

UNIVERSITY OF OXFORD
DEPARTMENT OF SOCIOLOGY

WHEN WORK IS MORE THAN A JOB: EMPLOYMENT AMONG PEOPLE WHO INJECT DRUGS

LINDSEY RICHARDSON
NUFFIELD COLLEGE



Submitted for the degree of Doctor of Philosophy (D.Phil.)

Hilary Term 2012

Acknowledgements

I am deeply grateful to the many people who have provided invaluable support and guidance throughout my time as a graduate student. In particular, my thanks go to:

The participants of the VIDUS and ACCESS studies, and especially those individuals who sat down with me for qualitative interviews. None of this research would have been possible without their willingness to share very personal details of their lives. I have been humbled by their acuity, insight and candour.

My supervisor, Professor Jonathan Gershuny, whose wisdom, enthusiasm and humour have made such a difference. His filing cabinet-esque memory ensured that on the rare occasions when he did not have the answer, he would know exactly where to send me (even if it was to unpublished work he had read 25 years prior). In less funded days, his determination that this work receive support was crucial to the survival of the project.

The team at the British Columbia Centre for Excellence in HIV/AIDS. My gratitude in particular goes to Drs. Thomas Kerr and Evan Wood for allowing me to use VIDUS data, encouraging me to tap into their existing research infrastructure for my qualitative work and welcoming me to the CfE. Their generous support and advice have been invaluable. Dr. Will Small and Caitlin Johnston's guidance and assistance in getting my qualitative work off of the ground were likewise crucial to the success of this research.

Alex Sutherland, foremost for his friendship and uncanny ability to keep me laughing at myself, but also for countless hours of useful conversation, timely and generous help, as well as a steady stream of tips, tricks and jokes. It was always more enjoyable not being the only drug researcher at Nuffield, appendages and all.

M-J Milloy, whose friendship, wit, advice and support during my time at the CfE have been such highlights. I have been incredibly fortunate to have shared an office with such an incredible researcher and generous soul, and look forward to many an enjoyable future collaboration.

Jon Fahlander, for his friendship, his camaraderie during our time teaching introductory statistics together, and for encouraging me both to go to ICPSR, and to focus on the important stuff while I was there.

Drs. Dave Armstrong and Ryan Bakker, with whom I credit a great deal of my understanding of statistics, and without whom ICPSR would have been much less fun.

My college supervisor, Lucy Carpenter, who has always been wonderfully encouraging.

Participants at the Nuffield Symposium on Cohort Studies and Substance Use, which I convened with Alex Sutherland in 2009.

The team at St. Anne's College, Oxford, with whom I lived and worked for the first two years of my doctorate, and with whom there was never a dull moment. My particular thanks goes to the former Dean, Liora Lazarus, for her laughter, support and sage advice.

Other friends during my six years at Oxford who provided many a wonderful distraction and late night voice of reason. Without Emily Paddon, Kate Higgins, Sarah von Billerbeck, Ellen Feingold, Erin Court, Sarah Gertjegerdes, Karina Wickland, Sarah Carten, Nicole Mireau, Paula Kueng, Andrea Nauman Ryan, Jen Bodmer and the dancing crews at the South Oxford Community Centre and Vancouver studios, graduate work would have been much less bright.

My master's and doctoral research was funded initially by a Clarendon scholarship, Nuffield College studentship and Department of Sociology bursary, and later by doctoral awards from Social Sciences and Humanities Research Council of Canada and the Pierre Elliott Trudeau Foundation. I am deeply grateful for all of this support. Being a part of the Trudeau Foundation community in particular has been an incredible experience, and I will be forever appreciative of the personal and intellectual enrichment that has come as a result.

Last, and certainly not least, my family, and especially my mother, who have provided unwavering support for what must have at times seemed like a completely irrational undertaking. I could never have arrived at the finish line without them.

When work is more than a job:
Employment among people who inject drugs

Lindsey Richardson, Nuffield College

D.Phil., Sociology, University of Oxford

Hilary Term, 2012

Abstract

This thesis explores employment among people who inject drugs (IDU). It seeks identify what differentiates IDU who work from those who do not, barriers to labour market participation, and how employment is perceived and experienced by IDU. Using longitudinal data from the Vancouver Injection Drug User Study (VIDUS), it conducts this research through a detailed examination of the implications of missing data, quantitative analyses of transitions into employment and qualitative, in-depth interviews.

Missing data analyses identified differences between those that those that do and do not have missing data, as well as predictors of observation gaps and how individuals end their study participation (either right-hand censorship, attrition, or death). Differences were observed along individual, behavioural and contextual dimensions. Analytical approaches to the relationship between data structure and content gleaned useful information for longitudinal studies with marginalized populations.

Discrete time event history analyses of work transitions revealed complex relationships between drug use, drug-related activities, situational risk factors, and transitions into employment. While most IDU did not make transitions into employment, some did, and while some statistical relationships were expected, others were surprising. Novel findings included mode-specific addiction treatment impacts on employment (methadone vs. non-methadone) and the importance of the broader risk environment over and above even high-intensity substance use.

Finally, qualitative interviews identified heterogeneity in individual motivations toward and experiences of work. Those who maintained concurrent drug use and formal labour market involvement utilized strategies to spatially and temporally separate the two activities. Individual capacities to employ these strategies were facilitated by material, vocational and temporal motivations, and interfered with by health conditions, catastrophic events and institutional relationships that operated as barriers to employment. This study provides insight into what is a known social determinant of health in the general population among injection drug users.

Word count: 86,873
(Includes tables and footnotes; excludes appendices and references)

Contents

ACKNOWLEDGEMENTS **I**

ABSTRACT **III**

LIST OF TABLES **VIII**

LIST OF FIGURES **X**

CHAPTER ONE: INTRODUCTION **1**

1.1 STUDY RATIONALE 2

1.2 CONCEPTUAL BACKGROUND 3

1.3 RESEARCH CONTEXT 6

1.4 STUDY AIMS 7

1.5 CHAPTER SUMMARIES 10

1.6 SUMMARY 12

CHAPTER TWO: DATA **13**

2.1 INTRODUCTION 13

2.2 THE VANCOUVER INJECTION DRUG USERS STUDY 13

2.3 VIDUS DESCRIPTIVE STATISTICS 14

2.4 STATISTICAL CONSIDERATIONS AND LIMITATIONS 15

2.4.1 Generalizability *16*

2.4.2 Self-report *17*

2.4.3 Longitudinal considerations *18*

2.5 QUALITATIVE STUDY RECRUITMENT AND DATA COLLECTION 20

2.5.1 Recruitment and sampling strategies *21*

2.5.2 Population-specific design considerations *23*

2.5.3 Topic guide and interview structure *25*

2.6 QUALITATIVE DESCRIPTIVE STATISTICS 27

2.7 SUMMARY AND CONCLUSION 31

CHAPTER THREE: MISSING DATA IN THE VANCOUVER INJECTION DRUG USER STUDY 33

3.1 INTRODUCTION 33

3.2 MISSING DATA IN THE LITERATURE 35

3.2.1 Typology of missing data 37

3.2.2 Methods for missing data 41

3.2.3 Methods for data missing not at random 48

3.3 MODELLING MISSING DATA IN THE VIDUS 52

3.3.1 Missing data diagnostics 53

3.3.2 Modelling Occasion Non-Response in the VIDUS 64

3.3.3 Intermittent non-response: predicting observation gaps 66

3.3.3.1 Pooled analysis of intermittent non-response 68
3.3.3.2 Wave-by-wave analysis of intermittent non-response 75

3.3.4 End-states: modelling right hand censorship, attrition and death 79

3.4 DISCUSSION 93

CHAPTER FOUR: TRANSITIONS INTO EMPLOYMENT 104

4.1 INTRODUCTION 104

4.2 EMPLOYMENT AND DRUG USE IN THE LITERATURE 107

4.2.1 Transitions into employment 107

4.2.2 Drug use and employment in the literature 112

4.2.2.1 Sociological theories of deviance and drug use 112
4.2.2.2 Ethnography, substance use and employment 116
4.2.2.3 Controlled use, social functioning and socially mediated recovery 117
4.2.2.4 Drug use and labour market participation 119
4.2.2.5 Employment transitions as an addiction treatment outcome 123
4.2.2.6 The Risk Environment and employment outcomes 125
4.2.2.7 Employment and health 126

4.3 HYPOTHESES 128

4.4 METHODS 129

4.4.1 Variables of Interest 130

4.4.2 Methodological considerations 134

4.4.3 Multiple Imputation Procedures 138

4.5 RESULTS 144

4.6 DISCUSSION 159

4.6.1 Implications for Hypotheses *161*

4.6.1.1 Differential substance and pattern of use hypotheses 161
4.6.1.2 Demographic disadvantage hypothesis 163
4.6.1.3 Treatment hypothesis 166
4.6.1.4 Differential risk hypothesis 169
4.6.1.5 Differential health status hypothesis 173

4.6.2 Limitations and Methodological Considerations *174*

4.6.3 Predicting transitions into employment among IDU: Conclusions *178*

CHAPTER FIVE: EXPERIENCES OF EMPLOYMENT AND DRUG USE 183

5.1 INTRODUCTION 183

5.2 INCOME GENERATION AND DRUG USE: A REVIEW OF QUALITATIVE RESEARCH 185

5.2.1 Demography, capacities and socio-economic context *186*

5.2.2 Socio-economic context and health *188*

5.2.3 Income generation, employment, and drug use *189*

5.3 ANALYTICAL STRATEGY 191

5.4 RESULTS 192

5.4.1 Interference and integration: Work and drug use (in)compatibility *193*

5.4.2 Exploring integration: Individual motivations for employment *200*

5.4.2.1 Material Motivations 201
5.4.2.2 Vocational Motivations 205
5.4.2.3 Temporal Motivations 210

5.4.3 Exploring interference: Barriers to socio-economic participation *212*

5.4.3.1 Health-related barriers to employment 213
5.4.3.2 The role of catastrophic events 215
5.4.3.3 Institutional relationships as barriers to employment 218

5.4.4 Informal work – balancing interference and integration *223*

5.5 DISCUSSION 230

5.5.1 Self-regulation, interference and integration *231*

5.5.2 Individual capacities *232*

5.5.3 Intrinsic and extrinsic work motivation *233*

5.5.4 Structural barriers to work among IDU *237*

5.5.5 Drug use and labour market trajectories *240*

5.5.6 Limitations *241*

5.5.7 Conclusion *242*

CHAPTER SIX: CONCLUSION **244**

6.1 INTRODUCTION 244

6.2 CONTRIBUTION 246

6.2.1 Methodological *246*

6.2.2 Theoretical *248*

6.3 EMPIRICAL FINDINGS 249

6.3.1 Implications of missing data in VIDUS *249*

6.3.2 What differentiates between drug users who engage in the formal labour market and those who do not? *251*

6.3.3 What are the barriers to labour market participation among IDU? *254*

6.3.4 How is work perceived and experienced by individual drug users? *256*

6.4 PUBLIC POLICY IMPLICATIONS 258

6.5 SUGGESTIONS FOR FUTURE RESEARCH 260

6.5.1 Missing data and longitudinal research *260*

6.5.2 Capability, motivation and labour market participation *261*

6.5.3 Employment trajectories, health, drug use, and drug-related risk *262*

6.5.4 Drug use and health across different types of income generation *263*

6.5.5 Assessments of context in quantitative research *264*

6.5.6 Low-threshold employment programming *264*

6.6 A FINAL NOTE 265

APPENDICES **268**

APPENDIX 2.1: VIDUS QUESTIONNAIRE EXCERPTS 269

APPENDIX 2.2: PSYCHOACTIVE SUBSTANCE PROFILES 273

APPENDIX 2.3: CONSIDERATIONS OF VALIDITY IN QUALITATIVE RESEARCH 276

APPENDIX 2.4: QUALITATIVE INFORMATION SHEET AND CONSENT FORM 280

APPENDIX 2.5: QUALITATIVE TOPIC GUIDE 285

APPENDIX 3.2: COMPETING HAZARDS DISCRETE TIME EVENT HISTORY ANALYSIS USING MULTINOMIAL LOGIT MODELS 297

APPENDIX 3.3: COMPARATIVE FACTOR CHANGE IN ODDS OF CENSORSHIP, DEATH OR ATTRITION 298

APPENDIX 4.1: VARIABLES USED IN MULTIPLE IMPUTATION PROCEDURES 303

REFERENCES **307**

List of Tables

TABLE 2.1 CHARACTERISTICS OF VIDUS STUDY PARTICIPANTS AT BASELINE STRATIFIED BY SELF-REPORT OF EMPLOYMENT OVER THE COURSE OF THE OBSERVATION PERIOD (N=1599) 16

TABLE 2.2 – SOCIO-DEMOGRAPHIC INFORMATION, HOUSING STATUS, CATASTROPHIC EVENT HISTORY, AND CURRENT DRUG USE 29

TABLE 2.3 – SOCIO-DEMOGRAPHIC INFORMATION, CURRENT INCOME GENERATION ACTIVITY AND FORMAL WORK HISTORY 30

TABLE 3.1 CROSS TABULATION AND BIVARIATE LOGISTIC REGRESSION COMPARING VIDUS PARTICIPANTS WITH AND WITHOUT NO MISSING DATA ACROSS BASELINE CHARACTERISTICS 61

TABLE 3.2 CROSS TABULATION AND BIVARIATE LOGISTIC REGRESSION COMPARING BASELINE CHARACTERISTICS OF VIDUS PARTICIPANTS THAT "ATTRITE" IMMEDIATELY AFTER BASELINE WITH THOSE THAT DO NOT 62

TABLE 3.3 OBSERVATION GAP PATTERNS IN THE VIDUS USING SURVEY TIME SCALE 67

TABLE 3.4 MULTIVARIATE EVENT HISTORY ANALYSIS OF INTERMITTENT NON-RESPONSE IN THE VIDUS (N=1599)† 72

TABLE 3.5(1) COMPETING RISKS EVENT HISTORY ANALYSIS OF STUDY PARTICIPATION OUTCOMES RELATIVE TO CENSORSHIP IN THE VIDUS (N=1599)† 83

TABLE 3.5(2) COMPETING RISKS EVENT HISTORY ANALYSIS OF STUDY PARTICIPATION OUTCOMES RELATIVE TO CENSORSHIP IN THE VIDUS (N=1599)† 85

TABLE 3.6 COMPETING RISKS EVENT HISTORY ANALYSIS OF STUDY PARTICIPATION OUTCOMES RELATIVE TO CENSORSHIP IN THE VIDUS (N=1599), INCLUDING PRIOR PARTICIPATION LEVELS§ 91

TABLE 4.1 VIDUS VARIABLES OF INTEREST 133

TABLE 4.2 EMPLOYMENT AND NON-EMPLOYMENT SPELLS IN THE VIDUS 136

TABLE 4.3 COMPARISONS OF VARIABLE DISTRIBUTIONS BETWEEN VIDUS OBSERVED (N= 14996) AND IMPUTED DATA (N=339360, M=15) 145

TABLE 4.4 EVENT HISTORY ANALYSIS PREDICTING TRANSITIONS INTO EMPLOYMENT BY DIFFERENT SUBSTANCES AND USE PATTERNS (N=1579)† 148

TABLE 4.5 EVENT HISTORY ANALYSIS PREDICTING TRANSITIONS INTO EMPLOYMENT BY DEMOGRAPHIC CHARACTERISTICS (N=1579)† 151

TABLE 4.6 EVENT HISTORY ANALYSIS PREDICTING TRANSITIONS INTO EMPLOYMENT BY ENROLMENT IN ADDICTION TREATMENT (N=1579)† 153

TABLE 4.7 EVENT HISTORY ANALYSIS PREDICTING TRANSITIONS INTO EMPLOYMENT BY INDICATORS OF DRUG AND ENVIRONMENTAL RISK (N=1579)† 155

TABLE 4.8 EVENT HISTORY ANALYSIS PREDICTING TRANSITIONS INTO EMPLOYMENT BY INDICATORS OF HIV AND HCV SEROPOSITIVITY (N=1579)† 157

TABLE 4.9 EVENT HISTORY ANALYSIS PREDICTING TRANSITIONS INTO EMPLOYMENT ACROSS DEMOGRAPHIC CHARACTERISTICS, ENROLMENT IN SUBSTANCE MISUSE TREATMENT, RISK, VULNERABILITY AND HEALTH INDICATORS (N=1579)† 159

TABLE 4.10 ASSIGNMENT TABLE OF PREDICTED VERSUS OBSERVED EMPLOYMENT TRANSITIONS FROM THE COMPOSITE MODEL; PROBABILITY CUTOFF OF 0.5 (N=1579) 177

TABLE 4.11 ASSIGNMENT TABLE OF PREDICTED VERSUS OBSERVED EMPLOYMENT TRANSITIONS FROM THE COMPOSITE MODEL; PROBABILITY CUTOFF OF 0.20 (N=1579) 177

TABLE 6.1 LEVELS OF CONCURRENT WORK AND DRUG USE IN THE VANCOUVER INJECTION DRUG USER STUDY (N=1599)* 253

TABLE A.1 (1) - (6) WAVE-BY-WAVE LOGISTIC REGRESSION PREDICTING THE START OF AN OBSERVATION GAP AT NEXT WAVE 291

TABLE A.2 (1)-(21) FACTOR CHANGE IN THE ODDS OF STUDY EXITS: BY VARIABLE 198

TABLE A.3 LIST OF VARIABLES USED BY AMELIA II IN IMPUTATION PROCEDURES 303

List of Figures

FIGURE 1.1 POSITIONING EMPLOYMENT AND HEALTH AMONG PEOPLE WHO USE DRUGS 5

FIGURE 3.1 VANCOUVER INJECTION DRUG USERS STUDY MISSING DATA MATRIX 55

FIGURE 3.2 PATTERNS OF PARTICIPATION AND NON-PARTICIPATION IN THE VIDUS: SURVEY TIMESCALE 56

FIGURE 3.3 NUMBER OF OBSERVATIONS MISSING PER PERSON IN THE VIDUS, EXCLUSIVE OF OBSERVATIONS MISSING BECAUSE OF DEATH 59

FIGURE 3.4 SPIKEPLOT OF MISSING DATA PATTERN FREQUENCIES IN THE VIDUS, INCLUDING AND EXCLUDING NO MISSING DATA AND IMMEDIATE POST-BASELINE ATTRITION PATTERNS 60

FIGURE 3.5(A) DEMOGRAPHIC VARIABLES PREDICTING INTERMITTENT NON-RESPONSE AT NEXT WAVE 76

FIGURE 3.5(B) SOCIO-ECONOMIC INDICATORS PREDICTING DIFFERENCES IN INTERMITTENT NON-RESPONSE AT NEXT WAVE 77

FIGURE 3.5(C) RISK/DISRUPTION INDICATORS PREDICTING DIFFERENCES IN INTERMITTENT NON-RESPONSE AT NEXT WAVE 77

FIGURE 3.5(D) INDICATORS OF CONTACT WITH SYSTEMS OF CARE PREDICTING DIFFERENCES IN INTERMITTENT NON-RESPONSE AT NEXT WAVE 78

FIGURE 3.6 PREDICTED HAZARD RATES OF VIDUS PARTICIPATION OUTCOMES OF RIGHT-HAND CENSORSHIP, ATTRITION AND DEATH 86

FIGURE 3.7(A) MULTINOMIAL LOGISTIC REGRESSION PLOT OF CENSORSHIP (C), ATTRITION (A) AND DEATH (D) ACROSS VIDUS DEMOGRAPHIC VARIABLES 87

FIGURE 3.7(B) MULTINOMIAL LOGISTIC REGRESSION PLOT OF CENSORSHIP (C), ATTRITION (A) AND DEATH (D) ACROSS VIDUS SOCIO-ECONOMIC CONTEXT VARIABLES 88

FIGURE 3.7(C) MULTINOMIAL LOGISTIC REGRESSION PLOT OF CENSORSHIP (C), ATTRITION (A) AND DEATH (D) ACROSS VIDUS RISK-TAKING AND DISRUPTION VARIABLES 88

FIGURE 3.7(D) MULTINOMIAL LOGISTIC REGRESSION PLOT OF CENSORSHIP (C), ATTRITION (A) AND DEATH (D) ACROSS VIDUS SUBSTANCE USE VARIABLES 89

FIGURE 3.7(E) MULTINOMIAL LOGISTIC REGRESSION PLOT OF CENSORSHIP (C), ATTRITION (A) AND DEATH (D) IN THE VIDUS ACROSS VARIABLES INDICATING CONTACT WITH SYSTEMS OF CARE 89

FIGURE 4.1 VIDUS EMPLOYMENT AND EMPLOYMENT ENTRY RATES, 1996-2005 (N=1599) 105

FIGURE 4.2 COMPARISON OF AGE DISTRIBUTIONS BETWEEN OBSERVED (N=14996) AND IMPUTED (N=339360) DATA 144

FIGURE 4.3 HISTOGRAM OF EMPLOYMENT TRANSITION PREDICTED PROBABILITIES USING COEFFICIENTS FROM MODELS USING OBSERVED AND IMPUTED DATA 178

Chapter One: Introduction

The use of psychoactive substances, from caffeine to opium, is and has always been a global phenomenon (Gossop, 2007; Jay, 2010). The consumption and trade of illegal drugs are often pointed to as considerable sources of individual, social, economic, environmental and health-related harm (Adlaf, Begin, & Sawka, 2005; Chisholm, Doran, Shibuya, & Rehm, 2006; Degenhardt & Hall, 2012). Subsistence opium farmers in Afghanistan whose crops are targeted by eradication efforts; drug mules from Latin America for whom the financial incentives outweigh the risks involved; inner-city youth bereft of economic opportunities who are drawn into both use and the drug trade; affected governments that struggle with systemic violence and the absence of the rule of law; all of these are implicated, voluntarily or otherwise, in the use of and global trade in illegal psychoactive substances. The production, distribution and consumption of illegal drugs are ubiquitous, systemically embedded, and intractable. The costs of these processes and of the prohibition of illegal drugs are variegated and widespread (Gossop, 2007). They include, for example, lost productivity, to which 61% of the total costs of substance use are attributed in Canada (Rehm, 2006), the global burden of blood-borne diseases such as human immunodeficiency virus (HIV) and hepatitis C (HCV) amongst injection drug users (IDU) (Mathers et al., 2008; Nelson et al., 2011), and the variegated costs of organized crime (Snyder & Durán-Martínez, 2009; van Dijk, 2007).

Drug use occurs amongst people from all socio-demographic and cultural backgrounds (Devereux, 2008; Jay, 2010) and across the socio-economic spectrum (Pierce, 1999; Reuter, MacCoun, Murphy, Abrahamse, & Simon, 1990). The United Nations Office on Drug and Crime (UNODC) estimates that, in 2009, between 149 and 272 million people, or 3.3% to 6.1% of global population aged 15-64, used illicit substances at least once in the previous year (UNODC, 2012). Each psychoactive substance carries with it specific properties and effects

(Nutt, King, Phillips, & Independent Scientific Committee on Drugs, 2010), and as such, its own impact on drug-related harm. To understand this harm, it is crucial to also recognize that "drug abuse is related to housing is related to health care is related to joblessness is related to poverty" (Shavelson, 2001). That is, broader socio-economic vulnerability impacts and is impacted by drug use in a complex intertwining of health, social and economic pathways.

1.1 Study rationale

This thesis is concerned with employment among people who use drugs. Whilst research in the general population suggests that most people who use illegal drugs are employed (French, Roebuck, & Alexandre, 2001), chronic unemployment and socio-economic vulnerability are often fundamental daily challenges. The compulsion towards and harm from drug use often impacts those who are most vulnerable to deprivation and social or economic exclusion (Pearson, 1987). Individuals with high intensity illicit drug use patterns in particular often face multiple social and economic disadvantages and may also experience concurrent health problems (Richardson, Sherman, & Kerr, 2012) both related and unrelated to their use. Generally confined to the margins of the labour market, it is for these individuals that viable, licit income generation may pose the greatest challenge, but for whom it may usher the greatest benefit. A select number of community-based studies of employment among drug users exist (Atkinson, Montoya, Trevino, & Richard, 2000; Koo, Chitwood, & Sánchez, 2007; McCoy, Comerford, & Metsch, 2007). However, employment among socio-economically vulnerable IDU has not been rigorously investigated. This thesis therefore focuses on employment among predominantly inner-city, high-intensity drug users, a population who are more likely to disproportionately bear the costs of substance use and less likely to have sufficient socio-economic resources on which to draw in order to mitigate these costs.

1.2 Conceptual background

It is well known that over and above individual health behaviour, a range of social and economic factors critically influence individual health outcomes and health inequalities in the general population (Marmor, Evans, & Barer, 1994; Marmot, Friel, Bell, Houweling, & Taylor, 2008). Literature on the social determinants of health asks two general questions: first, what are the social factors that shape and explain health and health inequalities, and second, what are the forces that shape the quality and qualities of these societal factors (Raphael, 2009)? There is a general paucity of research concerning the social determinants of health of drug users (Galea & Vlahov, 2002) in general, and injection drug users in particular, despite cautious global estimates that suggest that over 11 million people inject drugs on a regular basis worldwide (Mathers et al., 2008). The injection of psychoactive drugs, such as heroin and cocaine, is widely acknowledged to produce harms specific to this mode of administration, including the spread of blood-borne disease and impacts on public order and public health. An extensive scientific literature explores the epidemiological dimensions of injection drug use (Nelson et al., 2011; Strathdee & Stockman, 2010; UNAIDS, 2010). Social and structural factors, for example, are acknowledged as crucial in the production and reproduction of HIV-risk among injection drug users (Nutt et al., 2010; Rhodes, Singer, Bourgois, Friedman, & Strathdee, 2005). Nevertheless, most research on the health of drug users focuses on the physiologic or medical linkages between drug use and health outcomes or on behavioural research on drug users' risk behaviour and health (Galea & Vlahov, 2002), rather than those activities, experiences and exposures that may shape these linkages.

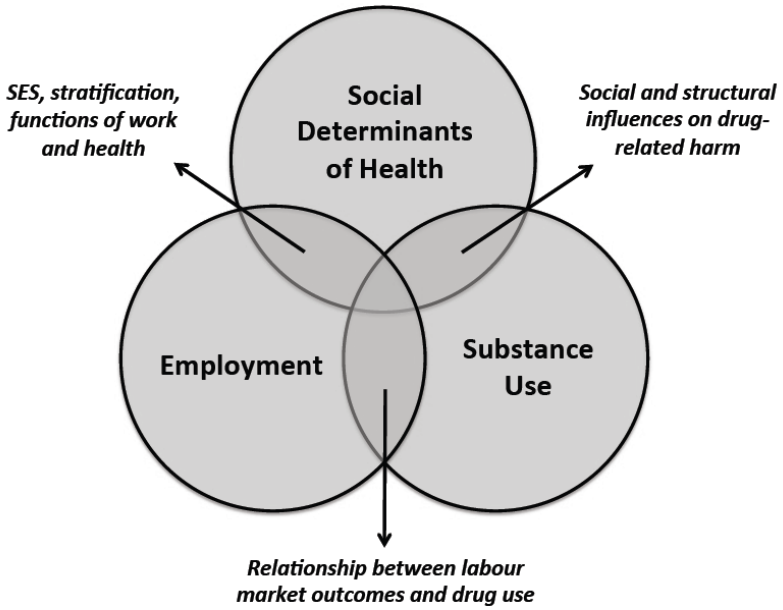
This study therefore focuses specifically on people who have injected drugs and and employment as one of the most widely acknowledged social determinants of health and well-being (Bambra, 2011). Research on the relationship between work and health examines how socio-economic status, labour market outcomes and unemployment map on to systematic variation in individual health outcomes (Adler & Ostrove, 1999; Bartley, 1994; van Rossum,

Shipley, van de Mheen, Grobbee, & Marmot, 2000). This relationship is multidimensional and complex (Adams, Hurd, McFadden, Merrill, & Ribeiro, 2003; Cutler, Lleras-Muney, & Vogl, 2008) with variation across dimensions of socio-economic status (Lahelma, Martikainen, Laaksonen, & Aittomäki, 2004). There is considerable debate on whether the relationship between work and health is characterized by causation, direct selection and indirect selection (Bartley, Ferrie, & Montgomery, 2006). Sociological and social-psychological literature on employment points a range of non-material functions of and benefits from employment that strongly influence health and well-being (Jahoda, 1982; Warr, 1994). Psychosocial factors identified in this literature, such as time structure, stress, and positive social interactions in the workplace (Nyberg et al., 2009) have also been identified as important mediating factors and mechanisms linking work and individual outcomes (Cutler et al., 2008; Matthews, Gallo, & Taylor, 2010). The role of labour market experience as a social determinant of health among drug users may therefore not be limited to the material benefits of licit income generation, but may also be connected to features and characteristics of the experience of employment.

While work and employment may have a substantial influence on health and well-being among drug users, drug use may also impact the existence and quality of labour market participation. Drug use is commonly cited as a negative influence on labour market outcomes (Henkel, 2011; Peck & Plant, 1986; UKDP, 2008), suggesting that it may be an important component of the forces that shape this particular social determinant of health. Research in economics, sociology and addiction treatment has explored the relationship between drug use and work (here reviewed in section 3.2), and hypotheses generally anticipate an inverse relationship between drug use and employment. This anticipation is in line with theoretical and empirical explorations of broader social and socio-economic deviance (Adler & Adler, 2011; Gandossy, Williams, Cohen, & Harwood, 1980; Goffman, 1963; Goode & Ben-Yehuda, 2009; Meneses & Akers, 2011; Oetting & Donnermeyer, 1998; Seddon, 2006).

Outcomes from studies in the general population are inconclusive (Kaestner, 1998) with indications that most drug users also have jobs (French et al., 2001), though a focus on different types and patterns of use may differentiate labour market outcomes between different populations of drug users. Ethnographic and clinical examinations of employment among high-intensity drug users in both the inner-city and addiction treatment programs generally demonstrate poor employment outcomes (Bourgois & Schonberg, 2009; Platt, 1995; Preble & Casey, 1969), despite demonstrations of high level functioning and the acquisition of skills among these populations (Dillon, Wong, Sylvest, Crone-Todd, & Silverman, 2004; Preble & Casey, 1969). Competencies may not translate into positive labour market outcomes for various individual, social, structural and environmental reasons. To date, the respective contributions of drug and non-drug related influences to labour market outcomes among drug users remain understudied and not fully understood. This thesis is positioned where research on the sociology of drug use, social determinants of health and sociology of employment intersect, as depicted in Figure 1.1. In addition to the conceptual background and broad research objectives that motivate this research as outlined above, each chapter also shares a common research context. It is to this common research context that I turn next.

Figure 1.1 Positioning employment and health among people who use drugs



1.3 Research context

Vancouver's Downtown Eastside (DTES) is a neighbourhood of fifteen city blocks directly to the east of Vancouver's downtown core. The DTES was traditionally a retail, banking and entertainment district that, as economic conditions changed and the area began to decline, was populated in large part by employees of the forestry and mining industries that drove economic growth in the province of British Columbia throughout much of the 20th century (Campbell, Boyd, & Culbert, 2009). High levels of legal and illegal substance use increasingly characterized the area, and economic decline attracted both petty and more serious crime (Smith, 2003). During the timeframe of quantitative data collection that is used for this thesis, from 1996 - 2005, studies estimate that the IDU population was estimated to be 5000 (Wood et al., 2000) in the DTES, compared to estimates ranging from 6000-15000 in Vancouver as a whole (Cook et al., 1996; McInnes et al., 2009; Strathdee et al., 1997).

The infiltration of HIV/AIDS in the injection drug using community in the early 1990s resulted in an explosive outbreak of HIV incidence among IDU and their sexual partners (Patrick et al., 1997; Strathdee et al., 1997), despite the presence of a highly successful needle exchange, a service that is thought to have kept HIV outbreaks in check in other jurisdictions (Bastos & Strathdee, 2000; Lurie & Drucker, 1997; Strathdee et al., 1997). In October 1997, The situation was declared a public health emergency (Vancouver/Richmond Health Board, 1997). At its peak, the incidence of new infections was estimated to be 18.6 per 100 person years, resulting in an increase in prevalence among IDU from under 2% to more than 25% (Strathdee et al., 1998). These incidence rates amongst injection drug users were considered amongst the highest in the developed world (Strathdee et al., 1997). While levels of HIV incidence have decreased considerably since then, the neighbourhood remains a locus of endemic poverty, unstable housing, crime, open drug use, high HIV prevalence and widespread mental illness (Wood et al., 2007).

The Downtown Eastside is frequently cited as Canada's poorest neighbourhood (Kazempiur & Halli, 2000; Tyndall et al., 2002). In 1996 at the start of the study period, 80.9% of DTES residents were in low-income households, compared to 31.0% of Greater Vancouver residents overall (Statistics Canada, 1998). Census data from 2001 indicate that the 22% unemployment rate among those 15 years and older was significantly higher than the Vancouver rate of 8% and national rate of 7% (Brethour, 2009; City of Vancouver, 2006). More indicative of the economic context of the neighbourhood, however, is the rate of labour market participation, which in the DTES in 2006 was 38%, only slightly over half the rate in Vancouver and the Canadian national average of 67% (Brethour, 2009). Statistics Canada places it as Canada's most deprived urban neighbourhood[1] with a 2001 median income of $12,084 CAD compared to the Vancouver median of $42,026. Government transfers comprise 37.5% of this income for DTES residents and 10% of the income of Vancouver residents (Brethour, 2009; City of Vancouver, 2006). Individual employment and income indicators for residents of the neighbourhood are significantly lower than the rest of Vancouver and Canada.

1.4 Study aims

This thesis explores the relationships between work and drug use in the context of potentially high-intensity substance use. Rather than focus on the impacts of drug use on work by comparing labour market outcomes between drug using and non-using populations, it instead aims to better understand the social processes surrounding demographic, behavioural, socio-economic and health-related characteristics that differentiate between labour market outcomes within drug using populations. Individual health status is inevitably implicated in these processes given its connection to both work and drug use. Because this thesis focuses on

[1] For the purposes of the census, a neighbourhood is defined as a Forward Sortation Area (FSA), which refers to an area covered by the first three digits of a Canadian six-digit postal code that refers to an average of 7,000 households (Statistics Canada, 2008).

within-group rather than between-group processes, it does not concern itself with questions relating to the etiology of drug use or drug use cessation. Instead, it takes an exploratory approach to the conditions surrounding an important social determinant of health among a group of people who inject illicit drugs and who are also often highly socio-economically vulnerable. This thesis assumes drug use among study participants as a starting premise, which facilitates a focus on the ways in which the patterning and positioning of drug use condition individual labour market experiences and vice versa.

The primary research question guiding this work is *"How is employment implicated in socio-economic processes related to drug use, socio-economic well-being and health among people who inject drugs?"* The central hypothesis of the study is that *legal employment is an economic and social undertaking that significantly impacts the risk behaviour of IDU and is likewise impacted upon by individual, social, structural and environmental factors*. Both the research question and central hypothesis are necessarily general; as subsequent reviews of the relevant literature on drug use and employment will make clear, there is little empirical work that looks at the relationship between drug use and work directly, and the work that does exist is in many cases inconclusive, thereby contradicting expectations of a simple, inverse relationship between the two. As a result, analyses are exploratory, and seek to elucidate the issues raised by the research question among a specific population. In order to test the central hypothesis and begin to answer the much broader research question that drives it, a series of subsequent research questions will be explored. These include:

- What differentiates between drug users who engage in the formal labour market and those who do not?
- What are the barriers to labour market participation among drug users?
- How are work and labour market participation, or a lack thereof, perceived and experienced by individual drug users?

To answer these questions, the study uses both quantitative and qualitative research methods. Data for both rely on the Vancouver Injection Drug Users Study (VIDUS), which emerged in response to the outbreak of HIV infection amongst injection drug users and their sexual partners in the mid 1990s described above (Patrick et al., 1997; Strathdee et al., 1997). Described in detail in Chapter Two, since its inception, VIDUS and related cohort studies have produced long-term longitudinal data on IDU in the Downtown Eastside and Greater Vancouver Region spanning over 15 years. They were also used as the sampling frame for the recruitment of participants for qualitative interviews. This approach is in line with the mixed methods design strategy of complementarity, where one data set is embedded within the other to play a supporting role (Creswell & Plano Clark, 2007).[2]

The decision to include both qualitative and quantitative methods derives from their respective capacities to answer the research questions. Adopting the philosophical approach of pragmatism outlined by Miles and Huberman (1994), the inclusion of both recognizes their strengths, limitations and potential complementarity in studying drug use and employment from multiple perspectives (Letourneau & Allen, 1999). For example, analyses of quantitative data from the large-scale survey undertaken for this thesis identify behavioural, socio-demographic and structural influences and associations on labour market outcomes. They are less able to examine individual processes by which some of these associations operate. Qualitative interviews clarify some of these key relationships that are not fully explained through quantitative analysis. However, on their own these qualitative analyses would be an insufficient basis for observing systematic variation in the study population as a whole. Consistent with prior qualitative work on substance use, this research seeks to challenge stereotypes about individuals who experience addiction with information that reflects the daily reality of their lives and improves general understanding of the every day context of drug use (Neale, Allen, & Coombes, 2005). This strategy is consistent with the case made by

[2] Other valid mixed methods designs include convergence, where data sets are merged, and expansion, where one data set is used to build on another (Creswell & Plano Clark, 2007).

McKegany (1995) for combining quantitative and qualitative work in the addictions. It also seeks to manage the epistemological tension of combining methodological approaches (Martin & Stenner, 2004; Rhodes & Moore, 2001a; Whittemore, Chase, & Mandle, 2001) by conducting the studies associated with each approach separately. A quantitative exploration of employment patterns identifies key systematic relationships in the data, and a qualitative inquiry explores potential explanations for these relationships. The goal is to capitalize on the strengths of both and to use their differences to aid interpretation and greater understanding (Rhodes 2001b).

1.5 Chapter summaries

Empirical chapters are supplemented with literature reviews specific to their substantive and methodological foci. Each chapter builds on the analyses and conclusions of the previous, and therefore together they comprise three separate but related studies on researching the labour market experience of IDU. The basic structure of this thesis is as follows. Chapter Two outlines the relevant aspects of the data used in subsequent analyses. It includes a summary of the VIDUS study design and data collection procedures as well as statistical considerations and limitations that stem from these. It then provides descriptive statistics about the study population. This chapter also details the data collection procedures for qualitative analyses, emphasizing population- and research context-specific considerations. Descriptive statistics of the qualitative sample are presented, including an analysis of their representativeness vis-à-vis the quantitative data sample.

Chapter Three examines missing data in detail as an important feature of VIDUS. One of the primary challenges of longitudinal, quantitative research with inner-city drug users is that the sometimes unstable and chaotic lives of participants (Fraser & Moore, 2008) produce complex patterns of missing data from similarly unstable study participation. In order to understand the potential implications of missing data on subsequent statistical analyses and

determine the most appropriate way of dealing with missing data, this chapter details the VIDUS data structure and the role of observation-level missing data within that structure. Descriptive and bivariate logistic analyses are drawn on to develop hypotheses about the underlying processes that produce missing data in the VIDUS. Multivariate event history and competing risks analyses test these hypotheses. Despite the potential challenges of missing data, this section argues that there is information to be gleaned from an analysis of the relationship between data structure and data content, that is, by exploring potentially important relationships between the substantive and structural data. Conclusions are drawn about the ways in which this information can be used in data collection procedures, data management strategies and subsequent analysis.

Chapter Four incorporates considerations of missing data into quantitative analyses. Building on existing research in sociology, health economics and social epidemiology, this chapter constructs a series of six hypotheses about the impact of socio-demographic disadvantage, drug use patterns, treatment enrolment, different types of risk and health status on transitions into employment. Conducted using both using the observed data of the original VIDUS data and a series of multiply imputed "complete" data sets, a series of discrete time event history models test these hypotheses. Results between the two sets of analyses are compared, and conclusions drawn about the relationship between socio-demographic, behavioural, environmental and structural characteristics, events and exposures and the individual propensity of IDU to move out of non-employment and into employment.

Chapter Five reports the outcome of a qualitative study examining individuals' experiences and perspectives on the relationship between drug use and work. Qualitative interviews explore the experience of work among IDU, its compatibility with drug use, and the practices, behaviour and circumstances that operate as either barriers or facilitators to labour market engagement. An additional objective of this chapter is to build on the results of quantitative analyses by supplementing statistical analyses with qualitative data that may

elucidate the underlying mechanisms that produce observed statistical relationships. Twenty-three respondents were recruited for participation. Qualitative data are thematically analysed, and conclusions drawn about the experience of work and income generation, strategies for balancing drug use and employment, barriers to labour market participation, and pressures towards informal and illegal income generation.

A concluding chapter provides an overview of the empirical findings. It then outlines broader conclusions about the relationship between work, drug use and health drawn from an examination of the relationships between the substantive chapters and a comparison of their respective outcomes. The policy implications from this research are discussed, as are potentially fruitful areas of future research.

1.6 Summary

The focus of this thesis is on the relationship between drug use and employment. It uses extensive information obtained from people who use injection drugs in Vancouver, Canada, and is guided by an understanding that the relationship between work and drug use is complex and does not exist in isolation from individuals' social and structural environments. It is thus motivated as an exploratory analysis of broader influences on both the patterns of work and the experience of work among inner-city IDU. Given the sometimes sporadic study participation of a population studied over a ten-year period, this thesis necessarily considers the intricacies of working with complex, long-term data in which observation-level missing data is a prominent feature. It also acknowledges that there is considerable benefit to examining complex issues from multiple perspectives, and therefore includes both quantitative and qualitative substantive analyses of the relationship between drug use and work. This approach seeks to both identify associations in a larger IDU population and explore plausible explanations for these associations through portrayals of the lived experiences of study participants.

Chapter Two: Data

2.1 Introduction

This chapter summarizes the data used in this thesis. It outlines the Vancouver Injection Drug Users Study, including descriptive statistics describing the study population, along with some of the common limitations to all analyses based on the design and data produced by the VIDUS. It also describes in detail the design and data collection procedures undertaken for the qualitative analyses included in this thesis. It closes with descriptive statistics of the qualitative study sample, including comparisons of its socio-demographic composition with that of the quantitative sample.

2.2 The Vancouver Injection Drug Users Study

The Vancouver Injection Drug Users Study[3] arose out of the Downtown Eastside context of the mid-1990s with a view to understand the dynamics of HIV-related risk, vulnerability, and substance use among people who inject drugs in Vancouver, Canada. A prospective, community-recruited cohort study of people who inject illegal drugs that ran from May 1996 to May 2005, recruitment strategies included local advertisements in the community, referrals from community organizations such as local needle exchange programs and word-of-mouth from participants. To be eligible for inclusion in the cohort, individuals must have injected drugs within the past month, resided in the Greater Vancouver area at the time of enrolment and be at least 14 years of age. The original study consists of a baseline interview and 18 semi-annual follow-up visits. The data used for the quantitative components of this thesis include the baseline interview and 17 follow up periods of the original VIDUS

[3] Access to VIDUS data was provided by Drs. Thomas Kerr and Evan Wood, the principal investigators of the study and co-directors of the Urban Health Research Initiative at the British Columbia Centre for Excellence in HIV/AIDS.

study, with the final, 18th follow-up excluded because a question format change renders the employment information in the final follow up incomparable with that of earlier waves. In total, observations from 1599 individuals are used for the purposes of this thesis.

The VIDUS was and continues to be run out of a storefront office near the epicenter of the open drug market on the Downtown Eastside. It houses a team of interviewers, nurses and field workers that conduct both on site and field-based interviews. At enrolment and semi-annually thereafter, a trained interviewer administers a semi-structured questionnaire that elicits information including socio-demographic characteristics, drug use patterns, sexual and criminal activity, risk-taking behaviour, participation in drug treatment and sources of income.[4] Participants also receive pre- and post-test HIV counseling, and at each visit participants give a blood sample that is tested for HIV and HCV. Participants receive a honourarium of CDN $20 (approx. GBP £10) at each visit and any participant requesting medical or social support is referred to an appropriate agency. The VIDUS study is housed institutionally at the British Columbia Centre for Excellence in HIV/AIDS and benefits from affiliation with St. Paul's Hospital in Vancouver and the University of British Columbia.[5] All participants provide written informed consent, and the study has been approved by the University of British Columbia/Providence Health Care Research Ethics Board.

2.3 VIDUS descriptive statistics

This section describes the characteristics of participants in the initial VIDUS study at the time of recruitment. Table 2.1 provides baseline descriptive statistics stratifying individuals by whether or not they report income from employment over the course of the study period. This allows the assessment of differences at baseline between those who report employment and those who do not across individual level socio-demographic characteristics,

[4] The VIDUS questionnaire items used in statistical analyses are included in Appendix 2.1.

[5] Funding for VIDUS includes grants from the Canadian Institute for Health Research (MOP-67262 and Operating Grant 122258) and the US National Institutes of Health (R01-DA011591-04A1).

indicators of drug use[6], HIV and HCV serostatus, drug use-related risk behaviour and indicators of socio-economic vulnerability. The 1599 individuals enrolled in VIDUS between May 1996 and November 2005 contributed a total of 14996 observations. Of these 1599 participants, 1402 (87.7%) reported for at least one follow up after baseline, and participants contributed a median of 10 observations (interquartile range [IQR] 4-16) over the course of the study period. At the time of recruitment the respondents were on average 33.3 years of age (IQR: 25.6-40.1) and 581 (36.3%) respondents were female. Five hundred and eighteen (32.4%) participants report having income from a regular job at least once, while 1081 (67.6%) do not report any employment over the course of the study. Statistically significant differences between those that report a employment and those that do not were observed for women ($p<0.001$), those reporting Caucasian ethnicity ($p=0.037$) or Aboriginal ancestry ($p=0.021$), individuals with less than a high school education ($p<0.001$) or having attained a trade or college-level education ($p=0.004$), those who are living with HIV ($p<0.001$) or HCV ($p=0.003$), and individuals who report unstable housing ($p<0.001$) or sex work in the six months prior to recruitment ($p<0.001$). With the exception of Caucasian ethnicity and trade or college level educational attainment, individuals reporting these characteristics, activities and circumstances were all disproportionately represented among those respondents who did not report an episode of employment over the course of the study.

2.4 Statistical considerations and limitations

This section outlines several characteristics of the data that require careful consideration in the design of statistical analyses. Specific attention is given to the impact of the study design on the construction of analyses and inference from results. These include limitations on generalizability, potential biases introduced by self-report and data issues specific to the prospective cohort structure of the VIDUS.

[6] Profiles of the drugs examined in the current study are included in Appendix 2.2.

Table 2.1 Characteristics of VIDUS study participants at baseline stratified by self-report of employment over the course of the observation period (n=1599)

Characteristic	Total (*n* = 1599)	Employment over study period		*p* - value
		Yes (32.4%) (*n* = 518)	No (67.6%) (*n* = 1081)	
Socio-demographic characteristics				
Age (med, IQR)*	33.3(25.6-40.1)	32.8 (25.0-39.6)	33.7 (25.9-40.4)	0.065
Female gender	581 (36.3)	117 (23.8)	458 (42.4)	<0.001
Ethnicity				
Caucasian	944 (59.0)	325 (62.7)	619 (57.3)	0.037
Aboriginal ancestry	432 (27.0)	116 (22.4)	316 (29.2)	0.004
Asian	74 (4.6)	27 (5.2)	47 (4.4)	0.441
Other	149 (9.3)	50 (9.6)	99 (9.2)	0.750
Marital status†	380 (23.8)	127 (24.5)	253 (23.4)	0.625
Educational attainment				
Less than h.s. ‡	316 (19.8)	73 (14.9)	243 (22.5)	<0.001
H.s. or equivalent	1015 (63.5)	336 (64.8)	679 (62.8)	0.425
Trade or college	149 (9.3)	64 (12.3)	85 (7.9)	0.004
University or more	119 (7.4)	45 (8.7)	74 (6.9)	0.189
Drug use				
Daily heroin injection†	551 (34.5)	178 (34.4)	373 (34.5)	0.955
Daily cocaine injection†	548 (34.3)	165 (31.9)	383 (35.4)	0.158
Daily speedball injection†	194 (12.3)	59 (11.4)	135 (12.5)	0.529
Daily crack use†	118 (7.4)	30 (5.8)	88 (8.1)	0.093
Health status				
HIV seropositive	322 (20.1)	49 (9.5)	273 (25.3)	<0.001
HCV seropositive	1,205 (75.4)	366 (70.7)	839 (77.6)	0.003
Drug use-related behaviour				
Binge drug use†	772 (48.3)	259 (50.0)	513 (47.5)	0.341
Shooting gallery use†	467 (29.2)	149 (28.8)	318 (29.4)	0.788
Syringe sharing†	783 (49.0)	265 (51.2)	518 (47.9)	0.225
Socio-economic vulnerability				
Unstable housing†	994 (62.2)	283 (54.6)	711 (65.8)	<0.001
Recent incarceration†	535 (33.5)	158 (30.5)	377 (34.9)	0.003
Sex work†	458 (28.6)	92 (17.8)	366 (33.9)	<0.001

*Median, Interquartile range; †Activities or situations in the previous 6 months; ‡h.s. = High school

2.4.1 Generalizability

The VIDUS cohort is not a random sample. As such, it is not possible to generalize findings to other IDU, though a previous study has concluded that the VIDUS sample is

highly representative of the Vancouver IDU population (Wood et al., 2000). Generalizability may also be compromised because individuals may undergo changes over the course of the observation period resulting from study participation (i.e. the "Hawthorne effect"). Semi-annual follow-ups provide a regular interface with staff and possible referrals to medical and social supports. Study participation may therefore have impact the behaviour and health of subjects, producing biases towards greater stability over time. A repeated cross sectional design would produce a sample whose risk behaviour would be unaffected by on-going participation. However, given the difficulty of recruiting high-risk and hidden populations such as IDU (Watters & Biernacki, 1989) and the value of longitudinal study for understanding change and event occurrences over time (Singer & Willett, 2003), these are acceptable potential biases.

2.4.2 Self-report

The study also relies on self-report, which has the potential to introduce both recall and socially desirable reporting bias (Biemer, Groves, Lyberg, Mathiowetz, & Sudman, 2011). This may result in overestimated perceived desirable behaviour, such as employment, and underestimated perceived undesirable behaviour, such as risky injection practices. Previous research suggests that the responses of those engaged in illegal activity are more likely to be reliable where there is prior institutional contact, assurance of no unwanted service or police involvement, and where interviews are structured (Ball, 1967). The VIDUS study fulfills all three criteria, optimizing conditions that encourage reliable responses and minimizing systematic bias resulting from self-report. Additionally, the long-term relationship that VIDUS research staff share with VIDUS participants has engendered relationships characterized by strong levels of trust and comfort with ongoing participation. This relationship may further serve to decrease the levels of bias associated with self-report in the study.

2.4.3 Longitudinal considerations

A further characteristic of the VIDUS is that revised questionnaires are introduced in June and December of each year (Tyndall et al., 2003). Items are generally identical between surveys. However, where there were changes, close inspection of the variables of interest using both substantive knowledge and analyses of the raw data determined whether items provided consistently reliable measures of the same underlying concepts. A previous analysis suggests that measures of temporary work, shooting gallery attendance[7] and injecting with other people do not retain internal validity across follow ups (Almond, 2010). Discussions with research staff suggest, however, that differences may also reflect changes in the behaviour patterns of participants, and differences in the effective sample at a given time point due to both observation-level missing data and the prospective recruitment format. These variables are therefore included in analyses, and one of the assumptions of analyses is that where survey items are deemed comparable, this is a valid judgment. Further, data that measure the same variable over time assume that the meaning of the questionnaire item to participants is consistent over time. Deviations from this assumption may impact the degree to which construct validity remains consistent over the time span of the study. There is little that can be done to address this, and consistent meaning of questionnaire items is another of the assumptions of analyses.

The time between semi-annual follow-up interviews also warrants further attention. One of the key questionnaire changes was that the first five follow-ups respondents were asked about items since the last interview. In subsequent follow ups they were instead asked about items in the prior six months. These intervals do not necessarily map on to one another. As noted elsewhere, this is particularly relevant for those with missing observations in the

[7] Shooting galleries are clandestine locations where the rental and multi-person use of injection equipment commonly occurs. Shooting galleries have been identified as HIV 'risk environments' (Rhodes et al., 2005) and have been associated with non-recreational, high intensity drug injection, higher exposure to HIV disease and substantially elevated risk for HIV infection (Chitwood et al., 1990; Des Jarlais & Friedman, 1990; Klein & Levy, 2003).

first five follow-ups (Almond, 2010). However, the respondent missed the previous in only 346 interviews conducted across the first five waves interview (representing 2.3% of all interviews attended). As in previous work (Almond, 2010) I therefore ignore this, although subsequent study might quantify the impact of this change on the reliability of results.

Additionally, because the questionnaires elicit information for the six months prior to interview, any within-period variation and the time ordering of events within a given follow-up period are lost. In some statistical analyses, it may be appropriate to include time lags to determine the sequencing of events. In others, these time lags may not make logical sense, as they may result in inferences being made about relationships between predictors and outcomes that are up to a full year apart. The time intervals may therefore also have implications for inference (specifically, limiting the ability to draw causal inference from results). Conclusions drawn from statistical analyses will therefore reflect an appropriate level of caution that gives consideration to the limitations on inference produced by non-random sampling, self-report and assumed consistency of construct validity over time and the time span of observation periods.

The prospective cohort structure of the VIDUS also means that while the majority of participants began the study at its inception, 672 of 1599 were recruited into the study after this initial period. The impacts of this rolling recruitment design are first, that not all individuals have the ability to contribute the same number of observations, and second and more importantly, the treatment of time in longitudinal analysis becomes complex and requires more detailed consideration in the model selection process. This can most straightforwardly be understood as introducing a second timescale into the data. The first, and most intuitive timescale is that of chronological time, which is easily tracked through interview date information. The second timescale is that of survey time, which corresponds to the amount of time that an individual has participated in the study. External confounding that is time-specific may occur on either time scale. For chronological time, this may be because

of any external event in the study context that has the potential to impact participant responses differently, be it a change in socio-economic conditions, an influx of a different batch or type of drug, or a change in public policy, such as a revisions to policing practices. For survey time, this confounding may be a function of any unaccounted for change in behaviour or participation that results from study participation, such as the aforementioned Hawthorne effect, study fatigue, or attrition directly after baseline. In both cases, there are potential consequences for the internal validity of participants' responses. Accounting for time on either of these scales will fail to account for serial correlation that occurs along the other.

A decision therefore has to be made about which timescale to use. On the one hand, chronological time may be important if the substantive questions relate to events or changes in the research environment. On the other, the amount of time of study participation may have direct consequences on some of the outcomes of interest, or in levels of study participation. While the possibility of accounting for both time scales was considered by including variables controlling for both survey time and chronological time, generally these analyses suffered from multicollinearity. A modelling strategy that utilizes survey time as the analytical time scale, rather than chronological time, was therefore adopted in statistical analyses.

2.5 Qualitative study recruitment and data collection

Since the original VIDUS study, which ended in late 2005, VIDUS has been split into two arms: VIDUS II, which replenished the first VIDUS study and is restricted to HIV seronegative individuals, and the AIDS Care Cohort to Evaluate Exposure to Survival Services (ACCESS), a similar study restricted to HIV seropositive individuals which further seeks to determine the health needs of HIV-positive drug users (Milloy et al., 2011). The replenished VIDUS and ACCESS cohorts were used as the sampling pool for the recruitment of participants into the qualitative component of the current study. The research context for qualitative research was therefore consistent with that of the quantitative analyses;

participants were individuals who were currently injecting or had a history of injection drug use, and who, in the majority of cases, had spent significant time or resided in Vancouver's Downtown Eastside. Semi-structured interviews sought to explore current and past sources of income generation, perceptions of the benefits and drawbacks of different work environments, views on the relationship between drug use and work, and perceptions and experiences of barriers to labour market access. The qualitative portion of the study received ethics approval from both the University of British Columbia/Providence Health Care Research Ethics Board and the University of Oxford Central University Research Ethics Committee. Given the inseparable relationship between research context, instrument development, and sampling strategies, the research site and study population gave rise to circumstances that required explicit treatment in the design and execution of this research. The notable methodological features of qualitative data collection are described below. Particular attention was paid to maximizing the validity[8] of qualitative data.

2.5.1 Recruitment and sampling strategies

A key consideration for the viability of the study was the ability to access individuals who would be willing to meaningfully participate. The high level of cohesion in the DTES among community members (Campbell et al., 2009) often creates dynamics whereby familiarity with the researcher or a sense of their credibility within the community is a crucial component of recruiting individuals, developing rapport, and individuals' subsequent forthrightness. It is therefore crucial to engender a considerable degree of trust and confidence from study participants that surpasses that produced from regular reassurances of confidentiality. Particularly because the research focuses on illegal substance use and a substantial portion of the potential study population is or has been involved in the criminal

[8] Note that the concept of "validity" in qualitative research is by construction subjective and therefore epistemologically distinct from considerations of validity in quantitative research. While a detailed discussion of qualitative validity is outside the scope of this thesis, a preliminary discussion of validity in qualitative context and the steps taken to maximize it in the current study is included in Appendix 2.3.

justice system, as Neale (2005) points out, participants have very real concerns about illegality, danger and stigma that may be associated with much of their behaviour and which may impact their participation.

These population and site-specific dynamics prompted a research partnership with an existing qualitative research program at the British Columbia Centre for Excellence in HIV/AIDS. This existing program, "Exploring the Natural History of Injection Drug Use: A Qualitative Study of Social and Environmental Influences," operates out of the same storefront office as the ongoing VIDUS and ACCESS cohort studies. The field office team has extensive research experience in the Downtown Eastside and enjoys a robust relationship with community residents. They therefore provided crucial support in facilitating relationship development with potential respondents and in providing support and advice on working with active, often high-intensity drug users.

Interview participants were selected from individuals reporting for their follow up interviews for the VIDUS and ACCESS studies. One further participant was from a now ended cohort study, the Community Health and Safety Evaluation (CHASE) project, which sought to identify priority health issues for residents of the DTES (Shannon, Ishida, Lai, & Tyndall, 2006). All three studies use similar or nearly identical (in the case of VIDUS II and ACCESS) questionnaires. Individuals were eligible for qualitative interviews if they were of adult working age (between 18-65 years old) and had a history of injection drug use. Recruitment efforts selected individuals whose income generation and drug use trajectories would provide information on a range of experiences pertaining to employment and labour market engagement (or a lack thereof). This recruitment strategy follows recommendations by Creswell (2007) and Morton-Williams (1985) to recruit participants based on their potential to elucidate the aim of the research from multiple perspectives.

Recruitment was also undertaken with a view to maximize sampling validity between quantitative and qualitative samples. Following a previous study (Draus, Roddy, &

Greenwald, 2010), the sub-sample was deliberately socio-demographically similar to the larger VIDUS study. Individuals were paid $20CAD honoraria for their participation, consistent with previous studies of this nature (Fast, Shoveller, Shannon, & Kerr, 2010; Small, Rhodes, Wood, & Kerr, 2007). No individual who was approached declined the invitation to participate. An information sheet and consent form outlined the background and objectives of the study, explained the possibility for harm resulting from participation and the right of the interviewee to end the interview at any point. It further detailed the implications of providing written informed consent, which were obtained from all participants prior to interview. The information sheet and consent form are included in Appendix 2.4. The study was approved by both the University of Oxford Central University Research Ethics Committee (CUREC) and the Providence Healthcare/ University of British Columbia Research Ethics Board.

2.5.2 Population-specific design considerations

Complex questions exist regarding the effect of compensation on individuals' motivations to participate in research, the ethics of paying individuals who suffer from addictions with money that may be spent on drugs, and their "freedom" to decline participation (McKeganey, 2001). However, economic remuneration as recognition of the time and cost of study participation is a widespread practice in research in the field of addiction, and individual motivations for research involvement are multidimensional (Fry & Dwyer, 2001). In keeping with existing practice in the field, it was decided that cash honoraria would compensate people for their time.

Consent procedures also have implications for active drug users. Given the unpredictability of interviews generally (Cutcliffe & Ramcharan, 2002), there is legitimate risk that participation may be emotionally costly to the interviewee. For example, recollections of painful events or upsetting moments may be considerable sources of distress

(Nunkoosing, 2005). In order to forewarn participants and attempt to mitigate these potential costs, the consent process both forewarned of this possibility and included the explicit provision that individuals could withdraw from the interview at any point in the process without penalty. These procedures also made clear the availability of post-interview counseling and support referrals.

A further issue concerns individuals' ability to legitimately provide consent, which could be problematized by mental health issues, intoxication, or severe financial need (McKeganey, 2001; Neale et al., 2005). Precautions were taken to ensure that participants understood the consequences of taking part in research, could communicate their decision about their willingness to participate and had circumstances that did not call into question their ability to make a free choice about participation. Individuals whose capacity to do so was in question were not invited to participate in interviews. The opportunity to withdraw from participation without financial penalty, alongside the interviewers' ability to end the interview should it become clear over the course of the interview that consent was not freely given further enhanced the probability that consent was legitimately provided.

The information sheet and consent form also outlined measures taken to ensure confidentiality, which, for reasons described above, are particularly salient for this study. Every effort was made to reassure participants and safeguard the confidentiality of interview data. Neale (2005) further points out that the effects of drugs can complicate the research task by interfering with comprehension, confusing memories or decreasing the quality and accuracy of expression. As such, it may be necessary to terminate an interview because a respondent may be intoxicated to a point that calls into question the validity of the information provided in the interview. While this point was reached with only one respondent (who herself ended the interview), issues associated with interviewing potentially active, high-intensity drug users were explicitly considered and discussed with research staff.

2.5.3 Topic guide and interview structure

The content of the original topic guide was designed to identify (1) individual work histories and motivations to work, (2) experiences of the relationship between formal employment and drug use, (3) perceived barriers to work and (4) perceptions of the benefits and drawbacks of different work environments and of work itself. Results of quantitative analyses described in Chapter Four also influenced the topic guide. Additionally, existing qualitative research on income generation identifies crucial linkages between drug use, personal, employment and social histories (Draus et al., 2010). Efforts to understand these linkages were an important focus of interviews, as evidenced by inquiries about what was going on more globally in people's lives when they were and were not working. Draus et al. (2010) also noted the importance of how people spend their time, asking participants to map a typical day in which they used heroin, describing people that they encountered and their relationship to the people described. The current study follows a similar approach.

Pilot interviews were conducted by myself and the Qualitative Research Coordinator at the British Columbia Centre for Excellence in HIV/AIDS.[9] This strategy produced multiple perspectives on the initial interview topic guide, was an important introduction to conducting interviews with members of this population, and, given his experience with the community, assisted in the development of rapport individuals who may be wary of someone perceived to be an outsider. This process also helped flesh out important considerations related to conducting qualitative work, including the explicit positioning of the interviewer vis-à-vis respondents (Mason, 2002; Nunkoosing, 2005), striving to authentically represent the experiences of the individual (Atkinson & Silverman, 1997), and a self-awareness that interactions with the interviewer play an active role in data generation and the topics covered in interviews (Briggs, 1986; Mason, 2002; Roulston, de Marrais, & Lewis, 2003).

[9] The Qualitative Research Coordinator is Dr. Will Small.

Interactions between researcher and respondent and their role in the construction of data were apparent at multiple points during field interviews. For example, individuals were often aware of and inquisitive about my role within the office as a newcomer, my studies, my host university and my background. While in some cases this was simply an inquiry regarding the reason for the interview, in others this information ascertainably interfered with participants' perception of my ability to understand their experiences. This interference also emphasized the potential of exposing individuals to perceived condescension, discrimination, social expectation or otherwise stigmatizing language or lines of inquiry. For example, it was apparent in a number of interviews that tension arose because of the topic of the interview. It was commonly perceived that, as an outsider asking about employment, my expectation was that the respondent would be engaged in formal work. This often resulted in misunderstandings of the goals of the research and, as Nunkoosing (2005) points out, emphasized the importance of a sensitive awareness of the interviewer's theoretical and professional position and the ways in which this may influence the production of data.

A number of changes were therefore made after pilot interviews. To circumvent misunderstandings of the objectives of the research I changed how I presented the topic of the interview from employment to exploring people's relationship with money. Rather than focus uniquely on their work histories, I broached the subject of employment as part of a broader line of inquiry about individuals' life histories and how they supported themselves financially at various stages. In all interviews, I undertook systematic efforts to marginalize any prejudgments about individuals' experiences (Moustakas, 1994). In addition to the changes made to the topic guide, I also adjusted my interviewing style to be more focused on anecdote and spent more time developing rapport at the beginning of interview.[10] These adjustments appeared to generally improve respondents' level of comfort, understanding of the research

[10] This involved, at various occasions, raising my own work history as a manual labourer and construction worker in an effort to dispel perceptions that I was incapable of relating to a broad range of work histories and circumstances.

goal, and the quality and depth of responses. The final topic guide is included in Appendix 2.5.

Roulston et al. (2003) identify a range of interview challenges, including unexpected participant behaviour, consequences from researchers' actions and subjectivities, difficulty phrasing and negotiating questions, particularly those dealing with sensitive issues, and managing rapport. These challenges were all encountered in the interview process. Of greatest consequence were instances of extreme fatigue among participants, language barriers, respondent's emotional responses and more substantial distress related to events outside the interview room that led one individual to provide only cursory responses to questions. In all cases, every effort was made to manage these challenges within the space of the interview, address them directly where appropriate, provide referrals to support once the interview was completed, and be flexible in the structure of the interview itself.

2.6 Qualitative descriptive statistics

Tables 2.2 and 2.3 display descriptive information for the qualitative study sample. The sample was comprised of 23 individuals, one of whom (who was female, Caucasian, and 31 years of age) stopped the interview in its early stages and whose interview is not included in analyses, leaving an effective sample of 22 people. Among the effective sample, the median age was 48 (interquartile range [IQR]: 42-50), 14 (63.6%) participants were male and eight participants were female (36.4%). The sample included 12 (54.5%) individuals who were Caucasian, seven (31.8%) reporting Aboriginal ancestry, which includes Métis, Aboriginal, First Nations or Inuit ancestry, and single (4.5%) individuals reported Southeast Asian, Latin American, or Black-Caribbean ethnicity. Socio-demographically, the sample is reflective of the VIDUS cohort, although the qualitative sample is considerably older than the larger VIDUS sample, a slightly smaller percentage of study participants were Caucasian and slightly larger percentage of Aboriginal Ancestry.

The housing status of participants included 11 individuals residing in single room occupancy hotels (SROs). SROs are single room rental hotels that are commonly unsanitary, unstable, and dilapidated facilities associated with "last resort" housing options, elevated drug- and health- related risks and generalized housing insecurity (Shannon et al., 2006). Five (22.7%) participants rented an apartment or a room in a shared house, three (13.6%) stayed with family and four (18.2%) were homeless at the time of interview. One of these was intentionally homeless and not seeking more stable housing.

More than half of the participants described experiencing a catastrophic event, defined as a significant and highly stressful life event that impacted their working life. While other events were described as catastrophic in terms of being significant and highly stressful, those included in Table 4.1 are restricted to events integral to narratives of participants' working history. They marked an alteration in their abilities or options for labour market participation. Catastrophic events described by participants included accidents and injuries, family breakup, bereavement, child loss through a custody battle, abduction or removal by government officials, and criminal convictions that ceased continued economic activity.

Drug use patterns at the time of interview were widely divergent across participants. Only two (9.1%) participants reported no current illegal drug use; both of these had extensive drug use histories and one was currently enrolled in methadone maintenance therapy (MMT).[11] The most common drug use reported by participants was crack smoking (12 or 54.5% of participants). This was followed by cannabis (50.0%), heroin injection (40.9%), cocaine injection (31.8%), and the injection of methamphetamine, speedballs and use of cocaine powder (5.4% for each). Sixteen participants (72.7% of the sample) were poly-substance users, and all participants had a history of injection drug use.

[11] MMT is a long acting synthetic opiate agonist used as substance replacement therapy that, when taken daily, blocks opiate receptors and prevents people who regularly use opiates from going into withdrawal while at the same time not producing the euphoric effects associated with their consumption {Mattick 2009}.

