used (or are currently using) for your mental health problem?

SECTION 1.5: ALCOHOL USE

The following questions are about alcohol use. The first set of questions are about alcoholic beverages such as beer, wine, or hard liquor or spirits (e.g. rye, vodka) commercially available from stores or restaurants. Later there will be a few questions about other types of liquids that contain alcohol, such as mouthwash. In the first set of questions “a drink” is equal to:

1) a glass or bottle of beer; 2) a single shot or measure of liquor or spirits; or 3) a single glass of wine.

ALC1. Do you drink alcoholic beverages?

0. No 1. Yes 77. Unsure 99. Refused

If No, go to section 1.5 – Solvent use

ALC2. In the last 6 months, how often did you have a drink?

0. Not at all *If “not at all”, go to ALC5* 77. Unsure
1. Once in a while, not every week 99. Refused to answer
2. Regularly, once or twice a week
3. Regularly, three or more times a week
4. Every day

ALC3. In the last 6 months, how many drinks did you have on a typical day when you were drinking?

0. 1 or 2 4. 10 or more
1. 3 or 4 77. Unsure
2. or 6 99. Refused
3. Between 7 and 9

ALC4. In the last 6 months, how often did you have six or more drinks on one occasion

0. Not at all 77. Unsure
1. Once in a while, not every week 99. Refused
2. Regularly, once or twice a week
3. Regularly, three or more times per week
4. Everyday

ALC5. How old were you when you started drinking alcoholic beverages (not including small sips for religious purposes)

Age: _____ 77. Unsure 99. Refused

ALC6. Have you ever drunk any other type of liquids containing alcohol (e.g. superjuice, mouthwash, cough syrups, aftershaves) to get drunk or high?

0. No 1. Yes 77. Unsure 99. Refused

If No, go to next section

ALC6A: If yes, specify type of liquid(s): _____

77. Unsure 99. Refused

ALC6B. In the last 6 months, how often have you drunk these other types of liquids?

0. Not at all 77. Unsure
1. Once in a while, not every week 99. Refused
2. Regularly, once or twice a week
3. Regularly, three or more times per week
4. Everyday

SECTION 1.6: SNIFFING AND SOLVENT USE

The following questions are about sniffing solvents such as gasoline or glue to get high.

SSU1. Have you ever sniffed any solvents?

0. No 1. Yes 77. Unsure 99. Refused

If No, go to next section

SSU2. In the last 6 months, how often did you sniff solvents?

0. Not at all
1. Once in a while, not every week
2. Regularly, once or twice a week
3. Regularly, three or more times per week
4. Everyday
77. Unsure
99. Refused

SSU3. How old were you when you first started sniffing solvents?

- Age: _____ 77. Unsure 99. Refused

SSU4. What community were you living in when you first started sniffing solvents?

- Community name: _____ 77. Unsure 99. Refused

SSU5. In the last 6 months, thinking of the places where you sniff solvents most frequently - what is the nearest intersection to that place?

- *Community name or region if outside of Winnipeg*
- *For places, like hotels, the name can be use*

Maximum of three: _____

77. Unsure 99. Refused

SECTION 1.7: CRACK SMOKING

CRS1. Have you ever smoked crack?

0. No 1. Yes 77. Unsure 99. Refused
If No, go to next section

CRS2. How old were you when you started smoking crack?

- Age: _____ 77. Unsure 99. Refused

CRS3. Have you ever used someone else's crack pipe?

0. No 1. Yes 77. Unsure 99. Refused

CRS3. In the last 6 months, how often did you smoke crack?

0. Not at all *If Not at all, go to next section*
1. Once in a while, not every week
2. Regularly, once or twice a week
3. Regularly, three or more times a week
4. Every day
77. Unsure
99. Refused to answer

CRS5. (Note – if participant answered No to CRS3, skip this question and go to CRS7) In the last 6 months, have you used someone else's crack pipe?

0. No 1. Yes 77. Unsure 99. Refused
If No, go to CRS7.

CRS6. In the last 6 months, how often did you clean these crack pipes with an alcohol swab before you used it?

0. Usually 1. Sometimes 2. Rarely 3. never 77. Unsure 99. Refused

CRS7. In the last 6 months how easy or difficult was it for you to obtain a brand new safer crack use kit if you needed one?

0. Very easy 77. Unsure
1. somewhat easy 88. Not applicable – not a crack user
2. somewhat difficult 99. Refused
3. very difficult

In the last 6 months, thinking of the times when you've needed to get a brand new safer crack use kit, would you agree or disagree with the following statements:

CRS8A. The places where the safer crack use kits are available are conveniently located near the places where I live or hang out

0. Strongly agree 77. Unsure
1. Agree 99. Refused
2. Disagree
3. Strongly disagree

CRS8B. I depend on other people to get new safer crack use kits for me

0. Strongly agree 77. Unsure
1. Agree 99. Refused
2. Disagree
3. Strongly disagree

SECTION 1.8: OTHER NON-INJECTION DRUGS

NID1. Have you ever swallowed, snorted, inhaled, smoked or applied (i.e. patch – not including nicotine patch) any of the following drugs that were not prescribed to you by a doctor (i.e. non-injection drug use). Please also indicate which ones you’ve used in the last 6 months and which one you’ve used most frequently:

If never used any of the drugs below, go to next section (Injection drug use)

	Ever used	Last 6 months	Indicate most frequently used in last 6 months Choose one only
0. Marijuana			
1. Cocaine			
2. Talwin & Ritalin			
3. Ritalin alone			
4. Morphine			
5. Amphetamines (not crystal methamphetamine – see below)			
6. Crystal methamphetamine			
7. Heroin			
8. Heroin and cocaine			
9. Oxycontin			
10. Opium			
11. Dilaudid			
12. Tylenol 3			
13. Ecstasy			
14. PCP/Angel Dust			
15. Gamma-hydroxybutyrate (GHB)			
16. Special K/ketamine			
17. Methadone			
18. Rohypnol (Ruffies)			
19. Barbiturates			
20. Other tranquilizers/downers (not barbiturates)			
21. Viagra or other erectile drugs			
22. LSD/Acid			
23. Mushrooms			
24. Gravol			
25. Fentanyl or other patch			
26. Other - Specify:			
77. Unsure			
99. Refused			

NID2. The first time you used any of these non-injection drugs, how old were you?

Age: _____ 77. Unsure 99. Refused

NID3. The first time you used these non-injection drugs, how did you get the drugs (choose from the list below)

- 0. Given to me for free
- 1. Given to me on credit
- 2. I purchased them
- 3. Other – specify: _____
- 77. Unsure
- 99. Refused

NID4. What was your relationship to the person who introduced you to the use of these non-injection drug ?

- 0. Friend
- 1. Family (related by birth)
- 2. Spouse, boy/girlfriend
- 3. Acquaintance
- 4. Stranger
- 5. No specific person initiated me to non-injection drug use
- 6. Other – specify _____
- 77. Unsure
- 99. Refused

NID5. What community (city/town/reserve) were you in when you first used these non-injection drugs?

77. Unsure 99. Refused

NID6. During the last 6 months, on average how often did you use these non-injection drugs?

- 0. Not at all If “not at all”, go to **Injection drug use** section
- 1. Once in a while, not every week
- 2. Regularly, once or twice a week
- 3. Regularly, three or more times a week
- 4. Every day
- 77. Unsure
- 99. Refused to answer

NID7. During the last 6 months, in which of the following types of places have you used these non-injection drugs?

- | | |
|---|--|
| 0. Private residence | 6. Indoor public places
(washrooms, shopping malls) |
| 1. Bars/strip bars | 7. Jail |
| 2. Bathhouses | 8. School |
| 3. Hotel(s) | 9. Other -
Specify: _____ |
| 4. Shooting gallery/crack house (<i>a private residence where people specifically go to inject drug</i>). | _____ |
| 5. Outdoor public places (parks, on the street) | 77. Unsure |
| | 99. Refused |

NID8. Thinking of the places where you use these non-injection drugs most frequently - what is the nearest intersection to that place?

- study participant can use neighbourhood name if they are uncomfortable giving intersection
- If outside Winnipeg, use community name or region

Maximum of three:

SECTION 1.9: INJECTION DRUG USE

IDU1. Have you ever injected any non-prescribed drugs:
 0. No 1. Yes 77. Unsure 99. Refused
If No, go to next section (Condom access)

IDU2: Which of the following drugs have you ever injected and which ones have you injected in the last 6 months. Of the drugs injected in the last 6 months, indicate which is the most frequently injected.

	Ever injected	Last 6 months	Most frequently injected in the last 6 months (check one only)
0. Cocaine			
1. Talwin and Ritalin			
2. Crack/rock cocaine			
3. Morphine			
4. Crystal methamphetamine			
5. Heroin			
6. Speedballs (heroin and cocaine)			
7. Oxycontin			
8. Steroids			
9. Methadone			
10. Barbiturates			
11. Other opiates (Percocet, Dilaudid)			
12. Other amphetamines or stimulants			
13. Alcohol			
14. Fentanyl or other patches			
15. Other - Specify:			
77. Unsure			
99. Refused			

IDU3. The first time you injected, how old were you? _____

IDU4. The first time you injected, how did you get the drugs (choose from the list below)

- 0. Given to me for free
- 1. Given to me on credit
- 2. I purchased them
- 3. Other – specify: _____
- 77. Unsure
- 99. Refused

IDU5. What was your relationship to the person who introduced you to injection drug use?