Table 2.2 – Socio-demographic information, housing status, catastrophic event history, and current drug use

ID	Age	Gender	Ethnicity[*]	Housing status[*]	Catastrophic Event[*†]		MMT[*‡]	Current Illegal Drug Use[*]
01	54	M	Aboriginal[§]	SRO[**]	Y	Accident (fall), criminal conviction	N	Heroin injection, cannabis
02	34	M	Aboriginal	SRO	N		N	Methamphetamine injection
03	44	M	Aboriginal	SRO	N		N	Crack smoking, cocaine injection
04	47	M	Caucasian	Room in house	Y	Death of partner	Y	Heroin injection, cocaine injection, cannabis
05	48	M	Caucasian	Brother's house	N		Y	None
06	48	M	Latin American	SRO	N		Y	Cannabis
07	42	M	Aboriginal	Homeless	N		N	Cannabis
08	31	F	Caucasian	n/a	n/a	n/a	n/a	n/a
09	41	F	Caucasian	SRO	N		N	Crack smoking
10	39	M	East Asian	Homeless	Y	Accident (hit by car)	Y	Heroin injection, crack smoking
11	35	F	Caucasian	SRO	Y	Child loss, assault	Y	Speedball and cocaine injection, cannabis
12	48	F	Aboriginal	SRO	Y	Abuse, child loss	N	Cocaine powder, crack smoking, cannabis
13	49	M	Caucasian	SRO	Y	Accident (fall)	N	Heroin injection, crack smoking, cannabis
14	43	F	Aboriginal	Homeless	Y	Serious illness, assault, child loss	N	Crack smoking, cannabis
15	52	F	Aboriginal	Apartment	N		N	Heroin injection, cannabis
16	53	M	Caucasian	SRO	Y	Loss of credential	N	Heroin and cocaine injection, crack smoking
17	48	M	Caucasian	Apartment	Y	Family dissolution	N	Heroin and cocaine injection, crack smoking, cannabis
18	42	F	Caucasian	Apartment	Y	Serious illness	N	Cocaine injection, crack smoking,
19	50	M	Caucasian	SRO	Y	Family dissolution	Y	Heroin injection, crack smoking
20	40	M	Caucasian	Room in house	N		Y	None
21	52	F	Caucasian	Mother's house	Y	Death of partner	Y	Heroin injection, crack smoking
22	59	F	Caucasian	SRO	N		Y	Crack smoking
23	48	M	Black - Carribean	Parents' house	N		N	Cocaine injection, crack smoking, cannabis

[*]Based on self-report; [†]Catastrophic events defined as significant highly stressful life event impacting or impacted by formal employment; [‡]MMT=current enrolment in methadone maintenance therapy; [§]Aboriginal ancestry including Métis, Aboriginal, First Nations or Inuit; [**]SRO=single room occupancy hotel

Table 2.3 – Socio-demographic information, current income generation activity and formal work history

ID	Age	Gender	Ethnicity	Current Income Generation	Formal Work History
01	54	M	Aboriginal	DB[*], scavenging[†], volunteer	Roofer, warehouses, forklift operator, carpenter, logger
02	34	M	Aboriginal	DB, sex work	Hospitality, construction, film
03	44	M	Aboriginal	DB, informal[‡], volunteer, dealing[§]	Labourer/construction, fishing, gas station attendant
04	47	M	Caucasian	EI[**], informal	Carpenter, ski station, cook, bowling alley, warehouse
05	48	M	Caucasian	Electrician	Electrician, forklift operator, construction
06	48	M	Latin American	DB, informal	Mechanic, operator, roofing, community outreach
07	42	M	Aboriginal	Welfare, informal	Commercial fishing, bottle depot, surveyor
08	31	F	Caucasian	n/a	n/a
09	41	F	Caucasian	Welfare, Sex work	None
10	39	M	East Asian	DB, dealing	Commercial fishing
11	35	F	Caucasian	DB, informal, sex work	Kitchen manager, business development manager, administrator
12	48	F	Aboriginal	Welfare, scavenging, sells art	Counsellor, bureaucrat, small business owner
13	49	M	Caucasian	DB, street hustling, dealing	Electrical engineer
14	43	F	Aboriginal	DB	Outreach worker, club owner, escort service owner
15	52	F	Aboriginal	DB, scavenging, odd jobs	Server, gas station attendant, cashier, chambermaid
16	53	M	Caucasian	DB, community outreach	Truck driver, landscaper, community outreach; peer support work
17	48	M	Caucasian	DB,	Computer engineer, electronics specialist, construction, warehousing
18	42	F	Caucasian	DB, volunteer	Cashier, waitress, odd jobs, construction, manual labour
19	50	M	Caucasian	DB, informal, family	Event general manager, facility manager, telemarketing, fundraising
20	40	M	Caucasian	DB, volunteer	None
21	52	F	Caucasian	DB, informal, dealing	Election scrutineer, census taker, hospitality
22	59	F	Caucasian	Community outreach	Baker, landscaping, construction
23	48	M	Black - Carribean	Electrician, informal	Electrician, collection agent

[*]DB=disability benefits; [†]scavenging includes street-based scavenging such as panhandling, recycling discarded cans or windshield washing; [‡]informal refers to unreported economic activity that is otherwise licit in nature; [§]dealing refers to drug trade involvement; [**]EI=employment insurance

Four (18.2%) of the participants were currently engaged in the labour market. This figure included one individual who was using and who had recently been laid off and was currently looking for work, one who did not report current drug use, and two individuals who were concurrently employed and using drugs (daily crack smoking by one individual and cocaine injection, crack smoking and cannabis use by the other). Seven (31.8%) individuals held formal stipendiary (paid) volunteering positions at the time of interview; these included volunteering at animal shelters, health service organizations, advocacy groups, and community centres. Fully 50% of the sample reported formal volunteering activity at some point. Overwhelmingly, individuals noted social assistance as a current source of income. Only three (13.6%) were not receiving some form of government assistance at the time of interview. Most supplemented government income with under the table work doing construction or odd jobs (36.4%), sex work (18.2%), drug dealing (18.2%), street-based scavenging in the form of recycling cans, panhandling or windshield washing (13.6%), or other forms of informal economic activity such as selling their artwork (5.4%). Notably, all but two participants (90.9%) had formal employment histories that included reported economic activity; these roles traversed the socio-economic spectrum. While most reported employment in manual labour, construction, trades, or resource-based industries, the array of employment roles included senior administrators, business owners, professionals and senior managers.

2.7 Summary and conclusion

This chapter has outlined the study design and collection of data for both quantitative and qualitative data used in subsequent empirical chapters. Quantitative analyses utilize data from VIDUS, an existing community-recruited cohort study in Vancouver, Canada. The study population, data collection strategies and prospective cohort structure necessitate consideration of

the implications of self-report and complex longitudinal data. Descriptive baseline statistics suggest a study population at recruitment that is socio-demographically diverse and socio-economically vulnerable, with a significant proportion engaged in high-intensity and risky drug use practices. A substantial number are also HIV and HCV seropositive. Qualitative design and data collection procedures were designed, piloted and adjusted with the characteristics of the study population and study context in mind. Participants were recruited from the ongoing VIDUS and ACCESS cohort studies, and the qualitative sample was generally representative of the larger quantitative sample.

Chapter Three: Missing data in the Vancouver Injection Drug User Study

> *"The inescapable conclusion seems to be that when dealing with real data, the practicing statistician should explicitly consider the process that causes missing data far more often than he does."* (Rubin, 1976)

3.1 Introduction

A notable characteristic of the VIDUS data is that it has potentially non-trivial amounts of missingness. This chapter describes the issue of missing data in longitudinal studies in general and in the VIDUS in particular. Missing data is ubiquitous in longitudinal studies, and the myriad processes that produce missing data can be traced to a number of factors including study design, participant characteristics, response refusal, the burden of participation, measurement characteristics, information processing, data collection conditions and chance (McKnight, McKnight, Sidani, & Figueredo, 2007). Missing data is of particular concern when employing longitudinal methods because missing data interrupts, truncates or leaves unobserved the measurement of change or the occurrence of events, often primary phenomena of interest in longitudinal studies. Strategies designed to address the potential impacts of missing data have emerged as an entire subfield in statistics over the last several decades, placing an exhaustive review of the literature outside the scope of the current study. Rather, this chapter begins with an overview of the basic principles of missing data theory, the potential impact that missing data have on the accuracy and validity of statistical analyses, and the particular challenges associated with observation gaps and attrition in longitudinal studies. It then summarizes those methods used to counteract issues related to missing data with a focus on the current 'industry standard' practices of multiple imputation (MI) and maximum likelihood estimation (MLE).

The chapter then turns to missingness in the VIDUS data. To date no study has examined missing data in detail for a large longitudinal sample of IDU, and there has been only a cursory acknowledgement of the topic in research using VIDUS data[12] (Wood et al., 2001). A series of analyses are presented to address this research gap. A range of diagnostic tests produce descriptive information about the structure, type and extent of missing data. Two types of missing data are identified: intermittent occasion non-response and attrition. This descriptive information is also used to determine, based on the structure of the data, considerations that should be taken into account when determining the most appropriate and feasible modelling approach to missingness for the VIDUS data. Following these initial conclusions from the descriptive statistics, four general hypotheses are formulated and tested about plausible processes that might produce these missing data patterns. First, systematic patterns of intermittent missingness are explored using a discrete time, repeated failure event history analysis followed by a series of wave-by-wave logistic regressions that decompose the pooled model to look at variation in patterns of missingness over time. Second, similar modelling strategies examine systematic variation in an individual's final participation end state in the study, be it right-hand censorship (i.e. participation until the last possible observation point), death, or attrition (i.e. where an individuals' participation ends prior to the last possible observation point. These models employ competing risks event history analyses, which use multinomial logit techniques to compare all three possible outcomes in the same analysis. The modelling of different types of missing data is undertaken with a view to understand the degree to which patterns of non-participation are linked to substantively relevant patterns in the data. That is, analyses explore the extent to which relationships between data structure and data content can be informative for subsequent analyses.

[12] Wood et al. (2001) compare the VIDUS baseline sample to that at later observations, showing that participants at later follow-ups are more likely to be female, Aboriginal, HIV positive, older and possessing a high school education.

Further, they may provide substantively meaningful information about the sample over and above what is contained in the observed data, including information about the study participation experiences of VIDUS respondents over time.

3.2 Missing data in the literature

Missing values are phenomena that fall under the general classification of coarsened data, or numbers that have been grouped, aggregated, rounded, censored or truncated, resulting in partial loss of information (Heitjan & Rubin, 1991). Missing data occurs as unit non-response, where an individual does not participate from the outset; item non-response, where a survey item is left unanswered; or occasion non-response in longitudinal studies, where an individual is absent for an entire observation period. All three types of missing data can be important in their pattern, quantity and the mechanism that produces them. In addition, there are two kinds of occasion non-response, the first being attrition, where a participant drops out of the study and does not return, and the second being intermittent occasion non-response, where an individual who has not left the study completely fails to contribute data at all possible data collection cycles, producing an observation gap. It is longitudinal-specific occasion non-response that is of primary concern in the VIDUS.

The goal of any statistical procedure should be to make valid and efficient inferences about a population of interest. As such, any treatment of missing data cannot be evaluated in isolation from the modelling, estimation or testing procedure in which it is embedded (Schafer & Graham, 2002). Two important criteria for assessing the effectiveness of a statistical procedure were established by Neyman and Pearson (1933) and Neyman (1937). First is the objective to avoid bias and produce a sample estimate that is close to the true value in the population both for any particular sample and over repeated samples. Second is the variance of an estimate, where

ideally the standard deviation of a sample estimate is small. The presence of missing data has the ability to distort both measures, increasing the probability of inflation bias, which loosely corresponds to a type I error where a true lack of association appears to be significant, and suppression bias, which corresponds to type II errors where a true association is overlooked (Graham, 2009).

The impact of missing data on statistical inference can similarly be thought of as a challenge to both construct and internal validity. In the case of construct validity, we seek to understand how well a given measure reliably captures the phenomena of interest (Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002). Construct validity is defined as true score variation relative to observed score variation, or

$$\rho^2 = \frac{\delta^2_{true}}{\delta^2_{observed}} = 1 - (\frac{\delta^2_{error}}{\delta^2_{observed}}) \quad (3.1)$$

where ρ^2 is the reliability of the measure, δ^2_{true} is the true variability in the phenomena of interest, $\delta^2_{observed}$ is the observed variation in the measure and δ^2_{error} is the unexplained variability in the measure. We can see by this equation that increases in δ^2_{error} result in decreases in reliability, and missing data can increase this error variance (McKnight et al., 2007). Response items can be differentially impacted by missing data, and therefore have unpredictable results for reliability. Additionally, internal validity, which refers to whether or not there is a true relationship between two variables (Hoyle et al., 2002), is weakened by confounders of and alternative explanations for a given relationship. Missing data can produce both. For example, if there is a systematic difference between individuals who provide full data in a longitudinal study and those who drop out, parameters may be systematically biased as this selection effect artificially decreases some group sizes. The smaller overall sample size also decreases the amount of available information, reduces statistical power, and impacts the degree to which data

fulfils the distributional assumptions of parametric tests. The impacts of missing data on inference are therefore crucial to the robustness of statistical analyses.

3.2.1 Typology of missing data

Until the 1970s, missing values were dealt with by deleting cases with missing data prior to analysis in what is known as the complete case method. A more nuanced understanding of the different types of missing data was introduced by Rubin (Rubin, 1976) whose framework for incomplete data remains in use. Rubin's typology refers to the probability of missingness given the variables with missing data, their associated variables, including covariates, and the hypothetical mechanism underlying the missing data. These components together determine the level of bias that missing data will bring into analyses. Outlined formally in detail elsewhere (Little & Rubin, 1987; Rubin, 1976; Schafer, 1997; Schafer & Graham, 2002), Rubin's typology identifies three different types of missingness. A matrix, *R*, indicates which data are known and which are not known. The type of missingness depends on the complexity of the pattern of missingness indicated by this matrix.[13] The distribution of *R* is often called the response or missingness mechanism,[14] although Rubin's typology is based on the assumption that processes that produce missing data are probabilistic and not deterministic (McKnight et al., 2007). In this sense Rubin describes statistical relationships between data and missingness, not causal relationships.

[13] The *R* matrix generally has a binary indicator of 1 if data are observed and 0 if data are missing, although McKnight et al. (2007) suggest the opposite in order to facilitate more formal comparisons of missing data patterns. This is the strategy adopted here.

[14] This terminology can become confusing because a 'mechanism' for social scientists suggests a real world process by which some data are recorded and others are missed, whereas statistically a 'mechanism' can simply refer to a mathematical device to describe the rates and patterns of missing values and an attempt to capture possible relationships between the missingness and the values of the missing items themselves (Graham, 2009; Schafer & Graham, 2002).

The first type of missing data in Rubin's typology is where data are missing completely at random (MCAR). This is the case if there is no relationship between missing values and either observed or unobserved values, suggesting that a given datum is no more likely to be missing than any other. In longitudinal data, data are considered to be MCAR if the probability of observation being unobserved on any occasion is independent of the particular time, the values of the substantive predictors, and the values of the outcome (Singer & Willett, 2003). MCAR missingness is statistically random, and will therefore not bias nor impact variability among parameter estimates. It is highly implausible in most social science research environments.

Missing at random (MAR) data demonstrate systematic missingness in observed values with a systematic underlying process, that is, where probabilities of missingness depend on observed data but not unobserved data. In longitudinal data, MAR is also called ignorable non-response or non-informative dropout (Diggle & Kenward, 1994). This property implies that MAR data can be analysed using techniques that do not explicitly model missingness (Jansen et al., 2006). While data is assumed to be MAR by almost all procedures that deal with missing data, the plausibility of MAR is not generally high; it is known to hold where there is planned missingness or latent variables, which are missing with a probability of one but depend on existing responses (Schafer & Graham, 2002). Where missingness is not intentionally built into research design, the actual distribution of R is unknown and MAR is an assumption, testable only by obtaining follow up data from non-respondents or by imposing an unverifiable model (Little & Rubin, 1987).

Finally, data missing not at random (MNAR) occurs where missingness is related to unobserved values, a relationship that cannot be determined since, by definition, the values of the missing data are unknown. Under MNAR, there remains a residual dependence between missingness and unobserved values after accounting for known variables (Schafer & Graham,

2002). For observation-level missing data in longitudinal studies, MNAR depends on the unseen responses either during an observation gap or after dropout. It is also differentiated from the other missing data in that it is both non-ignorable and beyond the control of the researcher to prevent (McKnight et al., 2007). The practical implications of MNAR are that the likelihood for the unknown parameters depends explicitly on a model for the missing data matrix R (Schafer & Graham, 2002). MNAR missingness is ubiquitous in longitudinal research in particular, and while it is important to acknowledge that in some cases study conclusions will be adversely affected by MNAR missingness, these impacts are generally not as severe as commonly feared (Collins, Schafer, & Kam, 2001; Schafer & Graham, 2002) and often have only minor impacts on estimates and standard errors. While this does not absolve analysts of the need to understand the pattern, quantity and mechanism of missingness in their data, it does provide encouragement that MNAR missing data do not automatically threaten statistical analyses with incomplete longitudinal data.

In addition to distinguishing between MCAR, MAR and MNAR missing data (and by definition ignorable and non-ignorable missing data mechanisms), it is also possible to distinguish between monotone and non-monotone missingness (Molenberghs, 2007). A pattern of monotonic missingness is one in which all $Y_{j+1}, \dots, Y_k$ are missing for cases where Y_j is missing for all $j = 1, \dots, K-1$ (Little & Rubin, 1987); in other words, where missing data for one varable increases the likelihood of missing data for subsequent questions, variables or observations. In longitudinal analyses, attrition is an example of monotone missing data, and the concept generally distinguishes attrition from intermittent missingness, which is non-monotonic. Both monotonic and non-monotonic missing data are highly common in longitudinal studies. A recent review cautions against ignoring missing data or assuming that the presence of even significant levels of missing data in longitudinal study are fatal to statistical inference (Graham, 2009).

Missing data in longitudinal studies are unique in that observations of the same individual tend to be correlated over time (Schafer & Graham, 2002), which provides more information than is the case in cross sectional data about what a missing value might have been had it been observed. While the reasons for non-response will inevitably vary, many of these reasons tend to be correlated with the missing item itself.[15] Indeed, if analysed properly, the within-person information unique to longitudinal data can be used to address the measurement uncertainty introduced by missingness, through missing data methods.

Rubin's classification system, while useful in understanding the potential implications of missing data, is an oversimplified typology of the data produced by real missingness processes. Often all three of MCAR, MAR and MNAR processes are present in any given dataset. Moreover, pure forms of any given type of missingness cannot be proven to exist because they require untenable assumptions (Graham, 2009; McKnight et al., 2007). Even if it were possible to accurately classify all missing data, knowledge of the reasons for missingness, while providing some indication of the statistical relationships between missing and non-missing data, does not provide a basis for judging its ignorability (McKnight et al., 2007) or the plausibility of data being MAR versus MNAR. Whether data is MNAR or not should not be the issue; what matters for statistical analyses is the degree to which departures from MAR are serious enough to compromise the performance of MAR-based methods by violating their assumptions (Graham, Hofer, Donaldson, MacKinnon, & Schafer, 1997), and whether the violations of these assumptions are big enough to matter to any practical extent (Graham, 2009; Schafer & Graham, 2002).

[15] This correlation will not be to the same degree for all observations, and in many case may even not be in the same direction.

3.2.2 Methods for missing data

Myriad statistical procedures have been developed to deal with missing data. Little and Rubin (1987; 2002) classify missing data methods into four general, non-mutually exclusive categories; (1) procedures based on completely recorded units, or data deletion methods; (2) weighting procedures; (3) imputation-based procedures, or data augmentation methods; and (4) model based procedures. For reviews of methods for missing data, see Afifi and Elashoff (1966), Hartley and Hocking (1971), Rubin (1976), Dempster, Little and Schenker (1977), Schafer (1997), Schafer and Graham (2002), Molenberghs and Verbeke (2001) and Graham (2009). Emphasis in the current study is placed on general uses and implications of these methods for longitudinal data.[16] Over time, widespread testing of different methods and simulations of different missing data scenarios designed to challenge these methods have led to a general consensus that maximum likelihood estimation-based methods (MLE) and multiple imputation (MI) are the most effective missing data methods under MAR. This consensus reflects an understanding that the goal of methods for missing data should not be to estimate, predict, or recover missing data, nor to obtain the same results that would have been seen with complete data (Schafer & Graham, 2002). Attempts to recover missing values may actually further impair inference (Allison, 2002; Graham, 2009), the danger being that some methods that solve the missing data problem inadvertently redefine the parameters of the population. Instead, the goals of missing data methods should be: first, to yield an unbiased parameter estimate over a wide range of parameters (including the mean and variance); second, to incorporate a degree of the uncertainty involved in parameter estimates where some data is missing; and third, to have good

[16] Specific models for longitudinal estimation relevant to the VIDUS structure include methods such as linear mixed models, marginal models and random effects models (see Hogan, Roy, & Korkontzelou, 2004 and), multiple imputation (Lavori, Dawson, & Shera, 1995), and both pattern mixture and selection models to manage MNAR in longitudinal data (Hogan & Laird, 1997; Hogan et al., 2004; Molenberghs & Verbeke, 2001). Rather than outline these in detail, the general framework for missing data methods is outlined and further details are provided about the methods used.

statistical power. General guidelines suggest that good practice is to make both the assumptions of missing data processes and the methods used to manage them explicit, and to investigate the sensitivity of results to departures from these assumptions (Schafer & Graham, 2002). The analyst's task therefore becomes not a search for the "ultimate" model, but to know what different models do to our conclusions given that we have access to only a portion of the data. As such, after only a cursory treatment of other MAR methods, much of this section of the literature review will focus on MI and MLE, followed by a brief description of recent developments in MNAR methods.

The data deletion category of missing data methods typically involves complete case analysis or listwise deletion, wherein any case with at least one missing value is dropped. In the case of longitudinal data, this translates into discarding data from those who do not participate in every data collection follow up. The probability of complete participation decreases as the number of observation points increases, making complete case analysis highly problematic for studies with high numbers of follow ups such as the VIDUS. Complete case analysis also introduces potentially significant bias and error into variance estimates if missing data occur systematically. An alternative method, the available case method or pairwise deletion, discards data only at the variable level. Including different sample sizes for different variables, however, is also problematic; the cases providing data may be dramatically different for different variables and any method requiring a balanced correlation matrix will not be estimable using pairwise deletion (McKnight et al., 2007). Despite being computationally simple, data deletion methods are only valid under MCAR. They may therefore lead to serious biases and compromised efficiency with anything more than small amounts of missing data. It is therefore generally agreed that the drawbacks of data deletion methods significantly surpass their advantages (Beunckens, Molenberghs, Thij, & Verbeke, 2007).

The second category of missing data involves weighting procedures. Derived from estimating the probability of response, weighting procedures weight complete cases so that their distribution more closely resembles that of the full sample and ignores incomplete cases (Little & Rubin, 1987). While weighting is a nonparametric procedure that handles missing values while avoiding the specification of a full parametric model for the population (Ibrahim, 1990; Robins, Rotnitzky, & Zhao, 1995), it does require a model for the probability of participation, the misspecification of which has predictable consequences on subsequent analysis. Although it enjoyed a resurgence in the late 1990s, and while this method is easy to apply for univariate and monotone missing data patterns, implementation is much more complex for non-monotone or arbitrary patterns (Schafer & Graham, 2002). Weighting procedures also assume MAR and are calculated as a modification of design weights that adjust for non-response as if it were a part of the sample design (Little & Rubin, 2002), therefore assuming, in many cases incorrectly, that the sample in question is random.

The third category, imputation-based procedures, or data augmentation techniques, involves the filling in of missing data with some plausible value followed by the analysis of data by standard methods. Three categories of single imputation can be used: constant replacement methods, random value imputation and non-random value imputation (McKnight et al., 2007). Constant replacement methods involve strategies such as unconditional mean substitution, conditional mean substitution, median substitution for non-Gaussian data, or zero imputation methods for binary responses. These methods invariably produce biased estimates of the variance/covariance, and therefore underestimate the size of confidence intervals, overstate sample size and understate variance, increasing the probability of type II errors (Graham, 2009; McKnight et al., 2007).

Random value imputation consists of hot deck imputation, where a random draw is taken from the observed values, or cold deck imputation, which uses values from other datasets to replace missing values. Imputing from unconditional distributions in this way may preserve variance but is highly likely to distort correlations and other methods of association, introducing unpredictable biases (McKnight et al., 2007; Schafer & Graham, 2002). Finally, non-random value imputation involves conditional mean imputation, such as relying on within subject imputation or regression imputation, last value carried forward (LVCF) methods that assume the most recent observation is the best guess for current missing data, next value carried backward (NVCB), or any combination of these. Conditional mean imputation can be nearly optimal if corrections are made to standard errors, but is not recommended for analyses of covariance or correlations because it overstates the strength of the relationship between the variables used to condition and the value selected for imputation. Single imputation is more efficient than case deletion since no data is sacrificed, it makes use of observed data to predict missing values, produces a 'complete' dataset that may be analysed by standard methods and software, and can be replicated in ways that facilitate the comparison of results (Schafer & Graham, 2002). However, imputation can be difficult to implement well, especially in multivariate settings, and ad hoc imputation can cause serious distortions to the distribution of data and relationships between variables. Single imputation also fails to incorporate imputation uncertainty. Further, in simulations it has been shown to suffer from chronic and significant undercoverage (Schafer & Graham, 2002) and may artificially inflate information content (Beunckens et al., 2007; McKnight et al., 2007). Finally, most single imputation methods generally require MCAR assumptions to hold (Beunckens et al., 2007).

Multiple imputation is a special case that also falls into the category of data augmentation procedures. Multiple imputation is a process by which each missing value is replaced by multiple

simulated values, producing multiple plausible alternative versions of the complete data. These multiple data sets are then used in complete case analysis to test statistical models, producing multiple parameter estimates. These estimates are combined by simple arithmetic to produce overall estimates and standard errors that account for both missing data uncertainty as well as finite sample variation (for reviews, see Graham, Cumsille, & Elek-Fisk, 2003; Rubin, 1996a; Schafer, 1997). In addition to retaining the advantages of single imputation from conditional distribution, it considers the level of uncertainty introduced into parameter estimation resulting from the missing data while still providing generalizeable estimates. Introduced by Rubin (1987), MI is consistently identified (often with MLE) as the most effective method for addressing missing data problems (Allison, 2002; McKnight et al., 2007; Rubin, 1996b; Schafer & Graham, 2002).

MI restores the error variance lost from single imputation by adding random error variance, preserving important characteristics of the data set as a whole. Because longitudinal observations are usually correlated, the added advantage is the possibility to use both sample characteristics and individual observations from other time periods to impute values. The viability of MI depends on how the imputations are created and how that procedure relates to the model used to subsequently analyse the data (Rubin, 1996b). Schafer and Graham (2002) suggest that MI is likely to be robust in many situations because the model for missingness is applied not to the entire dataset, but only the conditional distribution of the missing data. Finally, while MI generally requires distributional assumptions that may only be valid under MAR, Schafer and Graham (2002) have noted that there is nothing in MI theory that requires data to be MAR, and MNAR applications of MI models have been explored showing generally satisfactory approaches

to inference for means and regression patterns (Glynn, Laird, & Rubin, 1993; Verbeke & Molenberghs, 2000).[17]

The final type of missing data methods is the general class of model-based procedures. In model-based procedures a model is defined for the observed data and inferences from the model are drawn based on the likelihood or posterior distribution (Little & Rubin, 2002). The ability to compute maximum likelihood estimates for missing data problems was facilitated by the development of the expectation maximization (EM) algorithm by Dempster, Laird and Rubin (1977). The EM algorithm is an iterative computation of maximum likelihood estimates comprised of an expectation step and a maximization step. In the expectation step, individual cases are read into the model, and if a value is present, sums, sums of squares and sums of cross products are implemented. If a value is missing, the model imputes a current best guess for the value based on a regression-based single imputation with all the other variables as predictors. This step includes the incorporation of a correction factor that is the conceptual equivalent to adding a random residual error term in multiple imputation (Graham, 2009). In the maximization step, parameters, including the variance, covariance and mean, are estimated based on the current values of the sums, sums of squares and sums of cross-products. The covariance matrix from this estimation is then used to generate new regression equations for each variable as predicted by all other variables; the equations from these estimates are then used to update the best guess for the expectation step of the next iteration. These two steps are repeated until the EM algorithm converges and the elements of the covariance matrix stop changing (Graham, 2009). The idea behind the use of EM is to solve a difficult incomplete data problem by iteratively solving a complete data problem (Graham & Donaldson, 1993; for reviews see Little & Rubin, 1987; McLachlan & Krishnan, 2008; Schafer, 1997; Schafer & Graham, 2002).

[17] Discussions of MNAR missing data methods will be further expanded below.

The EM algorithm fills in missing data with a best guess of what it might be under the current estimates of known parameters, and then re-estimates these parameters from the observed and filled in data. The EM algorithm is broadly applicable, and examples have demonstrated its appropriate use in applications including grouped, censored or truncated data. Additionally, EM has been used in a range of applications, such as multilevel linear models for unbalanced repeated measures data, latent class analysis, finite mixture models and factor analysis (Dempster et al., 1977; Little & Rubin, 1987; Schafer & Graham, 2002). The advantages of the EM process are that when the underlying complete data come from an exponential family whose MLE estimates are easily computed, then each maximization step of the algorithm is also easily computed (Dempster et al., 1977). Further, because EM procedures rely on maximum likelihood, the parameter estimates produced in the process have been shown to be unbiased and efficient, provided that the model for the complete data is a reliable one (Little & Rubin, 1987; Schafer & Graham, 2002). Further advantages of model based procedures include the ability to test model assumptions underlying the resulting methods and the availability of estimates of variance that take into account incompleteness in the data (Little & Rubin, 1987). Likelihood ratio tests and other post-estimation diagnostics may also be used to compare model specifications.

These advantages notwithstanding, the appropriateness of MLE techniques rests on a number of assumptions. They assume that the sample is large enough for estimates to be approximately unbiased and normally distributed, and because MLE provides a likelihood for the observed data and ignores the missing data mechanism, MLE, like most methods, is generally valid only if the missing data are MAR. Simulations of ML estimates using the EM algorithm demonstrate that even with large sample sizes, both estimates and coverage are significantly biased if MAR assumptions are violated (Schafer & Graham, 2002). Further, recent developments in software used for multiple imputation combine MLE with advantageous features

of multiple imputation methods (Carpenter, Goldstein, & Kenward, 2011; Honaker, King, & Blackwell, 2011; StataCorp, 2011). For example, methods may use the procedures of MI and employ, in either Bayesian or MLE frameworks, the EM or similar algorithms in the construction of models that estimate missing data values in the implementation of models that create multiple "complete" imputed datasets. They therefore combine the desire to account for variance in imputation estimates of MI with the broad applicability of the EM algorithms in the construction of models for missing data. These, like most methods rely on MAR assumptions. It is therefore to methods for data that are MNAR that I turn next.

3.2.3 Methods for data missing not at random

A notable development in the missing data field in the 1990s was the emergence of modelling for non-ignorable missingness, where the probabilities of non-response were permitted to depend on the missing values themselves. These applications focused on dropout in clinical trials, where participants' departure from a study may be inextricably related to the outcomes of interest such as treatment effects. For example, in Hedeker and Gibbons' (1997) analysis of patients with mental illness, participants were shown to "attrite" both if they were doing well and no longer needed treatment, or if they were doing poorly and therefore sought out alternative treatment. Both processes clearly violate the assumptions of MAR missingness.

General consensus among missing data experts is that in the absence of a plausible assumption of missingness at random, it is necessary to explicitly model missingness in addition to the complete data (Molenberghs, 2007; Schafer & Graham, 2002; Singer & Willett, 2003).[18] Of relevance for discrete longitudinal data like that of the VIDUS are models that have been put forward for categorical data (Conaway, 1992; Stasny, 1986), intermittent missingness modeled

[18] For reviews of models that jointly model distributions for longitudinal studies with dropout, see Little (1993) and Verbeke and Molenberghs (Verbeke & Molenberghs, 2000; Ch. 18).

for repeated categorical outcomes (Baker, 1995) and binary outcomes both without (Baker, Rosenberger, & Dersimonian, 1992) and with covariates (Jansen et al., 2006). Methods that do not assume MAR take one of two routes – pattern mixture models or selection models.

Generally, pattern mixture models identify the number of missingness patterns and then fit a model that is stratified by these patterns. Pattern mixture models using both MLE methods, such as the random coefficients model used by Hedeker and Gibbons (1997), or MI, such as one that imputes for pattern-specific identifiable densities (Beunckens et al., 2007) are reliant on identifying restrictions. These restrictions impose strong assumptions about which the observed data provide no evidence to either support or contradict (Schafer & Graham, 2002) because a proportion of the complete data is hidden for every group. Pattern mixture models avoid the need to formulate hypotheses about the mechanisms of missingness by describing observed responses in each missing data pattern group, and extrapolating participation-specific information through a model for each pattern of missingness. Pattern mixture models, as opposed to selection models, are therefore by construction under-identified and over-specified (Beunckens et al., 2007).

Selection models, conversely, build a statistical model for the complete data (i.e. a measurement model) and another one to represent missingness (Beunckens et al., 2007; Singer & Willett, 2003). While substantive interest usually pertains to the complete data rather than the missing data, the model for missing data contributes information about the unknown parameters of the complete data population (Schafer & Graham, 2002). Applications of selection models, for example, allow the probability of dropout at a given time to follow a logistic regression on previous and current responses (Diggle & Kenward, 1994). Selection models have the intuitive appeal of considering how a participant's responses may influence processes related to missingness, but like pattern-mixture models, they rely on untestable assumptions about the population distribution; deviations from which may alter conclusions (Diggle & Kenward, 1994;

Kenward & Molenberghs, 1998; Little & Rubin, 1987). One formulation of a selection modelling approach is to conduct a survival analysis of time to dropout or a logistic regression for the probability of dropout at occasion *j* given that a subject is still in the study (Beunckens et al., 2007). This is a key feature of the strategy to explore missing data patterns employed here.

Because both pattern-mixture models and selection models rely on unverifiable assumptions, extreme caution must be used when interpreting evidence for or against MNAR using only the data under study (Beunckens et al., 2007; Diggle & Kenward, 1994; Jansen et al., 2006; Molenberghs & Verbeke, 2001). It is for this reason that that MNAR methods have been deemed more appropriate for sensitivity analysis, where the sensitivity of results to alternative hypotheses about the distribution of missingness are assessed (Beunckens et al., 2007; Little, 1993; Schafer & Graham, 2002; Verbeke & Molenberghs, 2000). These tests consider several statistical models simultaneously to determine the extent to which conclusions or inferences are stable across a range of MNAR models, providing a basic indication of the level of confidence that one can have in results. These may take the form of variations in a basic model, such as estimating different dependencies of the missing data process on outcomes or covariates of interest; changes in the distributional assumptions of the models; or identifying observations that exert high levels of influence on model results (Beunckens et al., 2007; Van Steen, Molenberghs, Verbeke, & Thijs, 2001). Whatever form sensitivity analyses take, the use of MNAR methods should be limited. The unavoidable inclusion of unverifiable assumptions makes them based, at least to a degree, on conjecture about the process that produces missingness and the relationship between these causes of missingness and the patterns of missingness produced. Fortunately,

simulations done by Collins et al. (2001) suggest that the biasing effects of MNAR attrition alone may be insufficient to compromise the validity of conclusions of substantive analyses.[19]

The previous section provides a general overview of the types of missing data, their potential impacts on parameter estimation, and possible methods for managing missing data, particularly when dealing with longitudinal data. Considerable work compares these methods. MI and MLE, occasionally complemented with pattern-mixture or selection model sensitivity analyses, have emerged as the most frequently recommended strategies (Graham, 2009; Molenberghs, 2007). When directly compared, the results of MI and MLE methods are similar, especially with larger sample sizes (Graham & Schafer, 1999). The validity of inferences depends on the relationship between the dropout process and the measurement process, and in the case of MNAR in longitudinal studies, the assessment of these relationship relies on unverifiable assumptions. Any understanding of relationships between processes of missingness and primary substantive research interests will therefore prove invaluable in dealing with missing data.

It is also important to note that whatever the method chosen, Graham (2009) cautions against using generic statements about the degree to which attrition plagues longitudinal research or unqualified fears of the impacts of missing data and attrition. Rather, he suggests, it is more important to be precise about the amount and type of missing data, to assess the degree to which estimates may be biased and in what way, and to draw conclusions in light of these facts. Rather than treat missing data as an impediment to analysis, it is more constructively viewed as a means to better understanding the structure of a given data set and its relationship to substantive questions of interest. This understanding can only increase confidence in research conclusions.

[19] These simulations demonstrate that a regression coefficient is only biased to a practical degree when there is 50% missing data on the dependent variable and the correlation between the dependent variable and true cause of missingness was 0.90. When the true cause of missingness is the response variable itself, failure to account for MNAR in certain scenarios may therefore introduce bias into parameter estimates, but in other cases where the true cause is an unmeasured variable that is not highly correlated with the response variable, failing to account for the cause of missingness appears capable of introducing only minor bias.

3.3 Modelling missing data in the VIDUS

The remainder of this chapter explores missing data in the VIDUS. In the first section, diagnostic tools examine the type, extent and structure of missing data. This diagnostic information is used to assess important considerations in the selection of the method used for missing data in subsequent analyses. Methods resembling selection models are subsequently employed to explore the relationship between substantive information contained in the data and the structure of the data produced by different participation patterns. Four hypotheses are developed using information from descriptive statistics about the potential underlying processes that produce missing data. The two different kinds of occasion non-response identified in the VIDUS – intermittent non-response and attrition – are then explored in detail using these four hypotheses as guidelines for statistical testing. Because the two kinds of occasion non-response have potentially different impacts on statistical inference and may be characterized by different underlying mechanisms, these tests are separated by missing data type.

First, predictors of intermittent non-response are modeled with a pooled discrete time event history analysis that controls for repeated events (in the event that there is more than one observation gap) and time varying covariates. This analysis is decomposed with wave-by-wave analyses predicting intermittent non-response using logistic regression to assess changes in the associations between variables and observation gaps over time. In a second set of analyses, competing risks event history analyses examine predictors of how individual study participation end. Here, the three possible end states of study participation of (1) right hand censorship, (2) attrition and (3) death are compared across the four guiding hypotheses. Death is included because the analytical decision of whether or not to treat death as having an impact on analyses similar to that of missing data warrants further exploration. Finally, conclusions are made assessing possible implications for analyses using the VIDUS data.

3.3.1 Missing data diagnostics

The first stage in determining the potential impacts of and appropriate procedures to address missing data is ascertaining the degree to which missing data are ignorable or non-ignorable. This is determined by the level of certainty one can have in a plausible assumption of MAR. There is no statistical test to differentiate between MAR and MNAR data; rather, it is necessary to rely on logic and what is known about the study design. Circumstances where missing data are not ignorable include sample surveys that do not have intensive follow up of non-respondents and thereby cannot understand the process of missingness, studies where missing data is intentional, and observational studies where it is beyond the control of the researcher to prevent data relevant to the substantive question of interest from being missing (Schafer, 1997). In the case of the VIDUS, while there is considerable pro-active follow up with participants over time, including tracing participants in other locations including hotels, prison, apartments and shelters (Tyndall et al., 2001), missing data is not intentional, nor do researchers have control over it. As such, it is not feasible to assume missing data is ignorable. A range of procedures are therefore undertaken to increase understanding of the missing data structure and its potential impact on inference.

The first missing data diagnostic procedure is the creation of a missing data matrix, R, that codes data 1 for missing values and 0 for nonmissing values (McKnight et al., 2007). The missing data matrix for the VIDUS is displayed visually in Figure 3.1. Divided into five large columns to fit the entire matrix on a single page, the range of identification numbers for those participants contained in each large column are listed across the top. Within the five columns, each horizontal row contains the information that a single VIDUS participant contributes to the missing data matrix over the 18 data collection points; each vertical, smaller sub-column within these larger columns represents a single data collection period.

The missing data matrix visually reveals a number of characteristics of the VIDUS data. These include the prospective recruitment format, indicated by the dark grey blocks indicating participation had not yet commenced for approximately one third of participants. Second, there are a number of individuals who leave the study and do not return (i.e. attrition), indicated by a white line for a single individual's horizontal row from a given time point to the right hand edge of the large column (or end of the study period). Third, there are observation gaps indicated by white blocks surrounded on either side by light grey blocks (i.e. intermittent non-response). And finally, there is considerable mortality in the study, indicated by a black line that extends from the observation marking the point of death to the right hand edge of each column.

The missing data matrix is used to determine the amount of missing data, which can refer to the total cases with some missing data, the total number of missing occasions, or the total number of missing observations for a variable. Because there is virtually no variable level missing data, in the VIDUS the amount of missing data primarily refers to number of missing occasions. The diagnostics in the following section refer to the 1,599 VIDUS participants who contributed data to any of the six-month collection periods from the baseline collection period (June to November 1996) to follow up 17 (December 2004-May 2005). The levels of observed cases, death, attrition and intermittent missingness are displayed in Figure 3.2. Of a total of 22,624 possible observed cases[20], there are 14,996 (66.3%) completed observations and 7,470 (33.0%) missing observations, including both observation gaps and observations missing because of attrition.

[20] An observation was considered possible if an individual had not died prior to or during the wave in question. Some participants contribute observational data in the six month wave in which they die and some do not. It is assumed that an individual who died and did not contribute data is not missing, but simply deceased before they were able to participate.

Figure 3.1 Vancouver Injection Drug Users Study Missing Data Matrix

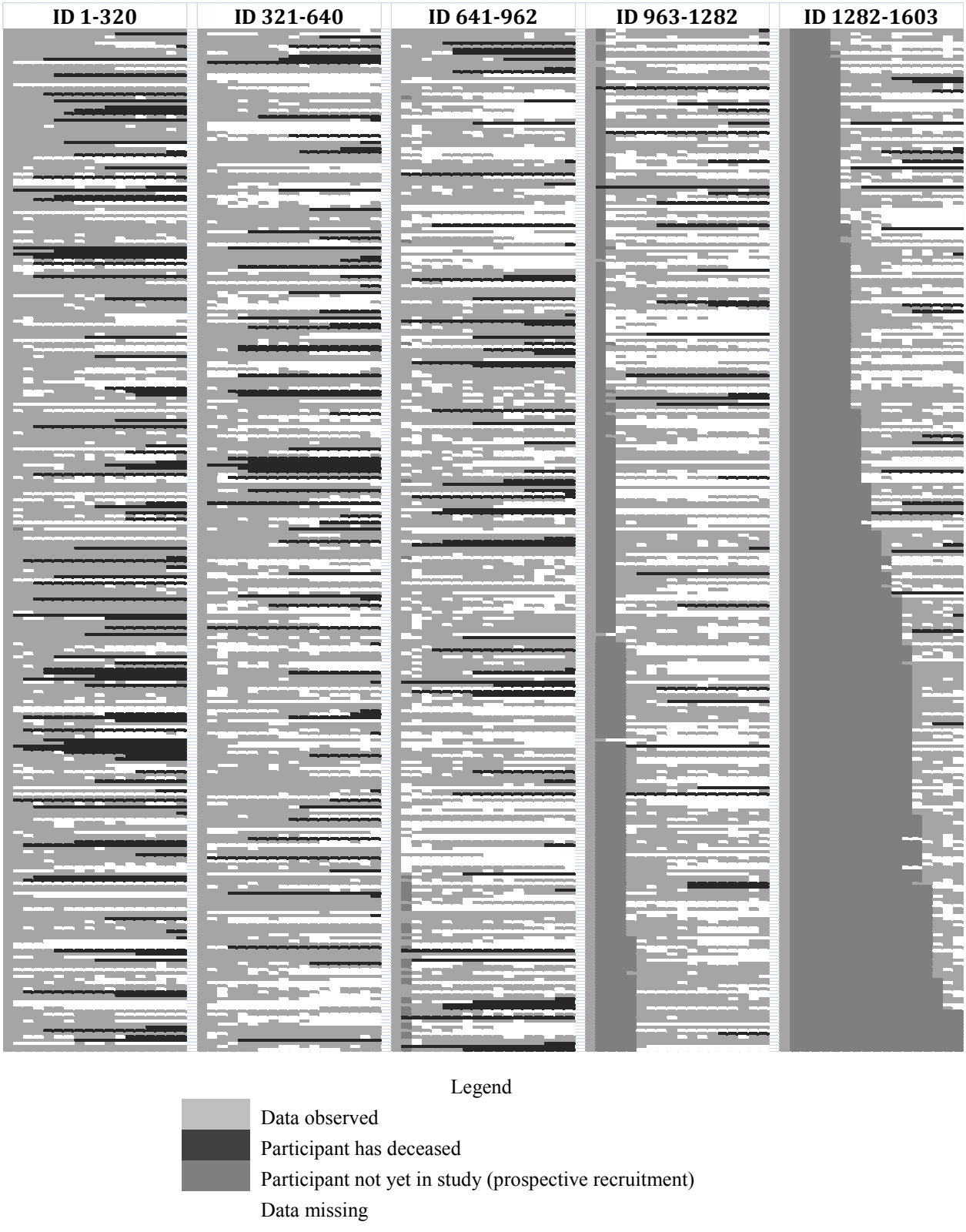
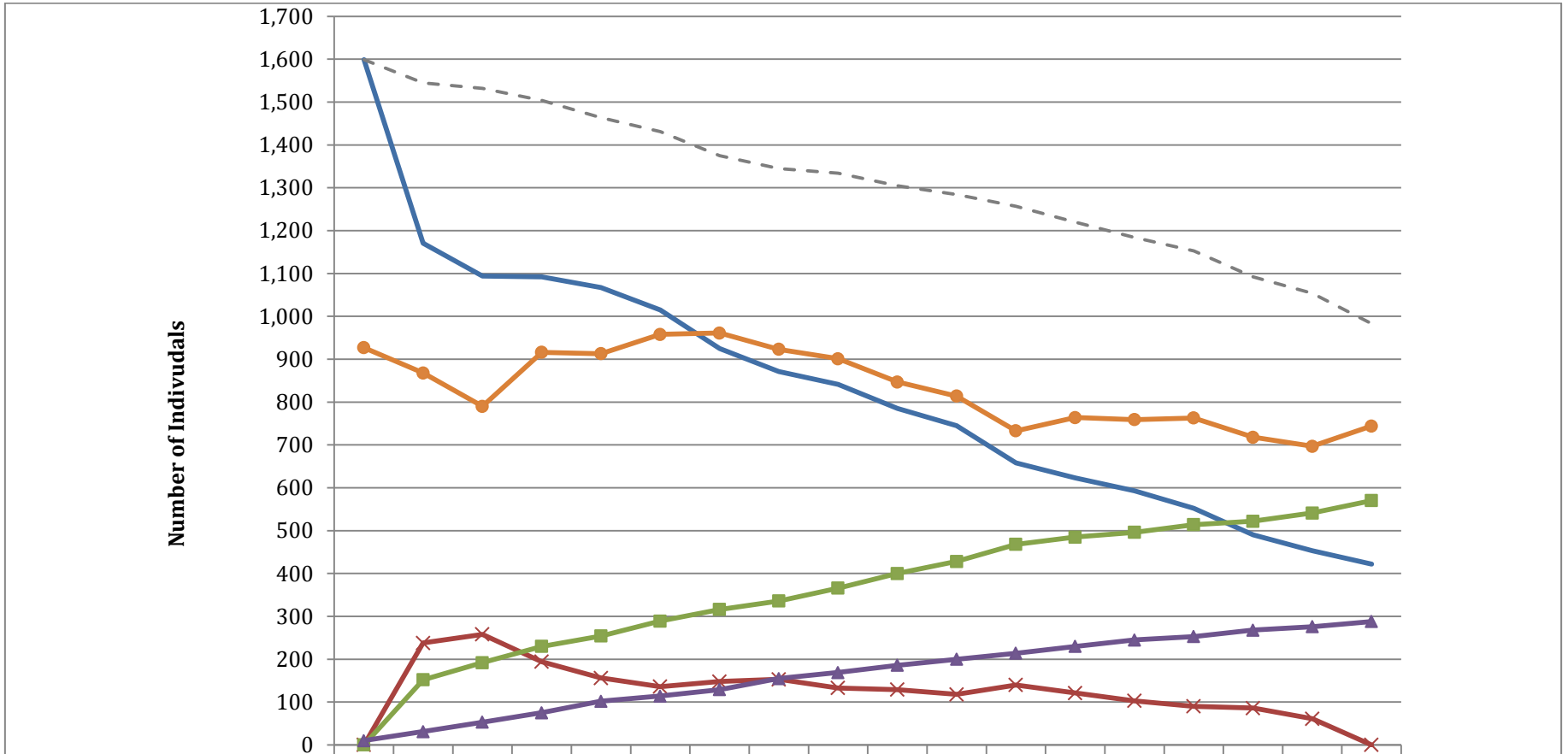


Figure 3.2 Patterns of participation and non-participation in the VIDUS: Survey Timescale



	Base-line	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7	Wave 8	Wave 9	Wave 10	Wave 11	Wave 12	Wave 13	Wave 14	Wave 15	Wave 16	Wave 17
Participants	1,599	1,171	1,094	1,092	1,067	1,015	925	871	841	785	745	658	623	593	552	490	453	422
Missing - This wave	0	238	258	194	156	136	148	153	133	129	118	140	121	103	90	86	61	0
Attrited - Cumulative	0	152	192	230	254	289	316	336	366	400	428	468	485	496	514	522	541	570
Death - Cumulative	10	31	53	75	102	114	129	155	169	186	200	214	230	245	253	268	276	288
Max. Obs Possible	1,599	1,545	1,532	1,504	1,464	1,431	1,375	1,345	1,334	1,305	1,284	1,257	1,220	1,184	1,153	1,092	1,054	983
Real time participation	927	868	790	916	913	958	961	923	901	847	814	733	764	759	763	718	697	744

Figure 3.2 uses the survey participation time scale, or the amount of time an individual has been observed rather than the chronological time in which the study is conducted. Given the prospective recruitment of VIDUS, participation patterns are usefully viewed in terms of the number of possible points of participation. A line denoting participation over calendric time is provided for comparison. The survey participation time scale is used in subsequent discussion and analyses. A total of 288 individuals experience mortality between baseline and follow up 17, a high but not unexpected level given the magnitude of HIV infection, vulnerability and drug use in this population. Of these 288, 130 contribute data during the follow up period in which they die[21] and 158 (the remaining 0.7% of observations from the above calculations of proportions of observed and missing data) die before contributing an observation in that follow up period. An average of 833.1 (SD = 305.5) complete cases are observed per wave. A mean of 125.8 (SD = 67.1) individuals miss an observation at each follow up but later return to the study; a mean of 31.7 (SD = 32.1) participants attrite at each follow up, and an average of 16.0 (SD = 5.6) individuals lose their lives at each follow up.[22] While the average levels of study participation across these four categories gives a general sense of overall levels of participation, these averages do not provide information about changes in the levels of study participation observed in Figure 3.2.

After the initial baseline interview, there is a spike in both the number of missing observations and attrition. After this initial decrease in participation, there is a steady rise in the cumulative number of individuals who have attrited, and a steady decrease in the number of missing observations per follow up. The cumulative number of individuals that die over the course of their participation in the VIDUS increases linearly, with no perceptible peaks or troughs. Finally, the number of possible observations per follow up is roughly parallel to the

[21] These are included in the total number of observations.

[22] Across follow-ups, the median number of participants with missing information is 131 (interquartile range (IQR): 90-153); the median number who attrite is 27.5 (IQR: 18-35) and the median number who die is 15 (IQR:12-21). While the per wave distribution of those with missing information and those that die is approximately normally distributed, attrition is not normally distributed across waves. This is dealt with in detail subsequently.

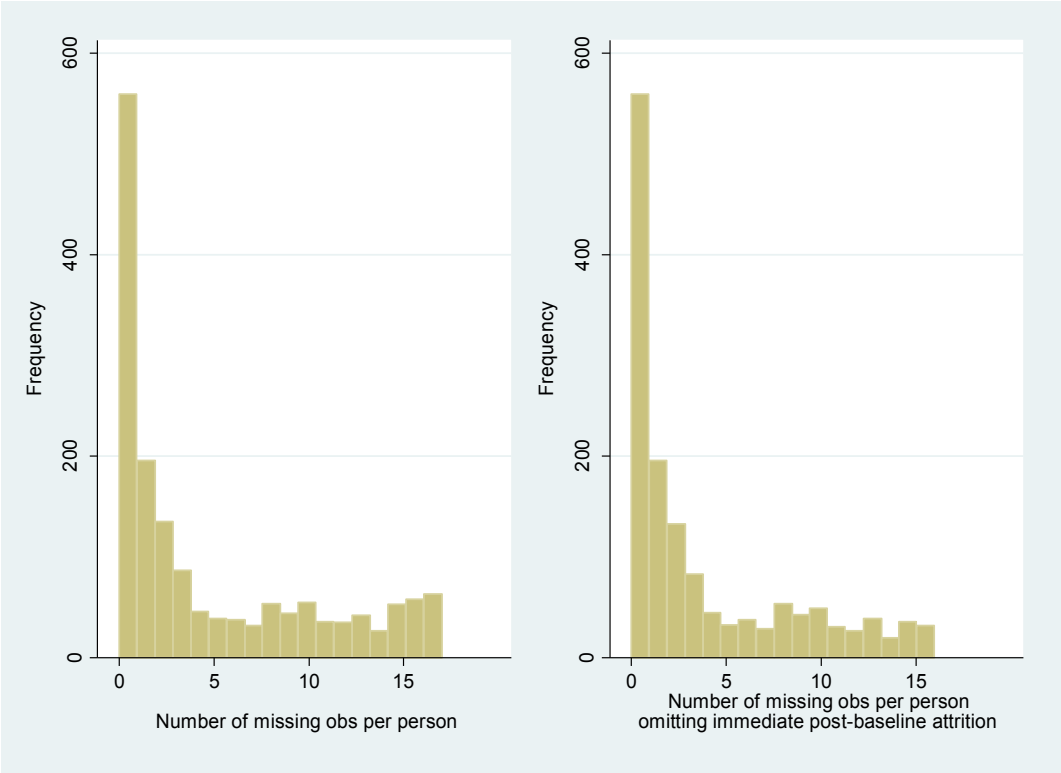
number of actual observations after the initial post-baseline drop in participation. When viewed in comparison to other longitudinal studies (Côté, Godin, Mercure, Noël, & Alary, 2006; Fuller et al., 2003a; Hammer, 1992), the levels of participation and study retention in the VIDUS are quite good and significantly higher than those of other studies of IDU.

Looking at individual levels of non-response, 559 (35.0%) participants have no missing observations, while 1,040 (65.0%) have at least one missing observation over the nine year, 18 data point study period. The mean number of missing observations per person is 4.67 (standard deviation [SD]: 5.77) and the median number of completed observations per person is two (IQR: 0-9). If those individuals that attrite directly after their baseline observation are excluded from these calculations, the mean number of missing observations per person is 3.66 (SD: 4.73) and the median number of missing observations is one (IQR: 0-6). The distribution of missing observations per individual is displayed in Figure 3.3; 1,062 of 1,599 participants, or 66.4% have five or fewer missing observations. If those individuals that attrite directly after baseline are excluded, 1,062 out of 1,447 or 72.5% of all participants have five or fewer missing observations. A considerable proportion of the VIDUS sample maintains relatively stable participation for the majority of the study period.

Another useful diagnostic tool for assessing occasion non-response is determining the degree of similarity of missing data patterns across individuals. Following the method outlined in McKnight et al. (2007), the heterogeneity of missing data patterns is determined; a missing data matrix is considered "clean" if there are fewer patterns, and "messy" if there are many patterns. An index of "messiness" is given by the ratio of missing data patterns to the number of participants with missing data. The higher the value, the more messy the missingness. A value of 1 indicates that each individual with missing data has a unique pattern of missingness. The number of missing data patterns is determined by giving each missing occasion a wave-specific identifier, $2^t;\ t = 1, \ldots, t$ where t is the wave number between 0 and 17. The wave-specific identifier is therefore 0 if data is not missing, and 2^t

where data is missing. These identifiers are summed across all waves, providing a unique missing data pattern identifier for each pattern of missing data.[23] Identifying the number of missing data patterns is also used in the development of pattern mixture models for NMAR.

Figure 3.3 Number of observations missing per person in the VIDUS, exclusive of observations missing because of death

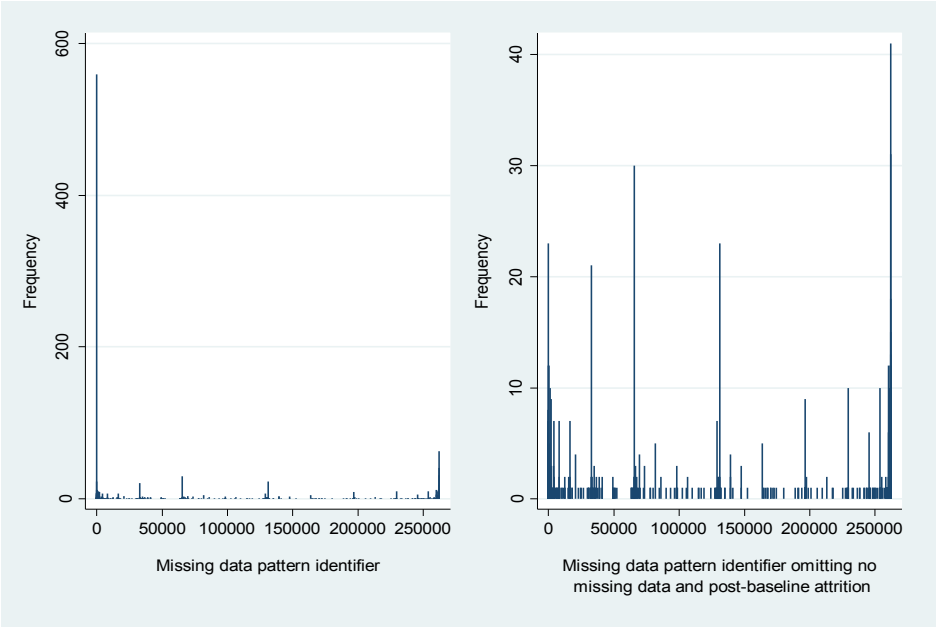


In the VIDUS, missing data pattern identifiers demonstrate 464 unique missing data patterns among the 1,040 individuals with at least one missing observation, giving a missing data pattern index of .446; nearly 45% of all individuals with missing data have a unique participation pattern. Data can be sorted by pattern identifier to determine the frequency of each missing data pattern, revealing further systematic missingness. Figure 3.4 displays spikeplots (1) of all possible patterns of missing data, and (2) of patterns of missing data excluding the two most common patterns of having no missing data at all and attrition directly after baseline interview. Excluding these two patterns, no greater than 40 people, or just under 2.5% of the study population, exhibit the same missing data pattern. While McKnight et al.

[23] Note that the size of the missing pattern identifier is unrelated to the quantity of missing data, and large identifiers may simply refer to a preponderance of missing data in later follow up periods.

(2007) do not develop a standard metric for assessing the meaning of the missing data pattern index, the high number of missing data patterns suggests that both pattern mixture models and MLE missing data methods will be highly complex, computationally intensive and statistically unfeasible (due to small pattern-specific sub-sample sizes) in this instance.

Figure 3.4 Spikeplot of missing data pattern frequencies in the VIDUS, including and excluding no missing data and immediate post-baseline attrition patterns



Information on patterns of missingness can also be garnered from statistical tests of homogeneity for contingency tables that examine individual characteristics across different participation patterns (Graham, 2009; McKnight et al., 2007). While exploring potentially systematic variation in these characteristics cannot indicate the degree to which missingness is MNAR, it does provide knowledge about systematic variation in missingness. Moreover, it can identify variables that may informatively comprise models to predict missingness. As a way of conducting a first exploratory step in this process, the two most common missing data patterns that have been identified thus far, that of there being no missing data and that of attrition directly after the baseline observation, are analysed in greater detail. Tables 3.1 and 3.2 display results from tests of difference for the missing data patterns of no missing data and attrition directly after baseline. Cross tabulations across select characteristics at baseline,

along with odds ratios from bivariate logistic regressions comparing the subsample of those who report a characteristic or behaviour with those who do not are displayed for both patterns.

Table 3.1 Cross tabulation and bivariate logistic regression comparing VIDUS participants with and without no missing data across baseline characteristics

Characteristic		Complete data n=559 n(%)	Incomplete data n=1,040 n(%)	Odds Ratio (95% CI*)	p-value
Female gender	Yes	210 (37.6)	371 (35.7)	1.09 (0.88 - 1.34)	0.453
	No	349 (62.4)	669 (64.3)		
Aboriginal ancestry	Yes	194 (34.7)	238 (22.9)	1.79 (1.43 - 2.25)	<0.001
	No	365 (65.3)	802 (77.1)		
Married/common law	Yes	148 (26.5)	232 (22.3)	1.25 (0.99 - 1.59)	0.062
	No	411 (73.5)	808 (77.7)		
Employment‡	Yes	24 (4.3)	65 (6.3)	0.67 (0.42 - 1.09)	0.104
	No	535 (95.7)	975 (93.7)		
DTES† residency‡	Yes	389 (69.6)	530 (51.0)	2.20 (1.77 -2.74)	<0.001
	No	170 (30.4)	510 (49.0)		
Unstable housing‡	Yes	380 (68.0)	614 (59.0)	1.47 (1.19 - 1.83)	<0.001
	No	179 (32.0)	426 (41.0)		
Treatment enrolment‡	Yes	119 (21.3)	204 (19.6)	1.11 (0.86 - 1.43)	0.427
	No	440 (78.7)	836 (80.4)		
HIV seropositive	Yes	155 (27.7)	167 (16.1)	2.01 (1.56 - 2.57)	<0.001
	No	404 (72.3)	873 (83.9)		
Recent incarceration‡	Yes	152 (27.2)	383 (36.8)	0.64 (0.51 - 0.80)	<0.001
	No	407 (72.8)	657 (63.2)		
Sex trade involvement‡	Yes	149 (26.7)	309 (29.7)	0.86 (0.68 - 1.08)	0.197
	No	410 (73.3)	731 (70.3)		
Frequent Injection‡	Yes	316 (56.5)	601 (57.8)	0.95 (0.77 - 1.17)	0.627
	No	243 (43.0)	439 (42.2)		
Shooting gallery use‡	Yes	161 (28.8)	306 (29.0)	0.97 (0.77 -1.22)	0.794
	No	398 (71.2)	734 (70.6)		
Injects with others‡	Yes	391 (69.9)	712 (68.5)	1.07 (0.86 - 1.34)	0.541
	No	168 (30.1)	328 (31.5)		
Injects publicly‡	Yes	114 (20.4)	269 (25.9)	0.73 (0.57 - 0.94)	0.015
	No	445 (79.6)	771 (74.1)		

* CI = confidence interval; † DTES = Downtown Eastside; ‡ denotes activities or events in the six months prior to interview

Table 3.2 Cross tabulation and bivariate logistic regression comparing baseline characteristics of VIDUS participants that "attrite" immediately after baseline with those that do not

Characteristic		Attrite after baseline: Yes n=152 n(%)	Attrite after baseline: No n=1447 n(%)	Odds Ratio (95% CI*)	p-value
Female gender	Yes	48 (31.6)	533 (36.8)	0.79 (0.55 - 1.13)	0.200
	No	104 (68.4)	914 (63.2)		
Aboriginal ancestry	Yes	26 (17.1)	406 (28.1)	0.53 (0.34 - 0.82)	0.004
	No	126 (82.9)	1041 (71.9)		
Married/common law	Yes	28 (18.4)	352 (24.3)	0.70 (0.46 - 1.08)	0.104
	No	124 (81.6)	1095 (75.7)		
Employment‡	Yes	16 (10.5)	73 (5.0)	2.21 (1.25 - 3.91)	0.005
	No	136 (89.5)	1374 (95.0)		
DTES† residency‡	Yes	62 (40.8)	857 (59.2)	0.47 (0.34 - 0.67)	<0.001
	No	90 (59.2)	590 (40.8)		
Unstable housing‡	Yes	94 (61.8)	900 (62.2)	0.99 (0.70 - 1.39)	0.931
	No	58 (38.2)	547 (37.8)		
Treatment enrolment‡	Yes	19 (12.5)	304 (21.0)	0.54 (0.33 - 0.88)	0.013
	No	133 (87.5)	1143 (79.0)		
HIV seropositive	Yes	8 (5.3)	314 (21.7)	0.20 (0.71 - 1.43)	<0.001
	No	144 (94.7)	1133 (78.3)		
Recent incarceration‡	Yes	51 (33.5)	484 (33.5)	1.00 (0.49 - 1.07)	0.979
	No	101 (66.5)	963 (66.5)		
Sex trade involvement‡	Yes	35 (23.0)	423 (29.2)	0.72 (0.55 - 1.07)	0.107
	No	117 (77.0)	1024 (70.8)		
Frequent Injection‡	Yes	78 (51.3)	839 (58.0)	0.76 (0.55 - 1.07)	0.114
	No	74 (48.7)	608 (42.0)		
Shooting gallery use‡	Yes	37 (24.3)	430 (29.7)	0.76 (0.52 - 1.12)	0.166
	No	115 (75.7)	1017 (70.3)		
Injects with others‡	Yes	110 (72.4)	993 (68.6)	1.20 (0.83 - 1.74)	0.343
	No	42 (27.6)	454 (31.4)		
Injects publicly‡	Yes	39 (25.7)	344 (23.8)	1.11 (0.75 - 1.62)	0.605
	No	113 (74.3)	1103 (76.2)		

* CI = confidence interval; † DTES = Downtown Eastside; ‡ denotes activities or events in the six months prior to interview

The systematic differences between those who have no missing data and those who do, as well as between those who drop out of the study directly after recruitment and those

who do not, provide preliminary indications of some of the substantive mechanisms underlying missingness in the VIDUS. There may be key demographic differences that alter the composition of the VIDUS sample over time, for example, the increased likelihood of complete participation of those respondents who are of Aboriginal ancestry. Those who are employed may be more likely to attrite, while those who live in the DTES, where the storefront study office is located, may be more likely to maintain participation. This suggests that factors related to both socio-economic circumstances and propinquity may influence participation levels. Additionally, the practice of injecting publicly, as an indicator of high-risk drug use, along with the potentially elevated injection risk and rushing of injections associated with public injection (McKnight et al., 2007; Small et al., 2007), may be a preliminary indication that VIDUS participants faced with high levels of risk or disruption may be less likely to participate. Finally, those who are likely to be engaged in systems of care, such as those who are HIV seropositive or those enrolled in addiction treatment appear to have higher participation. This may indicate that regular contact with care professionals reduces the probability of missingness.

In summary, preliminary analyses reveal that there is systematic variation between patterns of missingness at baseline and that socio-economic factors, the experience of major life interruptions, engagement in high-risk behaviour, and contact with systems of care may each play a role in processes of missingness. These results enable the formulation of four plausible hypotheses about the substantive reasons for which any given observation may not be observed:

> **Missing data hypothesis 1: Demography**
> *That there are systematic differences in study participation across demographic groups*.
>
> **Missing data hypothesis 2: Socio-economic context**
> *That an individual's participation is influenced by factors related to socio-economic context, such as holding a job or living in close proximity to the study office*.

Missing data hypothesis 3: Disruption and Risk
That recent life disruptions, relative levels of drug use and risk-taking behaviour may negatively impact an individual's study participation.

Missing data hypothesis 4: Contact with systems of care
That regular interaction with a system of care such as that involved in the treatment of HIV/AIDS or addiction will positively impact study participation by connecting them with mainstream institutions and professionals that may encourage them to continue participation.

Before proceeding to test the above it is important to note that, while preliminary descriptive analyses provide sufficient information about missing data to formulate hypotheses about the substantive mechanisms that create of missingness, they have a number of limitations. First, statistical tests of difference are conducted using baseline data, and while an important first step in providing guidance to analyses of missing data, it may be additionally informative to consider differences in participation dynamics over time. This is particularly the case when taking time-varying characteristics into account, due to potentially considerable variation in study participation depending on an individual's location, relative levels of vulnerability, drug consumption and interaction with systems of care. Second, these descriptive statistics deal with only the two most common *patterns* of missing data, and do not examine the two different *types* of missing data in the VIDUS – intermittent non-response and attrition – more broadly. Third, more nuanced and robust information about missing data may be gleaned from multivariate analyses. Finally, it may be necessary to consider the impact of other changes to the VIDUS sample composition, such as death. The following two sections address these limitations and further test the preliminary hypotheses produced by these diagnostic procedures about potential underlying mechanisms of missingness.

3.3.2 Modelling Occasion Non-Response in the VIDUS

The two types of observation-level missing data in the VIDUS – intermittent non-response and attrition – are characteristically different. Intermittent non-response may occur at any point in the study, while attrition is among the possible participation outcomes at the

point of departure from the study: (1) right hand censorship, where an individual participates until the last possible observation, (2) attrition, where participation permanently ceases before the last possible observation point, or (3) death. This distinction is a potentially important one when determining how to model underlying missingness processes: a participant with any one of the three possible study participation end states may have prior intermittent missingness. Intermittent non-response therefore constitutes a unique form of missing data that may or may not be related to these final study participation outcomes and is therefore considered separately.