- 0. Friend
- 1. Family (related by birth)
- 2. Spouse, boy/girlfriend
- 3. Acquaintance
- 4. Stranger
- 5. No specific person initiated me to injection drug use
- 6. Other – specify _____
- 77. Unsure
- 99. Refused

IDU6. Which community (city/town/reserve) were you in when you first used injection drugs?

 77. Unsure 99. Refused

IDU7. During the last 6 months, on average how often did you inject drugs?

- 0 Not at all If “not at all” chosen, go to question IDU21
1 Once in a while, not every week
2 Regularly, once or twice a week
3 Regularly, three or more times a week
4 Every day
77. Unsure
99. Refused to answer

IDU8. During the last 6 months, on the days you injected drugs, on average how many injections did you have per day?

-
77. Unsure 99. Refused

IDU9. During the last 6 months, in which of the following types of places have you injected drugs?

- | | |
|--|--|
| 0. Private residence | 6. Indoor public places
(washrooms, shopping malls) |
| 1. Bars/strip bars | 7. Jail |
| 2. Bathhouses | 8. InSite - Vancouver |
| 3. Hotel(s) | 9. School |
| 4. Shooting gallery/crack
house/party house (<i>a place where
people specifically go to inject
drug</i>). | 10. Other -
Specify: _____ |
| 5. Outdoor public places (parks, on
the street) | 77. Unsure
99. Refused |

IDU10. Thinking of the places above where you have injected most frequently - what is the the nearest intersection to that place?

- *study participant can use neighbourhood name if they are uncomfortable giving intersection*
- *If outside Winnipeg, use community name or region*

Maximum of three: _____

IDU11. In the last 6 months how easy or difficult was it for you to obtain a brand new, unused needle/syringe when you needed one?

- | | |
|-----------------------|-------------|
| 0. Very easy | 77. Unsure |
| 1. somewhat easy | 99. Refused |
| 2. somewhat difficult | |
| 3. very difficult | |

IDU 12. In the last 6 months, thinking of the times when you've needed to get new, unused needles, would you agree or disagree with the following statements:

IDU12A. Needle exchange sites are conveniently located near the places where I live or hang out

- | | |
|----------------------|-------------|
| 0. Strongly agree | 77. Unsure |
| 1. Agree | 99. Refused |
| 2. Disagree | |
| 3. Strongly disagree | |

IDU 12B. Needle exchange sites are open when I need them

- | | |
|-------------------|----------------------|
| 0. Strongly agree | 2. Disagree |
| 1. Agree | 3. Strongly disagree |

77. Unsure 99. Refused

IDU12C. I depend on other people to get new needles for me

- 0. Strongly agree 77. Unsure
- 1. Agree 99. Refused
- 2. Disagree
- 3. Strongly disagree

IDU12D. I feel judged when I go to get new needles.

- 1. Strongly agree 77. Unsure
- 2. Agree 99. Refused
- 3. Disagree
- 4. Strongly disagree

IDU13. In the last 6 months, where did you get your new needles from.? (Circle all that apply)

- 0. Pharmacy/drugstore 7. Shooting gallery owner
- 1. Street Connections 8. Someone on the street
- 2. Community Health Centres 9. Found on the street
- Specify: _____ 10. Other – specify: _____
- 3. Other needle exchanges – specify: _____ 77. Unsure
- 4. Nurse/doctor/hospital 88. Not Applicable (don't ever use new syringes)
- 5. Friends/family/partners 99. Refused to answer
- 6. Dealer

IDU14. In the last 6 months, where did you get most of your new needles from.? (Circle one only)

- 0. Pharmacy/drugstore 7. Shooting gallery owner
- 1. Street Connections 8. Someone on the street
- 2. Community Health Centres 9. Found on the street
- Specify: _____ 10. Other – specify: _____
- 3. Other needle exchanges – specify: _____ 77. Unsure
- 4. Nurse/doctor/hospital 88. Not Applicable (don't ever use new syringes)
- 5. Friends/family/partners 99. Refused to answer
- 6. Dealer

IDU15. Have you ever injected drugs that had been mixed in someone else's used syringe

- 0. No 1. Yes 77. Unsure 9. Refused

IDU15A. If yes, have you done this in the last 6 months?

- 0. No 1. Yes 77. Unsure 9. Refused

IDU16D. Have you ever injected drugs with a needle after someone else had already injected with it?

- 0. No 1. Yes 77. Unsure 9. Refused

IDU16A. If yes, have you done this in the last 6 months?

- 0. No 1. Yes 77. Unsure 9. Refused

IDU17. If yes to IDU16A: How often did you clean or rinse these syringes before use with:

	Usually	Sometimes	Never	Unsure	Refused
0. Bleach					
1. Water					
2. Alcohol					

SECTION 1.10: CONDOM USE AND ACCESS

SRKN1. Have you ever had sex (sexual intercourse)?

0. No 1. Yes 77. Unsure 99. Refused

If No, go to next section

SRKN2. The first time you had sex with another person, or another person had sex with you (either oral, vaginal, or anal), how old were you? (this includes consensual or forced sex)

77. Unsure

99. Refused

SRKN3. Have you had sex in the past 6 months?

0. No 1. Yes 77. Unsure 99. Refused

If No, go to next section

SRKN4. In the past 6 months, have you looked for sex or met any sex partners in the following settings (choose as many as applicable):

- 0. Rave/Circuit parties
- 1. Gay bars
- 2. Straight bars
- 3. Sex parties
- 4. House parties
- 5. Bathhouses
- 6. Internet (chat room, personal ads, sex sites)
- 7. Gym/health clubs
- 8. Public places (e.g. parks, on the street)
- 9. Other – specify: _____
- 10. None of the above
- 77. Unsure
- 99. Refused

SKRN5. In the last 6 months, have you (or your female partner(s)) been trying to get pregnant?

0. No 1. Yes 77. Unsure 99. Refused

SRKN6. In the last 6 months, have you used a condom during sex?

0. No 1. Yes 77. Unsure 99. Refused

If No, go to SRKN12

SKRN7. In the last 6 months, have you used condoms for birth control?

0. No 1. Yes 77. Unsure 99. Refused

SKRN8. In the last 6 months, have you used condoms as a way of protecting yourself against sexually transmitted infections?

0. No 1. Yes 77. Unsure 99. Refused

SRKN9. In the last six months, when you needed some condoms, would you say it was easy or difficult for you to obtain some?

- 0. Very easy
- 1. somewhat easy
- 2. somewhat difficult
- 3. very difficult
- 77. Unsure
- 99. Refused

SRKN10. In the last 6 months, where did you get your condoms from.? (Circle all that apply)

- 0. Store
- 1. Street Connections
- 2. Community health centres/clinics/doctor's office/nursing station
- 3. school
- 4. public washrooms
- 5. My partner(s) usually get them
- 6. Friends/family
- 7. Other – specify: _____
- 77. Unsure
- 88. Not Applicable (don't ever use/need condoms)
- 99. Refused to answer

SRKN11. In the last 6 months, where did you get most of your condoms from.? (Circle only one)

- 0. Store
- 1. Street Connections
- 2. Community health centres/clinics/doctor's office/nursing station
- 3. school
- 4. public washrooms
- 5. My partner(s) usually get them
- 6. Friends/family
- 7. Other – specify: _____
- 77. Unsure
- 88. Not Applicable (don't ever use/need condoms)
- 99. Refused to answer

SRKN12. What proportion of your friends do you think would have unprotected sex (i.e. without a condom) with a new sex partner?

- 0. Most of them
- 1. About half of them
- 2. Very few of them
- 77. Unsure
- 99. Refused

SECTION 1.11: SUBSTANCE ABUSE

SA1. In your opinion which of the drugs or other substances that we've talked about above, have given you the most problems in your life?

_____ 77. Unsure 99. Refused

SA2. Why did you first begin using [use name of substance from above]?

0. My friends were using, so I started using it too
1. My family was using it, so I started using it too
2. I was trying to deal with my mental health/emotions
3. There was nothing interesting going on in my life and I was bored
4. The other drugs I was using weren't having enough of an effect any more
5. Wanted to experiment with new things
6. I was forced to start using it by the people I was hanging out with
7. Other – specify:

77. Unsure
99. Refused

SA3. Have you ever tried to reduce or quit your use of [use name of substance above]?

0. No 1. Yes 77. Unsure 99. Refused

If No, go to _____.

SA4. Thinking of the last time you tried to reduce or quit your use of [use name of substance], why did you try and reduce or quit?