The modelling undertaken here adapts methods outlined by Buenckens et al. (2007) for discrete longitudinal data. They suggest estimating separate models, one for the measurement model[24] and one for the dropout process, effectively isolating the systematic processes of missingness from the research question of interest. This is useful if there is specific research interest in non-response or potential relationships between non-response and the research questions of interest that are identifiable though observed variables. The primary purpose for modelling missingness is to gain a better understanding about the degree to which part of the assumption of MAR - that missingness is systematically linked to observed data – holds. This modelling is akin to the specification of a selection model used in sensitivity analyses, but rather than used to test assumptions about missing data, it is used to glean information about the presence of missingness processes that could be classified as MAR.

Buenckens et al. (2007) suggest that if incompleteness is due to dropout, a possible model for the dropout process is a logistic regression for the probability of attrition at occasion j given that the subject is still in the study at occasion $j-1$. The use of logistic regression to model missingness is extended in the current study in three ways. First, if it is possible to do an occasion-by-occasion estimation of dropout, it should therefore also be

[24] In the missing data literature, the term 'measurement model' refers to models conducted to assess the substantive research question.

possible to conduct a discrete time event history analysis of dropout over all possible occasions. Given that event history analyses adapted for discrete time longitudinal analysis is equivalent to a logistic analysis controlling for both correlated observations at the level of the individual (unit correlation) and correlated observations over time (serial correlation), the use of this modelling strategy for dropout is relatively straightforward. Second, it is also possible to adapt this model for intermittent missingness by adjusting the model for repeated events. Third, if there are multiple possible outcomes at any given occasion, as is the case for the three study participation end-states, a discrete time competing risks event history analysis using a multinomial logit model is an appropriate method. Both the adaptation for intermittent missingness and that for multiple possible outcomes will be described in turn, beginning with the modelling of intermittent non-response.

3.3.3 Intermittent non-response: predicting observation gaps

Intermittent non-response is the most common form of missing data in the VIDUS. A total of 745 (46.6%) of all VIDUS participants have at least one observation gap, and the average number per individual among those who have them is 1.68 (SD 0.90). Table 3.3 displays counts of the gap patterns by the observation wave where the gap begins and ends. For example, there are eight individuals with gaps that begin in wave three and end in wave seven. Note that it is not possible for an observation gap to end at wave one, nor is it possible an observation gap to begin in waves 16 or 17, as this would require data prior to the beginning or beyond the beginning and the end of the observation period. Results show a total of 1250 observation gaps, 877 of which are a single wave period in length, a figure arrived at by summing the cells along the diagonal. One hundred eighty-two of these are two observations long and 191 are longer than two observation periods. The most common starting points for observation gaps are after baseline or the first follow up observation.

Table 3.3 Observation gap patterns in the VIDUS using survey time scale

Follow up in which observation gap begins	Follow up in which observation gap ends																	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	Total
0		131	47	23	9	5	2	4	4	3	3	3	1	0	1	0	2	238
1			115	23	6	2	1	1	0	1	1	0	0	0	0	1	0	151
2				69	17	4	2	1	1	1	0	1	1	0	0	0	0	97
3					58	7	8	0	2	0	0	1	0	1	0	0	1	78
4						48	10	6	1	3	0	1	2	0	0	0	0	71
5							60	10	2	1	0	1	2	2	0	0	0	78
6								62	16	2	2	2	0	1	2	1	0	88
7									42	7	2	1	1	3	4	1	2	63
8										54	2	3	0	0	3	1	1	64
9											40	9	3	2	1	1	5	61
10												41	14	2	3	2	10	72
11													33	5	2	1	3	44
12														32	5	1	1	39
13															25	6	4	35
14																38	4	42
15																	29	29
16																		0
17																		0
Total	0	131	162	115	90	66	83	84	68	72	50	63	57	48	46	53	62	1250

The modelling of intermittent missingness will proceed as a discrete-time event history analysis with both time varying covariates and repeated events to account for the impact of changing behaviour over time and the potential that the same individual may have multiple observation gaps. The dependent variable in these analyses is a forward lagged (i.e. leading) binary variable indicating that an observation gap of indeterminate length begins at the next wave (GNW). This forward lag of the dependent variable is constructed as such because the missing observations are by definition missing and contain no time-varying data, making it impossible to construct backward lagged independent variables rather than a forward lagged dependent variable. Second, a series of analyses decompose this pooled analysis, and while maintaining the same dependent variable, examine wave-by-wave variation in the direction, magnitude and variance of predictors of intermittent non-response. Only observations from the baseline interview to wave 15 are used in the current analysis because those who would have an observation gap beginning at wave 17, which would be predicted by an indicator during wave 16, are considered to have attrited from the study.

The variables included to assess the first hypothesis include age (in years), female gender, self-identified Aboriginal ancestry and marital status. Given the preliminary indications that individuals' employment status may impact their study participation, a range of indicators of socio-economic context and income generating activities are included, including DTES residency, holding a regular job, holding a temporary job, participating in illegal income generating activity such as drug dealing or panhandling, receiving social assistance, involvement in sex work and unstable housing. Recent incarceration, binge drug use, shooting gallery use, injecting with others, frequent (daily) injection and non-frequent (less than daily) injection, and frequent (daily) and non-frequent (less than daily) crack use are used to test the third hypothesis of disruption and risk-taking behaviour. The fourth hypothesis, that regular interface with systems of care may impact study participation, is tested using HIV serostatus, methadone maintenance therapy enrolment and non-MMT treatment enrolment. Excepting age, all variables are binary indicators where a value of one is observed in the presence of a characteristic, and zero otherwise. With the exception of demographic variables and HIV serostatus, covariates refer to events or behaviour in the six months prior to interview.

3.3.3.1 Pooled analysis of intermittent non-response

The first analysis of intermittent non-response pools information from all follow-ups into an event history analysis (EHA). EHA is suited to research questions addressing both if and when something happens (Allison, 1984; Blossfeld & Rohwer, 2002; Box-Steffensmeier & Jones, 2004).[25] Also known as survival analysis, EHA models the probability of a transition, known as failure, from one state to another state, conditional on the timing of the event and a range of covariates that are potentially associated with an event occurrence. The

[25] Discrete time event history analysis is used multiple times in this thesis; the method is summarized in some detail here, and only referred to subsequently.

risk set, or the set of subjects at "risk" of an event at a given point in time, varies depending on the number of individuals in the initial state and those who have already experienced or who are in the process of experiencing an event. Once an individual "fails," they are removed from the risk set. In the case of repeated events, an individual moves back into the risk set once they end their prior event. The point of entry into the risk set is usually some beginning point of a process or a state, and for the current analysis of missing data, entry into the risk set is recruitment into the VIDUS. Time is measured using a survey participation rather than chronological scale.

EHA determines the hazard rate, which is the risk of having an event at time t given that the event has not occurred prior to time t. It can be defined as

$$h(t|\boldsymbol{x}) = \lim_{\Delta t \to 0} \frac{\Pr(t \leq T \leq t + \Delta t | T \geq t, \mathrm{x})}{\Delta t} \qquad (3.2)$$

where, $\mathbf{x}$ is a vector of covariates that influence the probability of failure at time T at time t and the quantity of elapsed time Δt. EHAs generally require parametric assumption to be made about the distribution of failure times (Blossfeld & Rohwer, 2002; Box-Steffensmeier & Jones, 2004; Jenkins, 1995), although non- or semi-parametric methods are useful where there is no theoretical reason to expect one distribution over another.

EHAs generally assume the continuous measurement of time. Where observations are grouped or interval censored into discrete time points, as in the VIDUS, discrete time methods are used (Allison, 1984; Beck, Katz, & Tucker, 1998; Box-Steffensmeier & Jones, 2004; Yamaguchi, 1991). Discrete-time models can be simply and appropriately estimated with logit models that include (1) some measure to account for duration dependence; (2) standard errors adjusted for clustered data at the level of the individual; and (3) a binary dependent variable to denote whether or not an event occurs for an individual at each observation interval.

In discrete-time models the hazard rate is generated using the cumulative distribution function of a logit model; the probability of failure for subject i at time t is given as

$$P\left(y_{i,t}=1\middle|\mathbf{x}_{i,t}\right)=h(t|\mathbf{x}_{i,t})=\frac{1}{1+e^{-(\mathbf{x}_{i,t}\boldsymbol{\beta}+\tau_{t-t0})}} \quad (3.3)$$

where y is the value of the binary dependent variable, $\boldsymbol{x_{i,t}}$ is a vector of covariates of interest for subject i at time t and τ_{t-t0} is a temporal dummy variable indicating the cumulative number of observations a subject has been at risk.[26] Allison (1982) and Jenkins (1995) derive the log likelihood of an event history analysis with a binary dependent variable as

$$\log L=\sum_{i=1}^{n}\sum_{\tau=1}^{t_i} y_{i,t}\log\frac{h_{i,t}}{1-h_{i,t}}+\sum_{i=1}^{n}\sum_{\tau=1}^{t_i}\log(1-h_{i,t}) \quad (3.4)$$

which is identical to the to the log likelihood function for a binary regression model. The discrete-time event history model is therefore represented by a simple logit equation:[27]

$$\log\left[\frac{\Pr\left(y_{i,t}=1|\mathbf{x}_{i,t}\right)}{1-\Pr\left(y_{i,t}=1|\mathbf{x}_{i,t}\right)}\right]=\alpha(\tau_{t-t0})+\mathbf{x}_{it}\boldsymbol{\beta} \quad (3.5)$$

where the log-odds ratio of the probability of an event occurrence to the probability of a non-occurrence is conditional on the specification of time,[28] the vector of covariates and their beta coefficients. The interpretation of coefficients is thereby also that of a logit model. In the current study coefficients are exponentiated and log odds (i.e. hazard ratios) are displayed in results tables for ease of interpretation. To accommodate the longitudinal structure of the data and avoid violating the assumption of independence between observations, standard errors are adjusted for clustered observations at the level of the individual as per Williams (2000). Models are further adjusted for repeated failures, i.e. multiple observation gaps, per participant. I assume, following Allison (1984), that the underlying process leading to observation gaps are similar across successive gaps and are treated as uncorrelated and

[26] A number of options exist for incorporating duration dependence into discrete-time models, of which the inclusion of time dummies is only one. These include the use of cubic splines, linear, natural log, quadratic and lowess fits. The use of time dummies is the most flexible approach (Beck et al., 1998), but has the potential disadvantage of including many dummy variables that use up a lot of degrees of freedom.

[27] As per Beck, Katz and Tucker (1998) the term $a(\tau_{t-t0})$ is used instead of the $a(\tau)$ used in Allison (1984) to allow for repeated events.

[28] Which also addresses the serial dependence of observations in the model. For further information see Box-Steffensmeier and Jones (2004).

statistically independent. Time dummies are therefore reset to 1 after each gap ends, and all participation spells are pooled into the same analysis. Finally, no adjustments are necessary for the inclusion of time-varying covariates because the person-period structure of the data includes an observation for each individual at each time point, avoiding the complications of time-varying covariates in continuous time EHA (Blossfeld, Golsch, & Rohwer, 2007).

Results are displayed in Table 3.4. Covariates are grouped according to the hypothesis to which they are relevant. Time dummies for the length of the spell of continuous observations are relative to an observation spell of one wave. The lack of significance for a spell length of two or three observations, followed by a significant, negative hazard ratio for observation spell lengths of four observations or longer, indicates one of two possible scenarios. This may be indicative of individuals' propensity to have an observation gap directly after baseline, or it may indicate a propensity for those that have observation gaps to have multiple gaps over the course of the study period punctuated by brief periods of participation. However, given the average number of gaps reported earlier among those with any intermittent non-response of 1.68, the former seems more plausible than the latter.

Among the variables of interest, significant hazard ratios below one were observed for age (hazard ratio [HR] = 0.97, 95% confidence interval [CI]: 0.97-0.98), meaning that for each additional year, the hazard of a GNW decreases by a factor of 0.97. Aboriginal ancestry (HR = 0.79, 95% CI: 0.67-0.92), DTES residency (HR = 0 .54, 95% CI: 0.47-0.61), receiving social assistance (HR = 0.78, 95% CI: 0.66-0.94) and frequent crack use (HR = 0.84, 95% CI: 0.71 – 0.98) are also significant and inversely associated with an observation gap beginning at the next wave, while HIV seropositivity (HR = 0.87, 95% CI: 0.74 – 1.02) is marginally significant at the $p<0.10$ level. Significant and positive hazard ratios were observed for recent incarceration (HR: 1.38; 95% CI: 1.20 – 1.60) and shooting gallery attendance (HR = 1.45; 95% CI: 1.24 – 1.72). Results are robust across different time specifications, such as coarser

Table 3.4 Multivariate event history analysis of intermittent non-response in the VIDUS (n=1599)[†]

Hypothesis/Characteristic	Hazard Ratio	95% CI[‡]
H1: Demographic difference		
Age	0.97***	(0.97 - 0.98)
Female gender	1.07	(0.91 - 1.26)
Aboriginal ancestry	0.79**	(0.67 - 0.92)
Marital status (married or common law)	0.91	(0.79 - 1.05)
H2: Socio-economic context		
Downtown Eastside residency[§]	0.54***	(0.47 - 0.63)
Regular employment[§]	1.13	(0.91 - 1.40)
Temporary employment[§]	0.93	(0.79 - 1.10)
Illegal income generation[§]	1.00	(0.85 - 1.17)
Social assistance[§]	0.78**	(0.66 - 0.93)
Sex trade involvement[§]	1.16	(0.96 - 1.41)
Unstable housing[§]	0.99	(0.86 - 1.14)
H3: Disruption and risk taking-behaviour		
Recent incarceration[§]	1.39***	(1.20 - 1.60)
Binge drug use[§]	0.98	(0.85 - 1.14)
Shooting gallery attendance[§]	1.46***	(1.24 - 1.72)
Injects with other people[§]	0.93	(0.80 - 1.09)
Non-frequent injection (< daily) [§]	1.04	(0.85 - 1.28)
Frequent injection (≥ daily) [§]	0.91	(0.74 - 1.11)
Non-frequent crack use (< daily) [§]	0.92	(0.79 - 1.06)
Frequent crack use (≥ daily) [§]	0.84*	(0.71 - 0.98)
H4: Contact with systems of care		
HIV seropositive	0.89	(0.76 - 1.04)
Methadone maintenance therapy[§]	1.13	(0.95 - 1.34)
Non-methadone addiction treatment[§]	0.87	(0.74 - 1.02)
Observation spell length *(ref is one observation)*		
2 Observations	1.12	(0.94 - 1.33)
3 Observations	0.87	(0.71 - 1.07)
4 Observations	0.64***	(0.50 - 0.82)
5 Observations	0.63***	(0.49 - 0.82)
6 Observations	0.48***	(0.35 - 0.67)
7 Observations	0.63**	(0.46 - 0.87)
8 Observations	0.49***	(0.34 - 0.70)
9 Observations	0.58**	(0.40 - 0.83)
10 Observations	0.36***	(0.23 - 0.58)
11 Observations	0.47**	(0.31 - 0.74)
12 Observations	0.31***	(0.17 - 0.54)
13 Observations	0.46**	(0.28 - 0.75)
14 Observations	0.35**	(0.19 - 0.64)
15 Observations	0.38**	(0.20 - 0.73)
16 Observations	0.42*	(0.21 - 0.84)
Pseudo R^2	0.071	

*$p<0.05$, **$p<0.01$, ***$p<0.001$; [†]analysis used clustered standard errors; [‡]CI=Confidence Interval; [§]refers to events/behaviour in six months prior to interview

time dummies of one year and a Weibull distribution. The latter is the distribution suggested by the decreasing values of the time dummies relative to the reference category of an observation spell of one follow up wave.[29] Aside from small fluctuations in the wave-by-wave coefficients, results were similar when verified conducting identical models using the chronological time scale (results not shown).

These results provide moderate support for the above hypotheses. In the case of the first (demographic) hypothesis, the tendency observed in the descriptive analysis of those who self-identify as having Aboriginal ancestry to be more likely to participate remained in multivariate discrete time event history analysis. Additionally, older individuals are less likely to have intermittent non-response than younger participants. While postulation as to the potential mechanisms that produces these systematic differences is beyond the scope of the current analysis, these are important patterns to be taken into account when developing an imputation model or drawing conclusions from statistical models.

Among indicators of the socio-economic context hypothesis, DTES residency remained implicated in missing data processes, with those living in the neighbourhood less likely to have a GNW. While this supports the prediction that socio-economic context plays a role in participation, it may also be an indication of the importance of proximity, given that the storefront office of the study is located in the neighbourhood. Additionally, the disproportionate post-baseline attrition for those that report employment was not echoed by a significant and positive hazard ratio predicting a GNW here. This implies that employment may be less implicated in missing data processes than previously indicated. Further, individuals in receipt of social assistance were less likely to begin a GNW than those who were not. This may be an indication that individual availability, due to a lack of obligation to employment or other time consuming commitments, may have increased participation. It may

[29] An exponential distributional assumption equivalent to not controlling for time produces somewhat different results, with HIV seropositivity and MMT enrolment reaching statistical significance (results not shown), although the appropriateness of models that do not control for time is questionable because they do not robustly account for serial correlation among observations.

also be that the honorarium provided a relatively higher financial incentive to participate for those receiving social assistance.

There were also some indications of support for the third hypothesis: that those exposed to disruption, high intensity drug use or other risk taking behaviour may be less likely to maintain uninterrupted participation. Recent incarceration, and the disruption associated with going to prison may be one indicator of support for this hypothesis. However, the impact of recent incarceration on study participation may depend on the length of incarceration. Shorter periods of incarceration, such as those associated with summary convictions, may involve lower levels of disruption, while longer incarceration, such as that associated with indictable convictions, may increase disruption and risk exposure (C. Johnston, personal communication, 24 March 2010).

The significance of shooting gallery attendance, indicative of high-risk injection practices, may also indicate potential detachment from study participation, as shooting galleries are associated with high intensity drug injection and the dense social networks that often comprise drug markets (Fuller et al., 2003b; Klein & Levy, 2003; Latkin et al., 1995). However, this finding was not supported by other indicators of high-risk injection, such as binge drug use or frequent injection. Further, daily crack use was negatively associated with a GNW, which contradicts the notion that high levels of drug consumption will result in inconsistent study participation. In summary, analyses offered partial support for hypothesis three, but further analysis with an expanded set of indicators on both the disruption and risk dimensions would be necessary before formulating more definitive conclusions.

Finally, findings in descriptive analyses that those likely to have a regular interface with systems of care may be more likely to maintain participation do not reach statistical significance at the $p<0.05$ level. HIV seropositivity, however, is negatively associated with a GNW at the $p<0.10$ level, constituting a marginal level of support for the hypothesis.

3.3.3.2 Wave-by-wave analysis of intermittent non-response

Trends in intermittent missingness were further explored by decomposing the pooled event history analyses into wave-by-wave cross sectional analyses. This strategy examines the constancy of effects of pooled variables over time. Complete results are displayed in Appendix 3.1; here, a selection of variables' coefficients and confidence bounds are plotted over time in Figures 3.5(A) through (D). An attempt is made to fit a straight line between the upper and lower confidence bounds to assess whether or not variability in parameter estimates and variance over time is simple random noise. Briefly, decomposing the analysis of different predictors of GNW demonstrates three different types of covariates: (1) those that display a consistent, significant or near significant positive or negative trend; (2) those that have a generally neutral and consistent trend around one that is not significantly positive or negative; and (3) those that display a more volatile trend in parameter estimate and variance over time.

Some of those variables that were significant in the pooled EHA fall into the first category of predictor. Age and DTES residency both have stable coefficients negatively associated with a GNW and small confidence intervals, while recent incarceration and shooting gallery attendance tend to be positively associated with a GNW, though the consistency of effects is less clear and variance more volatile for these latter. It appears that the smaller number of clearly significant variables may be attributable to the greatly reduced cross sectional sample sizes and the consequent reduction in statistical power. Those variables that fall into the second category of variables include Aboriginal ancestry, female gender and marital status, temporary employment, frequent crack use, HIV positive serostatus and MMT enrolment. With the exception of temporary employment and HIV serostatus, a line of fit was placed well between the confidence intervals, and for these two the fit line only infrequently fell just outside the confidence bounds. Finally, those variables that displayed more volatile cross sectional trends included having a regular job, illegal income generation, receiving social assistance, sex trade involvement, binge drug use, injection with other people, and

frequent injection drug use. The volatility in these variables was exemplified in particular by the fluctuations in levels of estimate precision (i.e. the size of confidence intervals). With a line of fit only infrequently passing outside these bounds, much of the volatility in these variables was also therefore attributable to random noise, and a lack of estimate precision likely attributable to limitations in statistical power rather than any true volatility of effect.

Almost all of the variables displayed a widening of confidence intervals in later follow ups, which may indicate issues of statistical power. This interpretation is supported by the observation gap descriptive information in Table 3.3 showing a decrease in the number of gaps over time, and the decreasing levels of participation, and thereby sample size, indicated in Figure 3.2. Nevertheless, it is informative to decompose prior analyses; trends in the values of coefficientss and the sizes of confidence intervals indicate that many variables' relationship with observation gaps may be strong at points but inconsistent over time, again denoting that there may be a certain amount of random noise producing variance in estimates over time.

Figure 3.5(A) Demographic variables predicting intermittent non-response at next wave

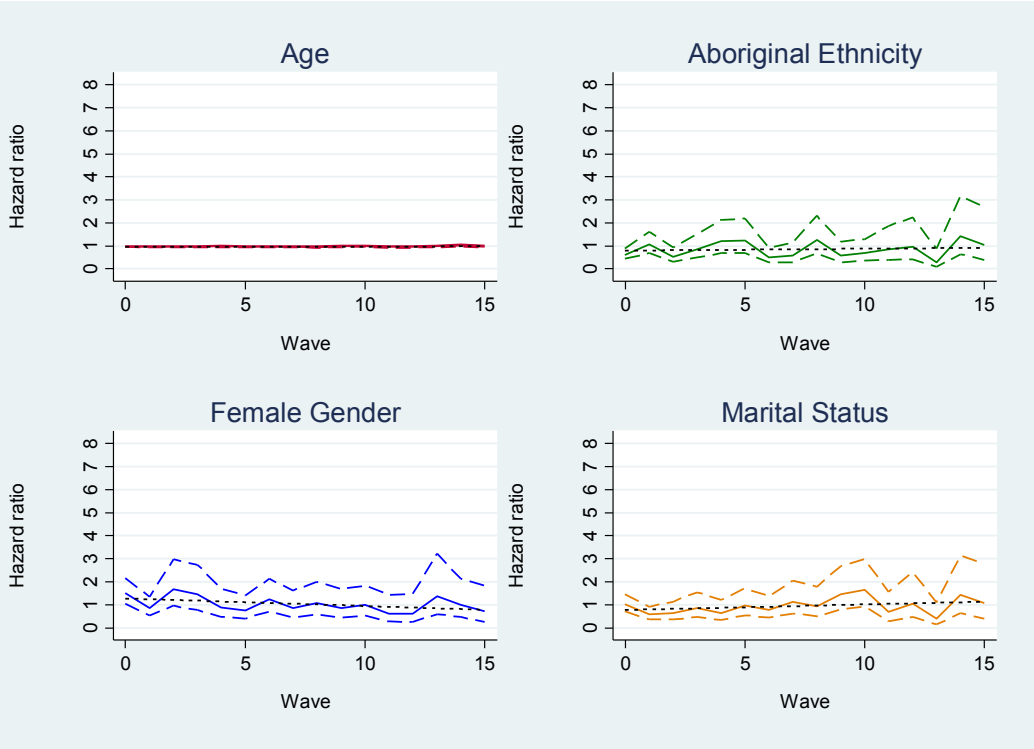


Figure 3.5(B) Socio-economic indicators predicting differences in intermittent non-response at next wave

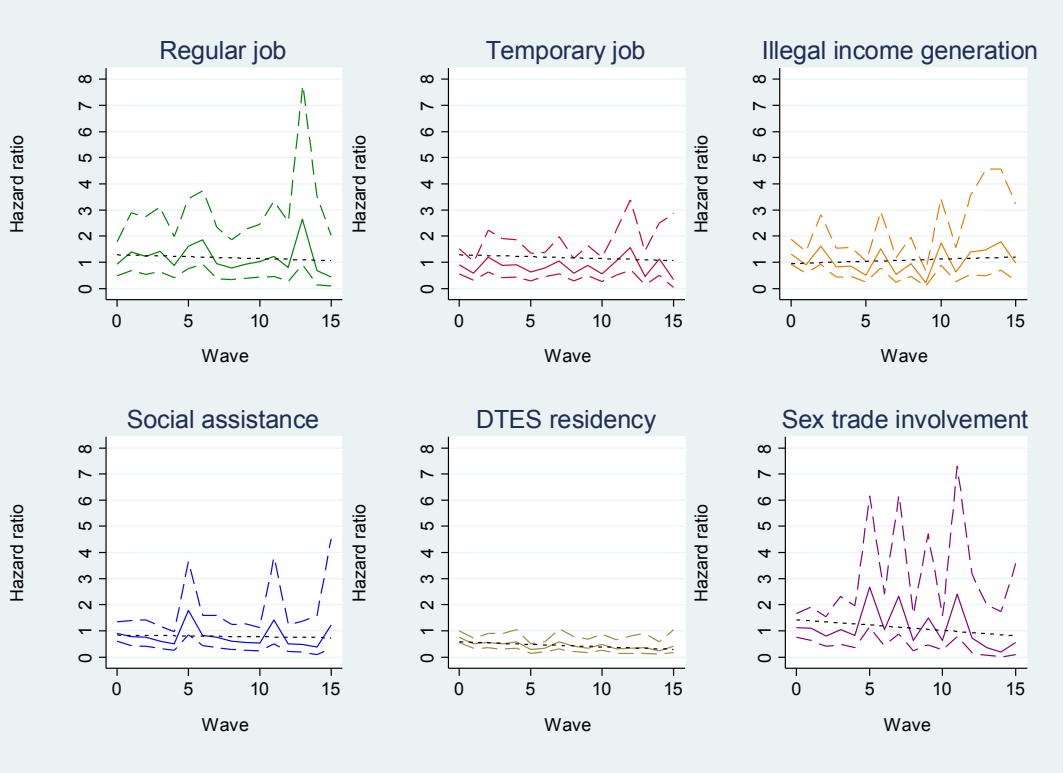


Figure 3.5(C) Risk/disruption indicators predicting differences in intermittent non-response at next wave

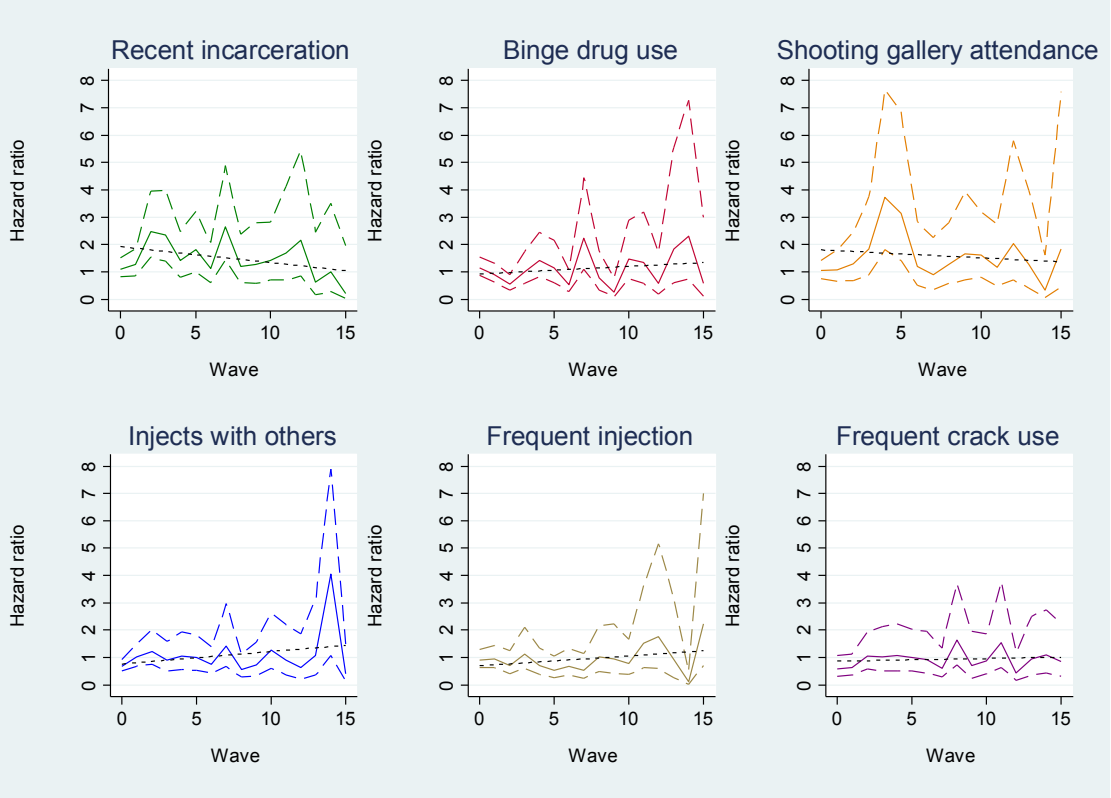
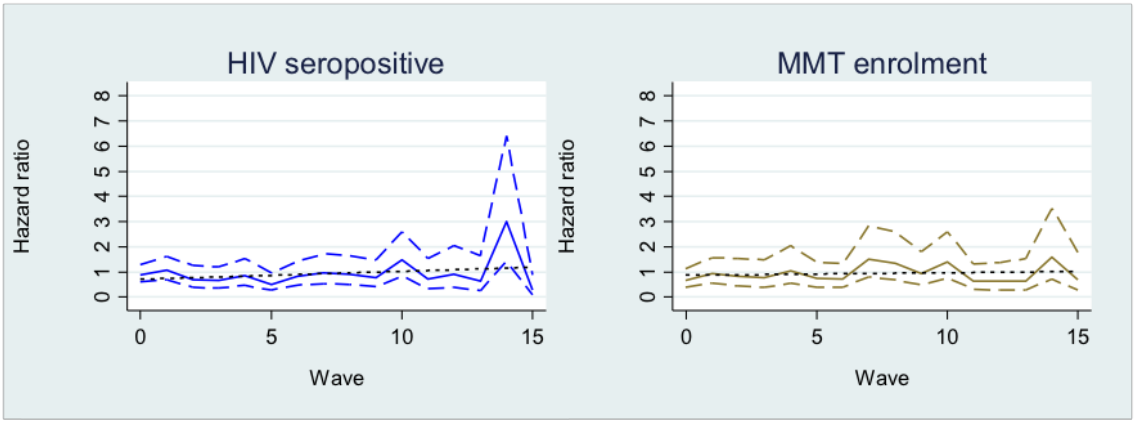


Figure 3.5(D) Indicators of contact with systems of care predicting differences in intermittent non-response at next wave



This modelling suggests some tentative conclusions about intermittent non-response, and a number of things to be cognizant of for future analyses. First, there are certain variables that are strongly and negatively associated with intermittent non-response, namely age and DTES residency. Second, there are also covariates that are significant in pooled analyses, but show a higher level of volatility in wave-by-wave analyses. These include the finding that individuals who receive social assistance and who use crack on a daily basis are less likely to temporarily leave the study. This is also the case for the positive relationship between those who have been recently incarcerated or attended shooting galleries with the likelihood of leaving the study. Third, other variables may be strongly and either positively or negatively associated with a GNW at any given point in time, but do not do so on the whole. Findings provide important information for subsequent analyses in that much of the variation in wave-by-wave variability is simply random noise. This implies that for multiple imputation procedures, it is appropriate not to differentiate models by time period, but that a simple accounting of the time structure of the data should prove sufficient to address the variability inherent in the data. Results also suggest that time-variant characteristics in the data that may be substantively linked to processes of missingness, which in turn may suggest that wave-by-wave counts of these characteristics may be over- or under- represented at particular points in time. This points to one of the primary issues of missing data: its potential to impact the accuracy of estimates and variance. Though the impact depends on the degree to which these

variables are important in subsequent analysis, it would be wise to account for this uncertainty regardless, which multiple imputation procedures incorporate by construction.

3.3.4 End-states: modelling right hand censorship, attrition and death

There are three possible ways in which a participants' time in the VIDUS comes to an end. The first of these, right hand censorship, occurs when an event of interest fails to occur before the end of the observation period (Blossfeld et al., 2007; Yamaguchi, 1991). The second, attrition, where an individual ceases participation, is less frequent than intermittent missingness in the VIDUS, but also has the potential to impact the efficiency and precision of statistical estimates. The third possible outcome is death. Potential predictors of each of these study participation exists will be modelled to see if the underlying processes that produce them, or at least those reflected by observed data, can be identified. These tests are similar to those of observation gaps in that they are EHA models, have the same time specification and clustered standard errors (following Enberg, Gottschalk, & Wolf, 1990) and examine the same set of hypotheses. Also similar to previous models, dependent variables in both are forward lagged by one observation, and hazard ratios represent the odds that a given outcome will occur at the next wave in the presence of a characteristic or behaviour rather than not.

These analyses are distinct from those examining observation gaps in three ways. First, rather than compare two outcomes, three different possible end points of study participation are included simultaneously in a competing risks model. I assess the role of death alongside that of attrition and right hand censorship in order to determine the degree to which each can be predicted by certain demographic, behavioural and contextual characteristics and thereby postulated to systematically alter the composition of the study population. Second, analyses are not decomposed into a series of wave-by-wave models. This decomposition becomes quickly complex and insufficiently powered with multiple types of failure. Third, it is plausible that there may be a relationship between intermittent non-

response and attrition, in that observation gaps may predict an individual leaving the study permanently. Inclusion of intermittent non-response in predicting the different possible participation end-states is a feature of the final missing data model.

The inclusion of death in these analyses is based both on the fact that it is a phenomenon because of which an individual ceases participation in the study, and because it may also bias the efficiency of parameter estimates. Death is an outcome unto itself, and in the case of many longitudinal medical studies, the primary outcome of interest. Similarly, it is intimately linked with many of the phenomena under consideration in the VIDUS such as HIV seropositivity or overdose. The question of whether the lack of data subsequent to death should be considered missing depends upon the relationship of death to the phenomena of interest. In cases where death is unrelated to the phenomena of interest, it may be beneficial to estimate parameters for the ideal scenario in which no one dies during a study (Schafer & Graham, 2002). Conversely, imputing data after death may further introduce biases into imputed data, as a change in mortality-related behaviour or disease progression may occur directly prior to death, changes that would be extended into imputed data that do not account for death as a unique participation outcome. In either case, it may be beneficial to model mortality formally either on its own or jointly with an outcome of interest in order to understand the potential impacts of death on subsequent parameter estimates (Hogan & Laird, 1997; Schafer & Graham, 2002). It is important to note, however, that, response trajectories estimated under an MAR assumption post-mortality may be somewhat optimistic (Schafer & Graham, 2002). To explore what role death should play in both the missing data methods and subsequent analyses, death is included in the current modelling strategy.

Competing risks event history analysis models are used where experiencing one type of failure removes the possibility that an individual can experience another type of failure, usually with more than two possible alternatives (Cox & Oakes, 1984; David & Moeschberger, 1978; Fine & Gray, 1999; Kalbfleisch & Prentice, 1980; Steele, Goldstein, &

Browne, 2004).[30] The existence of multiple outcomes calls for a multinomial logit model (MNLM) with the same time specification and clustered standard errors, but without the repeated events modelled in the previous section. The discrete time formulation of the competing hazards model using an MNLM is described in detail elsewhere (Enberg et al., 1990; Hill, Axinn, & Thornton, 1993; Steele et al., 2004), and will only be briefly summarized here. An MNLM for three outcomes, A, B, and C, simultaneously estimates three binary logit models to directly compare outcome A with outcome B, outcome B with outcome C, and outcome A with outcome C. Logical transitivity holds that if we know the parameters from that binary logit of outcome A versus outcome B, and of outcome B versus outcome C, then it is possible to derive the relationship between outcome A and outcome C. However, in order to compare parameter estimates corresponding to all three failure types, it is necessary to estimate all three outcomes at the same time rather than estimate three binomial models separately (Allison, 1982; Long, 1997; Lunn & McNeil, 1995). One set of results is suppressed in the output of an MNLM as the reference outcome; in the current analysis this is output for the reference outcome of right-hand censorship, or participation to the end of the observation period.

The primary assumption of MNLM competing hazard models is that of the independence of irrelevant alternatives (IIA), which states that *the odds of two alternatives do not depend on other alternatives that are available*. This assumption dictates that the alternative destinations are stochastically independent from each other, and that adding or deleting an alternative has no impact on the odds of the remaining alternatives (Freese & Long, 2006). McFadden (1973) and Amemiya (1981) advise that MNLM models be used only when the outcome categories can be assumed to be distinct and considered independently by each individual. While there are formal tests of the IIA assumption, such as the Hausman

[30] Technical details of how competing risks models differ from event history analyses with binary outcomes are included Appendix 3.2.

McFadden test (1984) and the Small-Hsiao test (1985), the properties of these tests have been shown to produce conflicting results, have poor size properties, and perform poorly in assessing violations of the IIA assumption (Cheng & Long, 2007). It is also not possible to conduct these tests on clustered data such as the VIDUS data. For longitudinal models, the analyst is thus left with the qualified advice of McFadden and Amemiya and their own best guess of whether outcomes constitute independent alternatives. In the current example, the distinction between outcomes of attrition, death and censorship is evident, and subsequent analyses demonstrate that death and censorship are predicted differently by different variables.

Results of MNLM models comparing different study participation outcomes are displayed in Tables 3.5 (1) and (2). Because of issues of statistical power due to the necessary inclusion of a time specification (here dummy variables) and the small number of attrition and death events, analyses of the first and second hypotheses, and then of the third and fourth hypotheses were conducted separately. Fifty-seven of the 288 individuals who died between baseline and wave 17 did so during an observation gap and therefore did not provide data in the observation period directly preceding their exit from the study. These individuals were omitted from analyses, altering the number of death "events," because the construction of the dependent variable using a forward lag made their inclusion impossible. That is, if the observation prior to death contained no observational data, it was not possible to predict dependency between this observation and that where death occurred. Statistical tests were conducted to determine if these individuals were systematically different from those individuals who had observational data directly before death, and it was found that they were more likely to be married or in a common law relationship (Pearson's $X^2 = 3.97$, p-value = 0.05) and of Aboriginal ancestry (Pearson's $X^2 = 5.81$, p-value = 0.02). These groups may therefore be slightly underrepresented in those who exit the study because of mortality. Models weighted to compensate for this were run, and results (not shown) were nearly

identical to those without weights. Finally, ten individuals who died during the baseline observation period are also omitted because it was not possible to obtain data prior to the observation in which death occurs.

Table 3.5(1) Competing risks event history analysis of study participation outcomes relative to censorship in the VIDUS (n=1542)[†]

	Death		Attrition	
Hypothesis/Characteristic	**Hazard Ratio**	**95% CI[‡]**	**Hazard Ratio**	**95% CI[‡]**
H1: Demographic Difference				
Age	1.04***	(1.03 - 1.06)	0.95***	(0.94 - 0.96)
Female gender	1.19	(0.87 - 1.64)	0.71**	(0.57 - 0.89)
Aboriginal ancestry	1.26	(0.93 - 1.71)	0.62***	(0.50 - 0.78)
Marital status	0.74	(0.53 - 1.04)	0.75*	(0.60 - 0.95)
H2: Socio-economic context				
DTES residency[§]	1.23	(0.89 - 1.71)	0.43***	(0.34 - 0.53)
Regular employment[§]	0.36*	(0.15 - 0.83)	1.41*	(1.06 - 1.87)
Temporary employment[§]	0.74	(0.52 - 1.05)	0.89	(0.70 - 1.14)
Illegal income generation[§]	0.57**	(0.40 - 0.81)	0.97	(0.78 - 1.20)
Social assistance[§]	1.43	(0.78 - 2.62)	0.52***	(0.41 - 0.66)
Sex trade involvement[§]	1.06	(0.65 - 1.73)	0.95	(0.72 - 1.27)
Unstable housing[§]	1.45*	(1.04 - 2.01)	1.46***	(1.19 - 1.80)
Time Dummy Variables (ref is baseline)				
Wave 1	1.88	(0.95 - 3.71)	0.39***	(0.28 - 0.58)
Wave 2	1.64	(0.81 - 3.32)	0.38***	(0.26 - 0.56)
Wave 3	1.87	(0.94 - 3.73)	0.25***	(0.16 - 0.39)
Wave 4	0.97	(0.43 - 2.18)	0.36***	(0.24 - 0.53)
Wave 5	1.08	(0.49 - 2.39)	0.30***	(0.20 - 0.47)
Wave 6	2.38*	(1.20 - 4.73)	0.23***	(0.14 - 0.38)
Wave 7	1.24	(0.57 - 2.71)	0.42***	(0.28 - 0.65)
Wave 8	1.42	(0.66 - 3.05)	0.51**	(0.34 - 0.77)
Wave 9	0.98	(0.42 - 2.30)	0.46**	(0.29 - 0.71)
Wave 10	1.24	(0.55 - 2.77)	0.77	(0.53 - 1.14)
Wave 11	1.51	(0.69 - 3.29)	0.37***	(0.21 - 0.62)
Wave 12	1.65	(0.76 - 3.57)	0.25***	(0.13 - 0.49)
Wave 13	1.04	(0.43 - 2.53)	0.46**	(0.27 - 0.77)
Wave 14	2.00	(0.93 - 4.29)	0.25***	(0.12 - 0.52)
Wave 15	0.98	(0.39 - 2.47)	0.66	(0.39 - 1.10)
Wave 16	1.36	(0.57 - 3.24)	1.29	(0.82 - 2.04)
McFadden's Pseudo R^2	0.06			

*$p<0.05$, **$p<0.01$, ***$p<0.001$; [†]analysis used clustered standard errors; [‡]CI=Confidence Interval; [§]refers to events/behaviour in six months prior to interview

Results were also compared across exponential, cubic and Weibull time specifications, (results not shown) across which coefficients were stable. As death appeared to follow an exponential parameterisation of time, and attrition a Weibull specification, time dummies were used to ensure maximum flexibility during simultaneous estimation of both in the same model. Models were further verified by constructing equivalent conditional logit models (following Freese & Long, 2006). Coefficients in both the MNLM and conditional logit models (not displayed) were identical.

A number of variables are statistically significantly associated with attrition, death or both relative to censorship. In terms of demographic differences, age is positively related to death (HR = 1.04, 95% CI: 1.03-1.06) and negatively related to attrition (HR = 0.95, 95% CI: 0.94-0.96). The demographic variables of female gender (HR = 0.71, 95% CI: 0.57-0.89), Aboriginal ancestry (HR= 0.62, 95% CI: 0.50-0.78) and being married or in a common law relationship (HR = 0.75, 95% CI: 0.60-0.95) are negatively associated with attrition. Indicators of the second hypothesis related to individual socio-economic context also have statistically significant relationships with the outcomes relative to the base outcome. Having a regular job (HR = 0.36, 95% CI: 0.15-0.83) and generating income illegally (HR = 0.57, 95% CI: 0.40-0.81) are negatively associated with death, while having unstable housing (HR = 1.45, 95% CI: 1.04-2.01) is positively associated with death. DTES residency (HR = 0.43, 95% CI: 0.43-0.53) and receiving social assistance (HR = 0.52, 95% CI: 0.41-0.66) have negative relationships with attrition, while regular employment (HR = 1.41, 95% CI: 1.06-1.87) and unstable housing (HR: 1.46, 95% CI: 1.19-1.80) have positive relationships. The time dummy variables for death are generally insignificant, and those that are significant demonstrate no discernable pattern. Conversely, those for attrition are predominantly significant and negative relative to the reference category of censorship.

Table 3.5(2) Competing risks event history analysis of study participation outcomes relative to censorship in the VIDUS (n=1542)[†]

	Death		Attrition	
Hypothesis/Characteristic	**Hazard Ratio**	**95% CI[‡]**	**Hazard Ratio**	**95% CI[‡]**
H3: Disruption and risk-taking behaviour				
Recent incarceration[§]	0.93	(0.66 - 1.32)	1.32**	(1.08 - 1.63)
Binge drug use[§]	1.25	(0.92 - 1.72)	0.75**	(0.60 - 0.93)
Injection gallery attendance[§]	0.90	(0.59 - 1.38)	1.17	(0.92 - 1.49)
Injects with other people[§]	0.90	(0.64 - 1.26)	0.78*	(0.63 - 0.96)
Non-frequent injection[§]	1.05	(0.66 - 1.66)	0.90	(0.67 - 1.20)
Frequent injection[§]	0.89	(0.56 - 1.41)	0.86	(0.64 - 1.15)
Non-frequent crack use[§]	1.18	(0.87 - 1.61)	0.94	(0.77 - 1.16)
Frequent crack use[§]	0.76	(0.52 - 1.11)	0.91	(0.71 - 1.16)
H4: Contact with systems of care				
MMT enrolment[§]	0.68*	(0.50 - 0.93)	0.61***	(0.48 - 0.77)
Non-MMT treatment[§]	0.60*	(0.37 - 0.98)	1.09	(0.85 - 1.40)
HIV seropositive	3.40***	(2.59 - 4.46)	0.40***	(0.31 - 0.51)
Time Dummy Variables (ref is baseline)				
Wave 1	2.02*	(1.02 - 3.99)	0.35***	(0.25 - 0.51)
Wave 2	1.74	(0.85 - 3.56)	0.37***	(0.25 - 0.54)
Wave 3	2.03*	(1.02 - 4.05)	0.24***	(0.15 - 0.37)
Wave 4	1.01	(0.44 - 2.30)	0.35***	(0.24 - 0.52)
Wave 5	1.16	(0.52 - 2.61)	0.29***	(0.19 - 0.45)
Wave 6	2.49*	(1.24 - 5.00)	0.23***	(0.14 - 0.38)
Wave 7	1.48	(0.67 - 3.25)	0.36***	(0.23 - 0.55)
Wave 8	1.68	(0.76 - 3.71)	0.45***	(0.30 - 0.67)
Wave 9	1.19	(0.50 - 2.81)	0.38***	(0.24 - 0.59)
Wave 10	1.61	(0.71 - 3.66)	0.62*	(0.42 - 0.90)
Wave 11	1.98	(0.89 - 4.43)	0.30***	(0.17 - 0.51)
Wave 12	2.33*	(1.04 - 5.21)	0.21***	(0.11 - 0.40)
Wave 13	1.51	(0.61 - 3.76)	0.36***	(0.21 - 0.61)
Wave 14	2.95**	(1.35 - 6.45)	0.18***	(0.08 - 0.37)
Wave 15	1.67	(0.65 - 4.28)	0.45**	(0.26 - 0.77)
Wave 16	2.32	(0.95 - 5.63)	0.82	(0.52 - 1.32)
McFadden's Pseudo R^2		0.09		

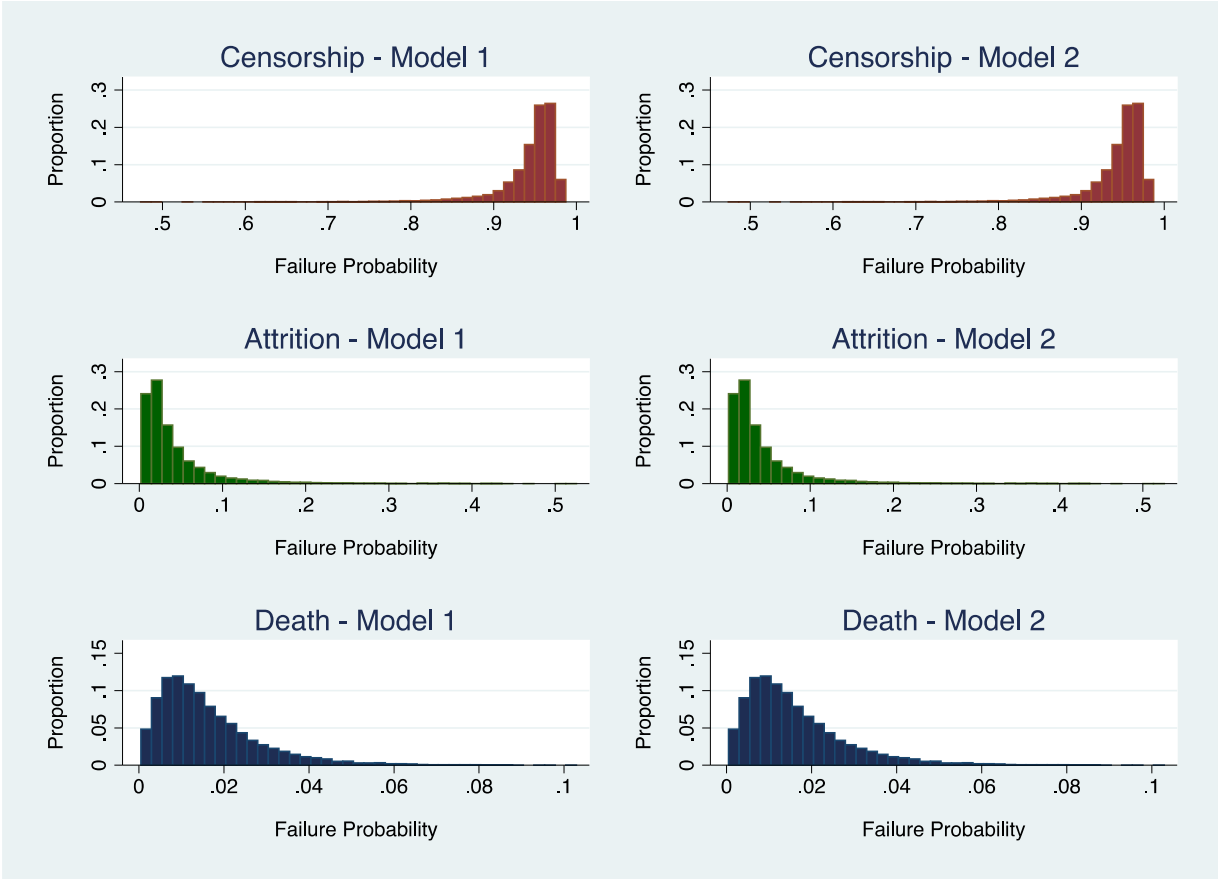
*$p<0.05$, **$p<0.01$, ***$p<0.001$; [†]analysis used clustered standard errors; [‡]CI=Confidence Interval; [§]refers to events/behaviour in six months prior to interview

In the second model, indicators for the third and fourth hypotheses are tested in the same fashion. None of the variables related to risk or disruption are significantly associated with mortality relative to censorship, while with regards to the final hypothesis, all of MMT enrolment (HR = 0.68, 95% CI: 0.50-0.93), non-MMT addiction treatment enrolment (HR = 0.60, 95% CI: 0.37-0.98) and HIV seropositive status (HR = 3.40, 95% CI: 2.59-4.46) are

significantly associated with death, though not all in the same direction. For attrition in the second model, recent incarceration (HR = 1.32, 95% CI: 1.08-1.63) is positively related to study exits, while binge drug use (HR = 0.75, 95% CI:0.60-0.93), injecting with other people (HR = 0.78, 95% CI: 0.63-0.96), MMT enrolment (HR = 0.61, 95% CI: 0.48-0.77) and HIV seropositive status (HR = 0.40, 95% CI: 0.31-0.51) are negatively associated. These results make clear that there are differences in the way that a number of variables are associated with the different outcomes in both direction and magnitude.

Because MNLM simultaneously measure all possible comparisons between multiple outcomes, they are most readily interpretable through looking at predicted probabilities (i.e. hazards) and factor changes in the odds. Comparisons of predicted hazard rates for the three possible outcomes, as displayed in Figure 3.6, demonstrate predicted probabilities that are highly skewed with long tails for all three outcomes.

Figure 3.6 Predicted hazard rates of VIDUS participation outcomes of right-hand censorship, attrition and death



A full list of results displaying comparative factor change in the hazard between any of the study participation end states for statistically significant variables appears in Appendix 3.3. Because of the number of comparisons involved, graphical methods more appropriately summarize results (Freese & Long, 2006). Figures 3.7(A) through (E) are multinomial logistic plots that show the relationship between all three outcomes simultaneously. Outcomes are represented by a 'c' for censorship, 'a' for attrition and 'd' for death. Letters are placed along a hazard ratio scale relative to the reference category of censorship, and lines connecting letters indicate that they are not statistically different from each other. Tables for time dummies are not shown in the interest of space. These plots provide additional information about the relationship between attrition and death not displayed in the regression Tables 3.5(1) and (2). They demonstrate that the comparative association for many independent variables on attrition and death to be statistically significant. This is not the case for most of the variables related to drug use, including direct measures of use, shooting gallery attendance and injecting with other people. That attrition and death represent statistically distinct outcomes is important; it suggests that if the processes producing each outcome may have different effects on estimates, and if observations after the time of death are treated as missing data, they should likely be considered separately when designing imputation models.

Figure 3.7(A) Multinomial logistic regression plot of censorship (c), attrition (a) and death (d) across VIDUS demographic variables

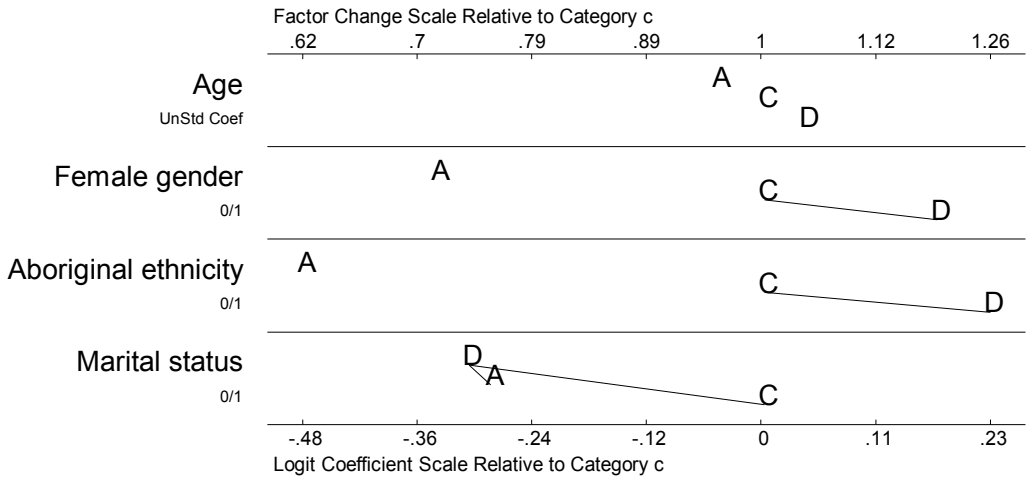


Figure 3.7(B) Multinomial logistic regression plot of censorship (c), attrition (a) and death (d) across VIDUS socio-economic context variables

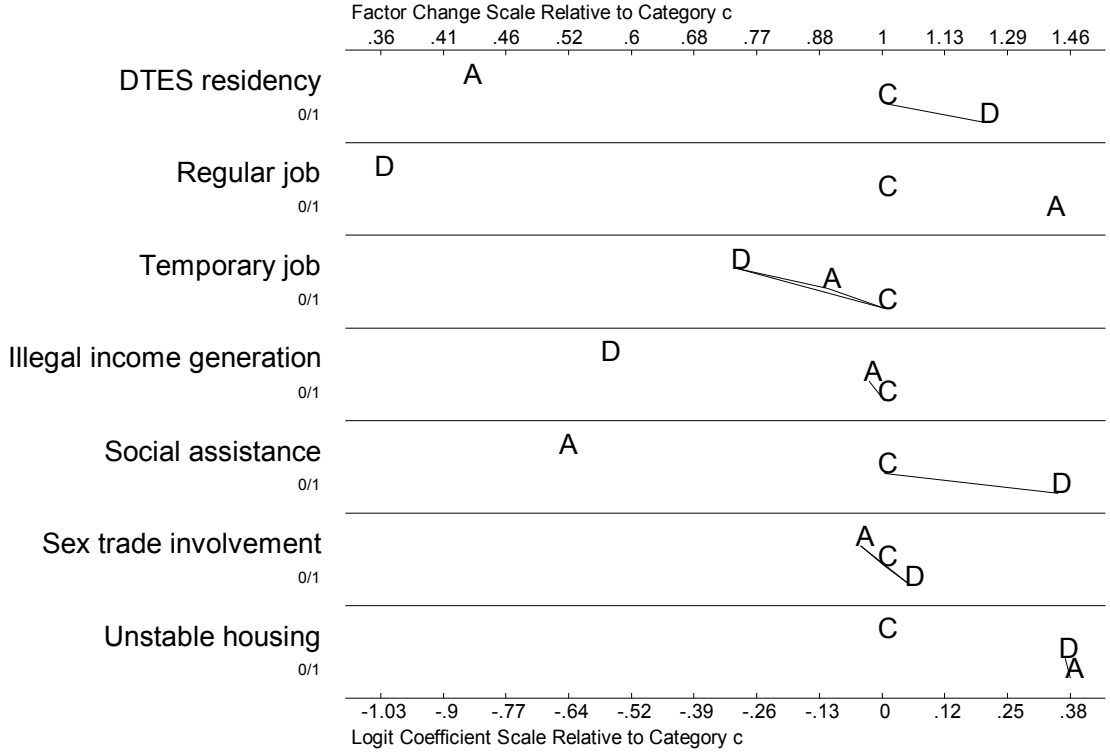


Figure 3.7(C) Multinomial logistic regression plot of censorship (c), attrition (a) and death (d) across VIDUS risk-taking and disruption variables

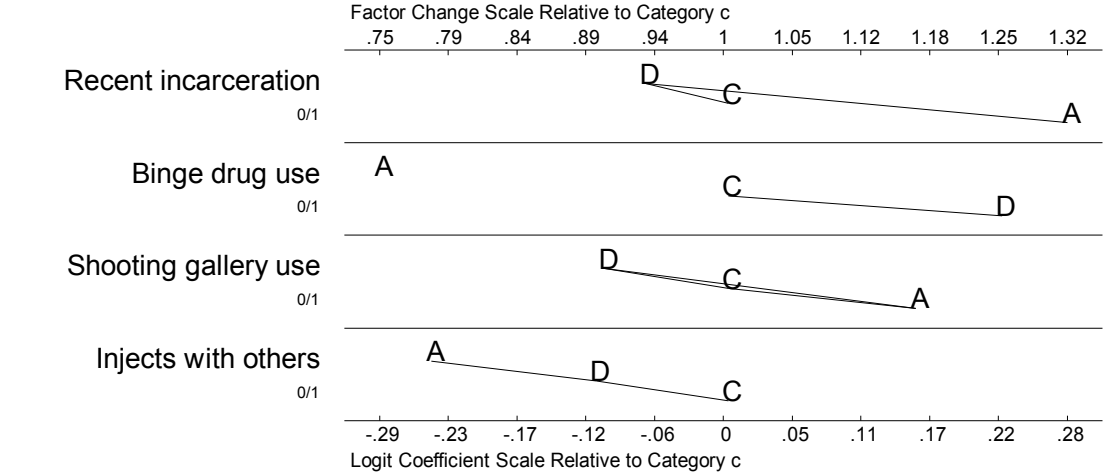


Figure 3.7(D) Multinomial logistic regression plot of censorship (c), attrition (a) and death (d) across VIDUS substance use variables

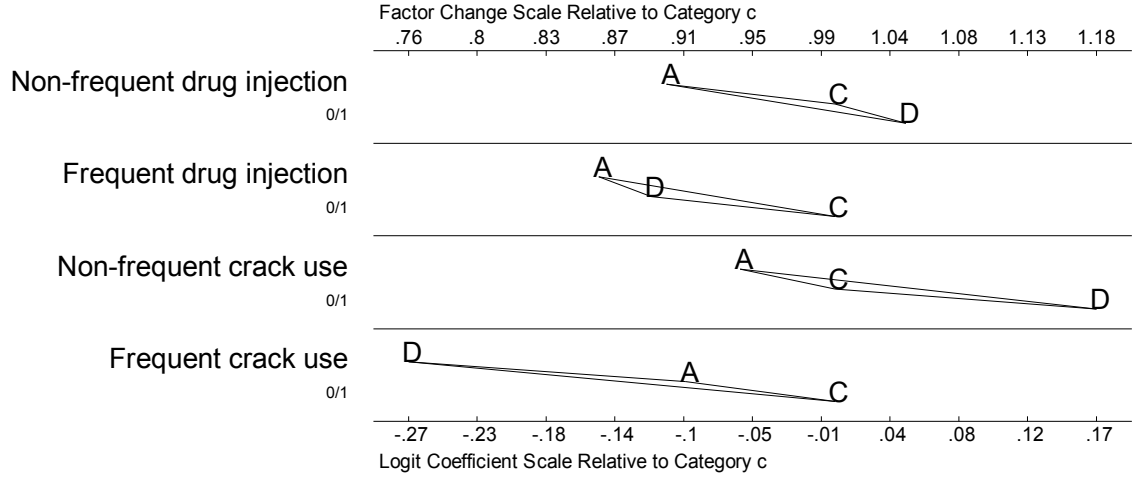
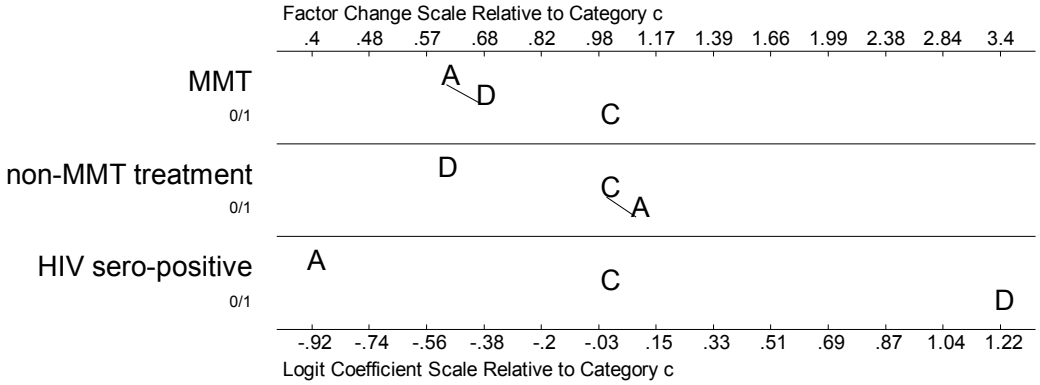


Figure 3.7(E) Multinomial logistic regression plot of censorship (c), attrition (a) and death (d) in the VIDUS across variables indicating contact with systems of care



Finally, as mentioned previously, different kinds of missing data may be related to each other. For example, an individual who has higher levels of intermittent non-response may have a higher probability of attriting out of the study. A final analysis, the results of which are displayed in Table 3.6, explored this potentiality. The same competing risks MNLM modelling strategy, with a forward lagged dependent variable and time dummy variables, was used. Any covariate in the preceding two models that was statistically significant across any comparisons of the three possible outcomes was selected for inclusion in the final model. In this way, the model also serves as a confirmatory test of the robustness of previous analyses. An additional variable measuring the level of participation is included as a covariate. This variable was constructed as a cumulative total of the number of observations

where an individual provided data divided by the total number of observations that they could have participated, giving the proportion of possible waves of participation. It is multiplied by 100 for ease of interpretation of the coefficients, which become the percentage of possible follow-ups actually completed. This method of accounting for intermittent missingness, rather than the use of a count variable, allows for the consideration that, because of the prospective recruitment format of the study, not all individuals have the same number of possible follow ups in which they can participate. This strategy transforms a particular type of missing data, intermittent non-response, into a source of information that can be useful in deepening an understanding of the patterns of missingness over time in the VIDUS data.

Results suggest that some variables maintain their significance in a more comprehensive model, while others do not. In the case of death, age (HR = 1.06, 95% CI: 1.04-1.08); illegal income generation (HR = 0.64; 95% CI: 0.47-0.88); MMT enrolment (HR = 0.67, 95% CI: 0.49-0.92) and HIV seropositivity (HR = 3.43; 95% CI: 2.60-4.53) all maintain significance in the same direction and to a similar magnitude as in previous analyses. Conversely, regular employment, unstable housing and enrolment in non-MMT addiction treatment do not retain significance. In the case of attrition, age (HR = 0.96, 95% CI: 0.95-0.98); female gender (HR = 0.71; 95% CI: 0.58-0.88); Aboriginal ancestry (HR = 0.68; 95% CI: 0.54-0.86); marital status (HR = 0.78; 95% CI: 0.62-1.00); DTES residency (HR = 0.49; 95% CI; 0.40-0.61); receiving social assistance (HR = 0.66; 95% CI: 0.52-0.83); unstable housing (HR = 1.39; 95% CI: 1.13-1.72); binge drug use (HR = 0.76; 95% CI: 0.61-0.94); injecting with other people (HR: 0.78; 95% CI: 0.64-0.94); enrolment in MMT (HR = 0.75; 95% CI: 0.0.58-0.96); and HIV seropositive status (HR = 0.47; 95% CI: 036-0.61) all maintain significance in the same direction and to a similar degree. Regular employment and recent incarceration do not maintain significance. While the percentage of total possible observations is not significantly associated with death, it is negatively and significantly associated with attrition (HR = 0.95; 95% CI: 0.95-0.96).

Table 3.6 Competing risks event history analysis of study participation outcomes relative to censorship in the VIDUS (n=1542), including prior participation levels[§]

	Death		Attrition	
Hypothesis/Characteristic	**Hazard Ratio**	**95% CI[†]**	**Hazard Ratio**	**95% CI[†]**
Participation level (% of possible obs)	1.00	(0.98 - 1.01)	0.96***	(0.95 - 0.96)
H1: Demographic Difference				
Age	1.06***	(1.04 - 1.08)	0.96***	(0.95 - 0.98)
Female gender	1.23	(0.91 - 1.67)	0.71**	(0.58 - 0.88)
Aboriginal ancestry	1.08	(0.79 - 1.47)	0.68**	(0.54 - 0.86)
Marital status	0.81	(0.57 - 1.13)	0.78*	(0.62 - 1.00)
H2: Socio-economic context				
DTES residency[§]	1.19	(0.85 - 1.66)	0.49***	(0.40 - 0.61)
Regular employment[§]	0.45	(0.19 - 1.06)	1.22	(0.92 - 1.61)
Illegal income generation[§]	0.64**	(0.47 - 0.88)	1.00	(0.81 - 1.22)
Social assistance[§]	1.23	(0.66 - 2.27)	0.66***	(0.52 - 0.83)
Unstable housing[§]	1.34	(0.97 - 1.85)	1.39**	(1.13 - 1.72)
H3: Risk, vulnerability and disruption				
Recent incarceration[§]	1.07	(0.75 - 1.53)	0.99	(0.79 - 1.23)
Bing drug use[§]	1.24	(0.91 - 1.68)	0.76*	(0.61 - 0.94)
Injects with other people[§]	0.85	(0.64 - 1.14)	0.78*	(0.64 - 0.94)
H4: Institutional Interface				
MMT enrolment[§]	0.67*	(0.49 - 0.92)	0.75*	(0.58 - 0.96)
Non-MMT treatment[§]	0.72	(0.44 - 1.17)	0.92	(0.71 - 1.20)
HIV seropositive	3.43***	(2.60 - 4.53)	0.47***	(0.36 - 0.61)
Time Dummy Variables (ref is baseline)				
Wave 1	1.78	(0.90 - 3.52)	0.39***	(0.27 - 0.56)
Wave 2	1.50	(0.74 - 3.06)	0.26***	(0.18 - 0.39)
Wave 3	1.70	(0.85 - 3.41)	0.14***	(0.09 - 0.23)
Wave 4	0.86	(0.38 - 1.96)	0.18***	(0.12 - 0.28)
Wave 5	0.98	(0.43 - 2.21)	0.15***	(0.09 - 0.24)
Wave 6	2.16*	(1.08 - 4.32)	0.12***	(0.07 - 0.20)
Wave 7	1.10	(0.51 - 2.40)	0.22***	(0.14 - 0.34)
Wave 8	1.26	(0.57 - 2.75)	0.25***	(0.16 - 0.40)
Wave 9	0.83	(0.35 - 1.98)	0.22***	(0.14 - 0.36)
Wave 10	1.09	(0.49 - 2.43)	0.39***	(0.26 - 0.60)
Wave 11	1.31	(0.59 - 2.91)	0.18***	(0.10 - 0.32)
Wave 12	1.40	(0.63 - 3.11)	0.11***	(0.06 - 0.22)
Wave 13	0.89	(0.36 - 2.20)	0.21***	(0.12 - 0.36)
Wave 14	1.66	(0.76 - 3.60)	0.13***	(0.06 - 0.28)
Wave 15	0.88	(0.34 - 2.26)	0.31***	(0.18 - 0.54)
Wave 16	1.19	(0.49 - 2.90)	0.64	(0.39 - 1.06)
McFadden's Pseudo R^2			0.14	

*$p<0.05$, **$p<0.01$, ***$p<0.001$; [†]analysis used clustered standard errors; [‡]CI=Confidence Interval; [§]refers to events/behaviour in six months prior to interview

These results suggest that generally, findings in previous models exploring correlates of how respondents end participation in VIDUS are robust to different model specifications. Employment, which significantly and negatively predicts death and attrition in prior analyses, fails to retain significance for either outcome in this final model. This is of particular relevance to this thesis, as it suggests that while employment may be linked with processes of non-response to a degree, it is not consistently associated with missingness. It is also notable that the existence of observation gaps prior to an individual's exit from the study via attrition is significant. Each increase in one percentage point of the total possible observations in which each person participates results in a decrease in the odds by a factor of 0.96 that that person will attrite out of the study rather than end participation with right hand censorship. This suggests that observation gaps are a precursor to leaving the study.