(circle all that apply)

0. Was using too much
 1. Was affecting my work, studies, employment opportunities
 2. Was affecting my family or home life
 3. Was affecting my relationships with friends or other social relationships
 4. Was affecting my physical health
 5. Was affecting my financial position
 6. Was affecting my outlook on life, happiness
 7. Family or friends encouraged me to reduce
 8. Forced to by legal system
 9. Trying to reduce my risk of infection from HIV or other infectious diseases
 10. My Friends were using less, so I cut down too
 11. It was getting hard to find that drug locally
 12. It was getting too expensive to buy that drug
 13. Pregnancy (became pregnant or was trying to get pregnant)
 14. I had a child (children) to raise
 15. Getting older
 16. Other _____
77. Unsure
99. Refused

SECTION 1.12: PERCEPTION OF RISK AND PREVIOUS DIAGNOSTIC TESTING

DT1. How much risk do you feel you have of becoming infected with the following bacteria or viruses?

	0. No risk	1. Little to no risk	2. Somewhat at risk	3. High risk	77. Unsure or don't know – have not heard of this infection	88. Not applicable – already infected	99. refused
Chlamydia							
Gonorrhea							
HIV							
Hepatitis C							
Tuberculosis							

DT2. Have you ever been tested for any of the following?

	No	Yes	Unsure	If yes, how many times have you been tested in the past year?
Chlamydia				
Gonorrhea				
HIV				
Hepatitis C				
Hepatitis B				
Syphilis				
Genital Herpes				
HPV				
Tuberculosis				

DT3. Have you ever been diagnosed with any of the following (i.e told by a nurse or doctor)?

	No	Yes	Unsure	If yes, indicate with a checkmark if the diagnosis was in the past year.
Chlamydia				
Gonorrhea				
HIV				
Hepatitis C				
Hepatitis B				
Syphilis				
Genital herpes				
HPV				
Tuberculosis				

If yes to chlamydia or gonorrhea in DT3:

DT4. How many chlamydia infections have you had in the past year? _____

- 77. Unsure
- 99. Refused

DT5. How many gonorrhea infections have you had in the past year? _____

- 78. Unsure
- 99. Refused

DT6. The last time you had a chlamydia or gonorrhea infection, did you have any symptoms?

0. No *If No, go to DT8*

- 1. Yes
- 77. Unsure
- 99. Refused

Read from list:

Males

- Redness at tip of penis
- Discharge from penis
- Pain on passing urine
- Swelling or pain of testicles/balls
- Itching of genitals

Females

- Vaginal discharge different from normal
- Pain on passing urine
- Pain in lower back or abdomen
- Pain during sexual intercourse
- Abnormal vaginal bleeding

DT7. If yes to symptoms in DT6:

From the time you first noticed your symptoms, how many days (weeks) passed before you saw a doctor or nurse?

- 77. Unsure
- 99. Refused

DT8. When you were diagnosed with chlamydia or gonorrhea, what was the main reason you went to see the doctor or nurse?

- 0. Symptoms
- 1. Contact of case
- 2. Prenatal
- 3. Routine check-up
- 77. Unsure
- 99. Refused

DT9. Do you agree or disagree with the following statement:

It is not worthwhile knowing if I am HIV positive.

- 0. Strongly agree
- 1. Agree
- 2. Disagree
- 3. Strongly disagree

- 77. Unsure
- 99. Refused



DT9A. If person indicates agreement or strong agreement, inquire as to the reasons why the person feels it is not worthwhile knowing if they are HIV positive.

- 77. Unsure
- 99. Refused

PART 2: SOCIAL NETWORKS

Interviewer instructions:

In this section, we are interested in the relationship between close personal contact and infectious diseases. We would like to ask you some questions about the people you normally associate with. We will not ask you for any information that could be used to identify those individuals and any information you provide to us will be confidential.

First, please think back over the last 3 months about the people with whom you have had more than casual contact. These would be people that you feel are important in your life and that you have seen or have spoken to on a regular basis. Most of these close contacts would be people such as friends, family, people you have sex with, people you use drugs with, or people with whom you live, hang out, or work.

Let's make a list of these people. Please use only initials, or some other identifier that will make sense to you such as a made up name. Do not use their last names.

INTERVIEWER – RECORD THIS INFORMATION ON THE FIRST PAGE OF THE SOCIAL NETWORK ANSWER SHEET

(ANSWER SHEET BEGINS ON PAGE 31)

SECTION 2.1: GENERAL SOCIAL NETWORK CHARACTERISTICS

Ask the following SOCIAL NETWORK questions and indicate a response for each network member in the respective table on page 2 of the network answer booklet. Always use the separate network table recorded on page 1 as a guide to link responses to the respective people within the network.

SN1. What is the gender of each of the people on this list?