Competing risks models that explore factors that are significantly and comparatively associated with one of the three possible study participation end-states provide additional insight into the processes that produce missing data in the VIDUS. Results indicate that there is considerable support for the hypothesis predicting significant and systematic demographic differences across the different outcomes. There are also differences across indicators of socio-economic activities and contexts; DTES residency, formal employment, receiving social assistance and having unstable housing are all differentially associated with attrition relative to censorship. The socio-economic context hypothesis is of particular relevance when incorporating considerations of the potential impacts of missing data, given the current study's focus on employment and income generation. However, in a comprehensive model that also includes an indicator of prior observation gaps, regular employment does not retain significance. Given that there was a strong prior of employment predicting a subsequent observation gap, this result may be interpreted as employment leading to intermittent non-response, which then leads to attrition. Inclusion of this "mediating" variable then takes away the effect of employment.

There is less support for the third hypothesis, which predicted that disruption and risk taking behaviour are systematically related to patterns of missingness. As Variation in the coefficients of these variables may provide key clues as to the configurations of risk and vulnerability that are predictive of systematic differences in labour market outcomes, a key purpose of the subsequent chapter, the absence of a relationship is a potentially positive development in terms of the precision of estimates. Intuitively one might expect these indicators to be systematically related to study participation. A lack of any statistically meaningful association suggests that the VIDUS data provides particularly fertile ground for exploration of substantive questions related to disruption and risk, and that these explorations may be less threatened by missing data than otherwise thought.

Finally, there is considerable support for the fourth hypothesis, that contact with systems of care may encourage on-going participation. Enrolment in MMT is negatively associated with both death and attrition, and in initial analyses non-MMT addiction treatment enrolment is also negatively associated with mortality. Predictably, and tragically, being HIV positive is the strongest positive predictor of death in these analyses. It is also one of the stronger predictors of remaining in the study. The intensive care regimens associated with anti-retroviral therapies (ART) used widely during the study period of 1996-2005 would bring some individuals into contact with care-providing institutions on a regular basis. This contact with mainstream institutions and health care practitioners may reinforce day-to-day behaviour and relationships that could increase the likelihood of study participation.

3.4 Discussion

This chapter outlined the potential significance of missing data in the VIDUS. It reviewed literature on what missing data is, the forms it can take and the theoretical and methodological considerations that missing data necessitate, particularly for longitudinal data. It subsequently explored missing data in the VIDUS. Diagnostic tests identified two types of

observation-level missing data – intermittent non-response and attrition – and suggested four preliminary hypotheses about the substantive processes that produce this missing data. These hypotheses were then used to construct statistical models resembling selection modelling strategies, which explore how participants' responses may identify influences on or correlates with processes related to missingness. Analyses here aim to explore relationships between the substantive content and structural features of the VIDUS, and to further understand the associations between the four hypotheses and two missing data types. Intermittent non-response was modelled first using a discrete time repeated events EHA specification, pooling observation spells across all time periods and individuals. These results were then decomposed into a wave-by-wave series of cross-sectional logistic regressions exploring correlates of starting of an observation gap at the subsequent wave. Competing risks discrete time EHAs that employed a MNLM modelling strategy then compared attrition, right-hand censorship and mortality as the three different possible outcomes at the point in which individual participation in VIDUS comes to an end. Finally, a similar model explored potential relationships between intermittent non-response and these three study participation end-states.

It is important to note that the statistical associations observed in these analyses are not evidence of causal relationships between the variables included in models of missingness and the type of missingness examined. These associations may, for example, capture the true effect of an unmeasured factor that is correlated with observed variables included in analyses. A degree of uncertainty may also arise as to whether a covariate is responsible for producing a particular pattern of missingness, or whether there is simply a systematic patterning of study participation among individuals who exhibit or report the covariate in question. While the forward lagging of the dependent variable in analyses may aid in addressing the time sequencing of the events under study, the interpretation of statistical relationships from a causal perspective is therefore best undertaken with an appropriate level caution.

The first hypothesis, *that there are systematic differences in study participation across demographic groups*, received some support across all analyses. Older individuals were less likely to observe a GNW and to attrite from the study, but more likely to experience mortality. Participants self-identifying as having Aboriginal ancestry also had systematically different participation patterns. In bivariate analyses they were more likely to have complete data over the course of the study and less likely to attrite out of the study, associations that were replicated in pooled multivariate analyses over time of intermittent non-response and attrition. After having no relationship with either type of missing data in bivariate analyses, female gender and being married or in a common law relationship were significant and negatively associated with attrition relative to right hand censorship, although coefficients were not significant in analyses of observation gaps or in predicting mortality. There were systematic differences, then, across some demographic variables, though these differences varied by the type of missing data and study participation outcome.

The second hypothesis states that *an individual's participation is influenced by factors related to socio-economic context, such as holding a job or living in close proximity to the VIDUS study office*. This hypothesis also received support, though like the first hypothesis, this support was not consistent in all analyses for all variables and depended on the type of non-response. The socio-economic variable most consistently associated with missingness was Downtown Eastside residency. Those reporting DTES residency at baseline were more likely to have no intermittent non-response and less likely to leave the VIDUS on either a temporary or permanent basis in all analyses. Proximity to the study office may therefore be a key factor in on-going study participation. Receiving social assistance, though not examined in bivariate analyses, was also significantly and negatively associated with a GNW, suggesting two possible processes: first, that a dearth of day-to-day obligations facilitates taking time to participate in the VIDUS, and second, that for those receiving social support, the financial incentive created by the participation honorarium is greater than for those

involved in potentially more lucrative income generating activities. The observed relationship may be a function of either or both. A number of other socio-economic context variables were also statistically significant. Unstable housing, which in bivariate baseline analyses was positively associated with having intermittent missing data, does not have a significant association with intermittent non-response in pooled multivariate models. In competing risks models unstable housing positively predicted both attrition and death. Other indicators of socio-economic context had more complex relationship with missing data and in particular, in the different participation outcomes relative to censorship. In bivariate analyses, regular employment was a significant positive predictor of attrition, a relationship that held in analyses of participation outcomes, where it was also, conversely, a negative predictor of death. However, in comprehensive analyses, these associations did not retain significance. Illegal income generation, unexpectedly, was also negatively associated with death, while receiving social assistance was negatively associated with attrition, lending further support to the idea that a dearth of income generating activities may provide time and incentive for on-going VIDUS participation. It is important to note, here, that issues of causality may make the negative association between both legal and illegal income generation and mortality unclear from the results of this study alone. These associations may indicate that additional income may improve health outcomes and decrease mortality, or that individuals who are unwell and at greater risk of mortality find it hard to maintain income generating activity. Both findings have been documented in the general population (Bambra, 2011; Bartley, 1994; Lynch et al., 2000). Nevertheless, on the whole, individuals' material circumstances and immediate surroundings may have significant roles in study participation patterns.

The third hypothesis postulates *that recent life disruptions, relative levels of drug use and risk-taking behaviour may negatively impact an individual's study participation*. As with other hypotheses, there was some support for this notion. However, this hypothesis more than any other saw somewhat counterintuitive results. Individuals reporting recent incarceration at

baseline were more likely to have intermittent missing data over the course of the study, and both it and attendance at a shooting gallery had the predicted positive association with missing data in pooled multivariate analyses. Unexpectedly, daily or greater crack use had a significant negative association with a subsequent observation gap. Wave-by wave decomposition of the pooled OGN analysis results revealed that coefficient values of the variables associated with risk-taking behaviour, drug use and disruption are predominantly quite volatile across time, although much of this variability is attributable to random noise. In competing risks models, none of the variables of interest for this hypothesis had significant associations with death relative to censorship. Consistent with results from bivariate analyses, recent incarceration was significantly and positively associated with attrition, a notable finding given its lack of relationship with both intermittent missing data and attrition in initial analyses. Binge drug use and injecting with other people was negatively associated with attrition. While it is plausible that injecting with other people is an indication of the social ties individuals share with others in the drug-using community, explanations for the negative binge drug use (for attrition) and frequent crack use (for intermittent non-response) results are elusive as these variables are generally indicators of high-risk substance use (Werb et al., 2010). A clue to these surprising results may lie in the fact that other than frequent crack use, which was negatively associated with intermittent non-response, none of the drug use variables, including daily injection, reached significance. This suggests that drug use of any intensity may not be sufficiently disruptive to impact study participation in any meaningful way. This surprising result may prove a fertile area for further study.

The final hypothesis predicted that *that regular interaction with a system of care such as that involved in the treatment of HIV/AIDS or addiction will positively impact study participation by connecting them with mainstream institutions and professionals that may encourage continued participation*. While bivariate baseline analyses suggest that individuals who are HIV positive are more likely to have complete data, and that both these and

individuals enrolled in addiction treatment are less likely to attrite from the study, none of the variables used as indicators for this hypothesis were significant in pooled predictions of observation gaps. Wave-by-wave decomposition indicated that these variables were relatively stable over time and not significantly positive or negative, with only minor variations in estimates over time. In competing risks models of study participation end states, MMT enrolment was negatively associated with both death and attrition, and non-MMT addiction treatment enrolment was negatively associated with death. Interestingly, though not unpredictably, HIV seropositive status was very strongly and positively associated with mortality and very strongly and negatively associated with attrition. These results suggest that the fourth hypothesis may have been too narrowly specified as the same behaviours or characteristics that may increase interaction with systems of care also convey important information about the health status of study participants. While the interaction with systems of care may have had the predicted impact on non-response, the health status that motivates these interactions appears to also profoundly impact study participation outcomes.

Time specifications in both pooled repeated events discrete time EHA of intermittent non-response and in the competing risks EHA of censorship, attrition and death warrant further attention. The time dummies in the intermittent non-response models correspond to the length of the observation spell that an observation gap interrupts. The insignificant coefficients for spells of two and three observation lengths relative to the reference category of one observation, followed by the significant and negative coefficients of longer observation spells, suggest that individuals were more likely to have an observation gap after short participation spells rather than longer ones. In other words, it appears that once a study participant was in the habit of participation for a certain number of follow ups, they tended to maintain it. A similar pattern was observed for those who attrite from the study relative to those who were censored. Here, time dummy variables were significant and negative relative to the reference category of censorship. This confirms the above observation that those who

remain in the study for longer tend to maintain participation. Both intermittent non-response and attrition had time dependencies over and above their significant associations with substantive predictors. There was no discernible pattern related to time for those who die relative to those whose study participation was right hand censored.

Analyses also demonstrated that there is a relationship between intermittent non-response and attrition. When incorporated into competing risks models, the higher the proportion of total possible follow ups a participant contributed, the less likely they were to attrite from the study. Observation gaps positively predicted attrition to a considerable degree, with, for example, someone who contributed 90% of their total possible follow ups having a 40% higher odds of attrition compared to someone who contributed 100% of their total possible observations, *ceteris paribus*.

These analyses suggest that exploring the relationship between the structure of the data and the content of the data may convey important information about both how an understanding of the ways in which patterns of non-participation are linked to the substantive content of the data and therefore relevant to subsequent analyses, as well as about those things that shape the study participation experiences of participants over time. Regarding the former, using observed data to explore patterns of missingness is one way to assess the degree to which non-response is connected to the research questions of interest and to the variables used to explore them. Indicators of socio-economic context and employment status, risk taking behaviour and HIV serostatus, among others — all indicators that comprise important components of later analyses — were systematically associated with different patterns of missing data. In particular, this may result in the over- or underrepresentation relative to baseline of particular characteristics or behaviours, though importantly, time varying events or activities that differ between earlier and later time periods may simply reflect changes in individual behaviours or experiences over time. Nevertheless, intermittent observation level non-response may result in the over-representation of individuals who are older, of Aboriginal

ancestry, residents of the Downtown Eastside, and receiving social assistance, while those experiencing incarceration or attending shooting galleries may be under-represented, assuming these time-varying experiences continue throughout periods where individuals are not observed. In the case of attrition, current analyses suggest that individuals who are older, of Aboriginal ancestry, females, married, living in the DTES, receiving social assistance, binge drug users, inject with others, enrolled in MMT and HIV seropositive may be over-represented, while those who report unstable housing are more likely to be under-represented. The potential that missingness will produce bias is therefore a very real one, though the effect of this bias may be either the suppression or inflation of effects, depending on the analysis and the variable in question. Notably, most drug use and drug-related activities appear not to be systematically related to data structure. Further research is required to determine whether or not the potential for over- or under-representation for time-varying characteristics of the sample is a product of missing data or change over time.

Analyses may also convey important information about those things that shape the participation experiences of VIDUS respondents. That is, the relationship between substantive content provides some indication of factors that shape individual motivation, availability and ability for study participation as well as those exposures that may precipitate changes in their participation patterns. For example, there is consistent evidence that individuals' material and living conditions impact participation, evidenced by significant associations with certain forms of income generation and housing stability. Once again, high-intensity drug use and many types of drug-related risk do not appear to negatively precipitate study dropout or periodic absence. Instead, participation changes appear to be foreshadowed by broader life changes such as incarceration. Those indicators that predict observation-level missingness may be conceptualized as potential precursors to participation pattern changes, the knowledge of which may be helpful in identifying individuals for whom follow up efforts may be

adjusted according to their relative likelihood of maintaining on-going participation after initial recruitment into the study and beyond.

Finally, these analyses elucidate important considerations for missing data management in subsequent analyses. First, analyses of intermittent non-response and attrition provide evidence of systematic relationships between variables of interest and both types of observation-level non-response. They further demonstrate a relationship between the two types of missing data, with intermittent non-response predicting subsequent attrition. It will therefore be important to manage both types of non-response in the treatment of missing data. Second, accounting for time in analyses of missing data patterns, both by decomposing pooled analyses into wave-by-wave examinations of predictors of missing data and by including time dummies in pooled models, demonstrated significant time dependency. While wave-by-wave variability in most cases appears to be random noise and therefore suggests that it is appropriate not to separate models for missingness in future substantive analyses by time period, instances where there are clearer time dependencies suggest that it will nevertheless be important to use a missing data strategy that is able to account for the serial correlation in the data. Third, analyses provide some indication of whether to estimate parameters in subsequent analyses in an ideal scenario where no one dies during a study (Schafer & Graham, 2002) by simply imputing those observations after the time of death as if they were missing. As mentioned above, ignoring instances of death my introduce biases into the data due to changes in mortality related behaviour or disease progression directly prior to death. Significant results in competing risks models comparing death to right hand censorship suggest that this may be the case. A prudent missing data strategy vis-à-vis death is therefore to only use observations up to the time of death in subsequent substantive analyses and not impute observations following death as if they represented a different type of attrition. Finally, given the structural complexity of the VIDUS data, it makes sense to manage missing data in a way that accounts for all of the above, but minimizes the computational intensity of building two-stage MLE

models that require a specification for missing data for each model. Given recent advances in multiple imputation statistical software capabilities for observation level missingness in longitudinal data, multiply imputing multiple data sets that can then be used for all subsequent estimates is the missing data strategy that will be employed here. Details on the software, specifications and outcomes of imputation processes will be reported in the following chapter alongside the methodological specifications of substantive analyses.

These analyses have a number of limitations. First and foremost, they are only able to examine processes surrounding data that are MAR, which is consistent for with most analyses of missing data (Graham, 2009; Rubin, 1996b). Any inferences about periods of non-participation are therefore not verifiable, since the information needed to confirm these inferences is not itself observed. This is potentially problematic for future analyses, as models here indicate in some instances a level of dependency between socio-economic context, including employment, and study participation. Nevertheless, there is considerable information contained in the longitudinal structure of the data, thanks to the time dependence across individuals, which may make an MAR assumption in subsequent imputations reasonable. Additionally, the VIDUS lacks an indicator that would permit the unambiguous distinction of intermittent non-response from attrition, such as a procedure where individuals could register their intention to leave the study permanently. As such it is impossible to determine definitively whether or not monotonic non-participation, particularly at the later follow ups, represents actual attrition or whether these individuals would have returned to the study at a later period in time. Exploring these issues of right-hand censorship and their implications for the conclusions drawn here may be a fruitful area of further inquiry. A further limitation is the lack of robust diagnostic framework for both logistic and multinomial logistic event history analyses using clustered data. The increased value of the pseudo R-squared noted between earlier competing risks models, for example, suggests an improvement of model fit for the final model. Nevertheless, the McFadden's pseudo R-square reported here is

only appropriate for comparative purposes across models using the same data, and cannot be used to draw conclusions about the amount of variation in missing data patterns that is explained by the variables included in models (Freese & Long, 2006; Long, 1997). Finally, the number of variables available for analyses is a further limitation of this work. There are inevitably substantive processes not assessed here that may produce observation-level missing data. However, like the missing observations themselves, without additional data, it is not possible to explore them in a substantively meaningful way.

In sum, this chapter explores the missing data of the VIDUS in detail. In identifying the pattern and extent of missing data, it identifies intermittent non-response and attrition as two types of observation-level missing data with potential consequence for future analyses. Analyses are conducted to identify substantive variables associated with the presence of both types of missing data at baseline and over the course of the nine-year study. In doing so, they explore relationships between the structure of the data and the content of the data that may be of consequence to subsequent substantive analyses, to the selection of a method to manage missing data statistically and to the management of study participation at an operational level. A detailed exploration of missing data in this instance is an important preparatory step in advance of substantive analyses; it foreshadows some of the inferential limitations that are important to consider when conducting research with complex data structures and involving marginal and vulnerable populations.

Chapter Four: Transitions into employment

4.1 Introduction

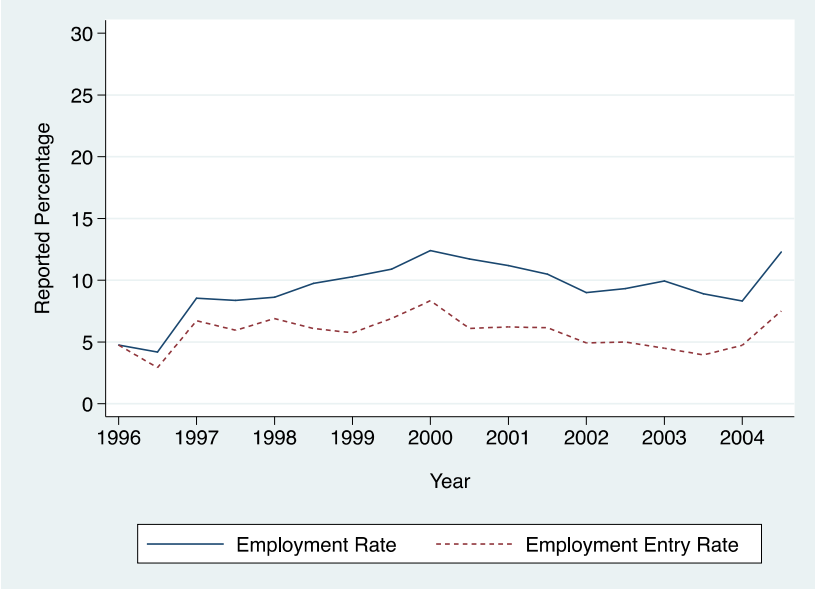
The consumption of psychoactive substances is often considered incompatible with employment; people who inject drugs in particular are generally categorized as either unable or unwilling to participate in conventional economic activity (Platt, 1995). While this may be true in many cases, it is not universally so (French et al., 2001; McCoy et al., 2007; Richardson, Wood, Li, & Kerr, 2010). Exploring systematic differences between IDU that do and do not engage with the labour market may increase understanding of the barriers to socio-economic participation experienced by this highly vulnerable population. Examining heterogeneity in employment patterns within drug using populations, as opposed to between drug using and non-drug using populations, may proffer considerable insight into social, behavioural, physical and structural factors that differentially impact labour market outcomes *among* drug users. This chapter examines one component of labour market involvement: transitions into employment. While employment transitions among IDU are relatively uncommon, results nevertheless demonstrate a complex relationship between drug use and work that challenges conventional assumptions about the social and economic functioning of IDU.[31]

It is perhaps not surprising, given the potential impact of injection drug use on a user's health and well being (Chen & Lin, 2009; Nutt et al., 2010; UNAIDS, 2010), that scholarship generally assumes that such behavior would prohibit active participation in the labor market.

[31] Portions of this chapter have been adapted for peer-reviewed publications and have been published or are under currently under review. References for these articles/manuscripts are as follows:
Richardson, L., Wood, E., Li, K, Kerr, T. (2010) Factors associated with employment among a cohort of injection drug users. *Drug and Alcohol Review*, 29(3): 293–300.
Richardson, L., Wood, E., Montaner, J. and Kerr, T. Addiction treatment-related employment barriers: The impact of methadone maintenance. Journal of Substance Abuse Treatment (in press). DOI: 10.1016/j.jsat.2011.12.008
Richardson, L., Wood, E. and Kerr, T. "The impact of social, structural and physical environmental factors on transitions into employment among people who inject drugs." *Social Science & Medicine (under review)*

The employment and employment entry rates of the VIDUS cohort displayed in Figure 4.1 confirm that while most study participants are not involved in formal employment, a sizeable number are. The employment rate among VIDUS participants ranges from 5.0% to 14.1% (mean = 10.3%; standard deviation [SD] = 2.6%). Importantly, this employment rate does not refer to the same VIDUS participants over time; fully 32.4% or 518 out of a total of 1599 study participants report income from formal employment at some point during the observation period. The percentage of VIDUS participants transitioning into employment at any given follow up ranges from 3.7% to 8.7% (mean = 6.4%, SD = 1.3%). The difference between the number of people reporting employment at any point and the number reporting employment at a given follow up suggests that there is a dynamic group of people within the study population who both inject drugs and engage with the formal labour market. These do not represent a single, stably employed group but rather a sizeable proportion of the total study population that move in and out of employment over time.

Figure 4.1 VIDUS employment and employment entry rates, 1996-2005 (n=1599)



While these employment rates are generally low compared to the labour market participation rates reported by other drug users (Platt, 1995), this consistent level of

employment maintained by a dynamic subpopulation of VIDUS participants warrants closer examination. These simple descriptive statistics suggest that it is inappropriate to assume that all IDU refrain from participation in conventional economic activity. They also imply that income generation in general and labour market participation in particular may represent a critical social and socio-economic dimension of drug use. Given the relationship between employment, occupational status and health that has been documented elsewhere (Krieger et al., 2008; Mathers & Schofield, 1998; Morris, Cook, & Shaper, 1994), this relationship may prove to be of considerable import for understanding the social stability, health, well-being and incidence of harm among this population. An individual's relationship with the labour market may involve complex processes related to labour market entry, the maintenance of employment, job transitions, job losses and labour market exits that are contingent on a range of individual, environmental and structural characteristics. Because of the dearth of research on the subject among populations of this kind, I employ an exploratory research strategy that looks at range of injection drug use patterns, individual characteristics, risky behaviour, personal circumstances and health conditions that may impact entry into formal employment. This strategy seeks to identify systematic differences that distinguish IDU who make transitions into employment from those who do not.

The remainder of the chapter is set out as follows: Section 4.2 reviews literature on employment transitions, sociological accounts of drug use as they relate to employment, and studies from treatment, health economics and epidemiology that explore the employment-drug use relationship. A series of hypotheses related to the employment transitions of IDU are outlined in Section 4.3, followed by a summary of the methods used for the current analysis in Section 4.4. Section 4.5 displays the results of these analyses and Section 4.6 discusses these results in further detail, focusing on some of the plausible social processes that may account for both expected and unexpected associations, emphasizing the implications of the current study for prior accounts of the employment-drug use relationship. It concludes the chapter

with a summary of findings, possible areas for future research, contribution to the existing literature, and suggestions about the implications of this research for public policy.

4.2 Employment and drug use in the literature

4.2.1 Transitions into employment

An expansive literature in the field of labour economics examines labour market transitions (see Devine & Kiefer, 1991; and Devine 1993 for a review). Characterized as "oppressive" (Devine & Kiefer, 1993, p. 21) in quantity, this literature includes research on job search, job transitions and exits from unemployment into either employment or labour market non-participation in national and international perspective. As such, a full review of the literature is outside the scope of the current study. An overview of job search theory and a summary of several of the empirical trends in this research are outlined here.

Job search theory acknowledges that the labour market is noisy, characterized by uncertainty and incomplete information among individuals and firms (Devine & Kiefer, 1993). This is especially the case given how individuals, the economy and the firm change over time. Job search theory formally addresses this uncertainty, modelling how unemployed individuals engaged in a job search spend time and effort in seeking out the best opportunity for subsequent employment. Individuals are assumed to have a reservation wage, below which they will reject an offer of employment (Devine & Kiefer, 1991). This search is further conditioned, among other things, by an individual's out-of-employment income, benefit eligibility, search efforts, and labour market attachment (Petrongolo, 2009).

Empirically, rates of job offer acceptance are generally high because workers tend to search in segments of the labour market where all jobs are acceptable (Devine & Kiefer, 1993; van den Berg, 1990), there are generally a low number of job offers received, and the costs of continuing the job search process are high relative to taking up employment. Research also stresses the important of systematic job search strategies (Eden & Aviram,

1993; McQuaid, 2006; Schaufeli & Vanyperen, 1993) that are multifaceted and non-sequential.

Previous work emphasizes the important differentiation between "nonemployment" and unemployment (Atkinson & Micklewright, 1991; Lynch, 1989; Mealli & Pudney, 1999). Nonemployment refers to those who are not registered as active in the labour market, while unemployment refers to those who are. Nonparticipants can further be divided by the different possible reasons for labour market nonparticipation, including long-term health reasons, disability, retirement, or training (Atkinson & Micklewright, 1991). This differentiation has led to a number of studies that also examine exits from labour market participation (Little, 2007; Narendranathan & Stewart, 1993; Roed, Raaum, & Goldstein, 1999; van den Berg, 1990), which note a positive relationship between the duration of unemployment and leaving the labour market. Further differentiations have also proven important, including separating new labour market entrants from those with experience, compensated from uncompensated unemployment, and unemployed individuals who are actively searching for work from those who are not (Atkinson & Micklewright, 1991; Devine & Kiefer, 1993).

Another focus in empirical work on job transitions is the role of unemployment benefits (Devine & Kiefer, 1993). Theoretically, the assumption is that unemployment assistance will decrease monetary incentives to return to work. A review of the literature in this area notes the issue is generally framed as the "adequacy of benefit levels being traded off against their disincentive effect in increasing unemployment at the expense of employment" (Atkinson & Micklewright, 1991). However, the debate over the role of unemployment benefits is unsettled (Devine & Kiefer, 1993) and varies considerably both within and across contexts (Atkinson & Micklewright, 1991). There appears to be a generally positive relationship between unemployment benefits and unemployment duration, though the magnitude is uncertain, and the effect is conditioned by labour market conditions and work characteristics (Devine & Kiefer, 1993). A selection of empirical studies demonstrates a

generally small negative or non-existent change in re-entry probabilities with increases in benefit levels, as the expiration of benefit eligibility neared, or if benefit eligibility is extended (see Bover, Arellano, & Bentolila, 2002; Jenkins & García-Serrano, 2004; Jurajda & Tannery, 2002; Layte & Callan, 2001; Narendranathan & Stewart, 1993; Spiezia, 2000; and Tsebelis & Stephen, 2001, for examples). Studies have come to conflicting conclusions about the effect of benefit sanctions, showing in one case that a decrease in benefits was ineffective in reducing unemployment duration (van den Berg, 1990). Sanctions in another context dramatically increased re-employment rates, though this change was potentially also attributable to increases in search intensity produced by threats of severe additional sanctions (Abbring, Berg, & Ours, 2005). Atkinson and Micklewright (1991) note that the framing of unemployment benefits in terms of their impact on financial incentives to work portrays the aim of unemployment benefit policy narrowly and assumes that the impact of unemployment compensation can be adequately summarized by referring to the level of benefit. They further suggest the importance of a range of institutional features relevant to labour market behaviour such as retraining and search requirements. Benefits may therefore have positive or negative impacts on re-employment incentives that may depend on qualifying conditions and institutional relationships (Atkinson & Micklewright, 1991). Finally, more recent studies note unintended consequences of toughening the benefit regime; more stringent eligibility criteria or decreased levels of benefit may push those on "margins of crime" toward increases in criminal behaviour (Calvó-Armengol, Verdier, & Zenou, 2007; Machin & Marie, 2006).

The focus on the relationship between unemployment benefits and time in unemployment emphasizes a predominant feature of the vast majority of studies on employment transitions, that of duration dependence. Here, the implications of a focus on duration are both methodological and substantive. Methodologically, duration models look at the probability distribution for lengths of unemployment spells, and the simplest search models assume that the probability of a job offer in a given period is fixed (Devine & Kiefer,

1993, p. 21). Changes in the specification of the hazard function in some studies has only a negligible impact on estimates of the effect of covariates on duration (Addison & Portugal, 1998; Hernaes & Strøm, 1996), while in others the hazard has been shown to depend on local market conditions (Lynch, 1989; Petrongolo, 2001). Substantively, considerable debate exists around whether models capture 'true' duration dependence from unobserved, time-varying processes or spurious duration dependence attributable to unmeasured heterogeneity (Devine & Kiefer, 1993). Studies have indicated duration dependencies that vary by particular socio-demographic groups, such as older workers, those without a previous unemployment record (Roed et al., 1999) and women (Theodossiou & White, 1994). Another study has shown a severe penalty on subsequent job tenure resulting from unemployment incidence rather than duration (Böheim & Taylor, 2002). In contrast, positive duration dependence has been associated with labour market exits (Roed et al., 1999), where increased time outside the labour market reinforces labour market detachment among the long-term sick and disabled (Little, 2007). This underscores the importance of examining heterogeneity (Devine & Kiefer, 1993), identifying the type of labour market transition and specifying a flexible baseline hazard (Narendranathan & Stewart, 1993). These are key features of the approach taken here.

Finally, job search models have incorporated various types of heterogeneity. Demographic lines of gender, race, age and marital status are of consequence to labour market transitions (Bloemen & Stancanelli, 2001; Devine & Kiefer, 1993; Lynch, 1989). Variation in transition probabilities along lines of educational attainment are also clear across studies (Bloemen & Stancanelli, 2001; Devine & Kiefer, 1993; Kettunen, 1997; Riddell & Song, 2011). However, there are instances where there are skill-opportunity mismatches, with higher unemployment among those with higher educational attainment (McQuaid, 2006). Heterogeneity across worker- and unemployment situation-specific characteristics have also proven important factors differentiating between employment re-entry probabilities. These include temporary versus permanent layoffs (Addison & Portugal, 2003); union members

versus non-members (Devine & Kiefer, 1993; Narendranathan & Nickell, 1985); benefit recipients versus non-recipients (Devine & Kiefer, 1993); and search activity (Devine & Kiefer, 1993). Person-specific unemployment propensity has been found to impact re-employment probabilities, implying an unemployment burden that is unequal across the population (Theodossiou & White, 1994). Another source of heterogeneity differentiating re-employment patterns are job characteristics, such as working hours (Bloemen & Stancanelli, 2001), wage (Devine & Kiefer, 1993) and types of work (Bradley, Crouchley, & Oskrochi, 2003). Importantly, the disaggregation of the type of work transitioned into emphasizes the role of the type of work on job tenure, as those in low-skilled occupations can be trapped in a vicious circle of low-skilled employment, unemployment and inactivity (Bradley et al., 2003). Finally, heterogeneity across economic indicators can strongly influence transitions. These include local demand conditions (Jurajda & Tannery, 2002; Lynch, 1989; McQuaid, 2006; Petrongolo, 2001) and business cycle fluctuations (Bover et al., 2002).

Importantly, the current study faces a number of limitations in replicating such analyses. While the VIDUS data includes data on the existence of employment and social assistance income, it does not include job search information, nor does it differentiate between unemployment and nonemployment. This makes it impossible to determine who is actively participating in the labour market. While data on individual health status does exist, it is insufficiently detailed to accurately assess the physical and mental capabilities of participants. As a result, this information cannot be used to infer labour market participation, particularly given the myriad other reasons that individuals may be unemployed (Atkinson & Micklewright, 1991; Devine & Kiefer, 1993). Further, while individuals indicate whether they are in receipt of social assistance, various questionnaire changes and relatively blunt response items do not permit the consistent differentiation between, for example, disability benefits, unemployment benefits, or welfare support consistently across follow ups. As a result, the current study is limited in its ability to appropriately nuance models for a range of the features

here identified as consequential to labour market transitions. It does, however, make use of existing information to incorporate considerations of individual heterogeneity, duration dependence and previous employment transitions.

4.2.2 Drug use and employment in the literature

4.2.2.1 Sociological theories of deviance and drug use

This review of drug use and employment in the literature critically assesses theoretical and empirical accounts of drug use in the sociological, health economics, treatment, and public health literatures. Particular attention is given to those studies that may provide insight into the relationship between drug use and employment. Notably, theories generally imply that those individuals who use psychoactive substances are also more likely not to engage the labour market. They generally struggle to accommodate those who engage in both. More recent empirical sociological research examines indicators of social and economic functioning among people who use drugs and mainstream social activity as potential mediators of the drug using experience. While this line of inquiry has not yet looked at the role of employment, it does provide a potentially fertile analytical perspective to explain heterogeneity in labour market outcomes among IDU. Literature from the fields of health economics, addiction treatment, and HIV/AIDS supplement this work and flesh out hypotheses that subsequently guide analyses of the associations between a range of characteristics, behaviour, contexts and circumstances and employment transitions. The section closes by pointing out important research design considerations drawn from the review.

Drug use for a range of purposes – medical, religious, artistic or otherwise – has long been culturally regulated and socially integrated into traditional rituals (Escohotado, 1998; Gossop, 2007; Knipe, 1995). It was only in the mid-nineteenth century that some drugs that had been used for medical or ceremonial purposes came to be regarded as dangerous and their abuse viewed as pathological (Bergeron, 2001). With increased consumption of drugs in the

early 20th century, came the proliferation of the use of the term "addiction", stereotypes of drug use as a "demon" that leads to social and moral misery, characterizations of drug using behaviour as "irrational" and drug addiction as an "epidemic or disease" (Bergeron, 2001). Early sociological considerations of drug use, coinciding with an increase in chronic and widespread drug use in inner-city neighbourhoods, drew unsurprisingly on concepts from the sociology of deviance (Bergeron, 2001). Three categories of sociological theories of drug use — strain, social control, and social learning — exemplify this tendency. Each of these early functionalist theories suggest that socio-economic participation, such as employment, is incongruous with drug use and drug seeking behaviour.

Strain theory is premised on the assumption that deviance results from frustrated needs or wants. In *Social Structure and Anomie*, Merton (1938) outlines how culturally ascribed goals related to material success, when combined with a lack of socially approved means to achieve that success, create a state of social strain that results in deviant conduct. Cloward and Ohlin (1960) suggest that the primary influence on the strain producing goals-means discrepancy is differential opportunity structures, which lead to an "acute pressure to depart from institutional norms," (Cloward & Ohlin, 1960, p. 105). This pressure is felt most strongly where rewards and opportunities are the scarcest — that is, among those at the lower end of the social-economic spectrum — resulting in a concentration of deviance at the bottom of the socio-economic spectrum. According to the theory, the delinquent response is an attempt to achieve goals that individuals do not believe can be met conventionally. Drug use, according to strain theory, is symptomatic of a failure to successfully achieve culturally ascribed goals by institutionally sanctioned means. This connection is tenuous, as it is more logical to assume that the anomic state would lead to deviant behaviour designed to meet those goals rather than drug use, which cannot be directly connected with the pursuit of material objectives. Moreover, with its focus on deviance, strain theory is unable to suggest motives for employment seeking behaviour that may co-occur with drug use, that is, where

deviance is not consistently expressed across the domains of drug use and labour market engagement.

Unlike strain theory, control theory posits that strain is a universal state and everyone has frustrated wants and unfulfilled needs (Elliott, Ageton, & Huizinga, 1985). Deviance results from the relative strength (or lack thereof) of social controls that restrict the impulse toward deviant behaviour. Formalized in Hirschi's (1969) *Causes of Delinquency*, control theorists focus on bonds created between individuals and social structures. According to Hirschi, "delinquent acts result when an individual's bond to society is weak or broken" (Hirschi, 1969, p. 16). The strength of these bonds determines the costs of non-conformity in the form of real or anticipated punishment, such as jeopardized social relationships, guilt from violating internalized norms, or compromised status in religious, professional or community groups (Elliott et al., 1985). Individuals are therefore more likely to conform when costs of non-conformity are high and are less likely to conform when these costs are lower. Drug use represents a failure of social controls to effectively sanction against a type of deviance. Non-employment may also reflect a failure of sanctions to incentivize socio-economic participation, and employment among drug users may therefore represent a configuration of social controls that produce conformity in one respect and deviance in another.

A third theoretical area, that of social learning theory, is also known as cultural deviance theory (Groves & Sampson, 1987), differential association theory (Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979; Sorenson & Brownfield, 1995), or interactionist theory (Gabe & Bury, 1991). Based on Sutherland's (1947) idea that individuals engage in deviant behaviour because they have learned to do so, social learning theory suggests that variation in socialization results from positive and negative reinforcement and through interactions with significant groups (Akers, 1968; Akers et al., 1979; Burgess & Akers, 1966). Behavioural decisions are therefore the result of differential social reinforcement by both conventional and deviant socialization agents. Heterogeneity in deviant behaviour is thus the result of variation

in individual capacities to learn and/or internalize norms and maintain the personal relationships required for social integration, as well as the effectiveness of socialization agents such as parents, peers, social forces or structural contexts (Elliott et al., 1985). According to social learning theorists, drug use is a learned process of group interaction that cannot be accounted for by pharmacological properties of the substances alone (Becker, 1953; Becker, 1963; Lindesmith & Gagnon, 1964). An individual has to learn both how to use and how to appreciate the effects of use. From this perspective, a lack of labour market participation may also be the result of normalized non-participation among disconnected groups. Heterogeneity in employment outcomes among people who use drugs may simply reflect differential reinforcement in the domains of labour market participation and substance use.

Though a useful introduction to the phenomenon, strain, control and social learning theory are ultimately too homogenizing for the purposes of this thesis in either their view of pressures toward drug use or outcomes related to drug use. Where strain assumes perfect socialization to universally held norms and variation in opportunities to pursue them, control theory assumes variation in socialization processes and universally experienced strain (Kornhauser, 1978). Both strain theory's invocation of universal goals and control theory's assumption of a universal tendency towards deviance oversimplify a complex relationship producing an individuals' propensity to use drugs. In turn, while social learning theory allows for different orientations in both dominant social norms and socializing forces, it has been criticized for propagating the idea of 'deviant subcultures.' The result has been an association of deviant groups with values such as toughness and trouble (Miller, 1958); sub-cultural preferences for immediate gratification and risk taking (Banfield, 1968); and impulsive, hedonistic, malicious and negativistic value orientations (Cohen, 1955). All three theories implicitly characterize all deviance as similar and, for example, that the reasons for stealing a car are the same as those for injecting heroin. The level of empirical support for all three general theories is further consistently modest or weak (Akers & Sellers, 2009; Sorenson &

Brownfield, 1995). The myriad proclivities for and pathways to substance use may not be the result of the processes described by strain, control or learning theory at all (Alexander, 2010).

Research in other domains differentiating between types of deviance is widespread. For example, Freidson (1965) formulates a general typology of deviance across dimensions of the perceived responsibility of the person, whether a particular deviation is considered "curable" or "incurable," and whether or not there is stigma attached to the deviant act. Orcutt (1976) differentiates empirically between moralistic and medical perspectives on different kinds of deviant acts within the field of substance use. Explaining simultaneous injection drug use and successful labour market engagement in the context of these frameworks is problematic, however, because each suggests that substance use and non-employment are deviant behaviour that result from similar social disconnection, social control or normalization processes. While it is plausible that any of these processes may produce either outcome, a lack of employment may not represent deviance at all, but instead may result from myriad causes ranging from labour market conditions to individual health to family commitments, complexity that Freidson's and Orcutt's studies fail to recognize.

4.2.2.2 Ethnography, substance use and employment

Ethnographic studies have challenged the premises of deviance-oriented theories and distanced themselves from attempts to identify the etiology of drug addiction. Preble and Casey (1969), for example, suggest that drug addicts are compulsive, hardworking business people who occupy their time with many intensive activities that lead to only a brief moment of euphoria after consumption. In this and other studies, even chronic users of the most vilified substances demonstrate activities, skills and competencies that allow them to survive in the street and cope with their addiction (Feldman, 1968; Johnson et al., 1985; Johnson, Williams, Dei, & Sanabria, 1990; Preble & Casey, 1969; Stephens, 1991). These studies suggest that people who use drugs are capable of and motivated to perform a range of

activities that may likewise be highly applicable in the labour market, creating an analytical space where heterogeneity of outcomes in both drug use and employment patterns is plausible.

4.2.2.3 Controlled use, social functioning and socially mediated recovery

A select number of studies demonstrate that many people who use drugs do not become addicted, are able to control use and do not associate with deviant subcultures (Castel & Coppel, 1991; Harling, 2007; Zimmerman & Wieder, 1977; Zinberg, 1984). These analyses offer evidence that people can continue to participate in mainstream social activities while chronically using highly addictive drugs. Consumption can be self-controlled and regulated through rituals and norms surrounding drug use, and people who use drugs are often able to learn the bounds of "socially acceptability" in terms of quantity, frequency and behaviour (Zimmerman & Wieder, 1977; Zinberg, 1984). Biernacki (1986) provides further evidence that chronic users do not necessarily become detached from mainstream society. These studies suggest that explanations of social behaviour related to drug use need to be more nuanced because many users are hidden; they belong to every social class and are able to straddle both the realm of mainstream social expectations and that associated with drug use (Granfield & Cloud, 1996). While these studies acknowledge that addiction remains, for many, a highly destructive experience, they also demonstrate that chronic drug use does not preclude mainstream social and economic functioning. This work challenges the aforementioned determinism associated with theoretical accounts of drug use; they provide empirical support for the notion that drug use and deviance are not causally linked (see Allen, 2007, pp. 24-32).

In the same vein, Zinberg's (1984) *Drug, Set and Setting* attempts an alternative theoretical account of drug use to those presented in the deviance literature. It postulates that using behaviour is a combined function of the pharmacological properties of the drug, the psychological mindset of individual users, and the setting in which drug use takes place. Zinberg's model improves the theoretical accounts of drug use described previously in three

ways. First, it differentiates between three analytical levels at which variation in the pressures related to drug use develop and how heterogeneity at each of these levels can produce meaningfully different outcomes. Second, it incorporates non-social pressures, including substance-specific properties and patterns of use. Third, it represents an important conceptual shift away from accounts that connect drug use exclusively with deviance. Further, the *Drug, Set and Setting* framework maintains emphasis on some of the most salient features of theoretical accounts such as sanctions and social reinforcement, an emphasis reiterates the importance of sociological perspectives to a general understanding of drug use. Despite these strengths, however, it is important to assess the theoretical value of the *Drug*, *Set and Setting* model with some caution; the theory is general, may be impossible to test and falsify, and may therefore be more appropriately characterized as a framework rather than a theory. It nevertheless points out useful themes for consideration.

Empirical work on individual outcomes has further implicated social processes and activities as mediators of drug using behaviour. For example, the analysis of different stages of drug use has led to explorations of why, after a period of intensive drug use or addiction, individuals may stop using drugs, reengage in non-drug using social networks or begin mainstream social activity without explicit interventions (Bennett, 1986; Stephens, 1991; Stimson & Oppenheimer, 1982). This line of inquiry has also examined the role of social structures and activities in drug use cessation, focusing predominantly on recovery defined as the achievement of abstinence (Bergeron, 2001). However, given the demonstrated heterogeneity of the drug using experience in the ethnographic literature, an abstinence-based focus overlooks the idea that the re-initiation of socio-economic activity may co-occur with active and even high intensity drug use (Richardson et al., 2012). In addition, studies examining mainstream economic activity as a mediating social pressure or as an aid to recovery are rare. The current study explores both by looking at transitions into employment in a context of potentially active drug use. Notably, while the sociological literature described

here provides both a general rationale for the current study and some initial guidelines for formulating hypotheses, an examination of further empirical literature outside sociology informatively supports the construction of more specific hypotheses.

4.2.2.4 Drug use and labour market participation

A number of studies in health economics examine how drug use impacts work-related outcomes such as income and labour market participation among the general population. Notably, the sparse number of data sources including both labour market and substance use information has limited the number of studies of this type.[32] Generally, in line with the theoretical literature discussed above these studies hypothesize that substance use and labour market participation will be inversely related.

Some studies confirm the predicted inverse relationship between drug use and labour market participation. Kandel and Yamaguchi (1987) find that illicit drug use is positively correlated with weeks unemployed, increased job mobility and job separation using data from a New York public school cohort. Kandel and Davies (1990) use the US National Longitudinal Survey of Youth (NLSY) to show that drug use has a negative effect on job stability, the probability of employment and the length of unemployment. Kandel et al. (1995) show that people who use drugs have more job turnovers than do non-drug users. DeSimone (2002) uses the same data to model employment probabilities and finds that both marijuana and cocaine use significantly reduce the probability of employment.

Other studies do not observe the expected inverse relationship. Kaestner (1991) shows that while in cross sectional analysis drug use has a large negative association with labour

[32] Sources that measure both include the US National Longitudinal Survey of Youth (NLSY), a cohort study focusing on marijuana and cocaine use (Kaestner, 1991; Kandel & Davies, 1990), the National Household Survey on Drug Abuse (NHSDA), a nationally representative sample of the non-institutionalized U.S. household population age 12 and older (Bray, Zarkin, Dennis, & French, 2000) and the British Crime Survey (BCS), that includes comparable drug use information in the 1994 and 1996 surveys (MacDonald & Pudney, 2000a). A limited number of studies use former New York State public school student cohort data and a single study uses the National Institute of Mental Health's Epidemiologic Catchment Area (ECA) Survey, a cross sectional random sample of adults from five American cities.

supply, longitudinal results show no significant association between the two. Gill and Michaels (1992) demonstrate that while the sample of all drug users have lower employment levels than non-drug users, a sub-sample of people who use "hard" drugs (identified here as cocaine, heroin and psychedelics) unexpectedly do not. Zarkin et al. (1998) analyse adjacent cross sections of the National Household Survey on Drug Abuse (NHSDA) from both 1991 and 1992. They find that substance use has little effect on the number of hours worked by young men with the exception of those who smoked one to three cannabis cigarettes in the last month. In the 1991 analysis, these individuals worked 42 more hours per month than nonusers, while in the 1992 analysis smoking the same amount was associated with 41 *fewer* hours of work. Buchmueller and Zuvekas (1998) find that there is no relationship between use and employment for young men, but that among men between the ages of 30 and 45 there is an inverse relationship.

Differentiating between levels of use renders the labour market participation-drug use relationship somewhat more coherent. French et al. (2001) separate chronic from non-chronic use and show that chronic use is strongly and negatively related to employment while non-chronic use is not related either to employment or to labour force participation. Other studies support these results and the importance of this analytic distinction (Alexandre & French, 2004; Bray et al., 2000; DeSimone, 2002). MacDonald and Pudney, for example, differentiate between "hard" and "soft" drug use (MacDonald & Pudney, 2000a; MacDonald & Pudney, 2000b; MacDonald & Pudney, 2001). Results suggest that past and current hard drug use is significantly and negatively related to employment. DeSimone (2002) emphasizes the importance of differentiating between substances, as the physiological effects of use may not impact employment outcomes in the same way (Nutt et al., 2010). Bray et al (2000) further control for multiple substance use demonstrating that poly-substance users are less likely to be in employment than mono-substance users. Specifying the type and pattern of drug use may be key to understanding the impacts of substance use on labour market outcomes.

Socio-demographic distinctions may also be sources of potential confounding. For example, the separation of younger from prime age earners produces distinct results for each (Buchmueller & Zuvekas, 1998; Kandel et al., 1995; MacDonald & Pudney, 2001). This is salient particularly because most studies focus on young people and not a range of individuals at various stages of their careers. Distinguishing between male and female subjects is also important given variations in the labour market behaviour, marriage and care responsibilities as well as drug use patterns of women and men (Bray et al., 2000; French et al., 2001; Hser, Huang, Teruya, & Anglin, 2003; Neale, 2004; Pelissier & Jones, 2005; Platt, 1995; Suffet, 1999; Yamaguchi & Kandel, 1985). Most studies that account for ethnic differences also observe systematically different effects (Hermalin, Steer, Platt, & Metzger, 1990; Platt, 1995; Sterling et al., 2001), although this observation is not consistent across all analyses (Atkinson et al., 2000; Koo et al., 2007; McCoy et al., 2007). The role of different socio-demographic characteristics may be another important aspect of associations between drug use and labour market outcomes.

The lack of a robust labour-supply drug use relationship (Kaestner, 1998) may also be attributable to considerable variation in definitions of both employment and drug use. DeSimone (2002) considers a subject to be employed if they have worked a single hour of paid labour in the past year, while Buchmueller and Zuvekas (1998) define employment as currently employed, Koo et al. (2007) selectively sample for those individuals who are employed full-time and Suffet (1999) operationalizes employment as working full- or part-time, being a student, or attending a vocational training or workshop program. Differences may have considerable effects on statistical outcomes, necessitating caution when comparing the results of different studies. Indicators of drug use are similarly inconsistent across studies. The NLSY data do not provide good measures of drug use intensity or frequency, rendering it difficult to differentiate among levels of use (Buchmueller, 1998). For example, Kaestner (1991) considers anyone who has smoked marijuana more than 40 times a heavy drug user.

However, daily consumption is commonly used as the indicator for heavy use (Anthony & Helzer, 1991; Kandel, 1991). Studies using the NLSY data are therefore only able to predict the effects of light or moderate use even though evidence suggests the effects of use on labour market outcomes are more pronounced among regular or heavy users. It may be clarifying to examine a range of drug use patterns to identify more specific relationships between different levels of drug use and employment.

That studies in health economics generally use nationally representative samples may further make it difficult to identify clear relationships between drug use and employment. While more appropriate for generalizing results, data from representative samples may not provide sufficiently detailed information to answer nuanced questions about the relationship between drug use and employment. Given that the effects of this relationship are likely to be more pronounced among those with more intensified or prolonged use, a different sampling strategy may prove elucidating. A select number of studies compare the characteristics of employed and unemployed drug users using data from community and street-recruited samples (Atkinson et al., 2000; Johnson, Reynolds, & Fisher, 2001; Koo et al., 2007; McCoy et al., 2007). These studies approach the employment-drug use relationship by seeking to identify the attributes of populations of people who use drugs that are predictive of employment. The intention is that knowledge of these factors might facilitate the development of supports that will increase the employment capacity of unemployed or non-employed, substance using individuals (Koo et al., 2007). While results from these studies cannot be generalized, they provide a means for comparing labour market outcomes within drug using populations. Further, they situate explorations of labour market outcomes among drug using populations within drug use contexts in order to provide more detailed and nuanced understandings of localized drug use and socio-economic participation patterns.

4.2.2.5 Employment transitions as an addiction treatment outcome

Employment is commonly upheld as an important outcome indicator in the context of addiction treatment and recovery (Magura, 2003; Platt, 1995). The tendency in the therapeutic literature is to frame "antisocial" behaviour (drug use) as inversely related to "pro-social" behaviour (employment). The emphasis on employment as an addiction treatment outcome reflects the assumption that in addition to providing a legal source of income, employment adds important structure and reinforcement to the lives of people who use drugs that discourages continued harmful use (Magura, Staines, Blankertz, & Madison, 2004; Vaillant, 1988). Labor market engagement may also mark a crucial step in reducing the socio-economic vulnerability for those drug users who face such challenges. Because of the symbolic and real importance of employment to addiction treatment and recovery, an increased understanding of individuals' employment processes as they relate to their addiction treatment enrolment may inform how vocational objectives are integrated into treatment conceptualization, design and implementation. The use of employment as a treatment outcome indicator implies that it constitutes a re-attachment to conventional socio-economic functioning, thus predicting the same inverse relationship between the two found in the theoretical and health economics literature.

Previous studies report correlations between employment and improved treatment outcomes (Robins, Helzer, & Davis, 1975; Vaillant, 1973), including positive associations between employment and longer term heroin abstinence (Hser, Hoffman, Grella, & Anglin, 2001), lower rates of substance use relapse (Castellani, Wedgeworth, Wootton, & Rugle, 1997), enrolment in more comprehensive treatment programs (Lundgren, Schilling, Ferguson, Davis, & Amodeo, 2003) and improved duration of treatment (Reif, Horgan, Ritter, & Tompkins, 2004). Literature has also focused on the impact of treatment on employment, where demographic and vocational characteristics have been associated with employment among treatment clients, specifically those enrolled in MMT and cocaine treatment. These

include race, gender, vocational training, age, lowered drug use, and a generalized expectation of success (Hermalin et al., 1990; Sterling et al., 2001). This last is a measure of optimism considered by Sterling et al. (2001) to be a potential indicator of employment acquisition behavior. The treatment-employment link has also been explored in the context of vocational rehabilitation (VR) (Magura & Staines, 2004). A study examining VR services (West, 2008), noting the inadequate provision of these services despite repeated calls for them and evidence of their cost effectiveness (Shepard & Reif, 2004).

Results from studies that examine employment as an outcome of treatment enrolment show a range of post-treatment employment success rates. These differences may reflect variation across different treatment modalities, substances, research designs and sampling strategies (Magura et al., 2004; Platt, 1995) that may constrain the ability to generalize results to a broader treatment–employment link and which necessitate a degree of caution in the interpretation and comparison of results. Limitations in many studies include small sample sizes (Sterling et al., 2001) that may limit the statistical power of analyses, a disproportionate focus on heroin users enrolled in MMT (Platt, 1995) and a lack of non-treatment enrolled individuals for comparison (Hubbard et al., 1989; Price et al., 1991). Given drug-specific patterns of use, health implications (Atkinson et al., 2000; Chen & Lin, 2009; Gossop, 2007; Nutt, King, Saulsbury, & Blakemore, 2007) and potential drug- or treatment-specific impacts on labour market outcomes, drug-specific selection effects may further limit the ability to generalize results to a broader treatment-employment link. For example, the decision to enter treatment already indicates movement to address problematic drug use that may predispose subjects towards engagement with mainstream social institutions. As such, treatment enrolled individuals may be at a particular stage of the addiction cycle (Platt, 1995). Finally, longitudinal investigations of the impact of addiction treatment on employment among people IDU are commonly limited to a single follow up (Reif et al., 2004; Sterling et al., 2001).

4.2.2.6 The Risk Environment and employment outcomes

A range of behaviors, activities, circumstances and events are specific to the social circumstances of different kinds of drug use (Donoghoe, Dolan, & Stimson, 1992; Duff, 2007; Rhodes et al., 2005). An emerging body of research has reinforced the important role that drug use scenes, as distinct risk environments, play in shaping the health and risk trajectories of drug users (Curtis & Wendel, 2000; Hough & Natarajan, 2000; Kerr, Kimber, & Rhodes, 2007). Drug scenes have been described as specific geographical inner-city areas characterized by high concentrations of drug users and drug dealing (Curtis & Wendel, 2000; Hough & Natarajan, 2000). These geographic areas host elaborate socio-spatial networks within which are further embedded the practices associated with the day-to-day realities of securing basic necessities such as money, shelter, and drugs (Bourgois, 1996; Fast et al., 2010; Maher, 1997). The context of drug use may therefore have considerable implications for the employment-drug use nexus. A consideration of context is noticeably absent from quantitative studies focusing on the relationship between drug use and work discussed above.

The relevance of socio-economic milieus and drug use scenes to income generating practices of drug users raises the issue of how to conceptualize these contexts in analyses of drug-related harm within quantitative social science research. The heuristic of Rhodes' (2002; 2009) Risk Environment Framework offers one such characterization. It accounts for the interplay of physical, social, economic and policy components that impact the production and reproduction of drug harms at micro-, meso- and macro-environmental levels. In doing so, the Risk Environment Framework engenders an analytical focus on the broadly defined context and away from individual factors or behaviour (Strathdee et al., 2010). Goldenberg (2011) importantly identifies that the purpose of the framework is not to provide a comprehensive categorization and labeling system for what are impossibly complex relationships between multifaceted and multilevel aspects of the broader environment. It instead serves to facilitate an explicit recognition and identification of environmental influences on health and risk.

Rhodes' emphasis on risk and response as "situationally and structurally dependent on the environments in which they occur" (Rhodes, 2002, p. 88) points to the importance of non-health oriented interventions in the reduction of harm among people who use drugs. Examples of these types of interventions include shifts in housing policy (Pearson, 1987) and microeconomic and community development initiatives (Blankenship, Bray, & Merson, 2000; Hawkins, 2001). Understanding the intersection of risk at various behavioural, physical, social and structural levels as well as identifying potentially stabilizing activities for vulnerable populations, such as employment, may also elucidate the connection between employment, employment transitions and substance use. While previous literature identifies the relationship between substance use and risks such as engagement in sex work (Sherman & Latkin, 2002), exposure to violence (Shannon et al., 2008), or unstable housing (Corneil et al., 2006), the current study examines the impact of components of the risk environment on employment. The use of an analytical heuristic such as the Risk Environment Framework to this end may be crucially important to the study of the relationship between drug use and income generation in quantitative contexts.

4.2.2.7 Employment and health

Individual health status has important implications for an individual's ongoing labour market participation and vice versa (Bambra, 2011; Bartley, 1994), and there is no reason to think that this would be different among people who use drugs. Moreover, employment and socio-economic status are often pointed to as important measures in the study of the social determinants of health (Graetz, 1993; Marmot & Wilkinson, 2006; Raphael, 2009). However, as Galea and Vlahov (2002) point out, there is a paucity of research specific to the social determinants of health of drug users. Either because of data limitations, or because of the primacy of research questions that focus on productivity-related variables, most studies neglect consideration of how the health status of people who use drugs may impact their

labour market activity and vice versa. The relationship is only briefly mentioned in the therapeutic literature (Castellani et al., 1997; Hser, Grella, Chou, & Anglin, 1998; Platt, 1995; Reif et al., 2004).

A commonly cited health risk in the context of injection drug use is the transmission of infectious diseases such as HIV and HCV (Lavanchy, 2009; UNAIDS, 2010). Considerable scholarship focuses on the employment status of persons living with HIV/AIDS (PHA), though most of this work does not focus on IDU (Worthington, O'Brien, Zack, McKee, & Oliver, 2012). Studies in this area generally follow one of three lines of inquiry. First, theoretical work and qualitative focus groups conducted on the role of employment and employment searches examine barriers to work, work motivation and the impact of chronic disease on employment (Conyers, 2004; Conyers, 2008; Dyer, Twillman, & Sequeira, 2006; Hergenrather, Rhodes, & Clark, 2006). Second, research on the relationship between antiretroviral therapy (ART) and employment explores whether ART helps HIV-infected patients return to work, remain employed and/or maintain hours of work and whether employment, among other things, impacts ART initiation and adherence (Celentano et al., 1998; Celentano et al., 2001; Goldman & Bao, 2004; Paterson et al., 2000; Singh et al., 1999). Finally, the majority of studies look at the impact of HIV/AIDS disease and disease progression on employment. Most studies use biological markers as proxies of functionality and examine their impact on labour market participation. The focus is typically on the amount of time since diagnosis to loss or cessation of work. This research also examines social inequalities in the probability of maintaining employment during the course of HIV infection (Brooks, Martin, Ortiz, & Veniegas, 2004; Dray-Spira, Gueguen, Lert, & VESPA Study Group, 2008; Dray-Spira et al., 2012; Ezzy, De Visser, Grubb, & McConachy, 1998). Results generally find increasing unemployment over time, with up to 50% leaving work within one month of diagnosis (Burns, Young, & Maniss, 2006). Findings also associate poor employment outcomes with negative impacts on health, finances and quality of life, though

findings are not consistent across studies. Health conditions, specifically those related to injection drug use such as HIV, may be an important factor in social processes related to transitions to employment.

4.3 Hypotheses

Because of lack of work on the employment outcomes of populations of people who use drugs in general, and IDU in particular, hypothesis development necessarily draws on a wide range of literature. This review of the literature has crossed multiple disciplines, subject areas, and methodologies. Five key themes from this literature guide the current analysis. First, the relationship between employment and drug use, while theoretically assumed to be an inverse one, is empirically ambiguous unless different substances and patterns of use are taken into account. Second, labour market outcomes may differ because of inequalities and inequities along socio-demographic lines. Third, programmatic and therapeutic interventions may influence labour market outcomes; here employment is considered to be a symbolic re-engagement with mainstream social norms. Fourth, the production of drug-related harm is usefully viewed in consideration of the individual, social, economic and policy characteristics of the broader drug using environment; outcomes such as employment initiation may be mediated by relative levels of risk and vulnerability at the micro- meso- and macro- levels. Finally, the relationship between health and employment is well documented, particularly among PHA, and individual health status may be of considerable import in understanding the labour market activity of IDU. These general conclusions from the literature lend themselves to the formulation of the following six hypotheses:

> **H1: Differential Substance Hypothesis**
> *That the association between injection drug use and transitions to employment varies by substance, with heroin users less likely to transition to employment than other drug users*.

H2: Differential Pattern of Use Hypothesis
That different patterns of drug use are differentially associated with transitions to employment, with non-frequent and single substance use showing no relationship and frequent use and multiple substance use showing a negative relationship with transitions to employment.

H3: Demographic Disadvantage Hypothesis
That socio-economic disadvantage among injection drug users is negatively associated with transitions to employment.

H4: Treatment Hypothesis
That enrolment in MMT and other forms of substance use treatment is positively related to transitions into employment.

H5: Differential Risk Hypothesis
That individual-, social-, and environmentally- based risk and features of drug use scenes are negatively associated with transitions into employment.

H6: Differential Health Status Hypothesis
That HIV and HCV positive serostatus are negatively associated with transitions to employment.

4.4 Methods

Analyses use data from baseline and seventeen follow up interviews from VIDUS covering the period from May 1996 to May 2005, testing whether the behaviour, exposures, characteristics and environments identified by the above hypotheses are significantly associated with employment transitions. Multivariate discrete-time event history models (Allison, 1984; Beck et al., 1998; Jenkins, 1995) are adjusted for time varying covariates and repeated failures (Box-Steffensmeier & Jones, 2004; Jenkins, 1995). Serial and unit correlation are accounted for by including time dummy variables (Allison, 1982; Beck et al., 1998), controlling for multiple transitions into employment, adding alternative time scales (Box-Steffensmeier & Jones, 2004) and adjusting standard errors to account for clustered observations at the level of the individual (Williams, 2000). Some study participants report employment at their baseline interview; these spells of employment are excluded from analyses to minimize issues of left-hand truncation. Analyses are replicated using multiply imputed data to account for observation-level missing values. This section includes a detailed

description the dependent and other variables of interest, and discusses issues of censorship, model selection and the multiple imputation process.

4.4.1 Variables of Interest

The dependent variable for these analyses is a transition out of non-employment into employment. Non-employment includes both unemployment and non-participation in the labour market, as the VIDUS data do not differentiate between non-labour market engagement and unemployment. Employment status is indicated by self-reported income from a regular job, which by inference indicates that a subject experienced a period of formal employment.[33] Regular employment is distinguished from temporary work by a separate response option for a "temporary job" (baseline to follow-up 5, follow-ups 15-17) or "alternate work" that includes options for a temporary job (follow-ups 6-14). These response items absorb short term and informal employment; income from regular work therefore reliably indicates non-temporary formal employment. The semi-annual interval of VIDUS follow up periods render the measurement of employment somewhat coarse; within the same follow up someone who intermittently holds full time work is classified as equivalently employed as an individual who is continuously fully employed. When compared to other studies, the VIDUS measure is more blunt than some, but fares significantly better than others (Buchmueller & Zuvekas, 1998; DeSimone, 2002; Koo et al., 2007; Suffet, 1999). An individual is considered to have made an employment transition if they indicated income from a regular job in the six months prior to interview, and had not indicated a regular job as a source of income during the previous follow up period.

[33] The VIDUS survey question from which employment data are derived changes over the course of the study, but remains comparable. For baseline and follow up questionnaires one through five, the question reads "Since your last visit, what were your sources of income?" to which a job or business with a regular salary was an optional response. For follow-up questionnaires six to seventeen, the question changes to "in the past six months, what have been your sources of income?" to which a regular job was a response option. The final VIDUS follow-up questionnaire (18) observed a more dramatic change from a question to an income chart, and is therefore excluded from analyses.

Other variables related to employment include a previous job variable reporting the number of previous transitions to employment within the study period. While individual work histories are unknown before the baseline data collection at the start of each individual's participation, this variable provides some indication of an individual's propensity to engage with the labour market. It is coded zero until after the first transition to employment, when it becomes one, one until after the second transition to employment when it becomes two, and so on.[34] The previous transition variable serves to control for correlations between multiple employment transitions made by the same participant. Also included are time dummy variables, τ_j , corresponding to the duration of a spell of unemployment. Dummies take on a value of 1 if a spell of unemployment has lasted a total of j observations at time t and represent a count of the consecutive number of observation in non-employment. The first of these, τ_0, corresponds to the first observation in which an individual reports unemployment and is equivalent to the constant term.[35] When an unemployment spell comes to an end by means of a transition to employment, the count is reset back to τ_0.[36] Similar to the spells of continuous observation described in analyses of intermittent non-response in Chapter Three, these time dummies serve to control for the serial correlation of observations over time.

Other variables are indicators used to test the six hypotheses outlined above. Drug use variables relevant to the first two hypotheses include binary variables for active injection; poly drug use; and non-frequent, frequent and single substance drug use variables for each of injection heroin, injection cocaine, injection speedball (cocaine and heroin mixed) and crack

[34] Successive observations of self-reported income from a regular job do not necessarily indicate that this income from the same job. However, back-to-back reports of employment income are assumed to be the ongoing result of the same employment transition. Given that the event of interest is a transition to employment rather than ongoing job tenure, this is a reasonable assumption to make as the individual maintains involvement in the labour market for the period of time covered by these observations.

[35] Equivalency between the constant term and τ_0 was verified by estimated models including and excluding both τ_0 and the constant. The coefficient for τ_0 was found to be identical to that of the constant.

[36] As per Beck, Katz and Tucker (1998) the following is an example of the τ for dependent variable y:

t:	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
y:	*0*	*0*	*0*	*1*	*0*	*1*	*1*	*0*	*0*
τ:	τ_0	τ_1	τ_2	τ_3	τ_0	τ_1	τ_0	τ_0	τ_1

use, which may be administered through injection or inhalation.[37] Demographic variables include a continuous variable for age, binary variables for female gender and marital status (being in a marriage or common law relationship) and categorical variables for education (less than secondary completion, secondary completion or equivalent, trade or college attendance, and university degree completion or greater) and ethnic origin (Caucasian, Aboriginal ancestry, Asian, or "other", which includes Latino, Middle Eastern, Black African or Black Caribbean grouped together). Addiction treatment variables include a binary indicator of any treatment enrolment, which is subsequently divided into MMT enrolment and all other non-MMT treatment enrolment combined.[38] Variables used as indicators of individual drug-related risk include binge drug use (periods of higher than normal use) and non-fatal overdose, both of which are associated with higher-risk injection (Darke, Ross, & Hall, 1996; Gossop, Griffiths, Powis, Williamson, & Strang, 1996; Hunter, Donoghoe, Stimson, & Rhodes, 1995; Tyndall et al., 2003). Also included is attendance at injection or "shooting" galleries, which are clandestine locations where multi-person, high intensity drug use and the sharing of injection equipment commonly occurs (Fuller et al., 2003b; Kerr & Palepu, 2001); and public injection, which is associated with elevated injection risk activities such as requiring help injecting, rushing injections, sharing injection equipment among multiple injectors and elevated blood borne viral risk (McKnight et al., 2007; Small et al., 2007). Variables used as proxies of the risk environment include unstable housing, which, as in previous VIDUS analyses (Wood et al., 2001) is defined as living in hotels, hostels, jail or prison or being homeless; sex work, which represents any involvement in the sex trade as a sex worker or pimp; Downtown Eastside residency; and recent incarceration, referring to any time spent in jail in the six months prior to interview.