SN2. What is the approximate age of each person?

SN3. What is the relationship of [person] to you?

SN4. How long have you known [person]? (*remind the participant of the time categories to assist them in remembering how long they've known the various people*).

SN5. Could you depend on [person] to do you a small favour (e.g. babysitting, helping you to a doctor's appointment)?

SN6. Could you depend on [person] for a big favour (e.g. you needed a place to stay for the night or you needed a loan of a fairly large amount of money - >\$100)?

SN7. Does [person] regularly provide you with money, food, drugs, or other items to help you make ends meet?

SN8. How close are you to each of the people on the list?

SN9. How physically close does each person live in comparison to where you live? (Answers are hierarchical and only one needs to be chosen)

SECTION 2.2: INJECTION DRUG USE

**ID1. To your knowledge, which of these people have ever injected drugs?
(place answers on page 3 of answer booklet)**

**** If refused or no IDU were indicated check here _____ and proceed to NON-INJECTION DRUG NETWORK section.***

ID2. To your knowledge, which of these people have injected drugs in the past 6 months?

**** If IDU are indicated to the above question, but study participant indicated no injection drug use in past 6 months (question IDU7, page 16), go to NON-INJECTION DRUG NETWORK section.***

The questions below pertain only to those people who are indicated as IDU. Use the first table(ID1) on the answer page as a reference and be certain that responses are placed in the appropriate column.

ID3. Has [person] ever shown you how to inject drugs?

ID4. Did [person] introduce you or initiate you to injection drug use?

ID5. Has [person] ever injected you with drugs?

ID6. Have you ever felt that [person] expected you to use a needle for injecting drugs after they had already used it.

ID7. When injecting with [person], how comfortable would you feel insisting on NOT sharing needles?

ID8. When you inject drugs with [person] who normally initiates it?

ID9. In the past 6 months, when [person] injects drugs, how often do you think they have injected with a needle that has already been used by someone else?

ID10. In the past 6 months, have you ever given away one of your used needles to [person] so they could inject drugs?

ID11. In the past 6 months, have you ever pooled resources (e.g. money) with [person] to purchase drugs?

ID12. In the past 6 months, how often did you inject drugs with a needle after [person] had already injected with it?

ID13. In the past 6 months, how often have you used [person's]cooker, rinse water, or cotton after they had already used them?

ID14. In the past 6 months, how often did you inject drugs after [person] mixed your drugs in a needle that they had already injected with?

SECTION 2.3: NON-INJECTION DRUG USE

Use page 4 of answer booklet

NID1. Do you regularly drink alcohol with [person] (any type of alcohol including liquids like mouthwash or superjuice)

If person indicates they do not drink alcohol, check appropriate box above table

NID2. Do you (or have you ever) smoked crack with [person]

- If participant indicates they do not smoke crack, check appropriate box above table NID2 and go to question NID4.

- if participant answers No for all applicable persons in their network, go to NID4.

NID3. In the past 6 months, how often did you use a crack pipe after [person] had used it?

NID4. Have you used any other types of non-injection drugs with [person]? (i.e. in addition to alcohol and/or crack)?

NID5. Does [person] obtain for you or give you any non-injection drugs? (any type including alcohol and crack)

NID6. Do you pool resources (e.g. money) with [person] to obtain non-injection drugs?

SECTION 2.4: SEXUAL NETWORK SECTION

SX1. Thinking back to the list of people in your social network, which of them have you had sex with? (this includes any type of sex – oral, vaginal, anal)

Interviewer – show original social network to study participant

Indicate answer on page five of answer booklet:

*If no sex partners indicated, check here _____ and proceed to **OTHER SEX PARTNERS SECTION***

SX2. When you have (had) sex with [PERSON] who normally initiates (initiated) it?

SX3. If you wanted to use a condom with [PERSON], how comfortable do you feel insisting that a condom be used?

SX4. Has [PERSON] ever given you money in exchange for sex?

SX5. Has [PERSON] ever given you drugs in exchange for sex?

SX6. Has [PERSON] ever given you food or clothes in exchange for sex?

SX7. During the time you were having a sexual relationship with [PERSON], do you think they were having sex with anyone else?

SX8. If yes to any person in SX7 ask if – Do you think [PERSON] would have usually used a condom when having sex with other partners?

SX9. In the past 6 months, how frequently have you used condoms with [PERSON]?

SX10. When did you begin a sexual relationship with [PERSON]?

SX11. When did the sexual relationship with [PERSON] end?

SOCIAL NETWORK ANSWER BOOKLET

USE THESE PAGES FOR ANSWERING ALL SOCIAL NETWORK QUESTIONS (I.E. QUESTIONS ON PAGES 26-30)

SOCIAL NETWORK

	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10
Initials or other identifiers										
RDS coupon from:										

If the interviewed person entered with an RDS coupon, ask them if the person who gave them the card is on this list – If yes, ask them which person it is on the list and indicate it on the row above

If person indicates they could list additional people ask how many more people they could list and write the number here: _____

KEEP THIS PAGE READILY AVAILABLE FOR REFERENCE SO THAT PARTICIPANT CAN REMEMBER THE LOCATION OF INDIVIDUAL PEOPLE WITHIN THEIR SOCIAL NETWORK TABLE.

SN1: Gender **99. Refused**_____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. Male										
1. Female										
2. Biological male										
3. Biological female										
77. Unsure										

SN2: Age **99. Refused**_____

	Person									
	1	2	3	4	5	6	7	8	9	10
Age										
Unsure										

SN3: Relationship **99. Refused**_____

	Person									
	1	2	3	4	5	6	7	8	9	10
Family (by birth or adoption)										
Spouse , boy/girlfriend										
Friend										
Other (no need to specify)										
Unsure										

SN4: Time known **99. Refused**_____

	Person									
	1	2	3	4	5	6	7	8	9	10
< 6months										
6 months to 1 year										
> 1 year -5 years										
> 5 years										
Unsure										

SN5: Small favour **99. Refused**_____

	Person									
	1	2	3	4	5	6	7	8	9	10
No										
Yes										
Unsure										

SN6: Big favour **99. Refused**_____

	Person									
	1	2	3	4	5	6	7	8	9	10
No										
Yes										
Unsure										

SN7: Provider **99. Refused**_____

	Person									
	1	2	3	4	5	6	7	8	9	10
No										
Yes										
Unsure										

SN8: Closeness **99. Refused**_____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. Very distant										
1. Distant										
2. Somewhat close										
3. Close										
4. Very close										
77. Unsure										

SN9: Physical proximity **99. Refused**_____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. Within the same residence										
1. Within the same apartment block										
2. Within the same housing complex										
3. Within the same neighborhood <i>(based on participant's perception of their neighborhood)</i>										
77. Unsure										

ID1: Ever injected drugs 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
Yes, has injected										

ID2: injected in past 6 months 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
77. Unsure										

ID3: Shown how to inject 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
Unsure										

ID4: Initiated to injection 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
Unsure										

ID5: Injected by network member 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
Unsure										

ID6: Sharing expectations 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
Unsure										

ID7: Resistance to sharing 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. Very comfortable										
1. Somewhat comfortable										
2. Not very comfortable										
3. Not comfortable at all.										
Unsure										

ID8: Initiation of use 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. myself										
1. him/her										
2. Both of us										
77. Unsure										

ID9: Member's syringe use 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. Usually										
1. Sometimes										
2. Rarely										
3. Never										
77. Unsure										

ID10: Provision of used syringe 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
77. Unsure										

ID11. Resource pooling 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
77. Unsure										

ID12. Receptive sharing 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. Usually										
1. Sometimes										
2. Rarely										
3. Never										
77. Unsure										

ID13. Receptive equipment sharing 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. Usually										
1. Sometimes										
2. Rarely										
3. Never										
77. Unsure										

ID14. Receptive drug mixing

	Person									
	1	2	3	4	5	6	7	8	9	10
0. Usually										
1. Sometimes										
2. Rarely										
3. Never										
77. Unsure										

NID1: drinking alcohol 99. Refused _____
 77. Not applicable – I don't drink alcohol _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
77. Unsure										

NID2: Smoke crack 99. Refused _____
 77. Not applicable – I don't smoke crack _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
77. Unsure										

NID3: Share crack pipe 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. Usually										
1. Sometime										
2. Rarely										
3. Never										
77. Unsure										

NID4: Other drugs 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
77. Unsure										

NID5: Obtains drugs 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
77. Unsure										

NID6. Pool resources 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
77. Unsure										

SX1: sex partner 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
Yes, is sex partner										

SX5: receipt of drugs 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
Unsure										

SX2: Initiation of sex 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. Myself										
1. Him/her										
2. Both of us										
77. Unsure										

SX6: receipt of food/clothes 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
Unsure										

SX3: Condom use resistance 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. Very comfortable										
1. Somewhat comfortable										
2. Not very comfortable										
3. Not comfortable at al.										
77. Unsure										

SX7: other partners 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
Unsure										

SX4: receipt of money 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
Unsure										

SX8: partner unprotected sex 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. No										
1. Yes										
Unsure										