[37] Some variables were derived from existing data to facilitate hypothesis testing. For example, the non-frequent drug use variables were generated by differentiating between those individuals that reported any use of a drug in the six months prior to interview (which includes frequent use) from those that report frequent use of the same drug to create a non-frequent use variable.

[38] Non-MMT drug treatment includes detoxification services, residence in a recovery house, attending a treatment centre, seeing a counselor or participation in a narcotics anonymous program.

Table 4.1 VIDUS Variables of Interest

Variable	Description
Employment Variables	
Employment event	=1 if a transition into employment
Previous jobs	previous number of transitions to employment
Duration of non-employment spell	temporal dummies for $\tau_{0\text{-}17}$
Drug Use Activities	
Non-frequent use *‡	=1 if uses a substance less than daily
Frequent use *‡	=1 if uses a substance daily
Single substance use *‡	=1 if uses a single substance only[39]
Poly-drug use *	=1 if uses multiple substances
Demographic Characteristics	
Age	age variable in years
Gender	=1 if female
Marital status	=1 if married or in a common-law relationship
Ethnicity	Caucasian, Aboriginal Ancestry, Asian, other
Educational attainment	Less than high school, high school or equivalent, trade or college attendance, university or greater
Treatment Enrolment	
Any treatment *	=1 if enrolled in any form of addiction treatment
MMT *	=1 if enrolled in methadone maintenance therapy
Other treatment *	=1 if enrolled in non MMT form of drug treatment
Risk-related variables	
Unstable housing *	=1 if lives in hotels, hostels, jail or prison or is homeless
Sex work *	=1 if engaged in sex work
DTES residency	=1 if resides in the Downtown Eastside
Incarceration *	=1 if reports recent incarceration
Injection gallery use *	=1 if injects in an injection gallery
Public Injection *	=1 if injects in public
Binge drug use *	=1 if has periods of elevated drug use
Non-fatal overdose *	=1 if has experienced non-fatal overdose
Health Outcome Indicators	
HIV	=1 if HIV seropositive
HCV	=1 if HCV seropositive

* Denotes activities/events in the six months prior to follow-up interview; ‡ Separate variable for each of heroin, cocaine and speedball (cocaine + heroin) injection and crack use

Finally, including the variables of HIV and HCV seropositivity tests the differential health hypothesis. Variables used in analyses are summarized in Table 4.1. Time-varying characteristics, such as treatment enrolment, drug use or injection gallery attendance, refer to activities or events in the six months prior to follow-up interview. Variables were also created to test for theoretically important interactions. These included, for example, gender and sex work, Aboriginal ethnicity and HIV status, and Aboriginal ethnicity and prior employment

[39] The multiple substance use variable is generated including consideration of the injection of crystal methamphetamine. The counts of people who report the injection of crystal methamphetamine are extremely low and as a result are not otherwise considered in analyses.

transitions. In an attempt to identify relevant or drug-specific configurations of and patterns of risk, models testing the risk and health hypotheses were constructed by also testing for significant interaction effects between all drug use variables, risk variables, and health indicators. These tests were not statistically significant except where indicated in the results.

4.4.2 Methodological considerations

While the methods used here have been described in detail in the previous chapter, analyses differ from these previous models. First, rather than having an analytically relevant natural starting point, the May 1996 start date of the VIDUS is arbitrary. Ideally it would be possible to examine the vocational activity of IDU from a more externally valid point of interest, such as the time since first injection or time since first entry into the labour market. It is commonly the case that the origin of the time scale for observation is unclear (Allison, 1984). One way to counter this ambiguity is to introduce different time scales, such as age or calendar time, as explanatory variables. In the current study this is done by including both age and time dummy variables measuring the length of each spell of unemployment.

This arbitrary starting point is further complicated because of the prospective open cohort design of VIDUS. Because of the rolling recruitment format, there is no common study entry point for all participants. The continuous enrolment strategy resulted in 672 (42.0%) participants entering the study after the initial recruitment. A previous study noted that those enrolled in later follow ups differed systematically from those recruited at the outset (Almond, 2010). At the time of their baseline interview, later enrollees tended to be older, more likely to reside in unstable housing, engage in sex work, report daily heroin injection, and less likely to have studied beyond high school, report daily cocaine injection or be HIV or HCV positive. These are unlikely to be the only differences between the two groups. A binary variable differentiating between those who were enrolled after the initial wave of recruitment and

those who were a part of the initial recruitment process is therefore included in substantive analyses to control for unobserved heterogeneity between initial and later enrollees.

The arbitrary starting point necessitates additional considerations. Event history methods assume that data specify when a subject enters and exits the process being analysed. Where a respondent's full event history is not observed, censorship of various kinds occurs (Blossfeld et al., 2007; Yamaguchi, 1991).[40] The arbitrary start date translates into a potentially important amount of left-hand truncation, where the participant enters the risk set before the beginning of the observation period, making it impossible to specify the length of time spent in the origin state of nonemployment. If censored and uncensored cases are treated equivalently the relationship between the covariates and the duration times may be under- or over-stated. This is an initial condition problem, referring to the fact that if a turnover process is sampled in progress, the distribution of unobserved data, conditional upon status when first observed, may depart from the corresponding population distribution (Enberg et al., 1990).

Allison (1984) and Blossfeld, Rohwer and Golsch (2002) suggest that if the hazard rate does not depend on the time in the origin state (non-employment), then the impact of left-truncated spells is unproblematic. Following Beck, Katz and Tucker (1998), a likelihood ratio test comparing the log-likelihood of a full model with that of a constrained model without time dummies is used to determine the dependence of the hazard rate on duration in the initial state. Otherwise stated, this test determines whether the amount of time an individual spends in un- or non-employment has a significant impact on their likelihood of making a transition into employment. The test examines whether the coefficients of covariates excluded from the constrained model are simultaneously equal to zero (Long, 1997) and is given as

[40] In addition to the left-truncation discussed here, the VIDUS employment data is also subject to (1) right-truncation, where a respondent has not had an employment event by the end of it; (2) right censorship where an individual leaves the risk set for reasons other than a transition to employment; and (3) observation gaps. Because the end of the observation period, is independent of the substantive process of interest, right truncation is unproblematic (Allison, 1984; Box-Steffensmeier & Jones, 2004; Yamaguchi, 1991) as individuals contribute what is known about them – that they did not enter employment over the course of the observation period. These patterns were treated at length in the missing data chapter.

$$LR = -2(lnL_{constrained} - lnL_{unconstrained}). \quad (4.1)$$

A basic model determined that there is significant duration dependence (χ^2 = 112.80 with 18 df; p<0.001).[41] While the duration dependence of the hazard is not the primary substantive consideration, with emphasis more on covariates, transitions into employment are dependent on the duration of non-employment spells. In dealing with this issue Allison (1984) and Yamaguchi (1991) suggest excluding left-truncated spells from the model. Table 4.2 outlines the number of spells including and excluding left-truncated spells. While excluding left-hand truncated spells of employment results in a loss of 10.2% of the total spells of employment, it results in a loss of 44.6% of the total spells of non-employment, and notably impacts the mean and variance of unemployment spell length. This represents not only an unacceptable loss of information, but would also significantly bias estimates, effectively excluding all participants who do not report employment over the course of the study period. An alternate suggestion is to include left-truncated spells in the initial state (i.e. nonemployment), exclude those in the destination state (i.e. employment), and condition inference about duration dependence on the fact that an individual has maintained the initial state "at least" up to a certain point (Blossfeld et al., 2007; Box-Steffensmeier & Jones, 2004). This is the strategy employed here.

Table 4.2 Employment and non-employment spells in the VIDUS

	Employment	Non-employment
Number of spells		
All data	876	3,385
Excluding left-truncated spells	787	1,875
Number of left-censored spells	89	1,510
Mean spell length		
All data	1.59	4.56
(standard deviation)	(1.37)	(4.81)
Excluding left-truncated spells	1.60	3.30
(standard deviation)	(1.30)	(3.26)

In addition to censorship and truncation, another issue of consideration for the current analysis is that of model selection. The statistical test commonly used during the development

[41] This test statistic follows a chi-square distribution with the number of degrees of freedom equal to the number of excluded variables in the constrained model.

and selection of logistic regression models is a simple likelihood-ratio chi-square test. However, these tests are not appropriate with clustered observations as they assume observations are independent (Long, 1997). This problem applies to other measures of model fit, such as the Aikake Information Criterion (AIC) and the Bayesian Information Criterion (BIC), as these are also based on likelihood estimation (Long, 1997). Based on this consideration, Wald tests, which accommodate clustered errors (Cameron, Gelbach, & Miller, 2008), are used to compare coefficients. For each model, a global Wald test is reported and tests of time dependence and equivalence between drug-use and other relevant variables are also conducted.

An alternative to a formal test statistic is to examine the percentage of correctly predicted outcomes (PCP), which compares predicted with observed outcomes. Herron (1999) contends that in cases where there are a relatively small number of events, the PCP predicts a high proportion of outcomes correctly by predicting that all outcomes are that of the modal category. Further, the PCP overestimates model fit because each probability that is less than 0.5 contributes a predicted outcome of zero to the PCP, and each probability of 0.5 or above contributes an outcome of one to the PCP. As such, observations with a predicted probability of .99 and .51 contribute the same to the PCP even though their actual predicted probabilities are quite different. Herron (1999) proposes an alternative statistic, the expected percent correctly predicted (ePCP), which uses actual predicted probabilities, given as

$$ePCP = \frac{1}{N}\left(\sum_{y_i=1} \hat{p}_i + \sum_{y_i=0} 1 - \hat{p}_i\right) \tag{4.2}$$

where $\hat{p}_i$ is the predicted probability of an outcome for individual i across the total number of observations N,[42] providing more precise and conservative[43] estimates than the PCP measure.

[42] The Stata utility that calculates the ePCP, developed by Christopher Lawrence, was downloaded from http://www.cnlawrence.com/papers/#data.

[43] A test to compare the PCP with the ePCP when all outcomes are estimated to be in the modal category. The ePCP was 89.73% compared to a PCP of 94.49%.

4.4.3 Multiple Imputation Procedures

The previous chapter produced useful information for the development of a strategy to manage missing data in the VIDUS for substantive analyses. The salient findings from these analyses, discussed previously in section 3.4, are briefly summarized here. First, there is a substantial amount of missing data in the VIDUS following complex patterns (see section 3.3.1) suggesting that ignoring missing data, practices of data deletion and weighting procedures (summarized in section 3.2.2) may be inappropriate for the current analyses.

Second, models explored the plausibility of the assumption that data are missing at random (MAR). This served to assess whether procedures that rely on MAR assumptions would be appropriate in the current context. These analyses examined the relationships between observed data and patterns of missingness in the form of both intermittent non-response and attrition. This explored the degree to which insight into the causes or antecedents of non-participation could be captured by observed variables. The better these processes are captured, the better the plausibility of MAR. Significant associations between observed data and missingness were found (l) along lines of demographic disadvantage; (2) according to features of individual socio-economic context, such as social assistance receipt, employment and unstable housing; (3) corresponding to disruptive life events such as incarceration and high-risk drug use behaviour such as binge drug us or frequent crack use; and, (4) as indicated by institutional connections produced through engagement in systems of care. As mentioned in the previous chapter, systematic relationships between a number of variables of interest in the current study and missing data patterns create the potential for bias in both model estimates and their variance. Notably, although analyses found significant associations, there is no way to know how much missing data is attributable to these observed variables. Nevertheless, the presence of statistically significant associations suggests that the MAR assumption will give much better results than ignoring the missing data (see Graham, 2009), making the use of methods that rely on MAR assumptions a reasonable approach.

Third, exploring variation in the relationship between observed variables and missingness over time led to the conclusion that much of the wave-to-wave variability in these relationships is random noise (see section 3.3.2). This suggests that for missing data methods in the current study context it is appropriate not to differentiate models for missingness by time period, but that a simple accounting of the time structure of the data should prove sufficient to preserve the time-specific variability inherent in the data.

Fourth, competing risks models comparing the three possible study participation end states of right hand censorship, death and attrition led to a consideration of how to treat death in missing data management. The main questions of interest here are, (1) whether to treat observations after death as if they were missing, and if so, (2) how they should be addressed compared to observations that are missing for reasons other than death. Comparative associations between coefficients for a number of observed variables and the outcomes of death and attrition were statistically significantly different from each other. This led to the conclusion that if observations after the time of death are treated as missing data, they should be considered separately when designing a missing data management strategy. Analyses also suggested that ignoring instances of death and treating observations after the time of death as if they were missing would likely introduce biases into the data due to changes in mortality related behaviour or health status directly prior to death. A prudent missing data strategy vis-à-vis death in the current study context is therefore to treat missing observations only up to the time of death, and not treat observations following death as if they were missing.

Given the complexity of the data, the plausibility of MAR conditions, the time structure of the data and conclusions about the appropriate treatment of observations following death, procedures of multiple imputation for longitudinal data are best suited to take into account the information gleaned from missing data analyses. Most contemporary programs use MLE methods to build a model for missingness. But unlike MLE methods used alone, these methods are able to more robustly incorporate a level of uncertainty about the

degree to which parameters are impacted by missing data and the imputation models derived from observed data (Graham et al., 2003; Rubin, 1996a; Schafer, 1997). This can be done while retaining a manageable level of computational complexity. This is achieved, as described in section 3.2.3, by constructing multiple data sets and adjusting estimates and standard errors to account for the variance across these different complete versions of the data. Recent software developments have improved the ability of MI methods to account for the serial correlation in the data due to its longitudinal time structure. They can also be specified in order to ignore data that may appear to be missing (such as an datum during an observation period following death), but that should be treated as ineligible for observation.

The Amelia II program (Honaker et al., 2011) is a multiple imputation program for the R computing environment designed to reduce computational requirements, improve validity, and maximize accuracy for imputations with time-series-cross-section (TSCS) data. While the current study uses longitudinal data, the discrete data collection points render it analytically similar to TSCS data (Beck, Katz and Tucker, 1998; see also the discussion in section 4.4.2 above), making Amelia II highly useful in the current context. Like most multiple imputation programs, it extracts relevant information from observed data via a statistical model, imputes multiple values for each missing cell, and uses these values to create multiple completed data sets (Honaker & King, 2010). Amelia II specifically accounts for the longitudinal structure of the data by incorporating time dependency in the correlation structure of the imputed data. Amelia II is designed to optimize data sets with many variables, that are non-rectangular and that are structured hierarchically, as is the case for the VIDUS data.

Described in detail elsewhere (Honaker & King, 2010a), Amelia II deals with the computational demands of MI algorithms with large data sets in a Bayesian context by using an EM algorithm (see section 3.3.2) and replacing part of the process with a bootstrapping algorithm that reduces the computational demands and conceptual complexities of more

traditional methods (Honaker & King, 2010a).[44] This algorithm adapts standard imputation models to accommodate correlation between individual units over time and to allow time-specific patterns to differ across individuals through the incorporation of time-specific basis functions in the imputation model (here, polynomials of time). Amelia II makes two assumptions that warrant further attention. The first assumption, as is common to nearly all methods for missing data, is that the data are MAR, with missingness patterns dependent only on the observed data. Considerations related to this assumption have been discussed above. The second assumption is that the complete data is multivariate normal. While the majority of variables used in the current analysis are categorical or binary in nature,[45] this may seem counterintuitive. However, there is robust evidence that this model works as well as other, more complex models in this circumstance (Schafer, 1997; Schafer & Olsen, 1998), and forcing variables to be imputed as binary or categorical may result in a loss of information in subsequent substantive models.[46] Amelia II has the ability to force variables to be treated as binary or categorical instead of multivariate normal, and in order to test the sensitivity of results to this second assumption, two separate imputation procedures are undertaken: one where variables are left as multivariate normal, and the other where variables used in analyses are forced to be binary. Analyses are run using data sets from both procedures.

The current study imputes fifteen "complete" versions of the VIDUS data for both of the multivariate normal and bivariate imputation procedures. A dataset is considered to be "complete" if all missing data that are attributable to intermittent non-response or attrition are

[44] Specifically, their bootstrapping algorithm draws *m* samples of size *n* with replacement from the data *D*. In each sample, they run the EM algorithm (described above in Chapter 3) to produce point estimates of the mean and variance, and then for each set of estimates, they use the original sample to impute the missing observations, producing *m* completed data sets (see Honaker & King, 2010b for further information).

[45] Note that the sole non-ordinal categorical variable, ethnicity, is recoded as a series of binary dummy variables representing white, being of aboriginal descent, being of Asian descent, or "other", as in Table 2.1.

[46] It warrants reiterating that the goal of any imputation model should not be to estimate, predict, or recover missing data, but are instead, to yield an unbiased parameter estimate over a wide range of parameters (including the mean and variance); to incorporate a degree of the uncertainty involved in parameter estimates where some data is missing; and third, to have good statistical power. This means that while counterintuitive, the treatment of binary variables as normally distributed may ensure that a maximum amount of information from the observed data is used in the imputation of missing values.

imputed. That is, observations are not imputed for individuals prior to their actual recruitment into the study, a practice which preserves the data structure produced by VIDUS' prospective recruitment design. Additionally, observations are not imputed after the time of death. This strategy thereby assumes that those who have attrited out of the study are not cases of undocumented mortality. While death data are compiled from coroner's records and knowledge drawn from a close relationship with the Downtown Eastside community and study participants (C. Johnston, personal communication, 24 March 2010), it is conceivable that this may be the case for some respondents. A potential future analysis involving a two-stage imputation could account for the possibility of death among participants assumed to have attrited out of the study. The first stage would impute death occurring at some time point by incorporating information about the antecedents of death derived from the competing risks models conducted in Chapter 3. A second imputation process would impute values for those without observational data up until the imputed point of death. While outside the scope of the current study, this may prove an interesting line of future inquiry.

For the current study, data sets were generated specifying individual participants as the cross sectional variable and the chronological follow up period as the time specification. Because imputations are predictive rather than causal, data impacted by time ordering, endogeneity or multicollinearity may all be unproblematically included in the MI model (Honaker et al., 2011). Imputation models therefore used all available variables, including those not used in subsequent analyses, derived variables and interactions. Imputations also included polynomial functions of time and a ridge prior equivalent to five percent of the number of rows of data, a recommended practice when there are high degrees of missingness or strong correlations among variables (Honaker et al., 2011). A general rule for multiple imputation is that the imputation model contain a large set of variables, because overfitting or multicollinearity are not problematic for imputation, and the MAR assumption will become more plausible as more variables are used in the imputation model (Honaker et al., 2011). A

list of variables used for imputation that also identifies their role in imputation procedures is included in Appendix 4.1. Finally, data were corrected for illogical imputations. For example, in the case of HIV status, it was possible that an unobserved value would be imputed as seronegative when a previous observed value indicated an individual was seropositive and vice versa. Given that it is not possible to seroconvert from HIV seropositive to HIV seronegative, it was necessary to overwrite illogically imputed values. Finally, the previous job variable was derived after the imputations were complete to avoid illogical over- or under-imputation given this variable's direct dependency on the sequencing of employment spells.

Comparisons of observed and imputed data were conducted to determine whether imputation procedures produced data sets with different properties. Mean comparison tests were used for tests of difference using the imputed data set where variables are assumed to be multivariate normal (imputation model 1), while two group tests of proportion were used where imputations restricted some variables as binary (imputation model 2). Subsequent event history models use the methods described previously. Calculations and analyses using imputed data used the multiple imputation suite in Stata 12 (StataCorp, 2011). This suite adjusts coefficients and standard errors for the variability between imputations according to the combination rules by Rubin (1987). Because the imputation of employment spells created variation in the size of the risk set across imputed data sets, different numbers of observations were used for each model from each imputed data set. The range of observations used across imputed data sets for each analysis is included in the reporting of results.

In sum, tests of hypotheses about the attributes, behaviour, circumstances and contexts that may differentiate between IDU who move out of non-employment and into employment are conducted through nested discrete-time event history models. Prior to analyses, data are multiply imputed to allow for comparisons between models that do and do not accommodate missing information. The binary dependent variable of a transition to employment is estimated conditional on demographic characteristics, time varying covariates and the

duration of unemployment spells, represented by a series of binary dummy variables, using both observed and imputed data. Repeated events are pooled into the same analysis and the models accommodate violations of the serial and unit independence assumptions through the inclusion of variables indicating the number of prior transitions, the inclusion of age, and by specifying robust standard errors adjusted for clustered observations. Estimation is conducted using Stata version 12 using the suite of commands for event history analysis for binary time-series cross-section (BTSCS) data developed by Tucker (1998).

4.5 Results

Diagnostic tests of the multiple imputation procedure employed are displayed in Figure 4.2 and Table 4.3. In imputation Model 1, all variables are treated as continuous regardless of their structure in the observed data, and in imputation Model 2, dichotomous variables used in substantive analyses are restricted to being imputed as binary. A comparison of distributions of age between the observed data (n=14996) and the imputed data (n=339360), here calculated using kernel density estimation, demonstrates very little difference between the observed distribution and the two different imputation data sets.

Figure 4.2 Comparison of age distributions between observed (n=14996) and imputed (n=339360) data

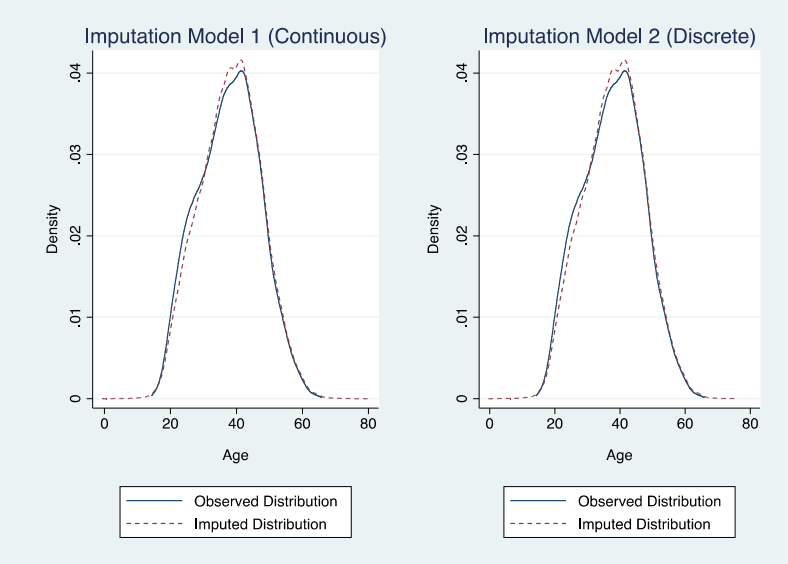


Table 4.3 Comparisons of sample proportions reporting select variables in VIDUS observed (N= 14996) and imputed data (N=339360, m=15)

Variable	Proportion: Observed	95% CI	Proportion: MI (1)*	95% CI	p-value†	Proportion: MI (2)**	95% CI	p-value†
Drug use								
Heroin injection	0.523	(0.515 - 0.531)	0.504	(0.502 - 0.506)	<0.001	0.507	(0.505 - 0.509)	<0.001
Cocaine injection	0.549	(0.541 - 0.557)	0.525	(0.523 - 0.526)	<0.001	0.529	(0.527 - 0.530)	<0.001
Speedball injection	0.252	(0.246 - 0.259)	0.236	(0.235 - 0.238)	<0.001	0.264	(0.263 - 0.266)	0.001
Crack use	0.514	(0.506 - 0.522)	0.531	(0.529 - 0.533)	<0.001	0.525	(0.523 - 0.527)	0.006
Poly-substance use	0.575	(0.567 - 0.583)	0.561	(0.559 - 0.563)	0.001	0.562	(0.560 - 0.563)	0.001
Treatment								
MMT enrolment	0.304	(0.296 - 0.311)	0.320	(0.319 - 0.322)	<0.001	0.333	(0.332 - 0.335)	<0.001
Non-MMT enrolment	0.126	(0.121 - 0.132)	0.126	(0.125 - 0.127)	0.911	0.153	(0.151 - 0.154)	<0.001
Drug-related risk								
Non-fatal overdose	0.088	(0.084 - 0.093)	0.080	(0.079 - 0.081)	0.001	0.109	(0.108 - 0.110)	<0.001
Shooting gallery use	0.149	(0.143 - 0.154)	0.146	(0.145 - 0.147)	0.339	0.174	(0.172 - 0.175)	<0.001
Public injection	0.153	(0.147 - 0.159)	0.145	(0.144 - 0.147)	0.012	0.174	(0.173 - 0.175)	<0.001
Socio-economic vulnerability								
Unstable housing	0.533	(0.525 - 0.541)	0.529	(0.527 - 0.531)	0.293	0.526	(0.525 - 0.528)	0.099
DTES residency	0.534	(0.526 - 0.542)	0.535	(0.533 - 0.537)	0.761	0.531	(0.530 - 0.533)	0.577
Sex trade involvement	0.164	(0.159 - 0.170)	0.153	(0.152 - 0.154)	<0.001	0.183	(0.182 - 0.184)	<0.001
Recent incarceration	0.225	(0.218 - 0.232)	0.213	(0.212 - 0.214)	0.001	0.240	(0.239 - 0.242)	<0.001
Health								
HIV seropositive	0.307	(0.300 - 0.314)	0.287	(0.285 - 0.288)	<0.001	0.331	(0.330 - 0.333)	<0.001
HCV seropositive	0.892	(0.887 - 0.897)	0.893	(0.892 - 0.894)	0.740	0.867	(0.866 - 0.868)	<0.001

* Model 1 models binary variables as continuous (tests are mean comparison tests); **Model 2 models binary variables as discrete (tests are two-group tests of proportion); †Significance tests refer to the null hypothesis of no difference; significant results therefore indicate statistically significant differences between samples

Comparisons of the proportions of individuals reporting a sample of variables are displayed in Table 4.3. Several of the tests of difference between observed and imputed sample descriptive statistics have statistically significant p-values, rejecting a null hypothesis of no difference. These findings suggest that imputations produced a data set that was statistically significantly different from the observed data. This is the case in imputation Model 1 (where binary variables are treated as continuous) for drug use variables, some of the indicators of risk, and HIV seropositivity. This was the case for all variables in imputation Model 2 (where binary variables are treated as discrete) except unstable housing and DTES residency. In this sense, imputation Model 1 appears to more closely preserve the distributions of the observed values. Such differences are expected in conditions where MAR holds, and the imputed data sets, according to MI theory, will be more like complete data than the observed data. Notably, the substantive differences between sample sizes are small, and significant results may have simply been a function of the statistical power produced by the large size of both the observed and imputed data sets. For example, the largest difference in the proportion between the observed and imputed data for imputation Model 1 was 0.024 for injection cocaine use (0.549 observed vs. 0.525 imputed). The largest difference between the observed and imputed data for imputation Model 2 was 0.029 for MMT enrolment (0.304 observed vs. 0.333 imputed). Particular attention will therefore be paid to differences in the analytical results for variables where the proportions were statistically different in order to assess whether these differences produce differences in substantive conclusions.

Analyses of observed data use 14390 observations from 1579 individuals, a smaller number than the 1599 individuals in the full data set. Omitted are 20 individuals with left truncated employment spells (i.e. report employment at baseline) who maintain employment throughout the observation period or attrite out of the study before transitioning to nonemployment. Reported measures of model fit are the ePCP and Wald χ^2 statistic for models using observed data, and F-tests comparing models using imputed and observed data

for models using imputed data. Time dummies are not displayed,[47] a common practice where substantive interest lies more in the effect of covariates than in that of duration (Blossfeld et al., 2007; Box-Steffensmeier & Jones, 2004). Each model is run with both data sets, though due to the similarity in results for estimations using the imputed data sets, only results using data produced by imputation Model 1 are reported. Results for substantive models are organized according to hypothesis and displayed in Tables 4.4 to 4.8, with Table 4.9 displaying a composite model that summarizes statistically and theoretically important results from all prior models. In addition to time dummies controlling for duration dependence, the previous job variable, which addresses correlations between repeated transitions, and age, included as an additional time-scale measure, are included in all models (Allison, 1984).[48]

Results from the first two hypotheses predicting differences across substances and patterns of use are displayed in Table 4.4. Model 1 examines multiple and single substance use of injection heroin, injection cocaine, injection speedball or crack use. In this and subsequent models, the base model variables behave very similarly: previous job transitions are positively and significantly associated with a transition into employment, suggesting those with previous transitions may be more likely; delayed recruitment is positively associated with a transition into employment,[49] indicating that later entries into the study are more likely to move into employment; and age negatively predicts an employment transition, suggesting a decreased probability of a transition for older participants.

[47] Time dummy variables are statistically significant and negative with the exception of Models 8 and 9, where some do not retain significance. Wald tests of the null of simultaneous equivalence of time dummies were rejected for all models. Due to space limitations these are not interpreted here.

[48] All models were additionally estimated including gender, because of prior research showing different drug use patterns and labour market behaviour of women (Bray et al., 2000; French et al., 2001; Hser et al., 2003; McCoy et al., 2007; Neale, 2004; Pelissier & Jones, 2005; Platt, 1995), and Aboriginal ethnicity, because prior studies of employment and drug use that account for ethnic differences observe systematically different effects (Hermalin et al., 1990; Platt, 1995; Sterling et al., 2001). Results were only marginally different with these included, and the effect of including these two variables in the model is clearly demonstrated in the composite model. They were thus excluded as base model variables for reasons of parsimony.

[49] This is the case with five exceptions: in Models 1 and 7 using observed data, delayed recruitment is only marginally significant (p=0.056, p=0.057, respectively), in Models 8 and 9 using observed data, it is not statistically significant (p=0.600 and p=0.552, respectively). In Model 9 using imputed data, delayed recruitment is marginally significant (p=0.052).

Table 4.4 Event history analysis predicting transitions into employment by different substances and use patterns (n=1579)[†]

Variable	Model 1 (Observed)		Model 1 (MI)		Model 2 (Observed)		Model 2 (MI)	
	Hazard Ratio	95% CI	Hazard Ratio	95% CI	Hazard Ratio	95% CI	Hazard Ratio	95% CI
Base variables								
Previous job transition	1.83***	(1.65 - 2.02)	1.44***	(1.34 - 1.55)	1.85***	(1.68 - 2.04)	1.47***	(1.37 - 1.57)
Delayed recruitment	1.19	(1.00 - 1.42)	1.28**	(1.11 - 1.48)	1.23*	(1.03 - 1.48)	1.33***	(1.15 - 1.54)
Age	0.98***	(0.97 - 0.99)	0.99**	(0.98 - 1.00)	0.98***	(0.97 - 0.98)	0.99**	(0.98 - 0.99)
Multiple substance use	0.29***	(0.24 - 0.35)	0.45***	(0.38 - 0.53)	-	-	-	-
Single substance use								
Heroin injection[‡]	0.51***	(0.38 - 0.68)	0.64**	(0.48 - 0.85)	-	-	-	-
Cocaine injection[‡]	0.38***	(0.28 - 0.52)	0.52***	(0.38 - 0.70)	-	-	-	-
Speedball injection[‡]	0.91	(0.42 - 1.96)	0.94	(0.46 - 1.95)	-	-	-	-
Crack use[‡]	0.50***	(0.38 - 0.67)	0.64**	(0.50 - 0.83)	-	-	-	-
Non-frequent use								
Heroin injection[‡]					0.69**	(0.56 - 0.86)	0.79**	(0.67 - 0.93)
Cocaine injection[‡]					0.67***	(0.55 - 0.81)	0.79**	(0.67 - 0.92)
Speedball injection[‡]					0.95	(0.73 - 1.23)	1.02	(0.84 - 1.23)
Crack use[‡]					0.84	(0.70 - 1.01)	0.88	(0.75 - 1.05)
Frequent Use								
Heroin injection[‡]					0.58***	(0.47 - 0.72)	0.73**	(0.61 - 0.87)
Cocaine injection[‡]					0.53***	(0.42 - 0.67)	0.71***	(0.59 - 0.84)
Speedball injection[‡]					0.50**	(0.33 - 0.77)	0.75*	(0.58 - 0.98)
Crack use[‡]					0.48***	(0.38 - 0.60)	0.64***	(0.54 - 0.75)
N of observations[§]		14390		18493 - 18596		14390		18493 - 18596
Wald X^2 / Model F-test (df, p-value)		4557.51 (26)***		174.70 (25) ***		4488.58(29)***		159.53 (28) ***
ePCP		90.22%				90.23%		

[*] p<0.05, [**] p<0.01, [***] p<0.001; [†] Models use clustered standard errors to account for multiple observations per respondent; [‡] Refer to activities/events in the six months prior to follow-up interview; [§] Number of observations used in analyses vary across imputations (m=15)

With the exception of the injection of speedballs, all of the drug use variables for both multiple and single substance use have significant negative associations with the dependent variable. The differences between them are in magnitude, with multiple substance use having the strongest negative association, followed by the single injection of cocaine, single injection of heroin and use of crack only. Model 2 examines frequencies of substance use, including both non-frequent (i.e. less than daily) and frequent (at least daily) use. Whereas heroin and cocaine injection were the only non-frequent drug use variables that significantly and negatively predicted transitions into employment, all four of the frequent drug use variables were significant. Results using imputed data are very similar in significance, direction and magnitude. The only notable difference was that the magnitude of coefficients was in some cases somewhat smaller. For example, the hazard ratio (HR) for previous job transitions in the observed model was 1.83, while that for the imputed data was 1.44. Similarly, the HR for multiple substance use for the observed data model was 0.29, while that of the imputed model was 0.45. This was consistent except for the delayed recruitment coefficients, whose magnitude was greater in imputed models than observed models. For reasons of parsimony, in subsequent models the inclusion of drug use variables is limited to frequent use variables.

In post-estimation tests of equivalency, in Model 1 only the hazard ratios for the single use of injection cocaine and that of speedball injection were statistically different from each other in the model ($X^2 = 4.62, p = 0.032$). This was also the case in Model 2 among the non-frequent use variables ($X^2 = 4.16, p = 0.041$) (results not displayed). The hazard ratios for substance use variables were not consistently significantly different from each other, even if their statistical significance varied in some cases. This suggests that while the biochemical effects of substances may be different, the statistical impact that each substance has on the probability of making a transition into employment is not different across substances, except in a limited number of cases involving singular or non-frequent use. Post-estimation tests of equivalence of the non-frequent and frequent hazard ratios for each substance paint a mixed

picture. Whereas hazard ratios for non-frequent heroin and frequent heroin injection ($X^2 = 2.23, p = 0.135$); and non-frequent and frequent cocaine injection ($X^2 = 3.39, p = 0.066$) were not statistically different from each other, non-frequent and frequent speedball injection $X^2 = 7.82, p = 0.005$) and non-frequent and frequent crack use ($X^2 = 19.70, p < 0.001$) were.

Table 4.5 displays the results of Model 3 that tests the third hypotheses: that socio-demographic disadvantage is inversely associated with transitions to employment. Results are again very similar between analyses using observed and those using imputed data in terms of direction, significance and to a lesser degree, magnitude. The same trends in terms of magnitude seen in Models 1 and 2 are observed here, with one exception: the magnitude of the Aboriginal ancestry coefficient for the model using imputed data is greater, rather than smaller than that of the model using observed data (0.75 vs. 0.81). Further, while frequent speedball injection is significant in the model using observed data, it is not in that using imputed data. Substantively, results display clear negative associations with employment transitions along lines of demographic disadvantage. Older age, female gender, Aboriginal ethnicity, educational attainment at a level of less than high school completion and not being married or in a common law relationship all having negative associations with employment transitions relative to demographically advantageous characteristics of being younger, male, Caucasian, having completed high school or more, and being either married or in a common law relationship. Notably, the 'other' category of ethnicity, which includes individuals self-identifying their primary ethnic affiliation as Latino, Middle Eastern, Black African or Black Caribbean, has a significant and positive relationship. It is not possible to further inquire whether any one of these groups drives the observed results due to small sample sizes for each individual category of ethnicity. In subsequent models, for reasons of parsimony, binary indicators of education (less than high school vs. high school or more) and ethnicity (Aboriginal ancestry vs. other) are used, given the results displayed here and the fact that that

drawing conclusions about the ethnic category of 'other' is not a logical ethnic category in a substantive sense. Further, individuals who self identify as having Aboriginal ancestry comprise the most significant non-white population in the DTES and have been the subject of considerable interest because of well documented health and social disadvantage faced by Aboriginal Canadians (Hogg, Strathdee, Kerr, Wood, & Remis, 2005; Kendall, 2001; Trocme, Knoke, & Blackstock, 2004; Trovato, 2001).

Table 4.5 Event history analysis predicting transitions into employment by demographic characteristics (n=1579)[†]

Variable	Model 3 (Observed)		Model 3 (MI)	
	Hazard Ratio	95% CI	Hazard Ratio	95% CI
Base variables				
Previous job transition	1.88***	(1.68 - 2.09)	1.46***	(1.36 - 1.58)
Delayed recruitment	1.21*	(1.01 - 1.46)	1.27**	(1.08 - 1.50)
Age	0.96***	(0.95 - 0.97)	0.98***	(0.97 - 0.99)
Female gender	0.49***	(0.39 - 0.60)	0.63***	(0.55 - 0.72)
Ethnicity (ref. = Caucasian)				
Aboriginal ancestry	0.81*	(0.67 - 1.00)	0.75***	(0.65 - 0.88)
Asian	1.09	(0.73 - 1.63)	1.07	(0.81 - 1.42)
Other	1.47*	(1.08 - 1.99)	1.28*	(1.05 - 1.56)
Educational attainment (ref = h.s./h.s. equivalence)				
Less than high school	0.66***	(0.52 - 0.83)	0.84*	(0.71 - 0.99)
College/trade	1.18	(0.93 - 1.50)	1.17	(0.97 - 1.40)
University or more	0.95	(0.69 - 1.31)	0.94	(0.72 - 1.22)
Married/common law[‡]	1.41***	(1.17 - 1.70)	1.25**	(1.06 - 1.46)
Frequent Use				
Heroin injection[‡]	0.65***	(0.53 - 0.79)	0.78**	(0.67 - 0.91)
Cocaine injection[‡]	0.62***	(0.50 - 0.77)	0.77**	(0.64 - 0.92)
Speedball injection[‡]	0.56**	(0.37 - 0.84)	0.79	(0.60 - 1.03)
Crack use[‡]	0.52***	(0.42 - 0.65)	0.68***	(0.58 - 0.79)
N of observations[§]		14390		18493 - 18596
Wald X^2 / Model F-test (df, p-value)		4554.64 (33) ***		139.37 (32) ***
ePCP		90.28%		

[*] p<0.05, [**]p<0.01, [***]p<0.001; [†] Models use clustered standard errors to account for multiple observations pre respondent; [‡] Refer to activities/events in the six months prior to follow-up interview; [§] Number of observations used in analyses vary across imputations (m=15)

Models 4 and 5, displayed in Table 4.6, test the treatment hypothesis. Initial results indicate that enrolment in addiction treatment is not significantly associated with a transition

into employment. The subsequent analysis that separates MMT from other forms of treatment shows that while non-MMT types of treatment have a positive and significant association with employment transitions, MMT has a significant and inverse association with employment transitions. The contrasting hazard ratios for different kinds of treatment clarify the insignificant association of all treatment modalities combined, indicating that a transition into employment for those enrolled in treatment is conditional on treatment type. All other base, demographic and drug use covariates remain stable in direction, magnitude and significance across both Models 4 and 5 for both observed and imputed data sets.

Notably, the relationship between addiction treatment and employment transitions is one where it is logical to examine whether lagged treatment variables share statistically significant relationships with employment transitions.[50] When identical analyses were conducted with time-lagged treatment enrolment variables, all those individuals who did not have at least one follow-up interview were excluded from analyses, as were those observations that came after a missed follow-up interview. This resulted in a reduced sample size of 1,326 individuals contributing 11,167 observations. Despite this reduction in statistical power, results demonstrate the same relationship between treatment enrolment and transitions into employment (data not shown). Coefficients for the pooled addiction treatment are not statistically significant (AOR=1.16, 95% CI: 0.94-1.42), while when examined separately, those for MMT (AOR=0.75, 95% CI: 0.58-0.98) and non-MMT treatment (AOR=1.94, 95% CI: 1.51-2.49) are. All other covariates remain similarly associated in direction, magnitude and significance as in previous models, with the exception of marital status, which is not significant in the first lagged model and Aboriginal ancestry, which does not reach statistical significance in either model.

[50] Given the six month observation intervals of the VIDUS, the use of lagged time-varying covariates in analyses is more generally unreasonable and would be equivalent to an expectation that, for example, a non-fatal overdose that could occur at the beginning of one observation interval, has an impact on a transition to employment at the end of the subsequent observation up to one year later. Addiction treatment is characteristically different from most covariates, in that it is more reasonable to expect the impacts of treatment enrolment may be longer term.

Table 4.6 Event history analysis predicting transitions into employment by enrolment in addiction treatment (n=1579)[†]

Variable	Model 4 (Observed)		Model 4 (MI)		Model 5 (Observed)		Model 5 (MI)	
	Hazard Ratio	95% CI	Hazard Ratio	95% CI	Hazard Ratio	95% CI	Hazard Ratio	95% CI
Base variables								
Previous job transition	1.86***	(1.68 - 2.07)	1.47***	(1.37 - 1.58)	1.88***	(1.68 - 2.10)	1.48***	(1.38 - 1.60)
Delayed recruitment	1.29**	(1.08 - 1.54)	1.33***	(1.14 - 1.54)	1.28**	(1.07 - 1.52)	1.31**	(1.13 - 1.53)
Demographic characteristics								
Age	0.96***	(0.96 - 0.97)	0.98***	(0.97 - 0.99)	0.97***	(0.96 - 0.98)	0.98***	(0.97 - 0.99)
Female Gender	0.48***	(0.39 - 0.59)	0.62***	(0.54 - 0.71)	0.51***	(0.41 - 0.63)	0.98***	(0.97 - 0.99)
Aboriginal ancestry	0.78*	(0.64 - 0.95)	0.72***	(0.62 - 0.84)	0.71***	(0.58 - 0.87)	0.65***	(0.56 - 0.75)
High school/equivalent	1.51***	(1.20 - 1.91)	1.19*	(1.00 - 1.40)	1.54**	(1.23 - 1.94)	0.69***	(0.59 - 0.81)
Married/common law[‡]	1.41***	(1.17 - 1.70)	1.25**	(1.06 - 1.47)	1.49***	(1.23 - 1.80)	1.20*	(1.02 - 1.42)
Treatment enrolment								
Any treatment[‡]	1.05	(0.89 - 1.23)	0.96	(0.83 - 1.11)	-	-	-	-
MMT[‡]					0.71**	(0.57 - 0.88)	0.77**	(0.65 - 0.92)
Non-MMT[‡]					1.71***	(1.41 - 2.06)	1.44***	(1.20 - 1.71)
Frequent Use								
Heroin injection[‡]	0.64***	(0.52 - 0.78)	0.77**	(0.66 - 0.90)	0.65***	(0.53 - 0.79)	0.77**	(0.66 - 0.91)
Cocaine injection[‡]	0.61***	(0.49 - 0.76)	0.76**	(0.64 - 0.92)	0.61***	(0.49 - 0.76)	0.76**	(0.64 - 0.92)
Speedball injection[‡]	0.56**	(0.37 - 0.85)	0.79	(0.61 - 1.04)	0.55**	(0.37 - 0.84)	0.79	(0.60 - 1.04)
Crack use[‡]	0.53***	(0.42 - 0.66)	0.68***	(0.58 - 0.80)	0.53***	(0.42 - 0.66)	0.69***	(0.59 - 0.81)
N of observations[§]	14390		18493 - 18596		14390		18493 - 18596	
Wald X^2 / Model F-test (df, p-value)	4516.77 (30)***		151.39 (29) ***		4520.66 (31)***		145.41 (30) ***	
ePCP	90.27%				90.31%			

[*] p<0.05, [**] p<0.01, [***] p<0.001; [†] Models use clustered standard errors to account for multiple observations pre respondent; [‡] Refer to activities/events in the six months prior to follow-up interview; [§] Number of observations used in analyses vary across imputations (m=15)

Table 4.7 displays results for Models 6 and 7, which test the differential risk hypothesis in two stages. Model 6 examines indicators directly linked to drug use. Of these, public injection and shooting gallery attendance are significantly and negatively associated with employment transitions, as is an interaction term between public injection and frequent cocaine injection. Binge drug use and non-fatal overdose are not significant. The interaction term between public injection and frequent cocaine injection was the only interaction term found to be consistently significant in models using observed data. The difference in both direction and magnitude between the cocaine and public injection variables and the interaction term, which is significant and positive, suggests that public injection is differently associated with employment transitions for those individuals who are also frequent cocaine injectors. That is, for analyses using the observed data the combined impact of public injection and frequent drug use on the predicted probability of an employment transition for frequent cocaine injectors is 0.39, while that for frequent heroin injectors, speedball injectors and crack users is 0.30, 0.21, and 0.20, respectively, *ceteris paribus*. This covariate is not significant in models using imputed data; it is nevertheless included to maintain consistency with observed data models.

Model 7 adds indicators related to generalized risk and the risk environment. Here, all of unstable housing, residency in Vancouver's Downtown Eastside, involvement in the sex trade and having been incarcerated in the six months prior to follow-up interview are negatively associated with employment transitions. Of great interest is what happens to other variables in the model when these indicators are included. Shooting gallery attendance, significant in the previous model, falls out of significance, while public injection and the interaction term between public and cocaine injection decrease in their level of significance, as do frequent heroin and frequent cocaine injection. In addition, both frequent speedball injection and frequent crack use become insignificant. Notably, in Model 7

Table 4.7 Event history analysis predicting transitions into employment by indicators of drug and environmental risk (n=1579)[†]

Variable	Model 6 (Observed)		Model 6 (MI)		Model 7 (Observed)		Model 7 (MI)	
	Hazard Ratio	95% CI	Hazard Ratio	95% CI	Hazard Ratio	95% CI	Hazard Ratio	95% CI
Base variables								
Previous job transition	1.94***	(1.76 - 2.14)	1.50***	(1.39 - 1.61)	1.75***	(1.58 - 1.94)	1.43***	(1.33 - 1.54)
Delayed recruitment	1.29**	(1.08 - 1.54)	1.36***	(1.18 - 1.58)	1.19	(1.00 - 1.41)	1.31**	(1.12 - 1.53)
Age	0.97***	(0.96 - 0.98)	0.98***	(0.98 - 0.99)	0.97***	(0.96 - 0.98)	0.98***	(0.97 - 0.99)
Drug use-related risk								
Binge drug use[‡]	0.85	(0.70 - 1.04)	0.93	(0.80 - 1.09)	0.90	(0.74 - 1.10)	0.96	(0.82 - 1.13)
Non-fatal overdose[‡]	0.96	(0.71 - 1.31)	0.92	(0.72 - 1.17)	1.10	(0.80 - 1.51)	0.98	(0.77 - 1.26)
Public injection[‡]	0.49***	(0.34 - 0.70)	0.69**	(0.52 - 0.91)	0.55*	(0.38 - 0.78)	0.73*	(0.55 - 0.96)
Public*freq. cocaine inj.[‡]	2.26**	(1.33 - 3.85)	1.35	(0.82 - 2.21)	1.98*	(1.15 - 3.39)	1.27	(0.78 - 2.08)
Shooting gallery use[‡]	0.69**	(0.52 - 0.91)	0.87	(0.71 - 1.07)	0.78	(0.59 - 1.03)	0.91	(0.74 - 1.13)
Non-drug related risk								
Unstable housing[‡]	-	-	-	-	0.62***	(0.51 - 0.75)	0.73**	(0.61 - 0.87)
DTES residency[‡§]	-	-	-	-	0.46***	(0.38 - 0.57)	0.66***	(0.56 - 0.78)
Sex work[‡]	-	-	-	-	0.27***	(0.19 - 0.38)	0.59***	(0.49 - 0.71)
Recent incarceration[‡]	-	-	-	-	0.78*	(0.64 - 0.95)	0.83*	(0.70 - 0.98)
Frequent Use								
Heroin injection[‡]	0.72**	(0.59 - 0.87)	0.83*	(0.71 - 0.97)	0.81*	(0.66 - 0.98)	0.89	(0.77 - 1.04)
Cocaine injection[‡]	0.58***	(0.46 - 0.75)	0.76*	(0.62 - 0.94)	0.76*	(0.58 - 0.99)	0.88	(0.72 - 1.08)
Speedball injection[‡]	0.54**	(0.35 - 0.81)	0.76*	(0.58 - 1.00)	0.67	(0.44 - 1.03)	0.85	(0.64 - 1.12)
Crack use[‡]	0.52***	(0.41 - 0.64)	0.67***	(0.57 - 0.79)	0.81	(0.65 - 1.02)	0.85	(0.72 - 1.00)
N of observations[††]	14390		18493 - 18596		14390		18493 - 18596	
Wald X^2 / Model F-test (df, p-value)	4518.10 (30)***		149.76 (29) ***		4499.51(34)***		127.45 (33) ***	
ePCP	90.22%				90.22%			

[*] p<0.05, [**]p<0.01, [***]p<0.001; [†] Models use clustered standard errors to account for multiple observations pre respondent; [‡] Refer to activities/events in the six months prior to follow-up interview; [§] DTES=Downtown Eastside; [††] Number of observations used in analyses vary across imputations (m=15)

using imputed data, all four frequent injection variables fall out of significance. Given the possibility of multicollinearity, I examined the variance inflation factor (VIF) for the covariates included in each of these models to assess whether or not estimates and standard errors are adversely affected. VIF values are evaluated relative to a benchmark of VIF of 10, commonly considered to be the value above which collinearity becomes an issue for estimates (O'Brien, 2007). The post-estimation examination of the VIF for model covariates suggests that multicollinearity did not impact estimates and standard errors. The mean VIF for the covariates included in Models 6 and 7 (observed data) were 1.14 and 1.19 respectively. No single covariate-specific VIF in any of the models is above 1.41.

Table 4.8 displays results for tests of the final differential health hypothesis. When indicators of HIV seropositivity and HCV seropositivity are added to the analysis in Model 8, both are significant and negative in models using observed and imputed data. Notably, in Model 8 using only observed data, frequent cocaine injection falls out of significance, while frequent heroin injection retains its statistical association with employment transitions. All other hazard ratios are similar to those in prior models, and with the exception of the public and frequent cocaine injection interaction term discussed previously; no interaction term between any of the drug use, risk or health variables reaches statistical significance.

Table 4.9 summarizes results from prior models in a composite model. It includes the base variables of previous job transitions and delayed recruitment, previously significant demographic variables of age, female gender, Aboriginal ethnicity, high school-level educational attainment and marital status; mode-specific treatment variables; the drug-use related risk variables of public injection and the interaction term public injection between frequent cocaine injection; general risk variables of unstable housing, DTES residency, sex trade involvement and recent incarceration; health indicators of HIV and HCv seropositivity; multiple substance use; and the frequent use variables for heroin injection, cocaine injection, speedball injection and crack use.

Table 4.8 Event history analysis predicting transitions into employment by indicators of HIV and HCV seropositivity (n=1579)[†]

Variable	Model 8 (Observed)		Model 8 (MI)	
	Hazard Ratio	95% CI	Hazard Ratio	95% CI
Base variables				
Previous job transition	1.73***	(1.55 - 1.93)	1.45***	(1.34 - 1.56)
Delayed recruitment	1.05	(0.87 - 1.26)	1.20*	(1.02 - 1.40)
Age	0.97***	(0.96 - 0.98)	0.98***	(0.98 - 0.99)
Drug use-related risk				
Binge drug use[‡]	0.91	(0.74 - 1.11)	0.97	(0.82 - 1.14)
Non-fatal overdose[‡]	1.09	(0.79 - 1.50)	0.98	(0.77 - 1.26)
Public injection[‡]	0.55**	(0.38 - 0.79)	0.73*	(0.56 - 0.97)
Public injection* freq. cocaine injection[‡]	2.06**	(1.20 - 3.53)	1.29	(0.79 - 2.11)
Shooting gallery use[‡]	0.76	(0.57 - 1.01)	0.91	(0.74 - 1.13)
Non-drug related risk				
Unstable housing[‡]	0.63***	(0.52 - 0.77)	0.74**	(0.62 - 0.89)
DTES residency[‡§]	0.47***	(0.39 - 0.57)	0.66***	(0.56 - 0.78)
Sex work[‡]	0.28***	(0.20 - 0.40)	0.61***	(0.50 - 0.73)
Recent incarceration[‡]	0.78*	(0.63 - 0.96)	0.83*	(0.70 - 0.99)
Health indicators				
HIV seropositive	0.44***	(0.35 - 0.56)	0.71***	(0.61 - 0.83)
HCV seropositive	0.76*	(0.59 - 0.97)	0.67**	(0.52 - 0.87)
Frequent Use				
Heroin injection[‡]	0.74**	(0.60 - 0.90)	0.86	(0.74 - 1.01)
Cocaine injection[‡]	0.81	(0.63 - 1.06)	0.92	(0.74 - 1.13)
Speedball injection[‡]	0.75	(0.49 - 1.15)	0.89	(0.67 - 1.18)
Crack use[‡]	0.80	(0.64 - 1.01)	0.85	(0.72 - 1.00)
N of observations[††]		14390		18493 - 18596
Wald X^2 / Model F-test (df, p-value)		4293.99 (36) ***		118.85 (35) ***
ePCP		90.53%		

* p<0.05, ** p<0.01, *** p<0.001; [†] Models use clustered standard errors to account for multiple observations pre respondent; [‡] Refer to activities/events in the six months prior to follow-up interview; [§] DTES=Downtown Eastside; [††] Number of observations used in analyses vary across imputations (m=15)

Most hazard ratios are similar to those of the same covariates in prior models although there exist a number of notable differences as well as differences between models using observed and imputed data. That of previous job transitions remains positive and significant. However, the delayed recruitment indicator fails to retain significance in both versions of Model 9. Age, female gender and Aboriginal ancestry continue to be negatively associated with employment transitions, while the educational attainment variable has a positive,

statistically significant association in the model using observed data, and being married or in a common law relationship fails to retain significance in both models. Indicators of drug-related and non-drug-related risk remain stable in the final model; public injection, unstable housing, DTES residency, sex trade involvement and recent incarceration are negatively associated with a transition into employment in models using both observed and imputed data, while the interaction term between public injection and frequent cocaine injection is significant only for the model using observed data. Of the two health indicators, only HIV seropositivity association with the dependent variable in the model using observed VIDUS data, while both have statistically significant and negative associations with employment transitions in models using imputed data. The statistical significance of multiple substance use is preserved only for the model using observed VIDUS data. Finally, among the frequent drug use variables, only daily use of injection heroin is associated with an employment transition in the model using observed data; no frequent drug use indicator retains significance in the model using imputed data.

Finally, a word about the measures of model fit. The ePCP improves only marginally from the Model 1 to 9, rising from 90.22% to 90.69%. While a more conservative measure of model fit than the PCP, which was higher for all models by approximately 4% (results not displayed), it does not vary considerably across models because of the aforementioned issues of a relatively small number of events. Wald chi-square statistics all significantly reject the null that all coefficients are simultaneously equal to zero, and F-statistics comparing models using imputed data to those using observed data without exception suggest that imputed models are a better fit to the data than those that are not imputed.

Table 4.9 Event history analysis predicting transitions into employment across demographic characteristics, enrolment in substance misuse treatment, risk, vulnerability and health indicators (n=1579)[†]

Variable	Model 9 (Observed)		Model 9 (MI)	
	Hazard Ratio	95% CI	Hazard Ratio	95% CI
Base variables				
Previous job transition	1.66***	(1.47 - 1.88)	1.42***	(1.32 - 1.54)
Delayed recruitment	1.06	(0.88 - 1.26)	1.17	(1.00 - 1.38)
Demographic characteristics				
Age	0.96***	(0.95 - 0.98)	0.98***	(0.97 - 0.99)
Female Gender	0.51***	(0.41 - 0.63)	0.64***	(0.55 - 0.74)
Aboriginal ancestry	0.76*	(0.62 - 0.94)	0.74***	(0.63 - 0.87)
High school/equivalent	1.43**	(1.14 - 1.79)	1.14	(0.96 - 1.35)
Married/common law[‡]	1.15	(0.94 - 1.39)	1.12	(0.94 - 1.32)
Treatment enrolment				
MMT[‡]	0.61***	(0.49 - 0.77)	0.73***	(0.61 - 0.87)
Non-MMT[‡]	1.55***	(1.28 - 1.87)	1.34***	(1.13 - 1.61)
Drug-related risk				
Public injection[‡]	0.48***	(0.34 - 0.69)	0.69*	(0.53 - 0.92)
Public*freq. cocaine inj[‡]	2.21**	(1.29 - 3.80)	1.28	(0.77 - 2.12)
Socio-economic vulnerability				
Unstable housing[‡]	0.56***	(0.46 - 0.69)	0.70***	(0.59 - 0.84)
DTES residency[‡§]	0.47***	(0.39 - 0.58)	0.67***	(0.57 - 0.78)
Sex work[‡]	0.38***	(0.26 - 0.54)	0.76**	(0.62 - 0.93)
Recent incarceration[‡]	0.69**	(0.56 - 0.86)	0.77**	(0.65 - 0.92)
Health Indicators				
HIV seropositive	0.47***	(0.37 - 0.60)	0.75***	(0.64 - 0.88)
HCV seropositive	0.80	(0.62 - 1.03)	0.72**	(0.56 - 0.94)
Multiple substance use[‡]	0.82*	(0.68 - 0.98)	0.89	(0.75 - 1.05)
Frequent drug use				
Heroin injection[‡]	0.76**	(0.61 - 0.93)	0.87	(0.74 - 1.02)
Cocaine injection[‡]	0.80	(0.62 - 1.04)	0.91	(0.73 - 1.13)
Speedball injection[‡]	0.80	(0.52 - 1.25)	0.94	(0.70 - 1.26)
Crack use[‡]	0.86	(0.68 - 1.09)	0.90	(0.75 - 1.07)
N of observations[††]		14390		18493 - 18596
Wald X^2 / Model F-test (df, p-value)		4084.54 (41) ***		101.68 (40) ***
ePCP		90.69%		

[*] p<0.05, [**] p<0.01, [***] p<0.001; [†] Models use clustered standard errors to account for multiple observations pre respondent; [‡] Refer to activities/events in the six months prior to follow-up interview; [§] DTES=Downtown Eastside; [††] Number of observations used in analyses vary across imputations (m=15)

4.6 Discussion

The current analysis examines whether, within a community-recruited sample of people who inject drugs in Vancouver, Canada, there are important systematic differences

between individuals that make a transition into employment and those that do not. In many cases the associations between transitions and the characteristics, activities, events and exposures examined here are as predicted. Higher intensity, poly-substance use tends to have a stronger, more negative association with employment transitions than lower-intensity use patterns, within this population socio-demographic disadvantage tends to translate into labour market disadvantage and compromised health status has a strong, negative relationship with moving into a regular job. In other cases the results are surprising. This is particularly so for the mode-specific relationship between addiction treatment enrolment and employment transitions, the differentiation between different types of risk and in the lack of a robust relationship between many frequent drug use variables and employment transitions once features of the risk environment and health status are accounted for. Results also imply some of the potential statistical implications of the missing data structure in the VIDUS as, while results between analyses using observed and imputed data were predominantly similar, some notable differences exist that may have implications for the interpretation of results. Finally, results point to shortcomings of the measures of model fit available for this type of analysis. Because of the small number of events relative to the total number of observations, the ePCP, which is adjusted to be more accurate and conservative than conventional PCP measures, nevertheless gives a generally poor indication of the relative strength of models. These results suggest multiple areas for further substantive, theoretical and methodological investigation.

The limited capacity of current analysis to enable causal inference from the statistical relationships must be carefully incorporated into the interpretation of results. As with previous analyses, associations between covariates and employment transitions do not imply causal pathways. For example, the lagged previous transition variable may be an indication that past employment success positively predicts future success, but it may also capture persistent unobservable effects that predict employment success at all time periods rather than true dynamic feedback into the labour market engagement patterns of study participants. The

results observed here do not therefore imply direct causal links between a particular covariate and employment transitions, but rather indicate systematically different characteristics and exposures between those individuals who make a transition into employment and those who do not.

4.6.1 Implications for Hypotheses

4.6.1.1 Differential substance and pattern of use hypotheses

Given the overlap between substance- and pattern- specific considerations, inferences that pertain to both the first and second hypotheses are here combined. The differential substance hypothesis stated that *the association between injection drug use and transitions to employment varies by substance, with heroin users less likely to transition to employment than other drug users,* while the differential pattern of use hypothesis stated that *different patterns of injection drug use are differentially associated with transitions to employment, with non-frequent and single substance use showing no relationship and frequent use and multiple substance use showing a negative relationship with transitions into employment*. In the context of single and multiple substance use, only the single injection of speedballs was not significantly and negatively related to employment transitions. However, in the final analysis, even multiple substance use, which had the strongest negative association in initial hypothesis tests, failed to significantly predict employment transitions. This finding was somewhat inconsistent with the literature initially motivating this hypothesis that suggested that multiple substance use, as opposed to single substance use, had a stronger negative impact on labour market outcomes (Bray et al., 2000).

Also somewhat inconsistent with previous literature were the results from comparisons of frequent and non-frequent use. The association between non-frequent or frequent drug use and employment transitions is substance specific. Whereas heroin and cocaine injection negatively predicted transitions to employment, regardless of whether use

was non-frequent or frequent, non-frequent speedball injection and crack use had no association with employment transitions. Frequent use of these substances significantly and negatively predicted transitions. Notably, tests of equivalence between non-frequent and frequent variables suggest that there is a threshold of use for crack and speedball injection; only after it is crossed do they significantly impact the hazard of a transition to employment. However, a dearth of research on the effects of combined cocaine and opioid use (Rowlett et al., 1997) make an explanation of the impacts of different frequencies of speedball injection on employment transitions difficult. Research on the impacts of different frequencies of crack use generally focuses on associated sexual risk rather than other outcomes (Hoffman, Klein, Eber, & Crosby, 2000; Latkin, Mandell, & Vlahov, 1996). These studies show increased risk taking with increased frequency of use, but further research is needed to determine if this relationship is consistent across other outcomes such as employment. Further, in subsequent models that explored features of the general risk environment and health status, frequent heroin injection was the only frequent drug use variable that retained a significant and negative association with employment transitions when examined with observed data. In analyses using multiply imputed data, frequent use of any substance and multiple drug of use failed to retain a statistically meaningful relationship with transitions into employment.

It is therefore possible to give only qualified support to the first and second hypotheses, although this partial support for the differential pattern of use hypothesis suggests that accounting for specific substances and drug use patterns is important. Heroin injection did appear to have the most consistent significant negative association with transitions to employment, a finding in line with the empirical literature (Adler, 1985; Feldman, 1968; Hanson, Beschner, Walters, & Bovelle, 1985; Johnson et al., 1985; Lindesmith, 1938; MacDonald & Pudney, 2000a; Platt, 1995). However, results suggest that the relationship between substance use and employment transitions is more complex than a ‘heroin vs. all other drugs’ scenario. The focus on heroin, particularly in the existing treatment literature,

may therefore be disproportionate. Indeed, only a single study was found that featured employment and crack use (Atkinson et al., 2000) and no study looking at the employment patterns of speedball users was encountered. Further, different patterns of use appear to matter in substance-specific ways, and a failure to account for both may produce ambiguous results. Bray et al. (2000) are among the few that have controlled for multiple substance use. The current analysis demonstrated that even frequent injection of drugs typically classified as "hard" may have relationships with labour market involvement that are conditioned by characteristics of the broader risk environment. Treating all drug use as a blunt category of behavior is therefore likely to increase the probability of ambiguous results. Future theoretical and empirical work on drug use and socio-economic participation would therefore do well to account for potential variation across different drugs and drug-use patterns.

4.6.1.2 Demographic disadvantage hypothesis

Results provided relatively clear support for the demographic disadvantage hypothesis that *socio-economic disadvantage among injection drug users is negatively associated with transitions to employment*. There are multiple possible explanations for the significant and negative associations suggesting that the hazard of women transitioning into employment is roughly half that of men. This employment advantage for men may be partially attributable to variations in the labour market behaviour and drug use patterns of female and male substance users (Bray et al., 2000; French et al., 2001; Hser et al., 2003; McCoy et al., 2007; Neale, 2004; Pelissier & Jones, 2005; Platt, 1995; Suffet, 1999). This result, which is consistent with results of a similar prior study (McCoy et al., 2007) may also be an indication of significant barriers to employment for women. Potential individual level explanations for these observed gender differences in labour market outcomes have not been thoroughly explored but may include individual factors such as women's differential treatment needs, increased incidence of physical and sexual abuse, or higher care responsibilities (Hser et al., 2003; Pelissier &

Jones, 2005), all of which may influence the probability of an employment transition among women. The results may also reflect women's greater involvement in illegal income generation (DeBeck et al., 2007), which may act as a disincentive to the pursuit of formal employment. However, these plausible individual level explanations cannot be viewed independently from systemic gender-based discrimination in the labour market, which also persists for the general population (Altonji & Blank, 1999; Padavic & Reskin, 2002).

The negative relationship between Aboriginal ethnicity and transitions to employment was also consistent with the demographic disadvantage hypothesis. It supports regional statistics on the labour market outcomes of the Aboriginal population that show significant labour market disadvantage, including lower educational attainment, lower wages, and unemployment rates that are more than three times higher than in the non-Aboriginal population (BC Statistics, 2006). The finding is also consistent with previous studies demonstrating significant social, economic and health disadvantage among individuals of Aboriginal ancestry. This disadvantage involves higher levels of poverty, increased exposure to violence, overrepresentation in the welfare system, elevated HIV infection rates, disproportionate representation among IDU and higher mortality rates (Craib et al., 2003; Hogg et al., 2005; Kendall, 2001; Miller et al., 2006b; Trocme et al., 2004; Trovato, 2001).

The positive association between marital status and employment transitions was also expected. It supports suggestions that strong social bonds, such as marriage, have a role in encouraging engagement with more mainstream social institutions (Sampson & Laub, 1995; Yamaguchi & Kandel, 1985). This could be the result of the stabilizing effect of primary relationships. It may also be attributable to financial obligations related to familial ties that create incentives for formal vocational activity. Regardless, the positive association between employment transitions and marital status among VIDUS participants was as hypothesized, and consistent with the role of social bonds in incentivizing non-deviant behaviour as characterized by social control theory.

Similarly, some of the results demonstrate the expected and generally positive relationship between educational attainment and employment transitions. This relationship did not hold for all models, however. Studies of educational attainment and labour market outcomes generally show the two to be positively related to one another (Breen & Jonsson, 2005; Finnie, 2000; Shavit & Muller, 1998) in a generally stepwise fashion, with greater educational attainment resulting in higher labour market outcomes (Andersen & van de Werfhorst, 2010). Educational attainment has also been shown to enhance the re-employment outcomes of unemployed workers (Riddell & Song, 2011). In the current analysis the level of education that demarcates between different labour market outcomes in some analyses was between those that did not complete high school and those that completed at least high school. This finding is consistent with a similar differentiation in a prior study suggesting that employed people who use drugs are more likely to possess human capital than those who are unemployed (Koo et al., 2007). However, the stepwise trend seen in the general population was not supported by the results of the current study. This may be because of a dearth of economic opportunities in the Downtown Eastside that attenuates any expected benefit from increased levels of human capital. It may also be because injection drug use affects an individual's ability to leverage human capital into labour market success. Notably, the relationship between educational attainment and employment transitions represents one of the key differences between analyses using observed and imputed data; the relationship between educational attainment and employment transitions ceases to remain significant in analyses using imputed data that also account for treatment enrolment, risk and health.

Socio-demographic characteristics clearly play a role in the employment transitions of individual IDU. Research outside of drug using populations indicates that labour market success is conditioned by social disadvantage (Berthoud, 2003; Hermalin et al., 1990; Suffet & Brotman, 1976). The results here confirm that this is also the case for IDU; the probability of making a transition into employment is significantly conditioned by individual

demographic characteristics. Empirical studies on drug use and work that consider demographic characteristics support the importance of their impact on individual outcomes (Bray et al., 2000; Buchmueller & Zuvekas, 1998; French et al., 2001; Hser et al., 2003; Kandel et al., 1995; MacDonald & Pudney, 2001; Pelissier & Jones, 2005). The concept of social disadvantage should therefore figure prominently in empirical and theoretical considerations of the social and economic outcomes of drug users and a more rigorous treatment of social disadvantage and exclusion may prove important for future work. This may include an exploration of configurations of multiple disadvantage, or other characteristics not included in the current analysis, such as mental or physical disability.