SX9: condom use with partner 99. Refused _____

	Person									
	1	2	3	4	5	6	7	8	9	10
0. Usually										
1. Sometimes										
2. Rarely										
3. Never										
Unsure										

SX10: Sexual relationship began 99. Refused _____

	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10	
Enter as precise a date as possible	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)

SX11: Sexual relationship ended 99. Refused _____

	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10	
Enter as precise a date as possible	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)	_____ (YYYY) _____ (MM) _____ (DD)
	OR <input type="checkbox"/> "still ongoing"	OR <input type="checkbox"/> "still ongoing"	OR <input type="checkbox"/> "still ongoing"	OR <input type="checkbox"/> "still ongoing"	OR <input type="checkbox"/> "still ongoing"	OR <input type="checkbox"/> "still ongoing"	OR <input type="checkbox"/> "still ongoing"	OR <input type="checkbox"/> "still ongoing"	OR <input type="checkbox"/> "still ongoing"	OR <input type="checkbox"/> "still ongoing"	OR <input type="checkbox"/> "still ongoing"

SECTION 2.5: OTHER SEX PARTNERS

Because some people in this survey have had sex with people who they don't consider part of their close social network (e.g. one night stands, client partners), we have a few additional questions to ask here.

OSX1. Thinking about people who you didn't list as part of your social network, is there anyone else you've had sex with in the past 6 months? (includes any type of sex – oral, vaginal, anal)

If No, check here _____ and go to section COLLECTION OF DIAGNOSTIC SPECIMENS

If yes, how many other sex partners have you had in the past 6 months? _____

Using the definitions below as a guide ask question OSX2:

A 'REGULAR' sex partner is someone with whom you have a relationship and with whom you are emotionally involved.

A 'CASUAL' sex partner is someone with whom you've had sexual relations with once or a few times, but with whom you have no emotional involvement and has not given you any money, drugs, or anything else in exchange for sex.

A 'CLIENT' sex partner is someone who has given you money, drugs, goods or anything else in exchange for sex.

A "SEX WORKER PARTNER" is someone who you have given money, drugs, goods or anything else in exchange for sex.

OSX2. How many of these additional sex partners are:

Type of partner	# of partners	If any partners are indicated, inquire regarding general frequency of condom use with a given type of partner			
		Always/usually	Sometimes	Rarely/never	DK/Refused
Regular partners					
Casual partners					
Client partners					
Sex worker partners					

If Client partners are indicated above:

OSX3. Thinking specifically about your client partners, where do you usually first meet or contact them?

	Check all that apply	Indicate the most frequently used type of venue for meeting client partners
Hotel(s)		
Massage Parlour(s)		
On the street		
In parks or riverbanks		
Strip bars		
Other bars (straight)		
Other bars (gay)		
Crack houses/shooting galleries		
Internet or chat lines		
Through my dealer		
Other (Specify)		

OSX4. Thinking of the place where you most frequently meet your client partners - what is the the nearest intersection to that place?

- *study participant can use neighbourhood name if they are uncomfortable giving intersection*
- *If outside Winnipeg, use community name or region*

Intersection: _____

If Sex worker partners are indicated above:

OSX5. Thinking specifically about your Sex worker partners, where do you usually first meet or contact them?

	Check all that apply	Indicate the most frequently used type of venue for meeting client partners
Hotel(s)		
Massage Parlour(s)		
On the street		
In parks or riverbanks		
Strip bars		
Other bars (straight)		
Other Bars (gay)		
Crack houses/shooting galleries		
Internet or chat lines		
Through my dealer		
Other (Specify)		

OSX6. Thinking of the place where you most frequently meet your Sex worker partners - what is the the nearest intersection to that place?

- *study participant can use neighbourhood name if they are uncomfortable giving intersection*
- *If outside Winnipeg, use community name or region*

Intersection: _____

COLLECTION OF DIAGNOSTIC SPECIMENS FOR THIS STUDY

DS1. Interviewer - Indicate below which diagnostic tests the study participant has accepted:

Urine testing _____
Serology testing _____
HIV point of care _____

DS2. Interviewer - if refusal for any or all tests, inquire as to reason for refusal and document if the study participant is willing to provide a reason

a) Reason for refusal for all tests

b) Reason for refusal for urine testing

c) Reason for refusal for serology testing.

d) Reason for refusal for HIV POC testing

Interviewer – complete section below after interview is complete

DS3. Describe the circumstances or setting in which the specimen was taken and/or test performed (i.e. HIV POC) – For example, what facilities were available for use; how was the test done to ensure participant privacy.

Urine _____

Serology _____

HIV point of care _____