4.6.1.3 Treatment hypothesis

Tests of the treatment hypothesis, which predicted that *enrolment in MMT and other forms of substance use treatment is positively related to transitions into employment*, produced highly unexpected results. Findings from multivariate analyses initially showed no association between treatment enrolment and employment transitions. However, when a distinction was made between MMT and other addiction treatment modalities, it became clear that the relationship between addiction treatment and employment outcomes for IDU in this setting was contingent upon the type of addiction treatment. Enrolment in non-MMT forms of treatment increased the odds of making an employment transition, while MMT enrolment had the inverse effect. This finding is not consistent with other evaluations showing that MMT had either a neutral or positive effect on employment outcomes (Gibson, Flynn, & McCarthy, 1999; Joseph, Stancliff, & Langrod, 2000; Sees, 2000). While the data presented here do not provide a sufficient basis to definitively account for this counterintuitive finding, a range of possible explanations exist. The observed systematic differences in employment outcomes might plausibly be related to individual-level characteristics or circumstances that either inhibit transitions to employment and systematically apply to those individuals enrolled in

MMT, or lead to both MMT enrollment and non-employment. In this sense, a selection effect where individuals already unlikely to obtain employment in the labour market but more likely to be enrolled in MMT may be operating here.

For example, in contrast to abstinence-based forms of treatment, MMT is geared towards stabilized maintenance (Ward, Mattick, & Hall, 1994) and aimed at reducing the major risks, costs and harms associated with untreated opiate addiction (Rosenbaum, Washburn, Knight, Kelley, & Irwin, 1996; UNAIDS, 2004; Ward, Hall, & Mattick, 1999). It may therefore be a part of the early stages of addiction treatment and rehabilitation, and the initiation of labor market activity might not be expected to follow MMT enrolment in the same way that it would for other treatment modalities. Additionally, explanations for differences in labour market outcomes among people with substance use disorders, such as lower education levels, work histories or motivation (Svikis et al, 2012) may be disproportionately prevalent among those enrolled in MMT. As with non drug-using populations (Dooley, Fielding & Levy, 1996), individuals may also have differing capacities related to physical or mental health that inhibit their ability to seek and find employment. Finally, the common presence of concurrent and on-going drug use by individuals enrolled in MMT (Barnas et al., 1992; Demaria, Sterling & Weinstein, 2000) may preclude transitions into employment. Selection effects, or potential reverse causation may therefore play a role in the results observed here.

However, many person-specific variables such as individual drug use are consistent across settings, and therefore do not fully explain the discrepancy between results from the current study and previous evaluations. Further, existing research has found that full time employment among MMT clients is compatible with both MMT enrolment and ongoing drug use (Silverman & Robles, 1999). Other evaluations show that MMT has either a neutral or positive effect on employment outcomes (Gibson et al., 1999; Joseph et al., 2000; Sees, 2000). Given previous reports of issues related to compliance with MMT treatment guidelines

and retention in British Columbia (Nosyk, Marsh, Sun, Schechter, & Anis, 2010), mode-specific differences in employment outcomes within the study population may therefore be the result of programmatic barriers of MMT in the Vancouver and British Columbia setting. In British Columbia, methadone is predominantly dispensed in single doses under the supervision of a pharmacist (Anderson & Warren, 2004) and, in most cases, requires daily attendance at a single methadone dispensing pharmacy. These characteristics potentially limit the geographical and time flexibility required in job search or work initiation processes. These programmatic features may also increase the likelihood that individuals will be forced to disclose their treatment status, subjecting them to the consequences of the stigma of having a history of opiate addiction (Murphy & Irwin, 1992) from potential employers, whether or not active opiate use is ongoing. The stigmatization of people who use drugs has been previously identified as a major obstacle to employment (Crisp, Gelder, Rix, Meltzer, & Rowlands, 2000). While similar programmatic barriers may exist for other treatment modalities, MMT is differentiated from these in that the inability or failure to obtain and consume an appropriate methadone dose results in the initiation of withdrawal symptoms (Ward et al., 1999). In this setting, it is also generally taken daily on a long-term basis, during which adherence to regulations may prove to be more consequential to labor market outcomes than other forms of addiction treatment.

Rules governing the provision of MMT in British Columbia and elsewhere are intended to prevent individuals from diverting methadone for either inappropriate use by MMT clients or use by individuals for whom it was not prescribed (Ritter & Di Natale, 2005). However, these precautions must be weighed against the potential impact that methadone dispensing regulations have on the ability of MMT-enrolled individuals to engage in the treatment and rehabilitation process generally, and on their ability to seek, obtain and maintain employment in particular. While policies may reduce methadone diversion, they may also reduce treatment retention and increase mortality by increasing the population of

untreated opioid users (Varenbut et al., 2007). A balance therefore needs to be sought between measures to reduce and prevent methadone diversion and ensuring ease of access to treatment enrolment and retention (Fountain, Strang, Gossop, Farrel, & Griffiths, 2000) that facilitates social and economic functioning among IDU.

These results speak, in particular, to the ambiguity of conclusions from the treatment literature. The current study shows that transitions to employment are conditioned by the type of addiction treatment. Requirements related to methadone dispensing that restrict MMT clients geographically, interfere with job-seeking or work flexibility or otherwise increase the difficulty and potential sensitivity of the negotiation of new employment may introduce significant barriers to the job search process. If treatment and the vocational training programs offered in conjunction with treatment are to be made more effective, a better understanding of the relationship between different forms of treatment and their role in improving or hindering employment prospects of treatment clients will prove invaluable. These results underscore the continued need to evaluate the impact of treatment design on the social and economic activity of IDU and the importance of exploring alternatives to MMT, such as buprenorphine, in order to facilitate positive treatment outcomes.

4.6.1.4 Differential risk hypothesis

A relatively clear picture emerged from tests of the differential risk hypothesis, which states that *individual-, social-, and environmentally- based risk and features of drug use scenes are negatively associated with transitions into employment*. This picture did not entirely correspond to the predicted hypothesis, with results instead differentiating between two kinds of drug-related risk that have different implications for employment transitions. The first is risk related directly to the frequency or outcomes of high-risk injection. Neither binge drug use, nor non-fatal overdose had the hypothesized relationship with employment transitions. This is consistent with previous studies that have found little or no evidence of a

significant association between employment and unsafe injection practices (Clatts, Giang, Goldsamt, & Yi, 2007; Wood et al., 2002).

The second type of risk-involved exposure to settings and environments associated with high risk injecting or more generalized vulnerability. In the case of injecting environments, public injection negatively and significantly predicted employment transitions. Elsewhere, a range of spatial, ecological and environmental factors has been shown to increase the probability of public injecting (Rhodes et al., 2006; Small et al., 2007) that is itself associated with elevated injection risk behaviour (McKnight et al., 2007; Small et al., 2007; Small, Wood, Jürgens, & Kerr, 2005). Those injecting publicly, for example, are likely to do so because they have no shelter where they can go to inject. Shooting gallery attendance was also negatively and significantly associated with employment transitions in initial analyses. Participants attending shooting galleries may represent a subpopulation of IDU that is highly disconnected from mainstream social institutions such as the labour market. Elevated shooting gallery attendance has been reported elsewhere by those who have dense social networks connected to participation in drug markets and high intensity drug use scenes (Fuller et al., 2003b; Klein & Levy, 2003; Latkin et al., 1995). Both public injection and shooting gallery attendance are injecting contexts, exposure to which are unlikely to be deterministically linked to employment transitions. Notably, shooting gallery attendance failed to retain statistical significance in analyses accounting for more generalized risk. They may however be indicators for IDU who inject in particularly risk-associated contexts.

Where the relationship between risk and transitions into employment was most clear was in the case of features of the broader risk environment not directly related to drug use or high-risk drug use environments. All of the features of the broader risk environment examined in the current study context appear to have important bearing on the employment outcomes of individual drug users. Unstable housing has previously been shown to create social instability that is inimical to holding a regular job (Beardsley, Clatts, Deren, & Davis, 1992; Suffet,

1999). The negative association between transitions and Downtown Eastside residency was also unsurprising, given the elevated and concentrated socio-economic disadvantage of the DTES (Smith, 2003) which may produce a socio-economic context detrimental to labour market opportunities and outcomes (Browning & Cagney, 2002). This finding is consistent with the unemployment rate in the area, which is significantly higher than the rest of Vancouver (Brethour, 2009; City of Vancouver, 2006). While predicted, the association is troubling. A lack of opportunities and high joblessness are considered to be primary drivers of neighbourhood disadvantage and deterioration (Duncan & Brooks-Gunn, 1999; Wilson, 1999). As such, the high incidence of unemployment in the neighbourhood may be self-reinforcing: a lack of vocational opportunities may worsen neighbourhood conditions, making transitions to employment increasingly difficult over time. Further, criminal justice system involvement, highly prevalent in the study population, is a barrier to labour market activity (Pager, 2003). In addition to disrupting daily activities, disconnecting individuals from support networks or removing them from a job, employers may systematically discriminate against potential employees on the basis of a criminal record (Holzer, 2007; Pager, 2003). A lack of prior convictions may be a condition of employment and it is therefore unsurprising that recent incarceration would negatively predict employment transitions.

Negative associations between employment transitions and sex work, independently of the effects of gender, suggests distance from labour market for both women and men involved in the trade. Results have important implications because of the association of sex work with significant health and social costs (Blankenship & Koester, 2002; Shannon et al., 2009; Sherman & Latkin, 2002). This negative association may be because sex work is conceptualized as employment (Weitzer, 2009) by some of the respondents in the study. If we assume that individuals in the study have choices in the ways that they generate income, then sex work and employment are potentially endogenous outcomes of the same decision, making the negative association between the two predictable. The association may also be indicative

of a lack of viable income generating options for individuals involved in this type of work (Sherman, German, Cheng, Marks, & Bailey-Kloche, 2006) in view of prior findings that a majority of individuals reporting income from sex trade work would give up this source of income if they did not need money for drugs (DeBeck et al., 2007; Debeck et al., 2011; Sheerin, Green, Sellman, Adamson, & Deering, 2004). The development of "legitimate" sources of income has been shown elsewhere to have a positive influence on reducing involvement in the sex trade and lowering high-risk behaviour, including decreases in the median number of sex work clients per month and daily drug use (Sherman & Latkin, 2002). This result underlines the importance of viable income-generating options (Sherman et al., 2006) and the potentially far-reaching health, social and safety-related implications of labour market involvement for individuals engaged in sex work.

The importance of the risk environment as a potential mediating factor in the impact that frequent substance use has on the probability of an employment transition represents a crucially important finding. The inclusion of indicators of features of the broader, non-drug specific risk environment importantly alters the association between high-intensity drug use and employment transitions. In final models, with the except of daily or greater heroin injection in estimates using observed data, the statistical association between high-intensity drug use and movement into a regular job disappears entirely. Statistically, it may have been features of these contexts that were captured by the daily use variables. This suggests that, rather than high-intensity drug use inhibiting employment transitions, the risk environment may be a predominant factor in determining the probability of employment transitions.

Making a transition into the labour market appears to be highly contingent upon those environments where levels of risk and vulnerability are high rather than risky behaviour or outcomes directly related to drug use behaviour. Lending qualified support to the differential risk hypothesis, those environments that represent or create distance between individual IDU and mainstream institutions and generalized stability had the most significant negative effect

on transitions to employment. The importance of contextual features in the current study supports the potentially crucial role of context in mediating drug-using behavior identified elsewhere, and lends support to Rhodes (2002; 2009) schema for assessing the social, economic, ecological and policy risk environment. These findings thereby raise questions as to the causal role that non-drug related risk may play in the initiation or intensification of drug use. However, given the constraints on causal inference of the current analysis, this line of inquiry is necessarily limited to a potentially fruitful topic of future research, and conclusions about causal pathways cannot be made based on the findings here. Nevertheless, quantitative studies of the drug use-employment relationship rarely consider contextual factors in analyses, and subsequent theoretical and empirical work would do well to emphasize the potential importance of exposure to features of the broader risk environment.

4.6.1.5 Differential health status hypothesis

The differential health status hypothesis, that *HIV and HCV positive serostatus are negatively associated with transitions to employment*, receives considerable support. HIV and HCV seropositivity are negatively associated with transitions to employment in statistical analysis. For HIV seropositivity, the negative association remains even after extensive adjustment for other known HIV risk factors in this population, such as gender (Spittal et al., 2002), Aboriginal ethnicity (Craib et al., 2003; Miller et al., 2006b), unstable housing (Corneil et al., 2006; Strathdee et al., 1997) frequent cocaine injection (Tyndall et al., 2003) and binge drug use (Miller et al., 2006a). This relationship is supported by prior research that links HIV risk and economic deprivation (Parker, Easton, & Klein, 2000; Rhodes et al., 2005). It is also consistent with literature outlining the physical, psychological, social and structural barriers to work for PHA (Blalock, McDaniel, & Farber, 2002; Braveman, Levin, Kielhofner, & Finlayson, 2006; Hoffman, 1997; Rusch et al., 2004; Vetter & Donnelly, 2006; Vitry-Henry, Penalba, Beguinot, & Deschamps, 1999). Similar concerns pertain to individuals

at risk for HCV infection, given its negative association with transitions. However, barriers to employment for those who are HCV seropositive have not yet been studied in detail. Nevertheless, both HIV and HCV infection represent potentially significant barriers to employment among IDU in the current study. The impact of health on the employment outcomes of IDU suggests that this is an important omission in prior theoretical and empirical research.

4.6.2 Limitations and Methodological Considerations

These analyses face a number of limitations. The current study reports a finding of systematic differences in the probability of employment transitions across a range of characteristics, activities, events and exposures in a specific context among a non-random prospective sample of IDU. As such, these findings may not be generalizable to other IDUs and more specific results, such as those related to treatment may not be generalizable to the broader addiction treatment-enrolled population. Other limitations include potential recall or social desirability biases, as all non-serological data used in the study are based on self-report. Further, the processes related to drug use and employment may be difficult to disentangle or accurately explain because of potential endogeneity between drug use and employment patterns. As mentioned previously, results do not indicate a causal pathway between covariates and transitions. Further, particularly in the case of mode-specific treatment outcomes, results may indicate systematically different outcomes between those individuals who have self-selected into different treatment types, which may be subject to further confounding by factors not examined in the current analysis. These findings may be subject to additional external confounding by factors not examined in the current analyses, and future work may benefit from further considerations of unobserved heterogeneity, including indicators of local labour market conditions such as unemployment rates or mismatches between local skills capacities and job opportunities.

An additional limitation is related to the analytical assumptions about labour market participation necessitated by the available information in the VIDUS. Of particular relevance to the study of employment transitions are the following. First, studies imply that all individuals are physically and mentally capable of making a labour market transition. Given the potentially high probability of elevated levels of limiting physical and mental illness among inner-city drug users, this may not be a tenable assumption. Second, analyses assume that all individuals included in the study sample are motivated to pursue formal employment, which, without additional information is unverifiable. Third, and perhaps most critically, analyses assume that individuals are all participating in the labour market. Without information on job search strategies, this assumption is equally unverifiable. Given previous information on employment among drug users (Henkel, 2011; Platt, 1995), it is reasonable to infer that individual capabilities, motivations and participation are not consistent across the IDU population examined here. Key findings are best understood with these caveats in mind.

The analyses reported here compare identical models using two different data sets, one in which only the observed values from the original VIDUS study are included, and one where observation-level missing data is multiply imputed. The longitudinal nature of the data may have particular implications for the assumptions made about unobserved information during observation gaps and what the information directly following these gaps implies vis-à-vis these assumptions. That is, in the current analysis an observation of employment directly following an observation gap is assumed to represent an employment transition. In analyses using imputed data, this assumption is no longer necessary. In this sense, analyses using multiply imputed data serve as a sensitivity analysis to modifications of this assumption. Additionally, the multiple imputation process utilized here is designed specifically to attend to the serial and unit correlations observed in longitudinal data. However, due to computational limitations it was not possible to include interactions between time and cross-sectional (i.e. individual participants) units in the imputation model, and therefore imputation did not allow

for individual random slope specifications. Further, the proportion of activities, events and exposures for some variables used in analyses were statistically different between observed and imputed samples, although these differences were substantively very small. Results are also very similar between analyses using observed and imputed data, with differences occurring only in terms of the magnitude or strength of associations between variables and in a select number of instances in levels of significance.[51] For the most part they appear not to have dramatically impacted the interpretation of analyses, with the exception of a few cases, including educational attainment, HCV seropositivity, multiple substance use, and frequent heroin injection. In all cases, F-tests suggest that models using imputed data are preferable to those using only observed data, and further research on the particular statistical implications of the multiple imputation strategy used here may prove clarifying for strategies to deal with missing data in highly vulnerable and often unstable populations.

Finally, issues related to model fit warrant further consideration. The ePCP, like any comparison of predicted and observed outcomes, is only marginally useful for models of relatively rare events because of the preponderance of cases in the modal category, which inflate the measure. The assignment table comparing the predicted and observed outcomes, Table 4.10, indicates 769 false negatives and 31 false positives, significant quantities given the total number of observed transitions is 794. The ePCP, like any other measure of model fit commonly used for logistic analysis or event history models, does not consider false positives and false negatives, balancing correctly predicted observations against incorrectly predicted observations. While perhaps an improvement on traditional PCP figures that tend to

[51] Notable cases of these differences are outlined in the results, and are summarized as follows. The first difference concerns the significance of an interaction term between public injection and frequent cocaine injection. Results from analyses using observed data suggested a substance-specific association between public injection and employment transitions that was systematically less strong for frequent cocaine injectors, while analyses using imputed data suggest no statistically significant drug-use specific association. Differences in final analyses that may have substantive implications for the interpretation of results included educational attainment, multiple substance use and frequent heroin injection, which are significant and positive in the analysis using observed data but not significant in those using imputed data. They also included HCV seropositivity, which was not associated with employment transitions in the final analysis using observed data, and a significant association found in analyses using imputed data.

overestimate the predictive accuracy of statistical models (Herron, 1999), the appropriateness of the ePCP for models of rare events is nevertheless questionable in the current context.

Table 4.10 Assignment table of predicted versus observed employment transitions from the composite model; probability cutoff of 0.5 (n=1579)

Predicted Employment Transitions	Observed Employment Transitions 0	1	Total
0	13,572	769	14,341
1	31	18	49
Total	13,603	787	14,390

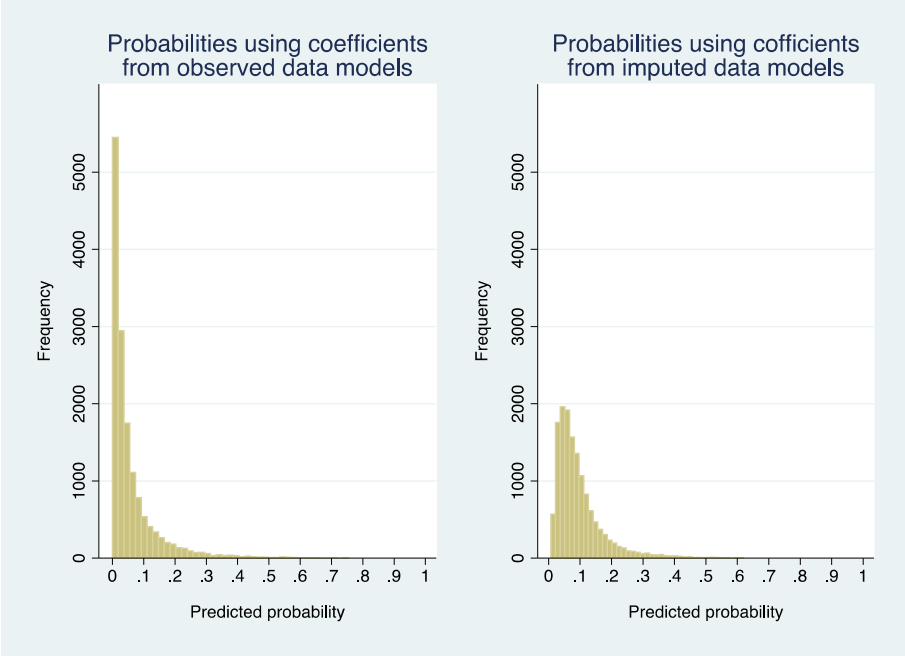
Figure 4.3 is a histogram of predicted probabilities of the observed data using the coefficients from the composite model estimates. The ePCP measure, like the PCP measure, uses a probability of 0.5 as the delineation between "in-group" and "out-group" members. Those predicted probabilities greater than 0.5 are counted as making a transition while those whose predicted probabilities are less than 0.5 are not counted as making a transition. With means of 0.055 (observed model coefficients) and .096 (imputed model coefficients), standard deviations of 0.074 (observed model coefficients) and 0.076 (imputed model coefficients) and no single predicted probability over 0.716 (observed model coefficients) and 0.620 (imputed model coefficients), the highly skewed distribution of predicted probabilities indicates that altering the arbitrary cut off point of 0.5 at which a predicted probability is classified as a positive outcome may provide a distribution of predicted versus observed employment transitions more reflective of the actual occurrence of events. For example, the creation of an assignment table for the observed model coefficients and observed data with a probability cut off of 0.2 instead of 0.5 produces results displayed in Table 4.11.

Table 4.11 Assignment table of predicted versus observed employment transitions from the composite model; probability cutoff of 0.20 (n=1579)

Predicted Employment Transitions	Observed Employment Transitions 0	1	Total
0	13,117	585	13,683
1	505	202	707
Total	13.603	787	14,390

When a probability cut off of 0.2 rather than 0.5 is used, the ratio of false positives to false negatives changes from 31:768 (0.040) to 505:585 (0.863) and the number of correctly predicted transitions increases by well over 1000%. The recognition that predictions of rare events significantly improve when the criteria used to delineate between predicted outcomes is adjusted may be a step toward developing a better indicator of model fit for event history analyses of rare events.

Figure 4.3 Histogram of employment transition predicted probabilities using coefficients from models using observed and imputed data



4.6.3 Predicting transitions into employment among IDU: Conclusions

The current study examined transitions into employment among a sample of community-recruited, predominantly inner city individuals who inject drugs. Rather than focus on the differences in labour market outcomes between individuals that do and do not use drugs, the aim here was to identify those characteristics, activities, events and exposures that differentiate those who move into employment and those who do not among a sample of often high-intensity drug users. This strategy is in line with previous studies (Atkinson et al., 2000; Johnson et al., 2001; Koo et al., 2007; McCoy et al., 2007) that seek to provide more

detailed and nuanced understandings of localized drug use and socio-economic participation patterns. These have been conducted with a view to explore ways to develop supports that will increase the employment capacity of unemployed or non-employed, substance-using individuals. Analyses used discrete time event history models to test six hypotheses about the impact of substance and frequency-specific patterns of use, demographic characteristics, treatment enrolment, drug-related and environmental risk and individual health status on employment transitions.

Figure 4.1 depicted the employment and employment entry rates in the VIDUS from 1994-2005, and descriptive statistics suggested that while employment and employment entry rates are low, a dynamic subpopulation of approximately one third of study participants successfully engaged in the labour market during the study period. Analyses that explored transitions into employment produced both expected and unexpected results. First, previous employment transitions increased the probability of future labour market engagement; employment transitions were more common among those who had previously moved into a regular job. Second, the impact of injection drug use on employment transitions was, in some cases, pattern and substance specific. Heroin use, multiple, and high-intensity drug use more consistently and negatively predicted labour market outcomes than other substances and patterns examined. However, features of the broader risk environment appeared to mediate the relationship between drug use and employment entries, particularly in models that used imputed data. This suggests that it was generalized vulnerability associated with the broader environment that inhibited employment transitions more strongly than high-intensity, high-risk drug use in and of itself. Third, within this population, socio-demographic disadvantage translated into labour market disadvantage, with participants who were older, female, of Aboriginal ancestry, lower educated and unmarried generally less likely to move into employment. It is important to note that when other behaviour and exposures were accounted for, the effects of educational attainment and marital status were less pronounced. Fourth, the

relationship between treatment enrolment and employment transitions was conditional on the type of treatment; MMT enrolment had a negative relationship with employment transitions, while non-MMT forms of addiction treatment were positively associated with successful vocational integration. Fifth, there was a clear delineation between the types of risk that were salient for employment transitions. Those that were associated with high-risk drug using contexts or the broader risk environment were more relevant than those associated with specific drug use behaviour. It was not so much drug use, but drug use in particular environments by individuals who were vulnerable in particular ways that appeared to impact the employment transitions of IDU. Finally, the negative effect that HIV and HCV seropositivity had on the odds of making a transition to employment speaks to the important relationship between health and work. Whether because of physical well being, care requirements or stigma, HIV and, to a lesser extent, HCV represented potentially significant barriers to employment among IDU.

These findings emphasize (1) the importance of high levels of specificity in describing drug use patterns, (2) the potential impacts that service design and delivery may have on the socio-economic functioning of IDU, (3) considerations of the context in which drug users live and operate, and (4) the importance of health status to individual outcomes vis-à-vis labour market participation. These findings also have particular salience for the literature reviewed earlier. For the theoretical accounts portraying drug use as deviance as in strain, control and learning theory, this study suggests that while the relationship between drug use and employment was predominantly an inverse one, portrayals of drug use and a lack of engagement with mainstream institutions as deviance neglect to address important contingencies and features of the risk environment that condition relationships with conventional socio-economic activity. Further, in future studies of the relationship between addiction treatment and work it will be important to assess the impact that characteristics of support services may have on social and economic functioning; the findings of treatment

mode-specific associations with employment transitions made clear the potentially considerable importance of treatment design for employment transitions. Finally, quantitative research on drug use and employment should not collapse different categories of drug use, use-related behaviour, or even demographic characteristics. A more nuanced approach, based on differentiating between aspects of the various dimensions that can act as barriers to socio-economic functioning, is clearly needed based on the findings of the current study.

This research also raises a number of areas for future research. Next steps in this line of inquiry could involve analyses of post-employment outcomes related to drug use cessation, similar analyses exploring different aspects of labour market experience such as the maintenance of job tenure, job changes, or job exits. It could also examine different socio-economic outcomes altogether. Exploring different configurations of demography, use, risk and vulnerability or the effects of multiple disadvantage may also prove fruitful, especially considering that elsewhere employment success has been shown to be inversely proportional to the number of social disadvantages of an individual (Berthoud, 2003; Hermalin et al., 1990; Suffet & Brotman, 1976). It may also prove informative to compare employment and labour market outcomes with different forms of income generation, such as informal work, drug dealing or sex work; or to explore income generation-specific configurations of drug use and drug-related harm. Further, there are opportunities for additional methodological work, such as investigating issues of endogeneity and developing a more appropriate measure of model fit for this type of analysis.

Finally, the significance of these findings may have particular policy implications for those interventions that are aimed at the social integration of IDU, though these are not straightforward. A range of personal, health and behavioral issues impact the employability of problem drug users, but these do not universally apply to all IDU. And, while there appeared to be demographic barriers to employment transitions, there was also evidence of drug use pattern-, behavior- and context-specific circumstances that need to be considered in

intervention design. Further, while interventions at the individual level must be appropriate to the drug-using population (Hartwell, 2000; Kemp & Neale, 2005; Magura, 2003; Magura & Staines, 2004; Platt, 1995), there may also be structural barriers specific to drug use that need to be addressed, such as stigma (Murphy & Irwin, 1992), employer prejudice and policy discrimination (Crisp et al., 2000; Dillon, 2004; Gold, 2004). Additionally, evidence of the link between low job satisfaction and increased substance use (Greenberg & Grunberg, 1995) requires that any initiative designed to improve the labour market outcomes of IDU deliver a measure of job satisfaction. Not all employment activity is inherently beneficial and may include unsavoury duties, irregular work patterns or inadequate pay (Hartwell, 2000). Any initiative to increase the labour market participation of IDU will need to consider the complex relationship between injection drug use, the individual and the broader social context.

Chapter Five: Experiences of employment and drug use

> *I mean I'm willing and somewhat able to do just about anything, but I've never had a job my whole life and I don't even know where to start to get one. I don't have a driver's license. I've got a fairly decent education and I know that, like academically I can accomplish just about… like short of maybe becoming an astrophysicist or a neurosurgeon there's nothing that I couldn't do academically, I know that. I even thought about writing a book called, "How to make a living when you haven't got a life" all about little scams and little ways of making money when you're destitute.* Participant #20, male

5.1 Introduction

This chapter reports the findings of a qualitative study on the relationship between drug use and work. This research supplements quantitative analyses of previous chapters with the perspectives and experiences of labour market involvement of predominantly high-intensity drug users. In doing so, it serves three primary purposes. First, it comprises an independent but complementary study of the relationship between employment and substance use. It thereby explores a complex phenomenon that is not wholly amenable to quantitative inquiry (Creswell & Plano Clark, 2007; Pope & Mays, 1995), building a wider picture of the phenomenon under investigation (Neale et al., 2005). Second, it explores some of the statistical relationships found in the previous chapter through experiential perspectives that may better elucidate the underlying mechanisms behind these relationships. Because of the explanatory limits of quantitative approaches, there is a growing interest in multi-method research as a means of disentangling the complex combinations of factors influencing drug use and its related harms, and as a way of generating interventions in response (Barnard & Frischer, 1995; Martin & Stenner, 2004; McKeganey, 1995; Rhodes & Moore, 2001a). Third, it examines some of the necessary assumptions of quantitative analyses. The models of the previous chapter assume, for example, that individuals are both motivated and able to participate in the labour market. In this sense, statistical analyses were unable to fully explore constraints on individual agency to seek out and obtain employment. These assumptions

represent potentially important limitations of statistical analyses that, in the current context, are not possible to address through existing data sources. The creation of a fuller portrayal of the subjective meanings surrounding individual experiences as they relate to drug use seeks to add greater explanatory power as well as practical and personal relevance to the findings of quantitative analyses (Martin & Stenner, 2004; Rhodes & Moore, 2001a).

Qualitative research in the field of drug use and addiction enables the discovery of plural and competing interpretations of drug use (Rhodes & Moore, 2001a). Emphasis in the field is placed on the ideas of "situated rationality" whereby an attitude or behaviour that initially seems irrational "becomes meaningful, reasonable and normal once you get close to it" (Goffmann, 1961, p. ix). Research therefore explicitly seeks proximity to individuals' cultural frameworks (Geertz, 1974). This style of inquiry aims to portray how the world looks from a disadvantaged position. It explores the political economies of everyday human action in terms of both individual behaviour and the broader social-structural forces that are at play with respect to drug use and drug-related harm (Rhodes & Moore, 2001a). The level of detail required for this endeavour can only be established by going to people directly for their stories (Creswell, 2007), particularly when the aim is to understand how people account for, take action and otherwise manage their day-to-day situations (Miles & Huberman, 1994). The focus on lived experience recognizes that "human beings are purposeful, goal seeking, feeling, meaning-attributing and meaning-responding" (Hughes, 1976, p. 24). It ascribes to the notion that research participants' perspectives can be invaluable in understanding individual behaviour (Neale et al., 2005). This is particularly the case when research concerns sensitive or illegal activities such as drug use.

The objectives of the current qualitative study flow directly from its ability to complement quantitative analyses with "thick" descriptions of the relationship between drug use and employment. The overall objective is to explore employment as an activity that mediates or moderates the natural history of injection drug use. Particular emphasis is placed

on exploring how employment, as a socio-economic undertaking that involves engagement with the formal labour market, influences and is influenced by drug use, drug- and non-drug-related risk, intervention efforts, medical treatment and individual health. In eliciting individual accounts, I aim to explore how ecological factors related to the spatial, cultural and structural environment interact with individual agency. Further research aims include identifying, from the perspective of individual-environmental interactions, what differentiates drug users who engage in the formal labour market and those who do not. Finally, interviews examine how individuals perceive and experience work and labour market participation.

The remainder of the chapter is structured as follows. Section 5.2 summarizes prior qualitative research on drug use with a specific focus on those studies that address work or income generation. Section 5.3 outlines the analytical strategy of this research. Section 5.4 outlines the results of qualitative analyses, and Section 5.5 comprises a discussion of the implications of these findings for qualitative research. While one of the objectives of qualitative study is to reflect on the findings and assumptions of quantitative work, this is addressed in the concluding chapter, which focuses on the relationships between each of the substantive chapters of this thesis.

5.2 Income generation and drug use: a review of qualitative research

A rich history of qualitative research looks at drug use (Feldman & Aldrich, 1990a; Rhodes & Moore, 2001a), in which insights about the relationship between drug use and income generation have played a small but notable part. Mentioned briefly in section 4.2.2.2 above, these studies have penetrated clandestine, drug using populations, countering perceptions of drug users as passive, deviant, or products of a Mertonian "anomie" (Merton, 1938). They instead portray the participants in drug scenes as active and purposeful. Oft quoted as the exemplar of this trend, Preble and Casey interpret the pursuit of heroin as a "quest for a meaningful life" (Preble & Casey, 1969, p. 2). Their observations, and those of

similar studies, point to the importance of grounding depictions of drug use in the shared meaning and experiences of drug users. In pursuing research about *how* people use drugs rather than etiological explanations of *why* people use drugs, ethnographic studies of drug use describe the ways in which drug users position themselves within their own socio-cultural context (Feldman & Aldrich, 1990b; Rhodes, 2000). These studies explore social status currencies where deviance replaces conventional measures of success (Jackson, 1978), ascendancy in deviance-oriented status hierarchies is a way to enhance prestige (Finestone, 1957a; Lindesmith, 1947a) and where focus is drawn away from psychological predispositions toward drug initiation (Feldman, 1968).

5.2.1 Demography, capacities and socio-economic context

Previous qualitative work has identified three themes of particular relevance to the current study. The first is a focus on situating drug use within population sub-groups. Feldman and Aldrich (Feldman & Aldrich, 1990b) describe early assumptions that drug use-related behaviour was conditioned by drugs of preference, a tendency fuelled by the notion of drug-specific subcultures. What has been demonstrated, however, is that an understanding of drug use-related behaviour is more aptly achieved by focusing on demographic configurations based on age, sex, race, ethnicity and neighbourhood affiliation (Feldman & Aldrich, 1990b). This suggests the importance of exploring socio-demographic characteristics as dimensions along which differences in drug use patterns and practices may occur. It also emphasizes the importance of not restricting inquiry to users of a particular substance.

The second theme is related to capacities and motivations surrounding income generation. Preble and Casey locate meaning in the "gratification of accomplishing a series of challenging, exciting tasks, every day of the week" (Preble & Casey, 1969, p. 3). Pearson (1987) further notes that the avoidance of withdrawal infuses daily activities with biologically motivated purpose. Studies also argue that individuals involved in high-intensity drug use

necessarily engage in activities requiring high levels of organizational skill, forward planning, relationship development and community involvement (Adler, 1985; Bourgois & Schonberg, 2009; Feldman, 1968; Johnson et al., 1985; Johnson et al., 1990; Preble & Casey, 1969; Stephens, 1991). These studies identify functionality among high-intensity drug users, skills and competencies that feature in individual survival strategies, the identification and capitalization of opportunities, and the management of drug use behaviour (Feldman, 1968; Finestone, 1957a; Hughes, 1977; Pearson, 1987; Sutter, 1966). Views of the street-based, high-intensity user as an entrepreneur who is "alert, flexible and resourceful" (Preble & Casey, 1969, p. 2) explicitly and implicitly portray drug users as active agents, emphasizing individual capacities and motivations. These skills are tailored to and develop as a function of the drug-use context described.

This points to the importance of a third theme: the implications of socio-economic context for income generation, drug-related harm and health. This context includes neighbourhood characteristics, as demonstrated by numerous studies situated within inner-city communities (Agar, 1973; Cloward & Ohlin, 1960; Finestone, 1957b; Hanson et al., 1985; Preble & Casey, 1969; Sutter, 1966). Draus et al. (2010), for example, identify the interdependence of social contexts, emotional well-being and drug consumption patterns, whereby heroin dependency operates as both a creator of and a way to cope with social marginality. Pearson (1987) points out that drug use in areas of high unemployment is more likely to assume a pattern of endemic growth because of the absence of any realistic economic alternatives or work commitments. He emphasizes the interaction between social and economic deprivation, the social-psychological consequences of unemployment and opportunistic drug marketeers as socio-economic drivers of heroin use in deprived areas. Pearson's observations further implicate the role of economic and labour market conditions, available social support, and social networks. For example, Johnson et al. (1985) observed that the probability of having a job in inner-city neighbourhoods was essentially nonexistent

even when individuals were not using drugs, and point to a systemic failure to provide enough jobs for all citizens. Similarly, Bourgois (2009) looks to the restructuring of the North American economy, combined with a shift away from rehabilitative social service provision, as playing a crucial role rendering entire categories of manual workers obsolete and without the ability to adapt to economic change. A detailed treatment of the complex relationships surrounding post-industrialism, economic security and impoverishment (Castells & Portes, 1989) is outside the scope of the current analysis. Nevertheless, these studies emphasize the importance of situating drug-related risk and socio-economic contexts, regarding "human motivation and capacity for change as socially conditioned" (Singer & Weeks, 1996, p. 490). That is, to rigorously understand drug use experiences, it is important to position rationality and choice as contingent upon individual networks, frames of reference and the degree to which people are embedded within these frames (Ghezzi & Mingione, 2007; Granovetter, 1985). The situated nature of economic behaviour and drug scene involvement implies that portrayals of the relationship between the two are inseparable from a considered treatment of the broader context within which drug users live and operate.

5.2.2 Socio-economic context and health

In the field of drug use and HIV/AIDS, linkages between socio-economic context and substance use have produced innovative explanations for patterns of HIV/AIDS infection (Moore, 2005). For example, despite disincentives for needle sharing among IDU, accounts of sharing among injectors as a result of needle scarcity (Koester, 1994) and the pooling of scarce resources to avoid becoming 'dopesick' (Bourgois, 1998) have been offered as explanations for the perpetuation of high-risk health behaviour. Syringe sharing has been shown as "mandated by the complex logics of precarious income generation, the moral economy of social relationships and the 'biological imperatives' of heroin addiction" (Moore, 2005). This example reinforces the importance of the concept of "situated rationality"

mentioned above; the compulsion to engage in high-risk behaviour persists despite the knowledge of how to prevent the acquisition of a highly destructive, often fatal infectious disease. Rather than a function of a lack of awareness, street injectors prioritized the more immediate risk of arrest over the risk of HIV infection. In ignoring the social and structural factors that shape health, prevention programs have often been inappropriate for affected populations (Moore, 2005).

That the structural pressures of the socio-economic context are so intimately linked with drug-related harm amplifies the need for a more detailed understanding of the broader environment and how it shapes the dynamics surrounding the income generating practices of individual drug users. This draws attention to utility of a heuristic such as the Risk Environment Framework (Rhodes, 2002; 2009) outlined in section 4.2.2.6 above; the interplay of physical, social, economic and policy components of the micro-, meso- and macro-environmental crucially impact the production and reproduction of drug-related harm. Indeed, Draus et al. (2010) suggest that it is possible to conceptualize addiction harm in terms of an individual's relative degree of segregation from mainstream economic and social engagement. Given this link, understanding the relative degree of segregation is crucial to explicating the distribution of drug-related harm within the drug using population.

5.2.3 Income generation, employment, and drug use

Qualitative work on income generation and employment covers the range of illegal, informal and formal income generation. Many studies have demonstrated behaviour or circumstances that create negative pressures against labour market involvement. Some drug users display erratic work hours and work performance (Johnson et al., 1985), generally leading to job termination. In other cases, the realities of being in addiction treatment are incompatible with formal labour market participation (Bourgois & Schonberg, 2009). Johnson et al. (Johnson et al., 1985) note that for many inner-city drug users, it is possible to subsist

without ever having cash through payment for work in kind, the avoidance of expenditure, gifts from family or friends or access to free services. Moreover, as an alternative to illegal and formal income generation, drug users commonly undertake informal or "under-the-table" work whereby individuals complete odd jobs, are paid in cash and are effectively excluded from the legitimate economic system (Bourgois & Schonberg, 2009; Draus et al., 2010; Johnson et al., 1985). Bourgois (2009) notes extreme competition for the limited number of available informal opportunities, and the underpayment, exposure to workplace hazards, vulnerability to abuse and generalized exploitation resulting from this competition. Draus et al. (2010) further observe a "symbiosis for contingent labour and heroin dependency, especially in the absence of social and institutional supports or economic alternatives" (Draus et al., 2010, p. 862). Informal income generation may accommodate drug use patterns, be easier to obtain or more flexible than a regular job, offer a way to avoid more serious criminal acts or be more accessible than formal work.

A number of studies explore those individuals who concurrently engage in non-recreational drug use and formal employment. Draus et al. (2010) identify three conceptions of the working drug user: the "stabilized junkie" (Faupel, 1987, p. 407), the working addict (Caplovitz, 1976), and the high-functioning or self-regulating user (Harding, 1988; Harling, 2007; Zinberg, 1984). Concurrent participation in employment and drug use has been observed across the socio-economic spectrum, ranging from street-based crack dealers who supplement their income from legitimate employment on weekends (Reuter et al., 1990) to middle and upper class suburban white heroin users (Pierce, 1999). Draus et al. (2010) further observe that in some work environments, drug use is woven into work patterns in much the same way as coffee or tobacco. Much of the research looking at employed drug users observes that in order to maintain employment, individuals adopt routines similar to those of the non-using working population (Caplovitz, 1976). This often involves counterbalancing use with employment or other valued commitments, such as non-using friends, family or

recreation (Pearson, 1987). Drug users may further develop use-related sanctions, rituals or "rules" in order to control use (Zinberg, 1984). These accounts emphasize that drug use and productive economic activity are not only, in some cases, compatible, but may also be interdependent.

Understanding the situated rationality of drug users and their economic activity relies on a number of analytical lenses. These include noting socio-demographic and spatial dimensions of particular practices, exposures and vulnerabilities. They also include focusing on the skills and aptitudes that both condition and are conditioned by opportunities and alternatives for income generation as well as an understanding that this broader socio-economic context is inextricably linked to individual health. It is with these analytical lenses that the current study seeks to describe those processes, practices, relationships and structures that shape the qualities of individual drug users' experiences of employment and income generation, and to position these experiences in relation to their drug use practices. It is explicitly geared towards accounting for the relationship between drug use and income generation across the working life-course, incorporating considerations of both the nature of work, that is, the tasks and environments associated with working experiences, as well as the availability of work, or relationship between the individual and the labour market (Amick & Lavis, 1999). In so doing, this qualitative study aims to offer fine-grained explanations from the users' perspective of what these experiences are comprised and how they operate. It does so with an explicit intention to document person-environment interactions and their role in the production of vulnerability and harm.

5.3 Analytical strategy

The analytical strategy employed followed the common process to most forms of qualitative research outlined by Neale et al. (2005), which includes coding the data, analyzing material to identify important patterns and themes, isolating emergent patterns, commonalities

and differences and producing general conclusions that address the consistencies and inconsistencies discerned in the data. Interviews lasted between 30 and 120 minutes and were transcribed verbatim. Transcripts were repeatedly verified against interview recordings for accuracy and read several times to develop familiarity with the data. The coding framework made use of themes derived both from the topics used to structure the interview guide and emergent codes that arose from the content of the interviews. The frame of analysis was interpretive, focusing on respondent's own understandings of the situations and circumstances they described. Themes emerged from theory, intuition and the data, all legitimate sources described by Fielding (Fielding, 1993, p. 227). These were then used to identify text related to relevant themes. Discussions about interview data with field office staff and the Qualitative Research Coordinator throughout the data collection and analysis process further identified emergent themes and served as a check on individual interpretations of interview data. No qualitative analysis coding software was used, and interview data were sorted, labeled and coded within a word processing computer program. All content related to each individual code was compiled, and the coded text segments were analysed thematically to develop an interpretation regarding the complex relationship between employment, income generation and related aspects of respondents' lives.

5.4 Results

Interview participants provided rich descriptions of their experiences with and opinions about the relationship between drug use and income generation. The results described here are a selection of these. Specific attention is devoted to the initial research questions driving this doctoral project, specifically: what differentiates between drug users who engage in the formal labour market and those who do not? What are the barriers to labour market participation among drug users? How is work and labour market participation, or a lack thereof, perceived and experienced by individual drug users?

Two important definitional issues were encountered in interviews. First, there was wide variation in what individuals classified as "work". A blurring of divisions between different forms of income generation often emerged as participants discussed more formalized positions that did not constitute a full time or temporary job, such as stipendiary (paid) volunteer positions. Instances where individuals considered themselves to be working or at work were portrayed as such. This is in keeping with the explicit attempt to represent individuals' cultural frameworks (Geertz, 1974) as characterized by participants themselves. Second, the categories of substance use described were far wider than those examined in quantitative work, where focus is predominantly on high-intensity use of injection heroin, cocaine, speedballs as well as crack use. During qualitative interviews, the most appropriate way to ask about drug use patterns was with broad questions about all drugs. Further, individuals identified legal psychoactive substances such as alcohol or prescription drugs on a number of occasions as being as, or more, problematic than illegal substances. It was therefore not appropriate in the interview context to limit discussion of those substances and patterns of use examined in quantitative analyses. Where relevant, references to individual alcohol and prescription drug use are therefore included in the reporting of results.

5.4.1 Interference and integration: Work and drug use (in)compatibility

Interviews revealed a wide range of experiences such that no consistent pattern concerning the relationship between drug use and work emerged across the sample. Narratives about the impact of drug use on labour market participation were instead divided between whether they felt that high-intensity drug use was compatible or incompatible with formal labour market participation both in general terms and at specific points in individuals' work and drug use histories. Importantly, this demarcation was contingent upon whether or not individuals saw substance use as *interfering* with socio-economic activity or as *integrated*

into patterns and practices that facilitated the use of illicit drugs concurrently with participation in mainstream economic activity.

Nearly one third of respondents indicated that for them, "it's gotta be one or the other. You can't have your cake and eat it too. It doesn't happen"(Participant #2, male). These participants saw substance use directly interfering with their ability to work, describing instances where drug use rendered vocational responsibilities impossible to execute. The idea was that for high-intensity users, "I'd spend all night [pause] putting needles in my arm and you're just all fucked up and you know just, you can't do that" (Participant #12, female). Physical impairment would result in an inability, for example, to perform in team environments.

> I'd go in there all fucked right up and it would just be being nuts over the whole thing. I would fuck everybody up, right. You have to be on the ball and you have to be really there, you've got to be in charge of people and you really got to be there in every sense of the word. And when you're not there, it totally shows. Participant #2, male.

For others, it would be an issue of safety, where impairment added to the potential for serious injury. This was particularly the case for individuals in occupations with widespread exposure to physical hazards.

> I got laid off because I was drinking too much…I was showing up for work but I got hit by a wall, it flung me off the building, and the safety officer was there, and when they finally pulled me off, he looked at me, he said "Why are you here?" like, "Your body's here, but the rest's not there." But I would do my job, like I would do my job properly, and they had nothing to complain about what I was doing. It's just it was dangerous. Participant #4, male

Despite an on-site accident and concerns expressed about workplace safety during a period of high-intensity alcohol consumption, this participant did not perceive any decrease in or complaint about the quality of his work. That is, the impact of his substance use was perceived as separate for issues of work quality and work safety. This emphasizes that physical impairment from use was neither universally nor uniformly perceived and

experienced. One participant described interest in his income generation as resulting from his consistent functionality regardless of whether or not he was high.

> They knew all my money went to dope but they can never tell I was on dope because I can keep a straight face, I can talk to people anytime, anywhere. And that's how I am. Participant #13, male

In this instance, concerns about physical impairment were again perceived as irrelevant to functionality. While there was heterogeneity across respondents' assessments of their physical impairment while under the influence of drugs, the perspective of their having no impact was uncommon.

Also interfering in the relationship between work and drugs were practices and behaviour related to drug use. Drug seeking activities produced daily routines and time-use preferences that many found inimical to the requirements of being a "nine-to-fiver" (Participant #11, female). The instability and unpredictability that some associated with use was perceived as directly consequential to being able uphold the expectations of the employment contract, either through interference with reliability, punctuality, or capacity to sustain prolonged economic activity. The consequences of instability on relationships between participants and their employers were often cited as one of the most important reasons for incompatibility between drug use and work. One individual, for example, described an instance in which their drug seeking behaviour led to an inappropriate use of company resources.

> If you work past a certain hour, you can get the company vehicle home, company credit card to get you home, right? I come down to play in the sandbox and get some dope and, you know, and yeah, I mean I was sick. So I'm sitting there and I says well the truck needs gas and um yeah, I'll to put some cigarettes on there, too, you know, definitely, the cigarettes can contribute to the dope. I leave the receipts in the vehicle, it was supposed to be used by the meter reader and I was a few minutes late and he got all upset. So he decides to show it to my boss, they called me up and said "Oh, so you got the truck so and so" and I says "Yeah." "Where did you go with it? Did you stop anywhere?" I says, "Well, I got gas" trying to stay ahead of the game and anyways, they're saying, "Bought gas" and asked "Well what else?" "I don't know, I got gas" and "Well it says here there was cigarettes purchased. You remember buying this?" I said, "you know, what? What happened was I was out one night with the boys and I paid for the gas but I

> had a hundred dollar bill and it was 3 in the morning and they didn't have change for this thing so I just put it on my company card, it was just kind of…" So, it sounded believable. They got the tape from Chevron about the whole situation, about how it all went down. They said, "You ought to take some days to think about it," you know, and I guess I kinda stuck to the story and they says, "you know, we have reason to believe it that didn't go down that way and, you know, so here's the short: you can resign, and we'll get you a letter of recommendation because you're a hell of a tradesman." They gave me that letter of recommendation in spite of me, because, you know, I lied, I took a credit card and abused it, there's no denying that, I mean, and they gave me a chance to get honest about it, you know, and I chose not to. Participant #23, male

This example demonstrated an inherent conflict that can arise between work-related responsibilities and the management of drug-dependency. The avoidance of withdrawal may result in the inappropriate use of resources, the evasion of responsibility, or the subjection of professional interests to personal needs. The interplay between the respective conditions surrounding both drug use and labour market involvement was by no means limited to physical impairment alone.

The negative impacts of drug use on work were in some cases specific to the substance in question, as vastly different experiences were described across substances, even for the same person. One current daily crack user identified crack as specifically impeding an ability "to go about 'that life,'" (Participant #21, female), whereas when speaking about her previous experiences with heroin, her reasons for being unable to function were related to *ensuring* access to the drug, rather than *avoiding* it.

> I was a heroin addict and when you're a heroin addict you can't make a dentist appointment because you don't know if you're going to have heroin that day to go and function. And same for work. You can't say you'll be there because you just don't know, you know? Participant #21, female

In the case of both crack and heroin use, the end result for this individual was the same: their drug use significantly interfered with their perceived capacity to work. The reasons for this interference were, however, substantively different across different substances. In the case of crack this was result of the effect of the drug on the individual's presentation and behaviour,

and in the case of heroin, a more indirect function of drug-seeking activities dedicated to the avoidance of withdrawal.

Individuals also identified work-specific circumstances that influenced their labour market participation during periods of high-intensity use, noting certain types of work that they could better undertake than others.

> I'd be running in and out of class, going to the washroom to use, then I'd go back to class, right? But I couldn't, I couldn't. There's some jobs that I just couldn't take. Participant #12, female

Differences were both reflective of the type and intensity of work and, by extension, the relative acuity required to fulfill the responsibilities of a particular role. The compatibility between drug use and work was connected to the ability to perform adequately on the job without, for example, having to be drug free or free from the after-effects of substance use.

> Since my addiction I've done other work. None of it as engaging as [what I'd done before], in my mind. I was doing some telemarketing and fundraising over the phone. And [laughter] it was chaotic. You know, my life was chaotic, so the job was chaotic. Everything was. I needed to work [laughter]. I did the job, but, you know, if you've been on a three-day run and you're falling asleep in the middle of a sentence, it's just kind of comical. You know, I didn't give it the respect that I gave other jobs I've had, certainly. Participant #19, male

In this case, drug use led to employment scenarios where the individual in question was less invested in their job performance than in previous roles. There were a number of instances where participants noted their drug use as decreasing the quality of work that they were able to undertake. Respondents were keenly aware of the negative impacts that drug use could have on labour market participation. This awareness incorporated both an understanding of the consequences of physical impairment and drug seeking behaviour as key components of the experience of interference.

In contrast to perspectives and anecdotes focused on the theme of interference, more than one third of participants discussed the experience of concurrent high-intensity drug use and holding a regular job. Some respondents further maintained that they had never experienced interference between their substance use and their working life. This was

expressed in the perception that their consumption patterns had not created any discontinuities in their work history, saying, "I've always worked. I mean I've never been fired for drugs or drinking" (Participant #16, male). This compatibility was also described in terms of use patterns that did not produce work-related performance issues, such as absenteeism.

> I drank harshly most of my twenties and thirties. And I mean, I never missed work due to it. That kind of thing, you know, last one out, first one in and all that stuff. Participant #19, male

Similar to the experience where access to drugs was necessary to reliably function, one respondent spoke not only of the *capability* to engage in concurrent high-intensity drug use and work, but also of the *importance* of heroin to labour market participation.

> I used heroin because it fixed something in me so I was able to do a productive life. Like if I hadn't found heroin I probably would've been entrenched and stuff down here cause I wouldn't have got the help I needed. Prozac and stuff like that they found years later; drugs that came out that might've helped me back then weren't available. Participant #22, female

According to many participants, the use of any substance, ranging from alcohol to heroin to crack, was in the very least possible with, and in rare instances complementary to, concurrently holding a formal job.

Individuals who concurrently engaged in high-intensity use and work described how they separated their drug use from their economic activity. This in part stemmed from an awareness of the potential interference of impairment described above, and the potential consequences of mixing the two. The following participant, who injected heroin and cocaine on a daily basis throughout much of his working life, described the separation as follows:

> R: There was drugs all the time. I would use less when I'm working but then as soon as I finished work, up I would go. It just seemed to work for me. I wouldn't do the drugs in the daytime cause you can't really think clear enough to do your drive. I'd be making two hundred deliveries a day, in a postal code. Now, you can't do that if your brain's all muddled and still make it back, you know, through that in ten hours. There's no way.
> I: But at the end of the day?
> R: Zoom! Away I go. Participant #16, male

Separating drug use and work activities in some cases involved restricting drug use to spaces that were separate from the regular work environment, allowing for an individual to "go out of town to do a camp job, you know, getting out of being in a sandbox" (Participant #23, male). More commonly, drug use was confined to times of the day or week in which individuals were not working, so that "we work hard all day and when I have legitimate work, it's just, you know, a weekend thing" (Participant #3, male). This spatial and temporal separation of work and drug use as a strategy to facilitate engagement in both was common to nearly every respondent who reported concurrent high-intensity use and formal income generating activity. The time delimitation between the two activities was described similarly across substances.

> If I were working, project working at home, for example, I can really see myself even saying, "Well, OK, there's some dope here but that'll have to wait till the job's finished." You know, just in the same way as I used to treat alcohol when I was younger, that for me, you know, for all of the drinking I did I can count on one hand the number of times I had a beer at lunch. You know, in all those years, because it just wasn't what I did. That was work. And for me having a glass of beer was the demarcation between work and play. Or a toke, you know, that was the moment when, where you took off your shoes, and you may be with the same people but that was the point when you were no longer working. Participant #19, male

Others echoed the parallels drawn by this respondent between the routinized practices of drinking once the workday is over or waiting to use heroin until the completion of a task. The following individual similarly described the particular way in which she *temporally* separated drug use from work; she delimited her work day with the procurement of whatever drugs she was going to do on her way home.

> My drug user never [interferes with work]. It's [pause] my drug use is a reward for working. And it's a real social thing with me. I don't chase it. I work every day. [Then I] buy a package every night to go home with and do it at home when I cook dinner. Participant #22, female

This temporal separation ensured that she did not have possession of any drug she might feel compelled to use while at work. In this and other ways, the practice of separating substance use from work was self-consciously undertaken and systematically applied across different

substances and types of work. It was motivated, for example, by the experience that being high while working "doesn't feel right. It's uncomfortable," (Participant #9, female), or a sense of duty to the job:

> I've used a lot. I'd use at the end of the night. Like at nighttime. Not in the day when I'm working. I mean I was responsible in that way. I'd never show up to do a job stoned. To this day I'm still like that. Respondent #18, female

The spatial and temporal separation of work and drug use constituted a form of self-regulation that allowed individuals to integrate seemingly incompatible activities into their daily routines and practices. While the presence of these practices was consistent across those describing concurrent drug use and work, abilities and incentives to develop or maintain them were not consistent between individuals or within the same individual over time. The remainder of this section provides a more detailed treatment of the conditions that shaped the experiences of integration or interference between substance use practices and vocational and income generating activity.

5.4.2 Exploring integration: Individual motivations for employment

The above section outlines how the relationship between drug use and work is differentiated by whether or not it is characterized by interference or integration. The low employment rate in this sample was connected to incentives for income generation outside the labour market.

> What I saw was all the guys that were my age that did have jobs, they worked so that they could do what I did all day long. And I got paid to do it and they spent money to do it. And so to me I was just like, "Ok that just doesn't make sense. Like this is what I do all day long. Just hang out with tighties, get drunk, smoke pot, go to parties and I make money doing it. And these guys work their asses off all week long just so they can do it on the weekend or maybe for a few hours after work, and spend all their money that they worked hard to get doing it. And so to me I was just like why would anyone want a job? Participant #20, male

Others described no desire to undertake employment, stating "I don't want to get a job right now" (Participant #2, male), or "I'm not really worried about looking for work right now, I'm

not. I just haven't had that drive because I'm just comfortable the way I am" (Participant #17, male). In contrast, many participants spoke about their drive for economic participation. Individuals' ability to employ self-regulatory practices to support concurrent drug use and employment was conditioned by their relative desire and capacity to be active in the formal labour market. That is, the confinement of their substance use practices spatially and temporally was connected to their motivations to work. It was also a function of individual self-control. However, an assessment of individual self-control is outside the scope of the current analysis, and this was not measured in qualitative or quantitative interviews. The following section therefore focuses on individual motivations; it details the perceptions, rationales and decision-making logics underlying these practices. Individual motivation spanned several domains. Here I describe a selection of these: the material, vocational and temporal.

5.4.2.1 Material Motivations

The most obvious motivations for economic activity were *material*. Some respondents spoke of how "it was all about the money…. having a job, a thankless job" (Participant #2, male), suggesting that for them that work was singularly focused on earnings. However, for others, the need to pursue material aims was intrinsically linked with broader relationships and responsibilities. These relationships and responsibilities were commonly expressed as driving individuals' formal and informal economic activity.

> I just can't stand the kids starving. You know, your kids, getting with the times. That's why, you know, I'll do just about anything. Not just personally for myself, but you know for the kids, eh? That's the bottom line, that's what makes me tick, anyway. Participant #3, male

This individual expressed a willingness to undertake whatever form of income generation was necessary to support his children. For others, children in the home or the desire to be reunited

with children who were living elsewhere were powerful motivators for formal labour market activity.

> When I was a heroin addict and working, my children, well, I raised them by myself; no interaction, you know, like, no government help at all [pause]. But yeah, they were, you know, what was going on with my kids was most important and that's why I worked legitimate jobs instead of trafficking all the time. Participant #22, female

Social ties that required material support, and individuals' desire to maintain, enrich or renew them, served as a powerful motivation for formal rather than informal or illegal forms of income generation. The idea of "legitimate jobs" expressed here draws attention to perceptions of the division between socially acceptable and unacceptable forms of income generation. The *inevitability* of work, for example, was couched as a way to avoid engaging in criminal activity.

> It's life. I mean you gotta work…you need to work to make a living. If you want to get payment you gotta pay for it, you gotta earn your money. I either gotta raise it or go steal it. That's the reason I work. Participant #4, male

Individuals' desire to refrain from less 'legitimate' forms of income generation was expressed by others as a predilection to avoid social assistance or to fulfill social expectations to participating in productive activity.

> Working for me is just a healthy lifestyle and something that I'm able to do. Well first of all, you know, I'm trying to become self-sufficient and not really on income assistance and that's, you know that's the obvious only choice that I have in order to get out of that cycle…We're expected to work if we're healthy and I'm healthy to do that so that's the way I look at it. It's something that [as a] functioning member of society that you should do. Participant #5, male

The adoption of this social expectation was not universal, however with others explicitly denunciating social expectations to work, saying "that need to do something, to show other people, right, you don't need to. It's just as long as you show for yourself" (Participant #17, male). While the motivations to fulfill social expectations to work were not consistent across participants, the delineation between socially legitimate and illegitimate forms of income generation was clear. This delineation was linked to perceptions of the worth of different

forms of income generation, responsibilities to others both in the immediate sense of being providers and the broader sense of being citizens, and as a function of the requirement to generate income to sustain substance use practices.

In contrast with motivations towards work, the motivation towards income generation of *any kind* to support dependent drug use was strong. The following participant aptly outlines the indenturing power of dependent drug use:

> Drug addiction is a big equalizer. It, you know, it's a big equalizer and it makes you go out and do things that you never thought you were capable of doing because, you know, it's about obtaining the funds to maintain your addiction. Participant #21, female

Expressed by multiple participants, the drive towards formal employment was implicated in struggles to avoid undesirable, demeaning, or dangerous forms of income generation. The following participant, for example, maintained that the capacity to refrain from street-based income generation was linked to stable, sustained income away from the drug use scene to which both her use and income generation strategies were linked.

> I cleaned myself up 'cause I got really bad into the powder and stuff and I was telling my friend, you know, like, "I'm just, I'm sick of that life, you know, I'm sick of jumping in garbage bins." The only way I was gonna maintain straightening out was to have a real job. So she actually gave me a [job]. One week I'm jumping in garbage bins, the next week I'm a secretary. Participant #12, female

This perceived interconnectedness between 'straightening out' and 'having a real job' draws further attention to the integration of economic activity, drug use and drug scene exposure. Participants described the need for material resources to support drug use as propelling them to engage in income generating activity that was located in street-based drug scenes. They in turn identified their drug-related vulnerability as driven by the frequent exposure to street-based drug use scenes in which this activity was embedded. Having the ability to meet their material needs outside of street based drug use scenes was therefore seen as crucial to reducing drug use, maintaining stability, and creating distance from the socio-economic milieu in which use and less desirable forms of income generation were embedded. One

respondent, for example, noted that having resources in cash or in kind to support her basic needs, alongside access to medical marijuana, allowed her to avoid sex work and its attendant pressures toward drug use, sexual risk, and exposure to structural violence.

> It has really allowed me to separate myself from being part of, having to go out. Because if I had to still be working the street corner then I wouldn't be able to turn down the drugs all the time. It just causes you to keep living the lifestyle. So I really just, like, I still have customers that pull up outside my building and honk for me and I don't even get up and look anymore because I don't want to. Respondent #11, female

For her, access to resources that met her basic and drug use-related needs enabled a choice to cease engagement in street-based sex work. That choice, in turn, removed her from a socio-spatial environment to which consistent exposure exacerbated her susceptibility to ongoing high-intensity drug use. This underscores the strong connection between the conditions surrounding use, drug-related socio-economic vulnerability and viable income generation alternatives. Pursuing material security outside of these drug use scenes was a primary motivation for seeking work.

However, the motivation to avoid drug- and street-based harm produced motivations not only away from income generation in drug use scenes, but also away from income generation entirely, including formal employment. These inconsistent cases documented how participants instead opted to restrict their income in order to restrict their drug use. Individuals were wary of additional opportunities to make money, stating, "they offered me more hours; I don't want them," (Participant #13, male), and "the more you have the more you spend" (Participant #21, female). Another participant outlined why he thought the opportunities brought by making more money were not a good thing.

> If I get a little more income than that then I'm gonna start thinking, "hey l got enough for a six pack of beer," or "hey, who knows maybe I can invite somebody else that I'm not accustomed to and might get in trouble with." So I really draw the line on how much I use. I don't [need] that much money to live. Participant #7, male

For many, their awareness of the issues created by additional income was a passing observation, but one participant in particular emphatically restricted herself from pursuing additional income.

> You're trying to stay away from the drugs, like you have to bar yourself from making money. When you have that money that's the first thing you go to. So you try not to make money. It's much harder to say no to drugs with seven or eight hundred bucks in your pocket than it is with forty or fifty. I'd rather not have the money than have all these bad things come along with the money. I've definitely held myself back a lot when I could've been saving or looking to the future or that sort of thing. I mean, like I said [I go on binges] on welfare day. And that just goes to prove how much trouble I have when I have got money. Participant #11, female

Conventional motivations to make money in order to improve material well-being were, for a number of participants, not only irrelevant, but also diametrically opposed to strategies of self-preservation. When faced with a choice between additional income (which may imply decreased material deprivation but also increased ability to consume drugs) and no additional income (which increased levels of impoverishment but restricted access to drugs), some participants systematically chose to regulate their income. Thus, while material interests were strong motivators for formal labour market activity, the types and implications of these interests were multidimensional, linked to broader notions of safety and vulnerability, and in many cases, counterintuitive.

5.4.2.2 Vocational Motivations

Engagement in formal economic activity was also motivated by *vocational* interests, or those interests that were linked to inherent characteristics of or benefits from work. In a general sense, some respondents described an uncomplicated desire to be productive.

> We built a school back up North and then the gymnasium came and then the overpass, and the people that put the overpass in said, "Hey, you're the first person that just said they honestly want work. They have all these certificates and want 50 bucks an hour." "[I didn't] ask for that, I don't care if it's only 15 dollars an hour" I said, "Just put me to work, man. I don't care how much I make. I don't have any certificates, all I have is you know right there" [points to arm]. Participant #3, male

For others, job-specific dimensions figured prominently in individuals' descriptions of their motivation for vocational and economic activity. These tended to be associated with one of three dimensions: the *work task*, the *work environment*, and *work output*. Although not mutually exclusive, these three themes were prominent throughout participant interviews.

The first category of *task-specific* characteristics predictably incorporated features that individuals identified with jobs that they did and did not enjoy. One participant, for example, considered it an unusual privilege that he had had a thirty-year career that he loved.

> Oh, I loved it, yeah. I used to look forward to going to work right. And I'd work, I would spend more time in the truck then I'd spend at home. I'd work seventeen, eighteen hours a day. I'm lucky that way, you know, like most people, they don't get to do what they wanted, like what they wanted to be when they grew up for work they never get to do it, right, and they either get married or some kind of thing so they have to do something like to support, so they're never happy with what they're doing. I got to do what I always wanted to do and I did it for thirty years. I just, I just loved it. Participant #16, male

Task-specific characteristics that produced enjoyment were an important source of positive reinforcement; people that enjoyed their work did more of it. The characteristics that produced this enjoyment included, among other things, jobs that involved a lot of task variety; those that involved the development or use of special skills and capabilities and were therefore neither menial nor demeaning; and, in particular, those that allowed independence at work. This last was consistently referred to by people who discussed their preferred labour market experiences in terms of an ability to make money in a self-reliant way without having to answer to anyone.

> And I guess after all the years I worked for somebody, I feel like I don't need to; I can work for myself. I'm a person who works for myself, I make my own way. I do good at it. Participant #13, male

Participants "liked being the boss" (Participant #14, female), "had a hard time having other people tell me what to do" (Participant #17, male) and were able to "make a job for myself" (Participant #22, female). Having the ability to exert some measure of control over how they made money was centrally important. The absence of this sense of control or individual

capacities to exert this control in a licit context served as a disincentive to pursue mainstream employment.

Another job-specific source of motivation was related to the work environment. Work environment-specific preferences were associated with the physical environment; individuals stated general predilections for being in- or out-side, and multiple respondents stated clear desires to avoid dirty, unclean, or hazardous workspaces. More prominent than the physical environment in respondents' descriptions of their work preferences, however, was the social environment.

> I work in the community and I love that. Going and talk to people, to communicate with people, give information to people. Participant #6, male

Those who "enjoyed meeting people from all over" (Participant #15, female), who were a "people person" (Participant #2, male), or who preferred environments where their colleagues and clients "actually liked you" (Participant #20, female) described preferences that spanned formal, informal and illegal forms of income generation. The avoidance of social isolation for many was a key component of enjoying the activities associated with income generation.

The final vocational dimension that individuals' linked with their motivations for undertaking different types of economic activity was related to work-related *outputs*. At a physical level, individuals' commonly referred to the satisfaction they drew from producing something tangible.

> We were all happy as farts, man. I was sitting there and he says, "They're going to use this for the Olympics." When I was watching the Olympics, yes, [laughter] I even went to a couple of games up there because [they] gave us tickets, eh, for residents. That was a good feeling, anyway. [I got to see] the end result. I was sitting there, and I says, "Hey, I was hired! I put the rebar in the bottom of that sucker!" [laughter] Yeah! Participant #3, male

Equally as common was respondents' recognition of the intangible outputs of their productive activity. These intangibles frequently included community service in the form of volunteer work, becoming program or "peer" officers for social and health service projects and

organizations, or even self-nominated community volunteers who monitor the well-being of members of their communities on a daily basis.

> I mean like I said I've been [injecting] for forty, well, since I was thirteen and I'm fifty-three now. So if I can help people not make the mistakes I made... Like, I've had all the "itises" [laughter]. Endocarditis and osteomyelitis and all, you know. If I can help people keep from getting any of that stuff then I feel like I've done something, cause it's not fun to go through. I feel like I'm giving something back. It's so fulfilling. I just love it, and I didn't think that I would. Like, people tell me, like people I work with, they say I'm good at talking and people, like, that I'm good at it. But I didn't realize that, right, I mean, I don't know, I don't think that. Participant #16, male

Importantly, the satisfaction described by participants from the intangible fruits of their labour were seen by multiple participants as intrinsically linked with their ability to control their substance use. Work-related fulfillment was inseparable from identity formation and understanding one's place in the world.

> Were I to run the world and treatment centers and stuff like that, an absolute ironclad element of any treatment program would be volunteering, where you have to give to where you live. Not because you owe it – but you do – but because that's when you realize your relationship with things. That's when you realize the benefits of being part of something. And you know, being part of something is part of what gets us in and out of, you know, the degree to which we're part of something has a lot to do with whether or not we're wired or not, or the degree to which [we're wired]. Participant #19, male

The idea of contribution was a fundamental component of an individuals' understanding of their social role, and this in turn was perceived as directly influencing individual drug use and drug use intensity. Contribution was noted by the following participant as more important than material gain:

> I want to do something that I get a sense of purpose out of, I don't wanna just get a paycheck. You know I'd rather just get by and be doing something that I love doing and that I get that sense of purpose from then making a lot of money and being miserable. Or even just making a lot of money and just not being miserable but not really feeling like I'm adding anything to life, right. And I believe that that's an important part of my sobriety that I do that. Participant #20, male

In the configuration of productive activity and drug use, individuals' conception of themselves as contributors through both their tangible and intangible productive output was inexorably linked to their use patterns and practices.

The benefits of identifiable contributions for individuals described above stem from the value attributed to the outputs of productive activity. This valuation was a consistent theme among participants describing the jobs that they preferred. It came from various sources. Recognition from authorities, acknowledgement of expertise from superiors, and being promoted or placed in positions of leadership were all cited as imbuing individuals with a sense of pride. Validation could also come from earning money through "socially legitimate" means, which differentiated work from non-work income in a meaningful way.

> Those jobs make me feel good because that little twenty five dollars for that little bit of work and a little paycheque, I go runnning around bragging, "look I made a little paycheque." [laughter] And I said, "I never made a cheque that's not welfare." And that little twenty five dollars I spend more preciously than the government cheque, like, I think cause I didn't work for it. And I tell people, "Do you know what I noticed about my life? If I work for money I take care of it more than what the government gives me. The government gives it to me, it goes like, all over the place." I talk to people and they said, they think it's the same way with them, too. Participant #15, female

Lastly, individuals described instances where the expression of gratitude for their work and being treated with respect were ways in which they derived meaning from their work.

> You know, that makes you feel good when someone comes back and thanks you. It's like they know. It just, it can make your whole day when someone comes back and thanks you. It really can. Participant # 18, female

One participant aptly described how he believed this meaning was implicated in identity construction, and a source of differentiation between those who were motivated to participate in the labour market and those that were not.

> You know we do define ourselves through our work. That's who we are. We spend more time with our workmates than we do with our spouses, with our kids. So yeah, there's a part of me missing when I'm out. You know it's like an amputation of a sort. Work is either the trip or the voyage or a combination of the two and I was fortunate in that I was there. I mean [what I did] was nuts, but god, it was fulfilling, you know? Post-partum? I know as much about post-partum as most men. But be that as it may I think that's what differentiates, the primary differentiation [between those that work and those that don't]. That and, yeah the fact that I valued it and that it valued me. Because, yeah, I mean, a lot of the guys I hang with they always have money in the counter. They're nice dudes but they've just never engaged with anything. Participant #19, male

Congruent with this participants' observation, the production of meaning through work-related validation was consistently enmeshed with satisfaction derived from economic activity. The experience of work as meaningful was a critical component of individual motivations to take on vocational activity.

5.4.2.3 Temporal Motivations

The final dimension of work that participants linked to their motivations for engaging in vocational activity was *temporal*, that is, they drew attention to the time structure imposed by employment and how it impacted their daily routines. A strong desire to use time productively was linked to the social expectations of labour market participation described above; in the eyes of a number of participants, it was an 'appropriate' use of their time.

> I think I'd find something to occupy my time with, you know, 'cause I think, you know, I'm a person, you know, I think a person should do something, you know? Participant #23, male

Over and above social expectations of what a person should or shouldn't do with their time, time structure was an important dimension of daily activity. Those who were not working because of physical or mental health complications, for example, felt particularly strongly about the absence of work as something that occupies their time. These participants spoke of being willing to do "anything" (Participant #10, male), of wanting to work "every day" (Participant #1, male) and that they "hate being lazy" (Participant #14, female). For some of those that were working, the prospect of not having a job or not being able to work was similarly undesirable.

> Oh not having something to do like this I'd…I couldn't…I couldn't… probably couldn't handle it. I'd be really, [pause] lost. I don't like being not busy. I like having something to do and I like being, having some part of my day being, done something useful and something social and it covers all those aspects, eh? Participant #22, female

Here, what was important to participants was the idea of engagement; the prospect of boredom, the absence of time structure and the thought of not being useful or busy were consistently spoken of in starkly negative terms.

The emphasis by many on the temporal function served by employment speaks directly to the potential impact of work on individuals' substance use. That is to say, that if drug use has potentially consequential effects on work experiences, what is the impact of work on drug use practices? Participants connected being adequately occupied with drug-related pathways, such as their initiation in to drug use, where, "I should've been kept busy being a young guy and, yeah, I wouldn't have steered myself the way I went" (Participant #1, male). In this sense, the temporal dimensions of individual work motivations were linked to the idea of avoidance, raised above; occupying time allowed individuals to avoid pathways into more harmful drug use practices.

When asked specifically about whether or not having a job increased or decreased the intensity of drug use, for example, some noted that employment assisted in refraining from poly-substance use.

> I'm doing something that I like to do and it keeps me busy and it keeps me off other drugs and [pause]. It's a good thing to be doing. Participant #22, female

The idea that having a job may reduce substance use was not consistently held across participants, regardless of the amount that they might be working. However, one participant maintained that, "I don't think it matters if I work or not, or if I work a lot, or anything. It's just how I'm [doing]." (Participant #4, male). In this case it was mental health, not vocational activity, which affected consumption patterns. It could also be the case that a job would produce no change, or even increase consumption because of additional available resources.

> When [I was working] I had lots of money I'd get lots of dope. When I didn't have a lot of money I wouldn't buy a lot of dope. Participant #18, female

The impact of employment on drug use based on respondents' experiences is therefore ambiguous; for some the requirements of having a job introduced pressures against drug use,

for some having a job changed little in their drug consumption patterns, while for others, the economic benefit of having a job created opportunity for additional use. The differences between these different outcomes did not appear to be systematically patterned across substance use patterns or occupational categories.

The above section outlines individual-level dimensions that differentiated between individuals who were and were not engaged in compatible, concurrent substance use and work. The ability to integrate the two was conditioned by specific motivations to implement self-regulatory behaviour and activities. Broadly speaking, these motivations centered on material interests, general predilections toward licit employment which included vocational-specific characteristics, and time-specific functionalities of work that promoted the avoidance of boredom, idleness, and drug-use pathways. Individuals who experienced interference between their substance use and their work patterns reported less of systematic self-regulation around substance use, and some of the reasons behind this may include the absence of the motivations described above. However, many individuals who did not work were motivated but unable to do so. Over and above the impairment and drug-seeking issues described above, or a lack of motivation, individuals experienced a broad range of employment barriers, and it is to these employment barriers that I turn next.

5.4.3 Exploring interference: Barriers to socio-economic participation

That drug-related and non-drug-related barriers to labour market participation exist for high-intensity drug users is intuitive. The processes and forces that produce these barriers are, however, less straightforward and, based on the narratives of participants in the current study, symptomatic of complex interrelationships between individual behaviour, health conditions, unforeseen events, service provision, and institutional forces. When asked more general questions about what determined whether or not they had a job or were able to work at a given time, participants spoke extensively about conditions and circumstances that interfered

with their labour market participation. Their awareness and experience of widespread barriers to employment and processes that permanently altered their capacity to work offer significant insight into the reasons why low levels of employment are observed amongst this population.

5.4.3.1 Health-related barriers to employment

The most commonly cited barriers to employment were individual health issues. For multiple study participants, their health was "the only thing that impacts if I work or not" (Participant #22, female). Participants identified health concerns as direct complications from their substance use patterns and behaviour. These included a wide range of conditions, including cirrhosis of the liver, pulmonary diseases such as pneumonia and asthma, infectious diseases commonly attributed to receptive syringe sharing (Bourgois, 1998; Rhodes et al., 2005) including HCV and HIV, infective endocarditis[52] and its related complications such as stroke. Participants were all too aware of the implications of these drug-related health problems on their capacity to work. Some were described as more immediate, in terms of impacts on their daily functionality.

> Physically, [I was] probably not in any kind of shape where someone would hire you during the worst part of my addiction, so. There were times where I just wasn't physically capable of working and doing the job I do. I mean, I go to work for eight or ten hours, go up and down stairs and ladders and carry materials, working with your hands over your head for hours. So living a lifestyle that's not healthy, not only, you know, it's just mentally, physically, it really takes you out of the game, right? Participant #5, male

Others involved more long term or permanent impacts on their capacity to work.

> I also got a bad heart from endocarditis. I've got degenerative arthritis in my neck up here. They want to take the vertebrae out which kills the nerves. My arms go numb, I can't work. If I carry something my arms go numb. I'll drop it. It sucks. Participant #16, male

[52]Infective endocarditis is an infection of the inner layer of the heart, usually involving the heart vales commonly considered an infectious complication of injection drug use (Brown & Levine, 2002).

Over and above problems associated with poor health alone, the treatment of health conditions also operated as a barrier to employment. One respondent noted the debilitating effects of undergoing treatment for HCV.

> I had hepatitis and I was sick. I had already been diagnosed but I had no idea that I was really sick. And within a matter of weeks I was on interferon and I stayed on interferon for one year and it has an incredible amount of side effects, my hair fell out, I went crazy, you know and you're sick, as a dog. With hepatitis I didn't have the stamina to do my nine to five. Participant #21, female

In this sense, the impacts of drug use on employability included both drug-related complications and the treatment of these complications.

Study participants also commonly referred to non-drug related health issues that impacted their ability to seek, obtain or maintain a job. These covered a wide breadth of physical and mental health issues, from injury and chronic disease to grief and depression. Individuals connected their health conditions to their work-specific capacities, including challenges to their physical capabilities, ability to be free from pain, capacity for concentration, emotional fortitude, facility to commit to regular activity, and the ability to engage appropriately with others. The following respondent summarized the connection between general health problems and employability.

> I'm not a reliable employee right now and it's not because of the drugs. It's because of the health thing. Like, I almost didn't make it here. And I would've come another day and all that, but, you know, you can't. You can't even be a good volunteer if they can't, if they don't know you're coming. I am trying to imagine or find something that I can do at home, you know. I can still write, I can still express myself, I can still count past, you know, fingers and toes. And there's something out there. I just haven't figured it out yet. I'm moderately optimistic. Not raging, but moderate. I think part of the challenge that I'm having still has to do with a degree of futility with the health thing. Knowing that it's not gonna get better. I won't be doing the Sun Run this year, you know? Participant #19, male

In the face of irreversible health problems, a frustrated desire to undertake productive activity, and an inability to find activity appropriate to health-delimited capacities speaks to the health-specific difficulties in finding, obtaining and maintaining employment faced by high-intensity drug users.

5.4.3.2 The role of catastrophic events

Consistent across the narratives of 14 of the 22 respondents (63.6%) was the experience of a catastrophic event, defined here as a significant and highly stressful life event that was self-described as impacting labour market participation. These events could be the result of an initial decision that initiated a pathway that was characterized by a subsequent catastrophic event. As such, these events could result from voluntary actions or involuntary exposures that, at the outset, seemed less than catastrophic. One individual, for example, noted her initiation of injection as an event that forever altered her life course. Initiation of injection is rarely characterized as independent of broader contexts and risk trajectories (Fast, Small, Krüsi, Wood, & Kerr, 2010; Hser, Longshore, & Anglin, 2007). It was here portrayed as an occurrence that began a chain of events that had calamitous impacts on health and the capacity to avoid risk and harm.

> And it's a lot of shit, like, I wouldn't of gotten raped and ended up with HIV. You know what I mean? Like, all these things that wouldn't have happened if I hadn't of started using. Now it's very hard to crawl out of the hole. Respondent #11, female

Many of the events described were directly relevant to the health-related barriers described above. These generally also demarcated a sudden change in socio-economic position or access to resources. For example, a number of participants recounted accidents that resulted in significant injury, which in multiple cases resulted in the initiation or intensification of opiate use as self-medication for pain. The following respondent, for example, describes how prior to an accident, he had never used heroin.

> [I was] walking and they hit me twice. And then I start using, [thinking I would] only use one time. With the pain and I want to get good sleep. On that time I get back on welfare, then day after day, month after month and year after year I keep using. My right leg and my right side, all my right side body it has no energy, you know. If I'm not using, I [would] enjoy going to work, right? Get a family or whatever, right? People they can come back with injury [after] one year, right? Yeah. But I get accident and then using now, and hard to say. Participant #10, male

The initiation of heroin use because of a catastrophic event was not limited to the self-medication of physical pain. The following participant noted that her initiation into heroin use coincided with distress from a cancer diagnosis.

> And that's when I found out in ninety-four that I ended up with cancer. Stomach cancer. And the doctor had given me the actual date that I'm supposed to die which, that shouldn't be allowed, and that's what made me begin to use heroin, was because of that. Participant #14, female

This participant attributes her drug initiation to the distress caused by a troubling (and, according to the participant, mistaken) prognosis. External attributions in changes in drug-taking patterns, whether truly causal, co-incident or simply the function of an individuals' perception or need to implicate these changes with external events or forces, often marked the initiation or intensification of drug use. The attendant consequences of harmful use would commonly follow.

Those experiencing other forms of emotional distress echoed these descriptions of individual-health related distress as an important aspect of the configuration of drug use and economic activity. Common among participants were depictions of intensified use in close succession to the death of a spouse, partner or loved one.

> I restarted after she died. It's not even getting high, or forget[ting] or anything, it's just that you need a break [to] stop my brain. Like after she died I got wired real quick, like three days. It took three days and I got wired again. Participant #4, male

Over and above the impact of tragic events on individuals' drug use patterns, event-driven emotional distress impacted individuals' ability to be productive. The idea that "grief is disabling" (Participant #21, female) was also reflected in the comments of individuals who experienced some form of family dissolution, either through relationship failure, divorce, or involuntary separation from children because of lost custody or seizure by government authorities.

> As soon as my separation happened I was over with the project. I was so screwed up and depressed and stressed and, you know, my husband ran away with my son. Participant 14, female

Study participants also demonstrated awareness of the long-term impacts of the events they described. They connected childhood events with decreased adult functionality.

> I have no sense of, I don't know. It's just I can't maintain stuff, right? I just can't. [pause] Like, I was abused, like, horrifically as a child. And I don't use that as an excuse but the way it has in the long term affected me is that I just don't have it within me to be that responsible for that long [pause]. You know, I can't explain it. I just know that's the way it is. Participant #12, female

Although the measurement of trauma severity and its impact on labour market participation is outside the scope of the current study, participants repeatedly referred to catastrophic events that adversely impacted multiple domains of their lives. These *compound events*, where, for example, an individual "lost my marriage, got shot and I was in a hospital all in one night" (Participant #17, male) or "lost my daughter, my home, my home based business all in one day" (Participant #12, female) invariably impacted individuals' ability to generate income. This consequent loss in economic capacity would in turn impact their ability to weather catastrophic events.

> I got served papers one day at work and it was custody papers and I came home, and my husband and daughter were gone. Everything was gone. So I kind of, I ended up getting cut off welfare, I lost my job. Things went downhill. There's no legal aid for family courts in Ontario so I ended up with no lawyers cause I had no job. I didn't even have - he signed the apartment over and everything - so I lost everything. I was literally more homeless than I was when I first moved onto the streets in Toronto. And so he got custody. Respondent #11, female

Importantly, these events are perceived as things that "happened" to respondents. While the occurrence of events may be involuntary, individuals' roles in the processes that led to catastrophic event are, along with other broader psychological, social, environmental and structural components, a part of this process. Foreseeable or otherwise, the consequences of these events are real and often irreversible. An exploration of the complex repercussions of catastrophic events across dimensions of physical and mental health, the initiation or intensification of drug use, changes to relationship and family composition, or other negative

changes in the capacity to generate income offer insight into the role of a particular type of event-driven process by which barriers to labour market involvement are produced or reinforced.

5.4.3.3 Institutional relationships as barriers to employment

Another type of barrier commonly cited was participants' relationships with social institutions and the regulations, requirements and restrictions involved therein. The three institutional relationships most commonly referred to were involvement in the criminal justice system, enrolment in addiction treatment, and receiving social assistance. All three exist with intentions to mitigate the effects of problems encountered alongside high-intensity drug use. For many, these institutions provided support that may encourage addiction recovery. For others, their impact on individuals' ability to seek, obtain and maintain employment was not consistently positive. The potential barriers produced by each of the criminal justice system, addiction treatment and social assistance will be discussed in turn.

Criminal justice involvement establishes an institutional relationship with very clear consequences for labour market participation. The most obvious of these is the acquisition of a criminal record. Criminal record checks are often required in the job or volunteer application process, and thereby criminal justice system involvement directly interfered with economic participation. It is in many ways designed to do so. Part of this may also be because incarceration involves exposure to environments that facilitate further involvement in criminal activity; "anytime I got arrested, when I got out I was bigger, meaner, stronger and a better criminal" (Participant #20, male). It may also be because of the impact of criminal activity on licensure, credibility or the capacity to undertake particular kinds of work. Additionally, while in many cases past criminal involvement was not perceived as directly relevant to their ability to do their job, a criminal record brought with it reputational consequences that had the potential to colour employer's perceptions of their employability.

R: Cause of my criminal record you don't want me, hire me I might steal something.
I: Yeah. So would employers look into your criminal record or would they ask you or…?
R: If they ask me I tell 'em that I'm a roofer. That's my trade. You know. Nothing I'm gonna steal. Oh I ain't gonna steal a piece of wood at night. I got all my tools. My tools are my bread and butter, nothing else that I could do. I wouldn't steal nothing, you know. It's my job. Participant #1, male

This participant separated his substance-use related criminal involvement from his socio-economic participation. Others refrained from applying for jobs or volunteer positions because they required criminal record verification. Regardless of whether or not criminal justice had any bearing on vocational capacity, reliability or integrity, a criminal record signaled a legal transgression that implies some type of moral insufficiency (Pager, 2003). Further, the supervisory conditions that commonly accompany criminal justice system involvement may also operate as barriers to employment. The various regulations and requirements, while in some cases designed specifically to promote labour market reintegration, may fail to take person-specific skills and resources into account.

> And after I told them my story he was like, "Okay, here's what I want you to do. I want you to go take this program called Job Start. It's a sixteen-week course. You go for nine hours a day Monday to Friday. The first twelve of the sixteen weeks was G.E.D.[53] upgrading. And then two weeks of inter-personal communication skills, and then one week of computers and one week of anger management." And so I said to him like, "you know I'm not sure which part of my file you haven't read or what part of what I just told you you didn't understand, but, like, I've already got my grade twelve. And as far as interpersonal communication skills go mine are probably about as good as seventy five percent of this planet's, so what am I supposed to do for the first fourteen weeks? And if you think that I'm gonna give you nine hours a day, five days a week or my life for an extra fifty bucks a month on a welfare cheque and you can't even guarantee me a job at McDonalds when I'm finished? You're out of your mind." And he's like, "well, let me put it to you this way. I'm the rehabilitation worker, you're the client, and you either do what I fucking tell you or I'm cutting you off." And I was on mandatory supervision at the time. If I didn't have a visible means of support my parole officer would've had no choice but to send me back to jail. Respondent #20, male

Thus, in addition to the direct and indirect impacts of criminal justice system involvement and incarceration on individuals' willingness and capacity to participate the in the labour market,

[53]G.E.D. refers to General Education development, a series of 5 tests that are a group of five subject tests which, when passed, certify that the taker has Canadian high school-level academic skills.

reintegration into conventional socio-economic activity has the potential to impose burdens on individuals through irrelevant, unsuitable or prohibitive program requirements.

Another institutional relationship that was frequently cited was being a *client* in addiction treatment. Some participants noted the expected, positive relationship between treatment enrolment and work. Enrolment in methadone maintenance, for example, was seen to have the predicted effect of supporting employment. Multiple individuals suggested that "My reason for getting in methadone is so to keep my job" (Participant #5, male) and to avoid the initiation of withdrawal symptoms in the workplace: "I didn't want to have to go to work and have to do a fix every two hours, so I went to see the doctor and got on methadone again" (Participant #4, male).

The idea that addiction treatment program requirements and regulations may structurally limit labour market engagement was, however, observed by many participants. These individuals cited, rather than a positive outcome, a negligible or negative impact on work from treatment enrolment. For example, the sequestration associated with residential recovery treatment programs was not always portrayed as a realistic path to recovery. While changing individuals' daily time structure, which was by some credited with creating a desire or perceived capacity to work, residential programs for many participants created only a temporary change.

> Yeah, it's an industry! There's not much that you do there. Like you're just separate. They just separate you from drugs and put you in a safe environment, in a cocoon, and it's when you get outside, its when you get out of there that they don't give you that much. They ask you to hook up with twelve-step program, stuff like that, but that's pretty much it. It's really hard to stay clean. Participant #4, male

Post-treatment relapse, common to participants in the current study, was often accompanied by the associated emotional consequences of having been unable to achieve or maintain sobriety. Further, the requirements and regulations surrounding treatment enrolment acted for

some as a barrier to maintaining a job. For the following individual, the requirement of filling a methadone prescription at a pharmacy on a daily basis resulted in employment loss.

> I: Have you ever been on methadone? Could you tell me what your experience with that was?
> R: I'd never do it again. It lost me a job. The doctor I went to [pause] put me on and he said I had to be on it for two months before I get carries. And I was on it a month and I got a job, you know, fucking feeling pretty good about myself. Finally got a job! But every day I need that methadone to keep me going so by the time I get back to town the place is closed.
> I: So you had to go every day to pick up your dose?
> R: [laughter] I couldn't. It wasn't open when I went to work
> I: And it was closed when you'd be done in the evening?
> R: Yeah. And they wouldn't let my wife pick it up, so. I was on it for about five weeks and doing one seventy-five. And I talked to my doctor about it and told him I had a job and he said he didn't care, I can't get carries. "You know I guess I have to go back to heroin" and he said, "yeah I guess you're gonna have to." Yeah. [sarcastically] Nice, nice doctor. I could still be working probably. Participant #1, male

For respondents, treatment enrolment enabled labour market participation only if treatment either did not create any interference with employment or facilitated the integration of work into their daily activities.

The final institutional relationship identified by respondents as relevant to their economic participation was as *recipients* of social assistance. At the time of interview, nineteen participants reported current or past receipt of some form of social assistance. In the British Columbia context this assistance primarily takes the form of (1) employment insurance (EI) whereby individuals who had been working were eligible to receive a proportion of their wage if they were laid off, fired, or a contract came to an end, (2) income assistance, where individuals receiving little or no income are eligible for a specified level of income support for limited period of time (commonly known as "welfare"), or (3) disability assistance, for those individuals deemed unable to work because of physical or mental disability. Respondents' commonly cited social assistance as one of their primary sources of income. Some highlighted it as an important form of support in the event of employment interruption.

> Uh, I just got laid off last week so um, I applied for EI yesterday online, my employers filled my form online already, so I show up at the office this morning. I didn't even need to show up to get my ROE [record of employment]. It was already all set up so I'm on the waiting period, which is two weeks, uh, but tomorrow morning I'll go in the welfare office with all my paper, and they'll issue me a cheque that I will pay back once I get my EI. Yeah, so, and it's the second day. It's pretty quick with that when you're on EI. Participant #4, male

Others, despite having some difficulty initiating receipt of social assistance, credited it as a way for them to stop or avoid engaging in criminal activity.

> I'm stealing. I'm stealing from store, yeah. And on that time I not even get on disability and I'm using and not enough money and I have to go steal it and I went to steal many, many, many times. And after 2004, I get on DB2, and then I stop it…[Before I was on disability] I didn't do anything. It was only day-by-day. I was stealing it and then sometime I get caught and I go to prison. Two, three, four month? That's it. Do over, over, over again. And after 2004 I get DB2 and I stop. Participant #10, male

Despite these positive benefits of social assistance that were echoed by a large proportion of study respondents, the configuration of social assistance was for some a disincentive to work. Prohibitions against holding a certain amount of concurrent part-time or temporary work would motivate individuals who had such opportunities to do such work informally or "under-the-table."

> I can't get caught working like right now while I'm on assistance, so I do everything under the table. I understand that if I get caught doing this kind of stuff I might not get criminally charged but it would be deducted off my support right. I myself in general, just me, I do not rip welfare off. It's not my thing. Respondent #7, male

For those individuals for whom social assistance was sufficient, these incentives were much lower than for those who were unable to support themselves on the amount provided. A key determinant of sufficiency was the intensity of their drug consumption. For one participant, who "spend[s] a hundred bucks a day easy by doing my dope" (Participant #13, male), his monthly receipt of approximately $1100 CAD was unable to support his drug consumption, even though it may have been sufficient to meet his basic needs of shelter, food and clothing. As a result, he was a "hustler on the street" (Participant #13, male) who combined drug dealing and informal odd jobs to supplement his assistance income. Social assistance

inevitably plays a role in income generating economic activity, and while providing crucial support to individuals it may also operate as a barrier to formal labour market activity.

Thus, those conditions, events and structural relationships that created interference between individuals' drug use and labour market involvement went far beyond the physical impairment and drug-seeking behaviour described above as barriers to work. Health conditions prominently featured in individuals' descriptions of their ability to work, as did catastrophic events that impacted their working and drug use trajectories, in many cases marking an intersection between the two. Finally, institutional relationships also played an important role in employment pathways, and while some of these institutional relationships had the desired impact of helping individuals into employment, others had the opposite, unintended effect of impeding or creating negative incentives for labour market participation. Faced with both significant barriers to work and the need to support themselves, participants often turned, voluntarily or otherwise, to non-formal types of income generation.

5.4.4 Informal work – balancing interference and integration

Where there was insufficient motivation to participate in economic activity or insurmountable barriers to formal labour market engagement, many individuals turned to informal forms of income generation strategies in order to make money. This work took a wide range of forms, including drug dealing, sex work, street hustling and informal labour. For the purposes of the current study, discussions surrounding informal work are restricted to (1) work by those engaging in unrecorded economic activity (see Gershuny, 1979; Pahl, 1987 for discussions on this versus other types of informal work); (2) stipendiary volunteer positions that may resemble formal labour market participation but are generally not included in reported income for taxation purposes; and (3) street-based scavenging. Other prominent activities in the informal economy such as sex work and drug dealing are outside the scope of the current analysis and have received more detailed treatments elsewhere (Kerr et al., 2008;

Shannon et al., 2008). The focus here is to document common types of informal income generation, their associated incentives, and their benefits and drawbacks.

The main categories of informal work among study participants were "under-the-table" jobs such as construction work, manual labour, or odd jobs. In some cases, employed individuals applied their technical skills outside of the workplace to supplement their income from formal activities.

> I've done a few houses and stuff, eh? You know, some guy wants a panel put in, you know, he's buying, you know, he bought a piece of equipment he wants hooked up, you know, or he buys a table saw he wants to get it hooked up. People buy hot tubs. You pay seven thousand for a hot tub, I mean, it's got to get hooked up. It's not going back to the store because your panel's too small. I mean, it's going to get hooked up. It's like four hours work and you charge a thousand bucks, and it's only, like, half of that's profit. Participant #23, male

Others are not in formal work but obtained informal work doing hard labour, odd service or manual jobs, or domestic tasks such as household bookkeeping, sewing, or cleaning.

> [I work] when it comes up. You know, probably happens a couple times a week. I even worked – biggest and hardest work I've ever done right now – maybe for the past two weeks I was working out at [X]. And I only went there 'cause I helped somebody out 'cause they wanted some other people to help work. Participant #13, male

Another type of informal income generation was volunteering, where individuals would fulfill tasks at community centres, health services, community organizations or political organizations. Participants typically volunteered or received small stipends, often as "peer workers" providing support services. Others spoke about the production and sale of art. Finally, individuals often referred street-based scavenging where they search for recyclable bottles ("binning"), resalable items from refuse "dumpster diving", or panhandling.

> I go binning, right? I'm averaging, I make about two hundred dollars a day, so. Well, between bottles and stuff that I find and then I go sell it down on Hastings. I mean, if you put the effort into it you can make any kind of money you want. Participant #12, female

The informal income generating activities described included such diverse activities as dog walking and providing parking assistance at major events. Participants demonstrated

remarkable creativity and resourcefulness in the ways that they supported themselves through services for cash or in-kind payments where they would exchange their skills and labour for food, drugs, shelter, or other commodities.

Pathways to informal work were commonly linked to the experience of a catastrophic event, as described above, that compromised their ability to participate in the mainstream labour market. In other cases, however, individuals cited a lack of legitimate and appropriate job opportunities, or interruptions to their regular work arrangements or associated production processes, as leading them to informal work.

> There was a period when I wasn't officially working. Well, they'll rehire, but they're not just sure when. There's [a] problem with the engineer, when are all the windows have got to be installed and it's crazy. It's been like four months. We should have started putting the windows in and we haven't put one window in yet. And the roof is done, so we're like, there's nothing, there's no work. Participant #4, male

In response, this participant would do construction work similar to what he had done previously, but would be paid under the table. For some types of informal labour, recruitment processes were organized into a designated 'cash corner', where "you can stand on the corner and they'll pick you up and give you a day's work" (Participant #5, male). Most participants, however, identified their personal and professional networks as generating opportunities for informal income generation.

> They see me hanging around all the time and they you know, I've actually – very seldom I go and approach them but they say, "Hey, you're down here all day long here, you know. We see you and you don't cause shit or nothing." And they ask me, "You mind picking up a bit of paper you know, and we'll give you a few bucks or whatever a week or each time you want to help out." Participant #13, male

Failing that, several respondents created their own opportunities by providing a needed or desired service.

Aforementioned patterns of self-regulation associated with integration and interference were likewise mentioned in relation to informal activity. A distinct difference between formal and informal activity, however, was that informal activities allowed

individuals in some cases to relax this separation. That is, informal forms of income generation could in some cases accommodate substance use in a way that formal employment could not. One individual described how simultaneous drug use and work were facilitated by the informal nature of her income generating activity.

> Oh and I sell my carvings, I do carving and that on good beach days at the beach. … So I'm sitting right there on the walkway with my other buddies who have been there for years, too, and we just drink beer, smoke weed and meet the world [laughter]. And they buy our stuff. Well, it's a good way to spend the day [laughter]. You have all these people all walking around and here we are carving away and you're making money, having a beer, 'cause people, there's so many people that come along and hand us a drink or, "You guys want to smoke some weed?" "Well, *yeah*." [laughter]. That's perfect. Because you could survive. Why would anybody want to do anything else? [laughter] I could drink on the job [laughter] and not get fired. It's a perk. Participant #12, female

This feature of certain informal strategies offers a plausible explanation why, for some drug users, beyond the structural circumstances such as a lack of available economic opportunity, there exists considerable incentive towards informal activity.

Motivations for informal work also occurred along material, vocational and outcome-oriented lines similar to those described in Section 5.4.3. However, dimensions of these motivations specific to informal work also warrant further attention. Materially, informal work as defined above allows social assistance recipients to either receive a legal supplement to their assistance for voluntary work, or to illegally "double up" by both collecting assistance and earning an income through unreported economic activity. While there exist in the current study context allowances for social assistance recipients to earn in some cases up to $500 CAD per month without jeopardizing their benefits, many participants earned far more than this through informal income generation. Further, informal activity as a means to both support drug use and avoid more serious criminal activity was cited as a material role of informal activity.

> I'd gotten to a point in my life where I wasn't really comfortable with the things that I had normally done to support my drug habit. Like the types of crimes and stuff and I just really wasn't comfortable with it. And not only that but, like, you know I am an addict of the hopeless variety, like once I start I can't stop and I

> consume in, like, stupid amounts. And so in order to support a habit like that I've gotta commit crime, right. And I wasn't really comfortable doing that anymore and I was able to pretty much support my habit by not having to commit crimes. Just doing other things, right, you know "and/or" like petty crime. And so I was able to kind of like justify that to myself like, that I wasn't really hurting anybody. Participant #20, male

Vocationally, characteristics specific to informal income generation in terms of tasks, the work environment and work outcomes were also discussed by participants as creating particular motivations for this kind economic activity. The ability to choose what kind of work to undertake, though not all participants felt they had this ability, created opportunities for a greater degree of variety in their work, stating that, "if it were my full time job and that was all there was in the world I would despise it" (Participant #19, male). Respondents also noted how informal work permitted not only independence and flexibility in their income generating activities, but also broader independence outside of their economic activities, particularly with regards to their drug use.

> For me it's about being independent and not being beholden to anyone and that way I don't have to explain my drug use. It's nobody's business. If I'm gonna blast my brains out, you know, it's my money, it's my life. Participant #21, female

This independence and the idea of choice was also noted in terms of study participants' ability to determine their own work environment.

> Some work I've had to refuse 'cause I don't do no lifting no more. And sure I can go out and do some cushy job sitting at a desk or whatever. I don't like to. I like to be on the outside, I like to be on the move and everything. Participant #13, male

Importantly, the ability to derive meaning from the outcomes of productive activity was not systematically different across different types of work. Informal work undertaken to provide community health, social services, some sort of community service or a needed commodity was particularly meaningful for active drug users; applying their knowledge of drug use practices, outcomes and potential harms was seen by multiple respondents as a crucial service requiring unique expertise.

> It's like I think our jobs are vital there. Just cause, I mean, like we're from the other sides of the tracks we know what it's like to be stoned. Like we know when someone just needs to be left alone. Whereas some people, you know they'll crowd them, "oh are you OK, are you OK?" It's like, "hey man they're fine, just leave them alone." Some people just don't, they don't know how to deal with someone like that. I think my job is really important. Participant #18, female

Finally, informal work was seen by some as an entrée into more formal types of income generating activity. It provided initial experience and generated contacts that may in turn lead to a formal job.

> I started at a cash corner where I went in there and they asked me to work, and I worked, you know, like a day and a day turned into a week and a week turned into 2 or 3 months. Finally after 6 months he turned around and says he liked what I did. I'm a quick learner, I'm observant, I pick up things very easy, and I actually started rebuilding motors. So they asked me if I want to do an apprenticeship and I took them up on it. Participant #13, male

While the impacts and incentives of informal work described here are not specific to drug users, those that are offer insight into more specific pressures that lead to this kind of work.

While the incentives and pressures for informal work may be compelling, this type of economic activity is has a number of drawbacks. Not the least of these is that many types of informal income generation are illegal for both those undertaking particular tasks and those engaging them to do the work. The threat of discovery of unreported economic activity was particularly acute for individuals receiving social assistance.

> I'm not allowed to, you know put in any paper or my signature. Well I can do [under the table work] but not with my papers you know. They're gonna get in trouble…They can cut me off or punish me for three months. Participant #6, male

Several characteristics of informal work itself were also undesirable; that individuals enjoyed choice in the determination of the qualities of their income generation assumed that this choice was available to them. In the same way that formal work was elusive or unattainable for some, opportunities to make money through informal work were also unequally distributed. Health issues, for example, impacted work-specific-capacities globally and did not differentiate between different forms of income generation. Importantly, the following participant outlined the fact that health-related issues do not necessarily exclude people from

all socio-economic participation, and that there may be possibilities to tailor economic activity to individual capacities.

> I like volunteer work. That's all good. And I did write a letter for them the other day cause there is an election. And I made them a challenge, you know, help me help you because I can't come down to your office every day. So we'll see what happens. Participant #19, male

This flexibility may also bring with it negative and potentially harmful impacts. Multiple individuals noted a particular lack of security or permanence in informal work, noting that, "you can't stay long and stuff because they don't need you for a long time" (Participant #6, male). Others reported abuses from their superiors that would have been remediated if there had been labour protection through the legal requirements imposed on employers for worker safety, minimum wage and standards surrounding the treatment of employees.

> They had us unloading containers, you know, chucking containers of rice. I tell you, it was hard. They were so cheap. They pay like 7 bucks. I waited for almost – they told me to start at 1 o'clock, so I got there at 1 o'clock, the truck wasn't there, so I got back at 2 o'clock and then 3 o'clock, by the time I got paid, it was like 7:30 at night. Which it should've only taken like a 2-hour job. But it ended up taking like 5 hours and they only paid me for 4. That's why I don't work for people like that. Participant #13, male

Informal work may create opportunities to exploit workers and bypass the legal protections workers are entitled to through formal labour market participation. This subjects individuals to the possibility of entrapment, where a lack of economic alternatives may compel them to undertake work that is potentially dangerous, where injury or maltreatment leaves them little or no recourse, or where their economic activity is demeaning or degrading. For street-based scavenging, this last was highly prominent; individuals consistently described panhandling, dumpster diving and binning as their least preferred means to make money.

> It's humiliating. It's humiliating. And ironically the more you're willing to humiliate yourself the more money you'll make doing it. Participant #20, male

This quote emphasizes the costs of economic incentives that hold the potential to compromise individual dignity. It was a characteristic that those who engaged in some types of informal income generation cited as highly reprehensible, and is a reminder that the compulsion

towards informal work among drug users is for many a daily reality configured by substance use and socio-economic vulnerability, sometimes in the form of a lack of viable alternative income generating options.

In sum, the role of informal income generation among drug users was common among respondents. It was often a scenario in which individuals could combine substance use and income generating activities in order to benefit from economic participation but required less spatial and temporal separation between economic and drug activities that formal employment. It further proffered the oft-lauded work characteristics of independence and flexibility that was for many not attainable in the formal labour market. It may have also allowed them to balance their health needs against economic activity more successfully. However, there were also drawbacks specific to informal work. These included the instability of work, potential difficulty accessing informal work, the possibility of exploitation on the job and a lack of formal legal protection in the case of injury or other work-related incident.

5.5 Discussion

This analysis is among the few qualitative studies that specifically examine the experiences of work and income generation among current or recent inner-city residents that inject drugs or have a history of injection drug use. While most individuals were not formally employed at the time of interview, nearly all of them had employment experience, and the relationship between this experience and their drug use was complex and varied between respondents and over time. Personal narratives demonstrated broad heterogeneity in work histories, income generation creativity, skills, and experiences. They also provided considerable insight into the relationships found in and assumptions of quantitative work; these will be discussed in detail in the concluding chapter. The relationship between drug use and work at a given time for a particular individual reflected a configuration of individual, social, environmental, institutional and structural features in their lives that strongly shaped

their motivations to engage in the labour market and their experience of barriers to work participation.

5.5.1 Self-regulation, interference and integration

Participants demonstrated considerable self-awareness about their relationships with money, drugs, and work. This was reflected by the range of opinions and experiences about the relative compatibility between employment and substance use, very clearly articulated reasons for working or not working, and the strategies and practices that comprised individual self-regulation around money and drug use. The idea of self-regulation as a modulator of the relationship between drug use and income generation is consistent with previous work that notes the various regulations, value commitments and practices that differentiate controlled from uncontrolled use (Caplovitz, 1976; Harling, 2007; Pearson, 1987; Zinberg, 1984). These practices routinized self-control, which is commonly pointed to as a predictor of differing levels of drug use (Vaughn, Beaver, DeLisi, Perron, & Schelbe, 2009; de Wit, 2009). Heterogeneity in the presence of such practices suggests variation in self-control both between and within users, but also reflects differential pressures towards or away from labour market involvement. Results are not, however, consistent with more recent findings by Draus et al. (2010) where work and drug use are woven together in much the same way as coffee or cigarette use. The experiences described by participants were instead more akin to the idea of having a drink at the end of the day once vocational responsibilities were over with (Ames & Grube, 1999). It was consistently those who were able to insert time and/or space between work and drug use that described sustained, concurrent and daily substance use and employment. When comparing the narratives of those who felt it was possible to include both as daily activities with those who did not, the self-regulatory spatial and temporal isolation of drug use among IDU differentiates practices of *use at work*, or simultaneous use and economic activity, from practices of *use while working*, where an individual would contemporaneously maintain both a job and regular substance use, but not do both at the same

time. This was the key distinction between drug use-work relationships characterized by interference as opposed to integration. The capacity and inclination to self-regulate was strongly influenced by broader physical, social, and structural environmental conditions; self-regulation was a necessary but not sufficient condition for non-interfering, concurrent use. Three dimensions that shape the possibility of labour market participation emerged from individual narratives and warrant further attention here: individual capacity, individual motivation, and opportunity. Each of these will be discussed in turn.

5.5.2 Individual capacities

Individual capacity to work, for example, figured prominently in the complex relationships between drug use and income generation. Deleterious, drug-related impacts on this capacity included both physical impairment from use and drug seeking behaviour. The role of physical impairment outlined in the current study is consistent with studies outlining the impacts of substance use (Kelly, Darke, & Ross, 2004; Mintzer, Copersino, & Stitzer, 2005a), though this impairment varies considerably across substances (Nutt et al., 2010). The importance of drug seeking behaviour in shaping the daily activity of high-intensity drug users is also consistent with previous research (Weiss et al., 2001). Adequate access to illicit substances is "not about getting high, it's just getting normal" (Draus et al., 2010, p. 859). Consistent with classic sociological accounts of drug use, the instability created by dependent substance use "rests fundamentally on the effects which follow when the drug is removed, rather than on the positive effects which its presence in the body produces" (Lindesmith, 1947b). These earlier accounts refer to opiate addiction in particular, highlighting the sometimes substance-specific patterning of drug use and associated activities.

Individual capacities were also strongly shaped by the social and human capital of participants that determined both the possibility and type of work reasonably undertaken. Heterogeneity in capacities, educational attainment, prior experience and work-relevant

personal networks all contributed to the labour market participation capacity of IDU. Particularly notable were individuals who had trades-related skills or qualifications, those with personal networks and connections (often with health, social services and community organizations that then translated into part time or volunteer positions), and those with work experience prior to periods of high-intensity use. These individuals more successfully leveraged these types of resources into licit economic activity. This speaks to the importance of personal capital accumulation and the accumulation of advantage (DiPrete & Eirich, 2006; Merton, 1988) as well as personal networks in the production of economic opportunity (Granovetter, 1973; Montgomery, 1992) which in the current study prove relevant to drug-using populations as they are in the general population.

This parallel between the drug using and general populations was equally relevant to the strong influence of individual health status on work participation patterns. The long-term impact of both temporary and chronic illness on labour market outcomes is significant, negative, and differentially experienced by different demographic groups (Montgomery, 1992) and evidence here reinforces findings in the general population (Bambra, 2011; Dixon, Goldberg, Lehman, & McNary, 2001). Susceptibility to labour market-relevant, health-related setbacks may be greater among IDU because of the health impacts of high-intensity or prolonged use (Chen & Lin, 2009). Notably, those health conditions cited by participants in the current study arose for both drug- and non-drug related reasons.

5.5.3 Intrinsic and extrinsic work motivation

Over and above individual capacities for employment, engagement with the labour market was strongly linked to individual motivations to work, which were both intrinsic and extrinsic to the source of income generation. Magura (2004) cautions against an oversimplified characterizations of drug users as unmotivated, and focus here is on looking at broadly defined motivations that include individual-, vocational-, socially- mediated

incentives towards or away from work. Motivation in the literature is conventionally classified according to the site of mediation, with internal mediation associated with intrinsic motivation and mediation outside the individual associated with extrinsic motivation (Deci, 1972; Mottaz, 1985). In the current study this differentiation was instead patterned around whether motivations were intrinsic or extrinsic to the characteristics and experiences of a particular job rather than the individual. Intrinsic sources of task-related fulfillment have been shown elsewhere to be crucially important to high levels of job satisfaction regardless of educational attainment or occupational category, while extrinsic motivations vary across both education and occupation (Gruenberg, 1980; Mottaz, 1985).

The dominant extrinsic motivations to undertake work were material. Remuneration was here cited as supporting survival, drug use activity and financial responsibilities and commitments to family or other dependents. These descriptions were met, however, with inconsistent cases where material motivations were not towards formal labour market activity, but away from it. Most intuitive of these inconsistent cases were individuals motivated to pursue material gain outside of the formal labour market, where the benefits of undertaking illegal and informal work surpassed those of conventional employment. These are consistent with Mertonian anomie-based explanations of deviance (Cloward, 1959; Cohen, 1965; Merton, 1938) whereby the pursuit of material gains by conventional means is frustrated and produces incentives for income generation outside the mainstream labour market.

In contrast, strategies to decrease the availability of cash from any source and thereby limit access to drugs counterintuitively produced motivations away from the pursuit of remuneration from *any* source. The choice between exacerbated material deprivation and increased means to procure and consume drugs characterizes a serious dilemma in the relationship between money and substance use. For individuals who are attempting to control their use, which is often accompanied by the intention to reinitiate mainstream socio-economic participation (Platt, 1995), there is a desire to hold drug use in check while

initiating licit income generating activity. The dilemma stems from knowing that in order to do former, if increased income likewise increases use, it may be necessary to forgo the latter. The cycles of deprivation, substance use and labour market estrangement are thereby not restricted to the excessive expenditure of money on drugs, but also indicative of the trap that individuals with active addiction face when trying to disconnect from substance use cycles that may be fueled by additional income. Further, increased income has elsewhere been shown to exacerbate unsanitary injection practices (Bourgois & Schonberg, 2009). The notion of self-regulation as restriction has been found in other contexts, where limited daily income the time spent generating it are perceived as a check on an individual's drug using habit (Draus et al., 2010). However, while in the case of Draus et al. (2010) a modest income was a check on drug use, it did not reflect the more extreme strategies of deprivation documented in the current study.

The example in Draus et al. (2010) points to the role of work in providing time structure in users' daily lives, another prominent theme encountered throughout the current study. Time structure represents one of the primary intrinsic motivations to undertake employment outlined by study participants, in that an inherent characteristic of work is the consequent patterning of daily life. Emphasis on time draws attention to previous research on the social-psychological functions of employment, whereby participation in employment provides a number of non-material benefits considered crucial to psychological well-being and mental health (Jahoda, 1982; Warr, 1994). As originally conceptualized through studies of mass unemployment, (Jahoda, 1938/1987; Jahoda, Lazarsfeld, & Zeisel, 1932/1971) these social-psychological functions of employment include, in addition to providing daily time structure, the provision of social contact outside the home, required regular activity, a means of connecting to a broader sense of purpose, and a source of identity formation or individual status (Jahoda, 1982). Consistent with this work, participants drew on multiple dimensions of time structure that were deeply relevant and strongly linked to motivations to undertake

employment. They included characterizations of work as a "socially appropriate" use of their time, descriptions of the common struggle with idleness in the absence of employment among those who wished to work but were unable to do so, and the impact (or lack thereof) of time structure on individual substance use patterns and attendant physical health benefits of reduced substance use.

Participants' reflections emphasize, however, that it is not simply that there is something to structure time, but that the way in which it is structured serves as a motivator for labour market engagement. People who enjoyed or valued what they did, did more of it. This enjoyment was linked to individual preferences related to the work environment and the nature of work tasks. Notable here were the desires for independence and flexibility. This is similar to general orientations against steady employment in other inner-city environments, where a lack of independence resulted in the pursuit of income in participants' own way and on their own time (Johnson et al., 1985). Participants' preferences for independence and control in income generating environments further emphasized the importance of the psychosocial work environment, which is linked to job satisfaction, low job turnover and work commitment (Spector, 1986) as well as work-specific and general health outcomes (Karasek Jr., 1979; Theorell, Karasek, & Eneroth, 1990; Van der Doef & Maes, 1999).

Also consistent with the labour market experiences of the general population was the importance of enjoyable social contact in the workplace, which has elsewhere been examined as associated with job tenure (O'Reilly, Caldwell, & Barnett, 1989). It is also in line with the aforementioned research on the social-psychological functions of employment (Jahoda, 1982; Warr, 1994), which point to social contact outside of the home as an important feature of the employment experience.

Participants' motivations were further connected to the social-psychological functions of employment as they commonly linked their work experiences with community or social causes external to their own individual goals. The importance of perceiving work as

meaningful activity is a central tenet of positive labour market involvement narratives and studies of the meaning of work in the general population (Cartwright & Holmes, 2006; Morse & Weiss, 1955; Wrzesniewski, 2003). The derivation of meaning in the current context was highly variegated, but was a function of the internal or external validation of skills, performance, contribution, or achievement. Regardless of the source, participation in meaningful activity was a further differentiating characteristic between those that undertook formal employment and those that did not and between those that positively valued work and those that did not.

The considerable importance placed on the different components of work demonstrated how the quality and qualities of work crucially shaped the lived experience, perceptions of and individual motivations to undertake paid employment among IDU. When combined with perspectives on the capacities to work, a picture of those things that might produce a sufficient alignment of interest and ability to result in labour market engagement becomes clearer. However, a mismatch between capacities and motivations, whereby individuals wanted to engage in formal employment but were unable to do so because of limiting health conditions or insufficient personal capital, was a considerable source of frustration. This mismatch speaks to a third influence on labour market engagement among IDU, that of opportunities to work and the barriers that shape these opportunities.

5.5.4 Structural barriers to work among IDU

Study participants demonstrated innovation in their ability to generate income. Where this occurred outside the formal labour market it often reflected a lack of appropriate economic alternatives. The lack of opportunity may be partially attributable to the dramatically higher unemployment rates, lower participation rates, lower median reported income (Brethour, 2009; City of Vancouver, 2006) that characterize economic conditions of the DTES reported earlier in this thesis. A scarcity of employment availability represents a

structural lack of labour market opportunity unlikely to be alleviated by employment programming or traditional vocational services for addiction treatment clients (Magura et al., 2004; West, 2008). A lack of economic alternatives produces significant pressures toward informal and illegal activity. Further, the skills and capacities that are honed in informal and illegal environments are not often those that are valued in the labour market (Johnson et al., 1985). Labour market exclusion among drug users is therefore reinforced by a labour market that is designed such that potentially chaotic daily life circumstances and economic instability entrench individuals in income generation patterns that distance them from employment participation.

The institutional barriers described above further reinforce labour market exclusion. The different institutional relationships of recipient, client and prisoner described above may improve individuals' capacities and motivations to undertake work, but may in other cases add further constraints on perceived and real abilities to locate and capitalize upon economic opportunities. These constraints included the labour market costs of criminal justice system involvement (Pager, 2003), the disincentives resulting from conditions of social assistance receipt (Blankertz et al., 2004) and the interference of addiction treatment on employment search, acquisition and maintenance (Peterson et al., 2010; Richardson, Wood, Montaner, & Kerr, in press). This includes the physical impairment from methadone use (Darke, Sims, McDonald, & Wickes, 2000; Mintzer, Copersino, & Stitzer, 2005b) as well as the regulations surrounding methadone dispensing also identified as influencing patients' experience with MMT in other contexts (Gourlay, Ricciardelli, & Ridge, 2005; Kleber, 2008). The mixed experiences documented here may help explain inconclusive results in the therapeutic literature (Magura et al., 2004; Platt, 1995; Reif et al., 2004; Sterling et al., 2001) and support the results from previous evaluations of methadone that demonstrate effectiveness for only a small proportion of opiate dependent users (Amato et al., 2005; Farré, Mas, Torrens, Moreno, & Camí, 2002; Ferri, Davoli, & Perucci, 2011). This study therefore contributes to a small but

informative literature on patients' experiences with MMT enrolment (Fischer, Chin, Kuo, Kirst, & Vlahov, 2002; Gourlay et al., 2005; Montagne, 2002; Rosenbaum & Murphy, 1984).

The challenges of employment at times of active drug use, combined with a scarcity of opportunity and structural or institutional barriers to work, further reinforce pressures toward informal and non-legal income generation practices. With these practices come the increased likelihood of the attendant health, social and safety hazards of street-based sex work (Blankenship & Koester, 2002; Shannon et al., 2008; Sherman & Latkin, 2002) the violence and danger associated with drug dealing and distribution networks (Adler, 1985; Fagan, 1989; Sommers & Baskin, 1997), the expansion of these networks and the attendant impacts on neighbourhoods and their inhabitants (Diez Roux, 2001; Hill, Ross, & Angel, 2005) and exploitation in the informal labour market. Bourgois (2009) identifies some of the potential forms of this exploitation, which include underpayment, exposure to workplace hazards or violence, the usage of drug dependency to manipulate individual's ability to decline otherwise unacceptable work arrangements and further workplace abuse. A further lack of institutional and legal protection against exploitation and workplace injury as well as the absence of access to any sort of employment protection or unemployment benefit add to the precariousness of informal work. This precariousness has the potential to translate the pressures towards informal work into broader exposures to physical and mental health-related hazards and the entrenchment of socio-economic instability. Further, participants noted experiences of shame by participating, for example, in degrading forms of work, street-based scavenging or panhandling, an experience also noted by Bourgois (Bourgois & Schonberg, 2009) and identified by Sen (1985; 1992) as a defining characteristic of the the experience of poverty. When combined with negative impacts of stigma on employment outcomes of both unemployment (Biewen & Steffes, 2010; Heckman & Borjas, 1980; Ho, Shih, Walters, & Pittinsky, 2011) and drug use (Crisp et al., 2000; Dillon, 2004; Gold, 2004), the confluence of

pressures against successful labour market engagement are considerable and cross individual, social, institutional and structural domains.

5.5.5 Drug use and labour market trajectories

The idea of the entrenchment of labour market exclusion draws attention to the relationship between individual drug use and labour market trajectories over time. In the case of drug use trajectories, processes may include initiation, experimentation, escalation, habituation, problematic experiences, treatment, temporary abstinence, relapse, maturing out, retirement and total abstinence (Shaw, 2002). Key markers that shape drug use trajectories include transitions, the role of social capital and turning points (Hser et al., 2007), and participants described all of these features in depictions of their drug use experience. Similarly, participants described experiences with the every feature of labour market trajectories, including capital accumulation, labour market entry, transitions into work, the maintenance of employment, job transitions, job losses and labour market exits (Furlong & Cartmel, 2004; Kemp, Bradshaw, Dornan, Finch, & Mayhew, 2004; Rigg & Sefton, 2006; Virtanen et al., 2005). Importantly, the current study demonstrates that there is no clear causal pathway between drug use and employment trajectories; drug use may, but does not necessarily result in a lack of work. Similarly, a lack of work does not necessarily fuel drug use, though it may in some instances.

The complexity of these trajectories and the interrelationships between them identified by participants' narratives suggest that, as has been found elsewhere among socio-economically vulnerable populations, multiple and possibly cumulative triggers may be implicated in shaping a person's trajectory (Kempson, 1996). The experiences surrounding catastrophic events in the current study demonstrate that these are phenomena where drug use and labour market trajectories often intersect. Involving displacement, the cutting of social ties, abrupt decreases in social, economic or other resources, acute emotional trauma or

decreased physical capacity, the experience of a catastrophic event was often described as having a deleterious impact on both drug use patterns and labour market activity. These events mark significant turning points in terms of the ability to make use of previously acquired social and human capital. Both drug use and employment trajectories are also implicated in individual health outcomes and the accumulation of risk over time (Ben-Shlomo & Kuh, 2002; Dorgelo, Pos, Vevoordeldonk, Jansen, & Vervoordeldonk, 2011; Virtanen et al., 2005). Importantly, as in the case of the a permanent injury or disease, the acquisition of a criminal record or a blood-borne pathogen such as HIV, the transitions undergone as a result of some catastrophic events are irreversible. Participants described the consequences of these events on the opportunity structures related to licit socio-economic activity as significantly impacting their prospect of labour market success.

5.5.6 Limitations

This qualitative study has a number of important limitations. As described in section 2.5.3, during the piloting phase, respondents anticipated interviewer expectations that they would be engaged in formal labour market activity. This suggests that individuals' narratives may be subject to social desirability bias. While analyses focus on the subjective experience of employment, given that participants offered, in some cases long term, retrospective narratives, their testimonials may also be conditioned by recall bias (McElrath, Chitwood, Griffin, & Comerford, 1994). These are common limitations to this type of qualitative analysis. Second, the non-random sampling of study participants limits the generalizability of the current study to broader IDU populations, although generalizability is not commonly considered to be a goal of qualitative research. While every effort was made to ensure the study population was representative of the VIDUS study sample, the average age of participants is considerably higher than that of the VIDUS and as such participants may be at more advanced stages of their addiction and labour market participation cycles. They may

also, however, have a larger range of experiences to draw on as a result. Third, while the current analysis focuses on the configurations of individual capability, motivation and opportunity that influence the relationship between drug use and income generation, this relationship may be further shaped by factors not examined here. These include, but are not limited to, individual job search strategies, the experiences of poverty, homelessness and other features of socio-economic vulnerability, as well as employer perceptions and broader labour market conditions that inevitably influence the quality and qualities of labour market participation. Lastly, individuals were recruited into the study in many cases because of current or past experiences with formal and informal labour market activity that may be atypical among the larger VIDUS population. More research is required to determine if the experiences described here are more broadly applicable to inner-city IDU in this and other contexts.

5.5.7 Conclusion

In sum, the current qualitative study explores the experiences of work and income generation among current or recent inner-city residents that inject drugs or have a history of injection drug use. A wide range of experiences of the relative compatibility between work and drug use suggest that those individuals who are able to support concurrent employment and substance use self-regulation strategies that spatially and temporally separate the two. The impetus to engage in this self-regulatory practice was linked to configurations of capability, motivation and opportunity that supported labour market engagement. The complex relationships between drug use and labour market trajectories often created considerable pressures toward informal or illegal income generating strategies, which brought with them increased likelihood to risk taking and drug-scene exposures that reinforced distance from the labour market and entrenched socio-economic vulnerability. The individual, social, structural and institutional processes entrenching vulnerability were often characterized by drug- and

non-drug related health issues as well as catastrophic events that marked simultaneous, negative transitions in both drug use and labour market trajectories. This study emphasizes the importance of recognizing the relationship between drug use and work as complex, multifaceted, and conditioned by the accumulation of risk and disadvantage over the long term.

Chapter Six: Conclusion

Work spares us from three great evils: boredom, vice and need.

Voltaire (1759)

6.1 Introduction

The economic activities of people who use drugs are a source of considerable concern. The need for socio-economically marginalized drug users to meet basic needs and support their use is consistently linked to the connection between drug use and crime (Bukten et al., 2011; Gossop, Marsden, Stewart, & Rolfe, 2000). The stigmatizing portrayal of the user-as-junkie in literature, film, popular culture and elsewhere engenders a perception that the high-intensity drug user inevitably becomes a drain on society incapable of contributory socio-economic participation. A common sentiment is the suggestion that a drug user "just get their act together, get a job, and stop shooting poison into their arms" (Leddin, 2012). Yet the biological, social and economic processes related to both addiction and labour market participation are complex, necessitating much more than a simple change of heart to alter individual pathways. The criminalization of drug users, for example, subjects individuals to processes of stigmatization, marginalization and social exclusion that may prevent recovery by hindering their reintegration into the wider social and economic community (Buchanan & Young, 2000; Lloyd, 2010). The prospect of formal employment among high-intensity drug users, then, becomes for some a herculean task hindered by obstacles such as ongoing drug use, socio-economic vulnerability and local economic conditions.

This thesis represents an exploratory analysis into the relationship between formal employment and drug use among predominantly inner-city injection drug users in Vancouver, Canada. It has been concerned with specific methodological issues of working with marginalized and socio-economically vulnerable populations in longitudinal context, and

seeks to disentangle processes related to employment and drug use at the individual, social, contextual, institutional and structural levels. It situates itself at the intersection of existing theoretical and empirical work on the social determinants of health, the sociology of drug use, and the sociology of employment, focusing in particular on the spaces in which these domains overlap. These overlaps produce the overarching research question for this thesis: "how is employment implicated in socio-economic processes related to drug use, socio-economic well-being and health among people who inject drugs?" As a first step in responding to this question, this work has sought to answer the following:

- What differentiates between drug users who engage in the formal labour market and those who do not?
- What are the barriers to labour market participation among drug users?
- How are work and labour market participation, or a lack thereof, perceived and experienced by individual drug users?

Chapter Two outlined the data used for the study. Chapter Three addressed issues of missing data, a common and potentially consequential feature of longitudinal research in general, and longitudinal research among marginalized and potentially unstable populations in particular. It explored patterns of missing data in the Vancouver Injection Drug User Study and their potential impacts on subsequent analysis. It also explored how the relationship between data structure and content can produce meaningful information for researchers. Chapter Four shifted the focus to substantive issues by examining labour market transitions. It tested a series of hypotheses about those things that might plausibly impact entries into employment among inner city, drug-using populations. Building on the previous chapter by conducting analyses both with observed and imputed data, it documented complex relationships with employment transitions. Finally, Chapter Five detailed the results of a qualitative analysis exploring users' perceptions and lived experiences of the relationship between drug use and work. This chapter also sought to address key limitations of quantitative analyses, explore

potential mechanisms that may explain some of the statistical relationships identified in the previous chapter. The remainder of this concluding chapter outlines the principal contributions of this work, main empirical findings, policy implications of the study and potential lines of further inquiry.

6.2 Contribution

6.2.1 Methodological

This is the first time that the missing data patterns in the VIDUS and their implications have been examined in detail. Further, this thesis examined a potentially informative analytical opportunity created by the presence of complex missing data patterns. Traditional studies of missing data in longitudinal analysis generally focus on the statistical implications and accommodation of missing data (Baker, 1995; Conaway, 1992; Molenberghs, 2007), with substantive input usually limited to the imputation model (Donders, van der Heijden, Stijnen, & Moons, 2006; Stasny, 1986). The emphasis on connections between data structure and data content is methodologically relevant in three ways. First, it outlined avenues for exploring underlying missing data processes. Second, it provided concrete information about the potential impact these processes had on subsequent analyses. Third, it suggested ways in which this type of focus might maximize participation from an operational perspective. This demonstrated how a thorough and detailed understanding of data structure, which is uncommon in the missing data literature, could be beneficial to researchers.

Additionally, the VIDUS data had not previously been examined with employment used as a focal outcome. This thesis' analyses further represent the first time the longitudinal structure of the data has been utilized to examine transitions in the income generating strategies of injection drug users (IDU). The event history models used in Chapters Three and Four offered a straightforward method for assessing associations with different missing data patterns, study participation end points, and transitions into employment. The use of time

dummies allowed analyses with non-parametric duration dependence and easily accommodated repeated transitions. This study also contributes to the very small but potentially important literature of employment among drug users in community-based context, where localized economic conditions and drug use patterns may configure in unique ways. It undertook this approach for the first time using long-term longitudinal data.

Finally, the inclusion of both qualitative and quantitative analysis represents a mixed methods design, which, to the author's knowledge, has not been commonly employed in the study of employment among drug users. Embedding a smaller quantitative study within a quantitative sampling frame is common practice in mixed methods research (Creswell & Plano Clark, 2007). In the current study it supported an exploration of some of the often made but rarely acknowledged assumptions surrounding labour market participation in statistical analysis through qualitative explorations of the lived experience of employment. These included the assumption that all individuals have the capacity to undertake paid work, are motivated to do so, and are consequently active in the labour market. The widespread incidence of limiting physical disability or illness in the qualitative sample called into question the tenability of the first assumption about individual capabilities. Heterogeneity in individuals' motivations towards or away form formal employment challenged the second assumption of homogeneous motivations towards work. Personal narratives further refuted the third assumption that all individuals participate in the labour market. The implications of these assumptions may result, in statistical analyses, of the inflation of covariates that may be disproportionately associated with labour market inactivity, such as unstable housing. The development of indices measuring individual capacities for, motivations toward and participation in the labour market could alleviate the need for these assumptions and elucidate the role of these dimensions of the employment process among IDU. Future research might consider the participation rate when determining the overall employment rate of IDU, as is done with the general population, which would likely render the employment rate and

employment transition rates outlined in Figure 4.1 higher than they originally seem. Despite the tenuous nature of these necessary assumptions, significant associations in quantitative analyses nevertheless implied systematic differences in employment engagement, and may also suggest differences in capability, motivation and labour market participation rates. In this regard, the conclusions drawn from quantitative analyses appear valid.

6.2.2 Theoretical

The complex configurations of use, features of the risk environment, strategies for concurrent use and work as well as configurations of individual capabilities, motivations and opportunities suggested that the relationship between drug use and work is anything but straightforward. This complexity pointed in particular to the shortcomings of deterministic deviance oriented theories of drug use described in Section 4.2. While elements of strain, social control and social learning theory resonated with individual narratives, no single approach was broadly applicable to the lived experience of the relationship between substance use and work reported in this thesis. Results instead implied the importance of a much broader consideration of those individual, social and structural forces that shape deviance trajectories. To economic analyses of the impact of drug use on labour market outcomes, results suggested a broader consideration of the contexts in which people live and operate. The invocation of the Risk Environment Framework (Rhodes, 2002; 2009) and its salience to the question of the relationship between drug use and employment heuristically identified the multiple levels at which socio-economic and labour market participation are shaped. This approach may usefully inform future theoretical work on the social and structural production of drug-related harm and vulnerability, work that would to well to avoid monolithic or deterministic expectations of deviance and detachment either producing or resulting from drug use.

6.3 Empirical findings

As the findings of each section of this these are outlined therein, the focus in this section is on the connections across the substantive chapters and on their respective contributions to answers of the research questions of this thesis. Since this study is designed such that the chapters build upon one another, attempting to address a number of the challenges of this type of research among marginalized populations, the ways in which the chapters inform one another is crucially important.

6.3.1 Implications of missing data in VIDUS

Longitudinal, quantitative research among drug users is subject to the instability that often characterizes daily life among this population, potentially resulting in complex patterns of missing data. The data used in the current study is no exception. The exploration of missing data in the VIDUS demonstrated the presence two types of occasion non-response: intermittent occasion non-response, where an individual is absent from the study for a period of time but returns, and attrition, where a participant drops out of the study and does not return.

There were systematic associations between measured variables in the data and both types of observation-level non-response. In the case of intermittent non-response (see Table 3.4), older individuals, those reporting Aboriginal ancestry, residents of the DTES, social assistance recipients and frequent crack users were less likely to report intermittent non-response. Conversely, individuals reporting recent incarceration and the use of shooting galleries were more likely to report periodic absences from study participation. In the case of attrition (see the composite multivariate model of Table 3.7), individuals with higher levels of participation over time who were older, female, married, of Aboriginal ancestry, resident in the Downtown Eastside, receiving social assistance, reported recent binge drug use, injection with other people, enrolment in methadone maintenance therapy (MMT) and HIV

seropositive were less likely to attrite out of the study. Conversely, those with unstable housing were more likely to attrite.

These systematic relationships between observed data and missing data patterns suggest a number of important trends in study participation. First, socio-demographic disadvantage generally translated into high participation levels and lower probabilities of study dropout, as did socio-economic contexts characterized by deprivation and proximity to the research field office. Some indicators of drug-related risk and potential instability were associated with differences in the consistency of study participation over time, but these were not consistent across all indicators. Finally, those individuals who were likely to have regular contact with health service organizations were neither more or less likely to have intermittent absences, but were less likely to attrite out of the study.

The implications of these results for subsequent analyses of transitions into employment centre around their impact on the effective study sample at each time point. For example, those indicating socio-demographic disadvantage could have been disproportionately overrepresented in follow ups when compared to the baseline sample. Bias, whereby observed associations for these variables may be stronger than those of the whole study population (which is not completely observed because of missing data) might therefore have been found in analyses using only observed data. Comparisons of models using observed and imputed data showed that this may indeed have been the case. While there were no differences in the significance or direction of associations, there was moderate variation in the *levels of significance* and *magnitude* of the associations in some cases. One exception was the case of educational attainment in the final composite model, where it was significant in the observed model, but not in that using imputed data. These differences may be attributable to changes in the effective sample used in analyses, a result of the systematic production of missing data.

Comparisons of the coefficients between observed and imputed models of employment transitions demonstrated analogously similar results, but there were two exceptions. First, shooting gallery attendance in the first model (testing the differential risk hypothesis, see Table 4.7) was significant and negative in the model using observed data, but not significant in that using imputed data. This difference, however, became less important once non-drug related risk variables were included and the association in the observed data model also ceased to retain significance. Second, the difference in significance of HCV seropositivity in the final composite model (Table 4.9) may have also reflected the impact of missing data. However, the coefficients and standard errors of HCV seropositivity between observed and imputed models Table 4.8) were similar, and models directly testing the differential health hypothesis are consistent between observed and imputed data sets.

In sum, while the missing data in the VIDUS may at first appear to have presented potentially serious challenges to the validity of results, these challenges were, on the whole, empirically unsubstantiated. Graham (2009) cautions against the assumption that the presence of even significant levels of missing data in longitudinal study are fatal to statistical inference, and this caution was certainly applicable in the context of the current study. Complex missing data patterns here were additionally used as an additional source of information about the data produced and operational considerations for the study, as outlined in section 3.4.

6.3.2 What differentiates between drug users who engage in the formal labour market and those who do not?

From the three conceptions of the working drug user outlined by Draus et al. (2010) of the "stabilized junkie", "working addict" and "self-regulating user"; to inner city IDU systemically and systematically excluded from the labour market (Bourgois & Schonberg, 2009); to the heterogeneity of relationships demonstrated by quantitative analyses (Kaestner, 1998), the existing literature on the relationship between employment and drug use suggests

wide ranging relationships between the two. This heterogeneity is consistent with results from the current study, where taken together, quantitative and qualitative analyses demonstrated multifaceted relationships between drug use and work.

First and foremost, levels of employment among VIDUS participants over the course of the quantitative study period were low. These rates were generally lower than the employment rates of other drug using populations (Atkinson et al., 2000; Johnson et al., 2001; Koo et al., 2007; Platt, 1995), though comparable to a similar group in a different context (McCoy et al., 2007). Approximately 30% of the sample comprised a population sub-group that moved in and out of employment over time. Despite these low levels of employment, qualitative participants described almost universal participation in formal labour market activities at some point in time.

In quantitative analysis, differentiations between those who engaged in the formal labour market and those who did not were in many ways intuitive. Differences across age, gender, ethnicity, and arguably educational attainment spoke to the role of socio-demographic disadvantage in labour market engagement. These findings supported those of other studies that note the translation of characteristics producing labour market disadvantage in the general population into similar disadvantage among drug using and treatment-enrolled populations (Atkinson et al., 2000; French et al., 2001; Hermalin et al., 1990; Koo et al., 2007; Platt, 1995). These socio-demographic distinctions carry with them all of the implications of structural disadvantage such as those associated with gender and ethnicity (Arber, 1991; Williams et al., 2010) that have been previously associated with the differential expression of drug-related harm (Duff, 2011; Maher, 2004; Measham, 2002; Weinberg, 2011). Consistent with these studies, results from this thesis also suggested that structural disadvantage is embedded within the material, social and institutional aspects of social disorganization.

Qualitative work, as well as time-variant variables examined in quantitative work, highlighted not only what differentiated between drug users that did and did not engage in

formal work, but what differentiated situations or periods where they were and were not able to balance both activities. Here the primary differentiation was the self-regulatory distinction between "drug use while working" and "drug use at work." The predominant strategy that permitted the balancing of both drug use and labour market participation as concurrent regular or daily undertakings was the spatial and temporal separation of activities associated with each. Other strategies to facilitate controlled use have been previously outlined (Pearson, 1987; Zinberg, 1984). However, the identification of temporal and spatial separation as the defining feature of integration (as opposed to interference) supplemented these explanations by detailing *how* concurrency between drug use and work operates. As the information in Table 6.1 demonstrates, as with the qualitative sample, concurrent use and work were present in the quantitative study population. It further shows that concurrent frequent use and work among those reporting employment was common.

Table 6.1 Levels of concurrent work and Drug use in the Vancouver Injection Drug User Study (N=1599)[*]

	Any Use[†]		Frequent use[‡†]	
Employment Status	No (15.1%)	Yes (84.9%)	No (45.5%)	Yes (54.5%)
No (n=13603)	1792	11811	5891	7712
Yes (n=1393)	478	915	930	463
Total (n=14996)	2270	12726	6821	8175

[*] Includes heroin, cocaine, crack, speedball and crystal methamphetamine
[†] Any use in the past six months
[‡] Daily or greater use in the past six months

Results from analyses additionally suggested that socio-economic vulnerability appeared to mediate the relationship between high-intensity drug use and transitions into work, a finding that to the author's awareness has not been previously demonstrated. This result was confirmed during interviews. Respondents clearly described how exposure to drug scenes, housing instability, localized drug-seeking behaviour and the acquisition of a criminal record all impacted the experience of being able to undertake formal employment. Quantitative findings are supported by previous research (Kertesz et al., 2007; Koo et al.,

2007; Pager, 2003). They are also consistent with qualitative and quantitative research showing how deprived neighbourhoods shape individual behaviour, health-related vulnerability and labour market outcomes (Browning & Cagney, 2002; Diez Roux, 2001; Wilson, 1996). Importantly, research on drug scenes highlighted how drug-using milieus operate to isolate and push individuals towards harm (Bourgois & Schonberg, 2009; Fast, Small, Wood, & Kerr, 2009; Lovell, 2002; Mayock, 2002; Small, Kerr, Charette, Schechter, & Spittal, 2006). This finding represents a further contribution to this body of work.

Variation in individual motivations towards formal employment was an important dimension that shaped relationships between work and drug use. These motivations were governed by material interests, characteristics specific to the tasks, environments and outcomes of vocational activity, and the ways in which work occupies and structures time. These motivations were linked for many to the idea of avoidance. Work was cited as a means to evade what they perceived as the perils of boredom and idleness, less desirable forms of income generation, damaging drug use practices and exposure to drug scenes. To the author's knowledge, the current study represents the first time that out-of-treatment drug users' motivations to undertake work have been examined in detail.

6.3.3 What are the barriers to labour market participation among IDU?

Both quantitative and qualitative analyses suggested considerable barriers to labour market participation among IDU. It is important to note, that the idea of a barrier implies a causal relationship between the aim of an individual and an impediment to their achieving it. Given the limitations on causal inference from analyses of this type described in this thesis and elsewhere (Goldthorpe, 2007; Hill, 1965), these are therefore only suggestions of the relevant barriers inferred from results.

First and foremost among these was individual health status. HIV and HCV seropositivity were negatively associated with transitions in quantitative analysis. This is

consistent with previous studies where they have demonstrated a significant negative impact on labour market outcomes (Dray-Spira et al., 2006; Goldman & Bao, 2004; Lem et al., 2005; Worthington et al., 2012), particularly among those of lower socio-economic status (Dray-Spira, Gueguen, Ravaud, & Lert, 2007). Studies of the impact of HIV generally focus on employment loss, however, and this is, to the author's awareness, the first study of the uptake of employment among injection drug users who are potentially HIV positive. In qualitative analysis, participants consistently cited individual health, in many cases over and above ongoing drug use, as one of the principal reasons for being unable to undertake formal employment. While the limiting health conditions described by participants spanned a much larger range than HIV or HCV, these were both also cited as serious impediments.

Institutional barriers were also prominent. Individual relationships with social institutions were suggested in quantitative analyses and confirmed by interviewees' reports of these relationships as highly consequential. Intuitive and in line with previous research (Holzer, 2007; Pager, 2003) were the associations with recent incarcerations and descriptions of criminal justice system involvement. Less straightforward were many of the institutional barriers that stemmed from arrangements designed to support individuals and facilitate socio-economic activity. The counterintuitive negative association with MMT in quantitative analyses was expanded upon in qualitative interviews with conflicting opinions marking individuals' experience with methadone and addiction treatment more generally. A number credited it with the management and elimination opiate dependency. Others vehemently denounced both impacts on daily functioning and the role of regulations and sequestration in discouraging employment. Finally, the conditions surrounding social assistance receipt, while a crucial support for many individuals, also often made it difficult to consider labour market engagement, in part because support recipients stand to lose medical or other benefits that may cover the costs of methadone or addiction treatment (Blankertz et al., 2004; Zanis, Coviello, Alterman, & Appling, 2001). These provided support to the notion of

"unemployment traps" (Neale & Kemp, 2009) whereby terminating social assistance likewise terminates other publicly funded benefits, reinforcing incentives to maintain social assistance receipt.

Lastly, the accumulation of advantage or disadvantage across time served as an important determinant of employment. This was implied, in the first instance, by the strong association of previous employment transitions with current employment transitions found consistently across quantitative analyses. Research among the general population suggests important linkages between prior work experience or spells of unemployment and future labour market success (Arranz Muñoz & Garcia-Serrano, 2004; Böheim & Taylor, 2002; Corcoran & Hill, 1985). Additionally, individuals described the interconnection between drug use and work trajectories. This study innovatively identified catastrophic events as a phenomenon in which these trajectories collide, with serious deleterious impacts on both. A significant clinical literature exists on the prevalence of traumatic events and post-traumatic stress disorder (PTSD) in the general population (Breslau, Davis, Andreski, & Peterson, 1991; Helzer, Robins, & McEvoy, 1987; Norris, 1992) and drug using populations alike (Brown & Wolfe, 1994; Clark, Masson, Delucchi, Hall, & Sees, 2001), some of which also measure the impact of PTSD on addiction treatment (Mills, Teesson, Ross, & Darke, 2007) and employment outcomes (Smith, Schnurr, & Rosenheck, 2005). This finding provided further evidence of negative events as turning points in both drug use behaviour and employment pathways. It also challenged the notion of causal sequencing of drug use and labour market detachment as described in section 5.5.5; often these changes occur simultaneously.

6.3.4 How is work perceived and experienced by individual drug users?

This question was addressed by qualitative study. Conclusions pointed to inconsistent perceptions and experiences of labour market involvement. Some respondents had no interest in work, some had great interest but limited capacity, some were formally engaged with the

labour market and some described periods where each of these situations was relevant. Work histories, their relationship with drug use trajectories, and perceived capacities to engage in work were equally variegated across participants.

However, there were a number of common threads. The first was the importance of the *quality of employment*. In describing their work histories, individuals consistently pointed to work roles that held meaning for them as primary contributors to their willingness to seek out, undertake and maintain employment. The second common thread to individuals' experience and perceptions of work was related to the *qualities of employment*. The alignment of individual preferences with the characteristics of individual tasks and work environments generated a propitious relationship with employment. Where this alignment was absent, the inverse was true and perspectives on employment were characterized by disdain and antipathy.

While the positive relationship between job characteristics and job satisfaction is also true of the general population (Drobnič, Beham, & Präg, 2010; Grant, 2008; Hackman & Oldham, 1976; Kelliher & Anderson, 2008; Muñoz de Bustillo Llorente & Fernández Macías, 2005), the presence of active drug use adds a further dimension to the consequences of a lack of congruity between individuals preferences and their work environment. The experience of employment as a means of avoiding drug use, less desirable forms of income generation and exposure to drug use scenes described by participants, and the attendant harms associated with all of these, identified attachment to employment an important avenue for promoting well-being. This attachment may be weakened or threatened by incongruity as described above.

Finally, experiences of employment reflected the social functions of work as outlined by Jahoda (1982) and Warr (1994). The persistent complaint of boredom and a desire to participate in productive activity among select participants who were unable to work for drug- or health-related reasons spoke directly to the difficulties associated with idleness and a lack

of time structure. The connection of social activity during and outside of work hours with work colleagues was commonly appreciated, as were roles and activities that individuals felt were contributory. The importance of time structure, positive social experiences linked to employment, and work that provided a connection to a broader sense of purpose were all commonly described.

6.4 Public policy implications

If social supports and employment-oriented policies intend to support high-intensity drug users in the initiation or resumption of licit labour market participation, a key component for those actively using drugs will be to emphasize configurations of capability, motivation and opportunity that support this participation (Dillon et al., 2004; Magura et al., 2004; Sherman et al., 2006). The barriers to employment described here do not negate the potentially significant benefits of work for even high-intensity drug users, including improvements in physical and mental health, decreases in HIV- and other risk behaviour, beneficial changes in drug consumption patterns, improvements in socio-economic security and the acquisition of skills, pro-social roles or enhanced beliefs about employability (Magura et al., 2004; Neale & Kemp, 2009). Given the low rates of employment and employment transitions among inner-city, high intensity drug users in this context, an increased policy focus on socio-economic integration would serve to potentially reduce the high levels of marginalization and vulnerability of this population. An ongoing prioritization of opportunity creation for drug users in the DTES through local economic development would, for example, be crucial in this regard.

Interventions to support employment among this population may involve conventional features of vocational services, such as motivational counseling, job readiness training or supportive employment (Kidorf, Neufeld, & Brooner, 2004; Magura et al., 2004; West, 2008). However, there is a dearth of vocational rehabilitation services specific to drug-using

populations (Platt, 1995; Schottenfeld, Pascale, & Sokolowski, 1992; West, 2008), and their expansion is therefore a crucial policy proposal based on the conclusions drawn here. Designing employment supports and services to be compatible with individual characteristics, skills, job preferences and abilities will improve the chances of individuals maintaining employment over the longer term. As described earlier, all work is not created equal (Dillon, 2004; Gold, 2004). A further focus on accounting for specific substances and drug use patterns may be important, given the importance of these patterns found here and elsewhere (Alexandre & French, 2004; Bray et al., 2000; DeSimone, 2002; MacDonald & Pudney, 2000b) and the substance specific relationships with employment entries found in this thesis. Culturally appropriate supports for individuals who are socio-demographically disadvantaged may also be a key feature of efforts focused on the uptake and maintenance of employment.

The consequential role of structural barriers to employment described in this thesis suggest that any initiative geared toward increasing the labour market participation of IDUs will need to consider these complex relationships. The institutional barriers identified by qualitative work may be fruitful areas for policy-based supports. For example, restructuring social assistance programs to expand coverage of addiction treatment and services for low income individuals as well as those in receipt of social assistance may prove crucial to supporting both the recovery process and the engagement in employment. The integration of appropriate, tailored vocational supports or training opportunities with parole conditions or post-incarceration reporting requirements may also encourage the resumption of licit economic activity. For MMT, any programmatic adjustments that decrease the time demands and the mobility restrictions associated with MMT could have potentially positive impacts on the labour market participation of MMT-enrolled IDU. These adjustments could include the broader implementation of low-threshold programs for patients with the ability to assume responsibility for the care and safeguarding of methadone, expanding the hours of service of methadone dispensaries or allowing MMT clients to access multiple pharmacies through the

implementation of an electronic tracking system. Alternatives to MMT, such as thrice-weekly buprenorphine may also have the potential to improve labour market outcomes (Johnson et al., 2000; Mattick, Kimber, Breen, & Davoli, 2008; Parran et al., 2010).

Lastly, the significance of the broader environmental context in both quantitative and qualitative analyses points to the importance of integrating vocational supports and interventions with those that may minimize exposure to environment-based risk and harm. For example, ensuring adequate housing and other basic needs are fulfilled must be a component of any attempt at socio-economic integration. Harm reduction policies that support safer drug use facilities, including safe injection and crack use sites may be crucial in this regard (Broadhead, Kerr, Grund, & Altice, 2002; Kimber, Dolan, van Beek, Hedrich, & Zurhold, 2003; Wood, Tyndall, Montaner, & Kerr, 2006). Institutional regulations and interventions should be designed, implemented and evaluated with a view to minimize interference with licit social and economic functioning, thereby reducing incentives to informal or illegal income generation practices.

6.5 Suggestions for future research

This section outlines potentially fruitful avenues for further research. The focus is first on overcoming some of the limitations of the current study. In the second instance, lines of inquiry that may serve to answer some of the questions raised by this research are addressed.

6.5.1 Missing data and longitudinal research

Limitations in the chapter concerning missing data included an inability to examine MNAR patterns and the limited number of variables available for inclusion. Further research in this area might explore the correlates and causes of non-participation by incorporating items in the VIDUS questionnaire to explore, when and if respondents return to the study, the events, activities and circumstances that characterize their time or reasons for being away.

This strategy may be useful in further identifying the processes that produce missing data within this population. It would, however, only provide additional information about intermittent non-response, and would not address attrition.

Given the recent advances in multiple imputation software, there is also an opportunity for research work on the relative performance of different programs with this particular type of complex data. Amelia II (in R), Stata, REALCOM, and potentially others have all developed the capability to incorporate serial correlation into imputation methods, including, in some cases random slope specifications that permit person-specific variation across time. Comparisons of these programs could provide further guidance for studies involving high levels of observation-level non-response in terms of computational efficacy, diagnostic capability, and relative performance of imputation models.

Finally, the usefulness of the strategy examining the relationship between data structure and data content in assisting with the operational management of missing data warrants further exploration both in this and other research contexts.

6.5.2 Capability, motivation and labour market participation

Quantitative analyses of employment transitions were here limited by the absence of data measuring individuals' real and perceived capabilities to take on paid work, their motivation to engage in the labour market, and their actual participation in the job search process. While qualitative analyses attempted to pursue these questions in further detail, findings from semi-structured interviews are not generalizable to the VIDUS population as a whole; they nevertheless suggested, particularly in the case of individual health, that these assumptions are far from tenable. Additional questionnaire items measuring these particular aspects would therefore serve to assess these assumptions in a more statistically rigorous way. They would provide data that could (1) serve as a limiting conditional variable as a criterion for inclusion in future quantitative analyses (2) be used to explore other aspects of the labour

market engagement process, including transitions into and out of labour market participation, and (3) assess the need for and feasibility of additional vocational services.[54] The assessment of motivation among treatment-enrolled drug users is problematized by its complexity and the dynamics of so called "motivated" behaviour by drug users (Magura et al., 2004) and may be better understood through instruments designed to assess labour market participation capacities, motivations and involvement from the user's perspective.

6.5.3 Employment trajectories, health, drug use, and drug-related risk

While this thesis examined those things that predict a transition into employment, other components of employment trajectories and their relationship with drug use and drug-related risk warrant further attention. This line of inquiry may include research on the impact of moving into employment on changes in levels of drug use, the incidence of drug-related risk, and levels of socio-economic vulnerability. This work may also examine different aspects of labour market trajectories, such as entries and exits from labour market participation, transitions between jobs, or movement form work into unemployment. Of particular interest to the current study population is whether legal employment limits HIV risk behaviour and, as a consequence, decreases HIV incidence rates. The linkages between employment and HIV viral suppression and related health outcomes have not been fully explored. Further, improvements in the availability and effectiveness of highly active antiretroviral therapy (HAART) delivery in preventing HIV transmission (Cohen et al., 2011) have not translated into improvements in labour market participation (Goldman & Bao, 2004). There are additionally challenges in pursuing HIV treatment among drug using populations,

[54] To address these limiting assumptions, the following questions based on findings from qualitative analyses have been included in the most recent VIDUS follow up questionnaire:

1. At this time, would you be willing to take on any (additional) paid work?
2. If so, how often would you like to work?
3. If not, why not?
4. How many days a week would you be willing to work?
5. How many hours per day would you be willing to work?
6. What kinds of work would be desirable and possible for you to take on right now?

including structural barriers to expanding HAART to IDU (Wood, Milloy, & Montaner, 2012). Given the results of this thesis concerning the employment and drug use trajectories, a greater understanding of the relationship of these trajectories with disease severity, progression and management may be of crucial importance to the experience of diseases such as HIV or HCV.

6.5.4 Drug use and health across different types of income generation

The current study focuses uniquely on formal employment. Low rates of employment among VIDUS participants imply a range of other income generation strategies, and qualitative work identified the widespread receipt of social assistance, informal work and participation in sex work, drug dealing, street-based scavenging and acquisitive criminal activity. Each of these may involve the production and reproduction of risk associated with specific income generation milieus. As a result, the comparative impact of each type of income generation on individual health outcomes and socio-economic vulnerability may represent a fruitful avenue for future research. To the author's awareness, little work has been done comparing the health outcomes associated with different types of income generation. Non-comparative work has identified significant negative health risk associated with sex work participation (Blankenship & Koester, 2002; Shannon et al., 2008; Shannon et al., 2009), as well as engagement with the criminal justice system and incarceration (Binswanger et al., 2007; Kerr, Small, & Wood, 2005; Maher, 2004), the likelihood of which increases with involvement in drug dealing and other criminal activity. Understanding the characteristics of each of these different socio-economic milieus and their relative impacts on individual health, well-being and vulnerability may provide considerable evidence supporting increased vocational services.

6.5.5 Assessments of context in quantitative research

The importance of contextual exposures in quantitative research examining the relationship between drug use and work was one of the more important findings of this research. It suggests that, as has been found elsewhere in studies of neighbourhood effects on health (Browning & Cagney, 2002; Diez Roux, 2001; Hill et al., 2005), the structural disadvantage of deprived neighbourhoods has serious negative consequences on the socio-economic vulnerability and labour market prospects of residents. Given the absence of contextual considerations from studies in health economics (see Bray et al., 2000; Gill & Michaels, 1992; Kaestner, 1994 for examples), this may prove important to future studies of this relationship and may represent an important source of confounding in previous studies. Rather than attribute suboptimal employment outcomes to drug use alone, any analysis looking at the relationship between drug use and labour market outcomes should also examine broader contextual and environmental factors that may impact or mediate the drug use-labour market relationship.

6.5.6 Low-threshold employment programming

Given the low levels of formal labour market engagement documented in this thesis, strategies to bridge this population with appropriate labour market participation opportunities are badly needed. Reports of concurrent use and work among some high-intensity drug users provided preliminary evidence that there may be a place for low-threshold employment opportunities among IDU, where individuals are not required to be drug free to participate (Magura et al., 2004). Specific accommodations may involve decreased hours or the integration of health and social services in the work place. The accommodation of episodic absences from the workplace might also be a feature that encourages employment success, particularly for individuals with limiting health conditions or drug use patterns that result in periodic or cyclical inabilities to participate in employment.

Exploring supportive employment as both a potentially stabilizing force that reduces barriers to effective HAART utilization among this population and as a bridge to appropriate labour market participation is a promising line of inquiry in efforts to overcome these challenges. Increasing the availability of appropriate labour market participation opportunities may increase individual resilience, reduce vulnerability and decrease the broader social costs associated with addiction. A range of innovative labour market models that may be relevant to this population exist (Blankertz et al., 2004; Sherman et al., 2006; Silverman et al., 2007), but few do not require abstinence, and most cannot accommodate episodic absences from participation because of health or drug-use related reasons. Flexible, low-threshold employment interventions to increase labour market access for this population may prove a successful way to connect high-risk drug users with appropriate employment and the attendant benefits of labour market participation.

6.6 A final note

This thesis sought to contribute to a more nuanced understanding of the relationship between drug use and employment among IDU. In doing so it necessarily explored some of the potentially consequential methodological issues involved in longitudinal research among marginalized inner-city populations. Quantitative analyses took into consideration insights gained from detailed analyses of missing data, examining those characteristics, activities, exposures and circumstances that encouraged or discouraged transitions into formal employment. They were, however, further subject to data limitations surrounding individual capacities, motivations and activities regarding labour market participation. By embedding a qualitative study on the lived experience of employment within a larger longitudinal cohort study these data limitations were acknowledged as potentially consequential to the results of quantitative analyses. As a result of this methodologically focused, mixed methods approach, each chapter built on the previous chapter. While there was a common thread between them,

this work, taken as a whole, offers different but overlapping perspectives on research on the labour market experience of IDU.

This thesis made a number of methodological, theoretical and substantive contributions. First, it established the value of looking at missing data from more than a purely statistical perspective; the relationship between data structure and data content informs understandings of the processes that produce missing data, strategies to manage missing data and the operations of longitudinal research involving what can be unstable research populations. Second, it examined employment transitions using straightforward and intuitive methods. Third, it offered a mixed methods approach to identify systematic patterns in quantitative data, explicate some potential mechanisms that may explain these patterns and overcome some of the limiting assumptions of quantitative analyses. Fourth, qualitative analyses in and of themselves added to the literature on the employment experiences of drug users, and demonstrated heterogeneity in the compatibility of drug use with concurrent employment, individual motivations towards or away from labour market participation, and the perceived and real barriers to employment among IDU.

In closing, these results offer a challenge to conventional assumptions about the social and economic functioning of injection drug users. While drug use and drug-seeking behaviour may pose considerable impediments to labour market engagement, the impact of drug use on labour market outcomes may be conditioned by socio-demographic disadvantage, impacted by the design of health services and mediated by contextual exposures. This thesis confirms that the relationship between drug use and employment is complex; those who are able to engage in both apply very specific strategies in order to do so. IDU further face formidable barriers to formal labour market participation, and as a result, considerable pressures toward informal and illegal income generation practices. These results have implications for how we as a society view the exigencies of labour market participation for vulnerable. Focusing on employment amongst people who use illicit drugs speaks to the importance of income

generation to multiple aspects of people's lives, including, but not limited to, their drug use. This recognition calls for vocational services that increase the availability of and access to appropriate labour market participation opportunities in order to increase individual resilience, reduce vulnerability and promote what is a known determinant of health in the general population among IDU.

Appendices

Appendix 2.1: VIDUS Questionnaire Excerpts

The Vancouver Injection Drug Users Study (VIDUS)
Follow-up Questionnaire #17

CODE:_____ INTERVIEWER: _____

DATE OF INTERVIEW: **PLACE OF INTERVIEW (IF NOT VIDUS):**

_____ _____

PROBLEMS WITH INTERVIEW:

ALL RESPONDENTS
A: Current Demographics

A3. What type of place are you living in now?
- ❑**A**partment
- ❑**R**oom in hotel
- ❑**H**ouse
- ❑**S**helter/Hostel
- ❑**N**FA/Street
- ❑**T**reatment/Recovery House
- ❑**J**ail
- ❑**O**ther (specify: _____)

A4. What type of places have you stayed in during the past 6 months? (**A, R, H, S, N, T, J, O**)
- _____ Past month
- _____ 2 mon. ago
- _____ 3 mon. ago
- _____ 4 mon. ago
- _____ 5 mon. ago
- _____ 6 mon. ago

Note: If R, record which ones.

A5. What local neighborhoods or other cities have you lived in during the past 6 months?
- _____ Past month
- _____ 2 mon. ago
- _____ 3 mon. ago
- _____ 4 mon. ago
- _____ 5 mon. ago
- _____ 6 mon. ago

A6. What kind of relationship are you in right now?
- ❑Legally married/common law
- ❑Single (widowed, separated, divorced)

A7c). Over the last six months, what were your sources of income?

	At all: (*Check **all** that apply*)	**Most important:** (*Check **one only***)
READ OUT LIST		
❑A job or business with regular salary	❑	
❑Temporary work	❑	
❑Disability benefits	❑	
❑Welfare	❑	
❑Sex trade (self or partner)	❑	
❑Dealing	❑	
❑Non-legal sources (not dealing or sex trade)	❑	
❑Recycling	❑	
❑Pan handling	❑	
❑UI (unemployment)	❑	
❑Spouse/partner or relative s income	❑	
❑Under-the-table job	❑	
❑Other (specify:_____)	❑	
❑Other (specify:_____)	❑	

ALL RESPONDENTS
C: Injection Drug Use

C1. In the past 6 months, have you used a needle to chip, fix or muscle even once?
- ❑Yes
- ❑No If have not fixed, go to E1

C6. In the last 6 months, have you injected in any of the following places? **PROBE**

Ever READ OUT LIST Most

❑Own place (eg. room/apartment)	❑
❑Other person s place	❑
❑Street (alley, doorway, etc.)	❑
❑Bathroom (any public washroom)	❑
❑Park	❑
❑Dr. Peter Centre	❑
❑InSite SIS	❑
❑NAOMI	❑
❑Parking lot	❑
❑Other (specify:_____)	❑
❑Other (specify:_____)	❑

C9. In the past 6 months- when you were using which of the following drugs did you regularly inject and how often?

Show Prompt Card A

a) Heroin alone

❑Y ❑N	How often?	A	B	C	D	E	F	G	H	I	J

b) Cocaine alone

❑Y ❑N	How often?	A	B	C	D	E	F	G	H	I	J

c) Heroin and Cocaine (speedballs)

❑Y ❑N	How often?	A	B	C	D	E	F	G	H	I	J

d) Methadone

❑Y ❑N	How often?	A	B	C	D	E	F	G	H	I	J

e) Morphine (peeler)

❑Y ❑N	How often?	A	B	C	D	E	F	G	H	I	J

f) Amphetamines (speed, uppers)

❑Y ❑N	How often?	A	B	C	D	E	F	G	H	I	J

g) Talwin & Ritalin (Ts & Rs)

❑Y ❑N	How often?	A	B	C	D	E	F	G	H	I	J

h) Dilaudid (dilly)

❑Y ❑N	How often?	A	B	C	D	E	F	G	H	I	J

i) Other (specify:_____)

❑Y ❑N	How often?	A	B	C	D	E	F	G	H	I	J

ALL RESPONDENTS
C: Injection Drug Use (continued)

C12. In the past 6 months, did you go on runs or binges when you injected drugs more than usual?
- ❑Yes
- ❑No **If no, go to C16**

If yes:
How many times did you binge?
_____/month or _____/6 month
On average, how long do they last?
- ❑<1 day
- ❑1-2 days
- ❑3-5 days
- ❑5+ days

C16. Have you overdosed in the past 6 months?
PROBE
- ❑Yes How many times?_____
- ❑No **If no, go to C16l**).

If yes, when was the last time you overdosed?_____ (mm/yyyy)

What neighborhood? _____
What type of place? _____
Specific place? _____

C33. In the past 6 months, have you fixed with a rig that had already been used by someone else?
- ❑Yes
- ❑No **If no or unsure, go to C34**
- ❑Unsure/Can t Remember

If yes, how often?
- ❑Unsure
- ❑Once
- ❑2-5 times
- ❑6-10 times
- ❑11-100 times
- ❑over 100 times

Who have you shared a rig with?
Check all that apply:

Ever READ OUT LIST	**#of people**	**Most**
❑Your regular sex partner	_____	❑
❑A casual sex partner	_____	❑
❑Close friend	_____	❑
❑Casual friend/acquaintance	_____	❑
❑Family member	_____	❑
❑Someone you didn t know	_____	❑
❑Inmate	_____	❑
❑Other (specify: _____)	_____	❑
❑Unsure		

C35. In the past 6 months, have you lent your used rig to someone else?
- ❑Yes
- ❑No
- ❑Unsure

If yes, how often?
- ❑Unsure
- ❑Once
- ❑2-5 times
- ❑6-10 times
- ❑11-100 times
- ❑over 100 times

Who did you lend your used rigs to?
Check all that apply:

Ever READ OUT LIST	**#of people**	**Most**
❑Your regular sex partner	_____	❑
❑A casual sex partner	_____	❑
❑Close friend	_____	❑
❑Casual friend/acquaintance	_____	❑
❑Family member	_____	❑
❑Someone you didn t know	_____	❑
❑Inmate	_____	❑
❑Other (specify: _____)	_____	❑
❑Unsure		

ALL RESPONDENTS
F: Incarceration

F1. Have you been in detention, prison, jail or drug court in the last 6 months?
- ❑Yes
- ❑No If no or refused, go to J14B
- ❑Refused

ALL RESPONDENTS
J: Sexual Activity

J13. Have you been paid for sex in the last 6 months?
- ❑Yes
- ❑No **If no, go to T1**

If yes, what kind of sex do you have with your regulars?

	Frequency #/wk #/mo #/6mo	Condom use **PROBE**	Always
			Usually
❑Vaginal			Sometimes
❑Oral			Occasionally
❑Anal			Never

If yes, what kind of sex do you have with you're the rest of your clients?

	Frequency #/wk #/mo #/6mo	Condom use **PROBE**	Always
			Usually
❑Vaginal			Sometimes
❑Oral			Occasionally
❑Anal			Never

ALL RESPONDENTS
T: Drug or Alcohol Treatment

T1. In the past 6 months, have you been in any kind of alcohol or drug treatment (including methadone)?
- ❑Yes
- ❑No **If no, go to T2**

If yes, what kind?
READ OUT LIST

Length of time in treatment
- ❑Detox/Youth detox _____
- ❑Recovery house _____
- ❑Treatment centre _____
- ❑Counselor _____
- ❑NA/CA/AA _____
- ❑Methadone program _____
- ❑Other (specify:_____) _____

If yes, why did you enter treatment?
READ OUT LIST
- ❑Wanted to stop drugs myself (own choice)
- ❑Health reasons
- ❑Convinced by family, friends, doctor, etc.
- ❑Coerced/forced by doctor
- ❑Coerced/forced by police, courts, etc.
- ❑Other (specify:_____)
- ❑Elected DTC

Appendix 2.2: Psychoactive Substance Profiles

Heroin[55]

Heroin (diacetylmorphine) is a highly addictive opiate. It is processed from morphine, a naturally-occurring substance extracted from the opium poppy - *papaver somniferum* - a plant indigenous to the Middle East and Southeast Asia. Heroin was synthesized from morphine in 1874 by the pharmaceutical company Bayer and was touted as a safer, non-addictive form of morphine. It became a widely used drug in cough medicines and a variety of other ailments. By the beginning of the twentieth century, heroin was understood to be highly addictive and in 1914 was banned in the U.S. as part of the Harrison Narcotics Act.

Heroin is most often injected intravenously for a quick and potent high, but there is a rising segment of users who sniff, snort, and smoke heroin. Heroin is a highly addictive drug regardless of the route of administration, and works as a central nervous system depressant. After taking heroin, the user reports feeling a surge of euphoria (or a "rush") accompanied by a warm flushing of the skin, a dry mouth, and heavy extremities. Mental functioning becomes clouded due to the depression of the central nervous system.

For addicted heroin users, withdrawal may occur within a few hours after the last administration, producing negative effects such as drug craving, restlessness, muscle and bone pain, and vomiting. Methadone and Buprenorphine, both semi-synthetic narcotic opiates, were developed as a way to minimize the drug's severe withdrawal symptoms. Many users continue using the drug even after they no longer experience the euphoric effects to avoid withdrawal symptoms.

Cocaine

[55] The substance profiles for heroin, cocaine and crack are adapted from drug information pages provided by the Centre for Substance Abuse Research (CESAR) of the University of Maryland at www.cesar.umd.edu/cesar/drug_info.asp, the National Institute of Drug Abuse (NIDA) at www.nida.nih.gov/DrugPages.html and the United States Office of National Drug Control Policy at http://www.whitehousedrugpolicy.gov/drugfact/index.html.

Cocaine is an addictive stimulant that heightens the body's activity, including increases in energy, alertness, heart rate, and blood pressure. The form of cocaine that is commonly used is a white powder obtained from the leaves of the *erythroxylon coca* plant, which is commonly chewed in everyday activities and religious rituals in many South American cultures. Cocaine first appeared as a surgical anaesthetic and soon became a common household drug, as well as an ingredient in Coca-Cola and in several types of wines. Cocaine was banned in 1914 as a result of the Harrison Act, but recreational use of cocaine remains popular.

The most common method of use is snorting but cocaine can also be injected intravenously, ingested orally, or even rubbed on the user's gums. Cocaine is a strong central nervous stimulant that interferes with and causes excess amounts of dopamine in the brain, which is a neurotransmitter related to pleasure and movement and is primarily associated with the brain's reward system. Users generally experience feelings of euphoria while under the influence of cocaine and may crave the drug after the effects have worn off.

Cocaine users can quickly develop a tolerance to the drug. Withdrawal symptoms may occur when use stops, and may include depression, irritability, extreme fatigue, anxiety, and drug cravings. In contrast to frequent heroin injectors who generally require two to four daily injections to avoid withdrawal symptoms, individuals who inject cocaine frequently report 10-12 daily injections. In addition, of all modes of consumption, cocaine injectors report having used cocaine more frequently, in higher doses and for longer periods of time. Further, cocaine taken by injection is associated with the highest levels of dependence of all modes of administration (Gossop, Griffiths, Powis, & Strang, 1994).

Crack Cocaine

"Crack" is the name given to cocaine that has been processed with baking soda or ammonia, and transformed into a more potent "rock" form. Crack cocaine is the most potent form of cocaine and was developed during the cocaine boom of the 1970's. Its use became

popular in the mid-1980s, particularly in urban areas. It is easy to produce and less expensive to consume than powder cocaine. It is most commonly smoked can also be injected intravenously or snorted.

Crack cocaine is a strong central nervous stimulant that causes excess amounts of dopamine to be released in the brain. As a result, the psychological effects can be extremely reinforcing. Crack brings an intense and immediate but very short-lived high that lasts about fifteen minutes.

Crack cocaine is substantially more addictive and potent than powder cocaine. Withdrawal symptoms occur when the drug's effects wear off and can include depression, irritability, extreme fatigue, anxiety, an intense drug cravings and psychosis.

Speedballs[56]

The combined use of heroin and cocaine, or "speedballing," is a long-established practice that dates back to the 1930s. Speedballing involves the simultaneous injection of heroin and cocaine. People who inject speedballs report that the effect sought is the rush or "flash" of cocaine injection combined with the mellowing effect of heroin. In the past, those who used speedballs were most likely drug users whose primary drug was heroin and in early ethnographic studies of drug use, concurrent use of cocaine among heroin users ran as high as 50-73 percent, predominantly in the form of speedballs. The use of speedballs is now more prevalent among a range of drug users, though remains more common among long-term heroin injectors. Clinical studies have observed enhancement of subjective responses produced by speedball compared to either substance alone, although very little is known about the neurobiological-specific effects of using the two in combination.

[56] The substance profile for speedballs is adapted from drug information pages provided by the Centre for Substance Abuse Research (CESAR) of the University of Maryland at www.cesar.umd.edu/cesar/drug_info.asp, a *Pulse Check* report on trends in drug abuse from the Office of National Drug Control Policy (ONDCP) at www.whitehousedrugpolicy.gov/publications/drugfact/pulsechk/summer98/speed.html and a report from a National Institute on Drug Abuse (NIDA) symposium on the combined use of heroin and cocaine (Rowlett et al., 1997).

Appendix 2.3: Considerations of validity in qualitative research

Qualitative techniques, while providing increased ecological validity over quantitative methods, are less able to fulfill the classic scientific requirements of reproducibility and generalizability (Martin & Stenner, 2004). This is in part because they utilize more opportunistic sampling techniques, have smaller sample sizes, and often lack clearly formulated procedures and conventions (Neale et al., 2005). As such, they compromise breadth and scale for depth and specificity. Qualitative methods, by design, are sensitive to the people and places under study and the political, social and cultural context of the researcher(s) (Creswell, 2009; Harling, 2007), and as a result, qualitative research findings can be interesting, illuminating, and erroneous (Miles & Huberman, 1994). In research among active drug users, additional consideration of the accuracy of responses are often called for given the high possibility for recall bias (Neale et al., 2005), though this potential bias is equally relevant to quantitative work. Previous research on the validity of self-report among drug users has provided equivocal results (Darke, 1998; for reviews, see Magura & Kang, 1996), though examinations of validity among community recruited research participants has found that self-reported drug use in not-in-treatment, non-institutionalized populations and highly correlated with toxicological findings, and reports of risk behaviour demonstrate high reliability (Darke, 1998; Fendrich, Johnson, Sudman, Wislar, & Spiehler, 1999; McElrath et al., 1994; Weatherby et al., 1994). As with all studies, attention to the validity of data, threats to that validity, measures taken to improve validity and the limitations on inference because of questions to validity are of considerable importance.

The debate surrounding validity in qualitative research refers to both the tension between qualitative and quantitative concepts of validity and the appropriate criteria for validity in qualitative studies. The following section outlines some of the salient features of these debates for the current project and summarizes how considerations of validity have been incorporated into research design and procedures. This task stems from a recognition that

standard quantitative definitions of validity – strictly, that measures reflect only the desired construct without contamination from other systematically varying constructs (Hoyle, Harris, & Judd, 2002), or more generally, the truthfulness of findings (Altheide & Johnson, 1994) – are not appropriately applied to research that explicitly incorporate subjective experiences, perceptions and interpretations of the research context, participant and researcher. The problem of validity in qualitative research is therefore anchored in the necessity to incorporate both rigor and subjectivity into the scientific process (Whittemore et al., 2001). Claims that it is possible and crucial to develop standards of validity in qualitative research that cross perspectives (Eisner, 1991; Miles & Huberman, 1994; Sandelowski, 1986) accompany calls for methodological and technical procedures essential to guard against the researcher from conjuring up concepts and theories that do not authentically represent the phenomenon of concern (Hammersley, 1992).

Whittemore et al. (2001) review existing research and provide primary and secondary criteria for validity in qualitative research. Primary criteria, necessary to all qualitative inquiry but insufficient in and of themselves include: (1) credibility, which encompasses efforts to establish confidence in accurate interpretations of the meaning of the data (Lincoln & Guba, 1985; Thorne, 1997); (2) authenticity, involving attempts to remain true to the meanings and experiences that are lived and perceived by participants (Hammersley, 1992; Sandelowski, 1986); (3) criticality, which includes systematic research design, critical assessment of data interpretations and guards against conjecture (Marshall, 1990; Whittemore et al., 2001); and (4) integrity, which refers to checks ensuring that interpretations are responsibly grounded within the data and situated as interpretations of the investigator(s) (Ambert, Adler, Adler, & Detzner, 1995; Johnson, 1999; Thorne, 1997).

A number of steps were taken in the design and execution of the current study to mitigate threats to these primary criteria. The criteria of credibility and authenticity both speak to the concepts of descriptive and interpretive validity (Maxwell, 1992), and in the

current study were attended to by an explicit analytical strategy of adapting research tools and procedures to approach, in as much as was possible, the experiences of respondents. This included the changes to the topic guide described above to minimize the interference of any perceived social expectations or criticism. It also involved follow up questions about respondent's opinions of the importance of meaning of their own and others' decision-making processes related to income generation. This was motivated by a developing awareness of the culturally- and community- situated goals surrounding local status, community membership and health that would often influence individuals' perceptions of their money-related activities. Analysis that explicitly avoided extrapolating meaning outside of interview data also contributed to maximizing the credibility and authenticity of the data produced and its interpretation. A systematic research design whereby each interview was undertaken with the same topic guide, in the same setting, with the same researcher in the room for all interviews ensured against procedural distortions related to the variation in the research setting. Within interviews, an explicit strategy to parrot interpretations of individual experience back to respondents and ask them for their reactions to the interviewer's understanding of what they were expressing guarded against conjecture. In the interpretation of data, a concerted effort to critically reflect on alternative hypotheses and explore negative and outlying instances promoted the criterion of criticality. Finally, recursive and repetitive checks of interpretations conducted by verifying understandings of the meaning of the data with more experienced researchers, field office employees and research participants promoted integrity within the data analysis process.

Secondary criteria for validity identified by Whittemore et al. (2001) provide further benchmarks of qualitative research quality and are more flexibly applied to and vary between particular investigations. Most salient to the current study are the criteria of explicitness, thoroughness, and sensitivity. Explicitness refers to the ability account for methodological decisions, the interpretive effort of the investigator and the explicit presentation of results as

evidence for inferences and conclusions (Ambert et al., 1995; Marshall, 1990; Sandelowski, 1986). All three were undertaken as components of the current study. Thoroughness encompasses sufficient and appropriate sampling and data analysis (Popay, Rogers, & Williams, 1998), consistency and saturation in data collection, various techniques to check data quality, and the development of convincing answers to data questions (Whittemore et al., 2001). Attention to sampling issues, consistency in the research milieu, repeated data quality checks, all of which are described above, have been incorporated into the current study to this end. Finally, qualitative interviews were adapted in ways that account for the specific cultural and social specificities of the research context, a key component of the criterion of sensitivity (Altheide & Johnson, 1994). Lincoln (Lincoln, 1995) further calls for a demonstrated concern for human dignity and respect for participants. A commitment to enshrine the dignity of respondents is evidenced by sensitivity to respondents' potential to perceive condescension or judgment because of the topic of the interviews and consequent adjustments to the interview guide, alongside fair remuneration for the cost and time required for study participation. While the assessment of validity in qualitative research remains a debated topic, steps to promote the validity of findings, measured against established criteria for validity played a central role in the conceptualization, design, execution of the current project.

Appendix 2.4 Qualitative information sheet and consent form



British Columbia Centre *for* excellence *in* HIV/AIDS



Providence Health Care, St. Paul's Hospital,
The University of British Columbia and the
Ministry of Health, British Columbia, Canada

Department of Sociology,
University of Oxford
Oxford, UK

Exploring the Natural History of Injection Drug Use:
A Qualitative Study of Social and Environmental Influences

Project name:Exploring employment and its impacts among people who inject drugs

Principal Investigator:	Dr. Thomas Kerr, BC Centre for Excellence in HIV/AIDS
Project Researcher:	**Lindsey Richardson BC Centre for Excellence in HIV/AIDS and the Doctoral Candidate, University of Oxford (604 806 9142)**
Co-investigators:	Dr. Evan Wood, BC Centre for Excellence in HIV/AIDS Dr. Mark Tyndall, BC Centre for Excellence in HIV/AIDS Dr. Will Small, BC Centre for Excellence in HIV/AIDS Dr. Jo-Ann Stoltz, BC Centre for Excellence in HIV/AIDS
Study Sponsor:	Canadian Institutes of Health Research (CIHR)

Introduction

We would like to invite you to participate in this qualitative research project because your particular experiences as an injection drug user are of great interest to us, and we would like to discuss them with you.

Voluntary Participation and Withdrawal

It is up to you to decide whether to participate in this project. If you refuse, you will not be denied access to any other BC Centre for Excellence research projects you may be participating in or to any other medical services you may be accessing through Providence Health Care. Even if you agree to participate now, you can still change your mind in the future, without having to give any reason. The researchers may also decide to discontinue the study at any time, or withdraw you from the study at any time, if they feel it is in your best interest.

Background

Injection drug use leads to many health and social problems in Canada. The public health problems which result from injection drug use include fatal overdoses, the transmission of blood-borne viruses (including HIV and HCV), and soft-tissue infections (such as abscesses). Additionally, injection drug use has a wide range of social impacts upon both individuals and communities.

Vancouver is home to one of the largest populations of injection drug users in Canada. While Vancouver has previously experienced a major public health crisis among injection drug users, the city is currently the location of innovative interventions to reduce the harm associated with the injection of illicit drugs. This research project is being conducted by researchers at the BC Centre for Excellence in HIV/AIDS and is part of a larger ongoing program of research into injection drug use. The principal investigator for this study is Dr. Thomas Kerr.

Your participation is voluntary. It is up to you to decide whether or not to take part in this research by being interviewed.

Purpose of This Study

The objective of this study is to generate qualitative information on the behaviours and social processes that surround injection drug use in Vancouver. There are many topics related to your life experiences as an injection drug user that we wish to discuss with you further, including: addiction treatment, medical care (including HIV and HCV treatment), drug use patterns, injecting practices, access to harm reduction services, and the impact of social stigma related to drug use. Depending on your particular circumstances, we may also wish to ask you about incarceration, work history, income generation, and day-to-day activities.

The purposes of this study are to:

- increase scientific understanding of the health and social consequences of injection drug use, with a particular focus on the impact of injection drug use on employment, income generation and time use
- help devise health and social programs for injection drug users
- improve the health of injection drug users
- reduce the harms associated with injection drug use
- reduce health, social, and legal costs associated with drug use

The researchers hope to use the results of the study to advocate for improvements in the delivery of health care, harm reduction and social services for injection drug users in Vancouver.

Research Design

This study will make use of a variety of ethnographic and qualitative data collection techniques, including semi-structured interviews where questions will be used to guide the discussion. Signing this consent form means you are agreeing to participate in qualitative interviews.

Semi-Structured Interviews

As part of the research project, we would like to interview you. If you agree to take part in this research, you will be asked to sign and date this consent form before the interview will take place. During the interview, which takes about 30 to 90 minutes, you will be asked about your life experiences and injection drug use. Your interview has three parts:

- a series of questions that asks you about your work status and history, how you make money, your attitudes and beliefs about formal and informal work, and your thoughts and experiences about the social and psychological benefits associated with work

- the reconstruction of a period of a few days where an interviewer walks you through your day-to-day activities
- a short questionnaire on your general health status

The interview will be tape-recorded and later transcribed (typed out) onto paper. All identifying information about you will be removed from the interview transcript. You have the right to refuse to answer any question.

Follow-up

You *may* also be asked to participate in follow-up interviews in the future, so we are also asking for your permission to try to find you if you are selected for further qualitative interviews. If you agree by signing the consent form, research staff will try to reach you at your last known address, email address or telephone number. Staff may also try to reach you through agencies that you access, such as the needle exchange or Insite.

Risks

There is no direct risk associated with your participation in this study. However, your injection practices may put you at risk for HIV and HCV infection as well other drug related harms, including bacterial infections and overdoses.

The risks associated with being interviewed may be related to your feelings when answering the questions. This could possibly cause a negative emotional response. You may refuse, for any reason, to answer any questions that make you feel uncomfortable, and there will be no consequences for refusing to answer any questions. If you want to talk or seek services after being interviewed, you may ask the interviewer for assistance, and the interviewer may ask if you need help if he or she thinks you are having difficulty.

Benefits

The research team will not be able to offer you addiction or medical treatment but can refer you to appropriate treatment services if you request. You will receive $20.00 at the end of your interview for your participation.

Confidentiality

Your confidentiality will be respected. Information that reveals your identity will not be released without your consent unless required by law or regulation. However, research records and medical records identifying you may be inspected, in the presence of the investigator or his or her designate, by representatives of Health Canada and the UBC/PHC Research Ethics Board for the purposes of monitoring the research. No records that identify you by name or initials will be allowed to leave the investigator's office.

Data Storage

All information obtained during the course of the study will be kept confidential. Records containing identifying information will be kept in a secure database in a locked and secured office at the BC Centre for Excellence in HIV/AIDS. All information contained in electronic databases will be password-protected. All consent forms, audio tapes, and interview transcripts will be kept in a locked filing cabinet within the research office. Only the principal investigator and research staff will have access to the information obtained during the course of this study.

The maintenance of the confidentiality of the information you provide as a part of your participation in the study is subject to normal legal requirements of confidentiality.

If You Have Questions

If you have any questions or concerns about this study, you can contact Dr. Thomas Kerr at 604.806.9116.

Your Rights

By signing the consent form, you in no way give up any of your rights and you do not release the study doctors or other participating institutions from their legal and professional responsibilities.

This research project has been reviewed by and received ethics approval from the University of British Columbia/Providence Health Care Research Ethics Board and University of Oxford Central University Research Ethics Committee.

If you have concerns about your rights as a participant in this research, contact Dr. Ingrid Fedoroff, Chair, UBC Providence Healthcare Research Ethics Board, at 604-682-2344, extension 62325.



British Columbia Centre
***for* excellence *in* HIV/AIDS**



Providence Health Care, St. Paul's Hospital,
The University of British Columbia and the
Ministry of Health, British Columbia, Canada

Department of Sociology
University of Oxford
Oxford, UK

Exploring the Natural History of Injection Drug Use: A Qualitative Study of Social and Environmental Influences

Project Title: Exploring employment and its impacts
Principal Investigator: Dr. Thomas Kerr, BC. Centre for Excellence in HIV/AIDS

Please Initial Box

1. I confirm that I have read and understand the study information sheet (Version 2, Dated 2010-06-09) and have had the opportunity to ask questions which have been answered fully ☐
2. I understand that my participation is voluntary and I am free do withdraw at any time by notifying the researchers of this decision. I understand that I am free to withdraw without giving any reason, without penalty, and without my medical care or legal rights being affected. ☐
3. I understand that only the principal investigator and research staff will have access to the data I provide for this study, that data will be stored in a locked cabinet at the B.C. Centre for Excellence in HIV/AIDS; and that information will be destroyed after 5 years.. ☐
4. I that if I have any questions or concerns about my participation in the study.that I can contact Dr. Thomas Kerr at 604.806.9116. ☐
5. I understand that this project has been reviewed by, and received ethics clearance through the University of Oxford Central University Research Ethics Committee. ☐
6. Compensation arrangements have been discussed with me. ☐
7. I agree to participate in this qualitative interview process, give my permission to be contacted for potential follow-up visits and acknowledge receiving a copy of this form. ☐

Signature of Participant	Printed Name	Date

Signature of Principal Investigator/Designate	Printed Name	Date

Appendix 2.5: Qualitative Topic Guide

QUALITATIVE INTERVIEW GUIDE
Exploring employment and its impacts among people who inject drugs

The purpose of this interview is to explore your experiences related to work, making money and how you use your time. Unlike some interviews you may have done with us, this interview is designed to be more like a conversation. I'll ask you some general questions in order to open up a discussion of your personal experiences. The interview will last about one hour.

There are no right or wrong answers. I'd ask you to be honest and open, and please remember that what you say is confidential. The interviews will be audio-recorded and transcribed, but all names will be removed from the written transcripts. If you don't feel comfortable answering a question, or don't want to answer, that's not a problem. Also, if you have any questions or need more clarification on any of the questions , please do not hesitate to ask. Your views are important to us, and we are very interested in hearing about your experiences.

Topic Area: Introductory Questions	
Questions	**Probes**
▪ Where are you living right now?	▪ Where are you staying or sleeping currently? ▪ How long have you been living there? ▪ Do you have plans to stay there or move? ▪ How do you feel about where you are living? What is it you do or don't like?
▪ What kinds of drugs are you taking? ▪ Anything else you're taking? Is that the only thing you're doing? ▪ What about prescription drugs, are you taking any of those? Which ones? What for?	▪ How often are you taking drugs? How long have you been taking them? ▪ How are you taking them? Are you injecting? Smoking? Snorting? Ingesting? ▪ Have there been any major changes in your drug use patterns recently?
▪ How are you making money right now?	▪ Do you have a job right now? What is it? ▪ How often are you working (hours/day; days/week)? ▪ How much money are you making right now? ▪ Could you tell me what you like about it? Could you tell me what you don't like about it? ▪ Are you collecting social assistance benefits at the moment? Is it DB I? DBII? ▪ Are you getting money informally right now? (i.e. by binning, panhandling, drug dealing, sex work,

	etc.) Anything else you like to do to make a little money? ▪ Is there nothing else you're getting income from?

I'd now like to ask you about your experiences and opinions on making money, work and employment. I'd like to start by asking questions about your past work experiences.

Topic Area: Employment History	
Questions	**Probes**
▪ How have you made money in the past?	▪ What have you done for money before?
▪ Have you had formal jobs in the past? ▪ What other jobs have you had in the past?	▪ Starting from when you left school, what were the jobs you've had in the past? ▪ When did you have these jobs? How long did they last? Who did you work for?
▪ Of all the jobs you've had –which was your favourite? What did you like about it? What was your least favourite job? What didn't you like about it?	▪ Can you recall a job you enjoyed or found satisfying? ▪ Can you recall a job you didn't enjoy or find satisfying? ▪ Are there other pros and cons of these jobs?
▪ Everyone experiences unemployment at points in their life. Can you recall times in the past when you would like to have been working but weren't?	▪ What was going on in your life when you weren't working? ▪ What was the reason you weren't working? ▪ In the past, what have you done for money when you weren't working? ▪ When you weren't working, what did you miss aboutit? What didn't you miss aboutit?
▪ Have you ever done a bit of work off the books? Do you have other informal sources of money?	▪ Have you ever 'worked under the table,' where you had a regular job, for example in construction, but weren't "officially" employed)? ▪ What did you do? ▪ Does this informal source of money keep you from looking for a more regular job? If so, why?
▪ Have you ever moved around for work? Where did you move? What kind of work was it?	▪ Have you lived in other places so you could have a job? Have you ever chased a job somewhere else? What was the job?

Next I'd like to ask you about what you think about having a regular job.

Topic Area: Attitudes about formal employment	
Questions	**Probes**
▪ What are your main reasons for working?	▪ What things are going on in your life when you are working? ▪ Are there reasons why you work aside from making money? What are they?
▪ What are you main reasons for not working?	▪ What things are going on in your life when you're not working?
▪ Would you say that work fits with your life right now? Why do you think that is?	▪ Do you feel like there is enough time in your life right now to have a job? ▪ Do you feel like your other activities make it possible to have a job? ▪ If not, what would need to change? ▪ What things do you think would prevent you from taking a job right now?
▪ In an ideal situation, what would you do for work?	▪ If you could have any job you like right now, what would you do? ▪ What would be your ideal way to make money? ▪ How many days per week would you like to work? How many hours? ▪ What would be an acceptable wage to you?
▪ If you could choose between working and not working, what would you choose?	▪ Do you think that having a job is a worthwhile thing to do with your time? Why or why not?

Topic Area: Barriers to getting a job	
Questions	**Probes**
▪ What kinds of things impact whether or not you have a job or work?	▪ Do you have health issues that affect your ability to work? (e.g., arthritis, pain, mobility, etc.) Can you tell me about them? ▪ Are you enrolled in addiction treatment right now? Do you think this would help you to get a job? Is so, how? If not, why? ▪ Is your housing situation good enough so that you could have a job? Why or why not? ▪ Have the conditions of any criminal justice involvement such as parole or probation interfere with your ability to work? Why or why not? ▪ Do you have a criminal record? Does having one make getting a job harder? How? Would employers ask about it?

	What do you think would happen if an employer found out about your drug use?
▪ Has there been a time when your drug use interfered with you employment? If so, can you tell me what happened?	▪ What about when you're using, do you think that affect whether or not you have a job? How? ▪
▪ Does having a job affect your drug use?	▪ Do you use more or less at times when you're working compared to times when you're not working? ▪ Do you change the way you use drugs? When you use? The frequency? Who you use drugs with? How so?
▪ What other commitments or responsibilities do you have that could interfere with your ability to work? Why do they do so?	▪ Do you do any drug dealing, steering, holding or other job in the drug trade? How does this influence whether or not you have a job? ▪ Are you currently taking methadone? Do you think methadone makes working easier or harder? Why or why not? ▪ Are you looking after someone, like a child, parent, or partner that needs a lot of help? How does this affect your ability to work?

In the second section, I'd like to ask you some questions about your financial situation

Topic Area: Financial Strain	
Questions	**Probes**
▪ Do you generally make enough money to meet your needs? Is your DB/Income enough to make it through the month?	▪ What do you do if you're short on money these days? ▪ Who would you borrow money from if you needed to?
▪ What are your major expenses?	▪ What things do you need money for right now?
▪ Thinking back over the last month, how often have you had money problems?	▪ How often do you worry about money?

Now I'd like to ask you a few more general questions about your activities, your role in your community and your social relationships.

Topic Area: Activity	
Questions	**Probes**
▪ What are you spending most of your time on? Can you describe the things that you spend most of your time on?	▪ What would a typical day look like for you? ▪ Do you ever feel bored or that you don't have enough to do? Can you describe such a time?

	▪ Do you ever feel rushed or that you have too much to do? If so, can you describe such a time?

Topic Area: Time structure	
Questions	**Probes**
▪ What sort of things do you *have* to do on a daily basis?	▪ Do you have activities that you must do on every day? Are they important to you? Why? ▪ How do you decide what to do with your time?
▪ Do you have things that you're responsible for? What are they?	▪ Are there people in your life that rely on you to turn up for things? Who are they? What do they rely on you for? ▪ Can you describe things that you have to do at specific times in the day?

Topic Area: Social Contact	
Questions	**Probes**
▪ Who do you like to spend time with? In addition to those you've mentioned, are there any other friends or people you would see regularly?	▪ Who do you spend your time with? Are they family? Friends? Workmates? How do you know them? ? ▪ Most days, do you meet a range of people?
▪ What do you do with your friends?	▪ Can you describe the time that you spend with your friends? ▪ Are your friends important to you? ▪ Do you think that you are important to them?
▪ Have you ever hung out or socialized with people you worked with?	▪ Can you describe these times? ▪ Did the relationships you had with these people last after you changed jobs or work situations?

Topic Area: Collective Purpose	
Questions	**Probes**
▪ Does having a job change the way you that you think about your relationships with others? What about how you feel about yourself?	▪ Think back to a time when you were working in a regular job. Does having a job change the way you feel about things? How?
▪ Do you feel like you contribute to the people around you? Does this change depending on whether or not you have a job?	▪ Are you doing things that need doing by someone? Why or why not? ▪ Does what you're doing have value for other people? How? ▪ Can you describe how things that you're involved in are useful for other people?

	▪ [sensitive probe: Is there demand for the things that you do? Do you have a good sized clientele?]
Topic Area: Social Standing	
Questions	**Probes**
▪ Do you feel like you're a member of a community? Can you describe your community?	▪ What do you think your community is? What role do you have in your community? ▪ Does your role change depending on whether or not you have a job? ▪ Do you feel like people in your community treat you with respect? ▪ Can you describe a time when you felt respected or disrespected by someone in your community?
▪ Did having a job affect how you felt about being a member within the community or how others treated you? If so, how?	▪ Can you tell me about a time when you felt like you were treated differently because you were working?
▪ How do you feel about the people that you come across outside your circle of friends and family?	▪ Does the way you feel about people outside your circle of friends and family change depending on whether or not you have a regular job? How so?

Table A.1 (1) Wave-by-wave logistic regression predicting the start of an observation gap at next wave

Variable	Pooled – all waves		Baseline		Wave 1	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% C
Age	0.97***	(0.96 - 0.97)	0.97**	(0.96 - 0.99)	0.97**	(0.95 - 0.99)
Female Gender	1.06	(0.89 - 1.27)	1.52*	(1.06 - 2.19)	0.83	(0.52 - 1.30)
Aboriginal Ethnicity	0.76**	(0.64 - 0.91)	0.63*	(0.45 - 0.91)	1.02	(0.67 - 1.56)
Marital Status	0.90	(0.77 - 1.05)	1.00	(0.70 - 1.42)	0.54*	(0.34 - 0.88)
DTES Resident	0.52***	(0.45 - 0.60)	0.78	(0.56 - 1.07)	0.58*	(0.39 - 0.88)
Regular Job	1.12	(0.90 - 1.40)	0.91	(0.47 - 1.78)	1.35	(0.65 - 2.80)
Temporary Job	0.86	(0.73 - 1.02)	0.91	(0.55 - 1.50)	0.59	(0.33 - 1.05)
Nonlegal Income	1.01	(0.86 - 1.19)	1.33	(0.93 - 1.90)	0.90	(0.58 - 1.41)
Social Assistance	0.77**	(0.64 - 0.92)	0.89	(0.60 - 1.33)	0.79	(0.44 - 1.43)
Sex Trade Involvement (6 mo)	1.20	(0.99 - 1.47)	1.14	(0.77 - 1.68)	1.15	(0.67 - 2.00)
Unstable housing (6 mo)	1.00	(0.86 - 1.15)	0.91	(0.66 - 1.25)	0.71	(0.47 - 1.07)
Incarceration (6mo)	1.49***	(1.29 - 1.72)	1.11	(0.82 - 1.51)	1.32	(0.90 - 1.93)
Binge Drug Use (6 mo)	1.03	(0.90 - 1.20)	1.16	(0.87 - 1.54)	0.95	(0.65 - 1.39)
Shooting Gallery Use (6 mo)	1.46***	(1.24 - 1.71)	1.03	(0.75 - 1.41)	1.06	(0.65 - 1.76)
Fix with other People (6 mo)	0.93	(0.79 - 1.09)	0.67*	(0.50 - 0.91)	1.08	(0.72 - 1.62)
Non-Frequent injection (6 mo)	1.14	(0.93 - 1.41)	1.05	(0.78 - 1.43)	1.11	(0.53 - 2.34)
Frequent injection (6 mo)	0.99	(0.81 - 1.22)	0.98	(0.72 - 1.32)	0.89	(0.43 - 1.85)
Non-frequent Crack Use (6 mo)	0.87	(0.74 - 1.01)	0.90	(0.66 - 1.23)	0.87	(0.57 - 1.34)
Frequent Crack Use (6 mo)	0.73***	(0.61 - 0.86)	0.59	(0.32 - 1.07)	0.67	(0.38 - 1.19)
MMT enrolment (6mo)	0.81*	(0.68 - 0.95)	0.65	(0.38 - 1.11)	0.93	(0.56 - 1.56)
Non-MMT treatment (6mo)	1.10	(0.92 - 1.31)	0.99	(0.61 - 1.61)	0.63	(0.34 - 1.16)
HIV Positive	0.82*	(0.69 - 0.98)	0.89	(0.61 - 1.30)	1.08	(0.71 - 1.63)
N	14966		1599		1171	
R-squared	0.058		0.046		0.055	
Log Likelihood	-4052.660		-642.010		-425.510	
LR Chi2 test (p-value)	418.95 (<0.001)		61.38 (<0.001)		49.20 (<0.001)	

Table A.1 (2) Wave-by-wave logistic regression predicting the start of an observation gap at next wave

Variable	Wave 2		Wave 3		Wave 4	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% C
Age	0.96**	(0.93 - 0.99)	0.97	(0.94 – 1.00)	0.98	(0.95 - 1.01)
Female Gender	1.71	(0.97 - 3.03)	1.46	(0.78 - 2.75)	0.87	(0.46 - 1.63)
Aboriginal Ethnicity	0.53*	(0.31 - 0.94)	0.86	(0.50 - 1.51)	1.19	(0.67 - 2.11)
Marital Status	0.66	(0.37 - 1.18)	0.84	(0.46 - 1.54)	0.63	(0.33 - 1.19)
DTES Resident	0.56*	(0.34 - 0.92)	0.59	(0.33 - 1.03)	0.64	(0.35 - 1.19)
Regular Job	1.26	(0.56 - 2.84)	1.35	(0.60 - 3.00)	0.86	(0.38 - 1.93)
Temporary Job	1.18	(0.63 - 2.21)	0.83	(0.38 - 1.81)	0.90	(0.44 - 1.85)
Nonlegal Income	1.58	(0.90 - 2.75)	0.81	(0.43 - 1.52)	0.86	(0.46 - 1.59)
Social Assistance	0.75	(0.40 - 1.39)	0.60	(0.31 - 1.15)	0.51*	(0.27 - 0.99)
Sex Trade Involvement (6 mo)	0.80	(0.41 - 1.56)	1.04	(0.47 - 2.26)	0.85	(0.36 - 1.99)
Unstable housing (6 mo)	1.05	(0.64 - 1.74)	0.80	(0.45 - 1.40)	0.84	(0.47 - 1.52)
Incarceration (6mo)	2.44***	(1.52 - 3.91)	2.44**	(1.43 - 4.17)	1.47	(0.82 - 2.64)
Binge Drug Use (6 mo)	0.52*	(0.32 - 0.86)	0.98	(0.56 - 1.70)	1.45	(0.83 - 2.56)
Shooting Gallery Use (6 mo)	1.28	(0.68 - 2.41)	1.83	(0.90 - 3.73)	3.74***	(1.81 - 7.72)
Fix with other People (6 mo)	1.11	(0.67 - 1.84)	0.87	(0.48 - 1.57)	1.12	(0.58 - 2.16)
Non-Frequent injection (6 mo)	1.58	(0.59 - 4.24)	0.75	(0.30 - 1.90)	0.84	(0.35 - 2.04)
Frequent injection (6 mo)	1.09	(0.42 - 2.84)	1.09	(0.47 - 2.56)	0.62	(0.25 - 1.55)
Non-frequent Crack Use (6 mo)	1.06	(0.61 - 1.85)	0.85	(0.45 - 1.60)	1.46	(0.79 - 2.69)
Frequent Crack Use (6 mo)	1.05	(0.57 - 1.92)	1.05	(0.51 - 2.15)	1.09	(0.53 - 2.25)
MMT enrolment (6mo)	0.80	(0.42 - 1.50)	0.76	(0.39 - 1.49)	1.06	(0.55 - 2.05)
Non-MMT treatment (6mo)	1.53	(0.84 - 2.80)	0.96	(0.48 - 1.91)	1.36	(0.71 - 2.60)
HIV seropositive	0.70	(0.39 - 1.28)	0.67	(0.37 - 1.22)	0.86	(0.47 - 1.56)
N	1094		1092		1067	
R-squared	0.120		0.084		0.080	
Log Likelihood	-290.250		-255.090		-237.660	
LR Chi2 test (p-value)	79.32 (<0.001)		42.66 (0.002)		41.36 (0.008)	

Table A.1 (3) Wave-by-wave logistic regression predicting the start of an observation gap at next wave

Variable	Wave 5		Wave 6		Wave 7	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% C
Age	0.96*	(0.93 - 0.99)	0.97*72	(0.94 - 0.99)	0.97	(0.94 - 1.00)
Female Gender	0.76	(0.41 - 1.43)	1.26	(0.73 - 2.19)	0.86	(0.45 - 1.67)
Aboriginal Ethnicity	1.26	(0.71 - 2.24)	0.51*16	(0.28 - 0.92)	0.57	(0.29 - 1.14)
Marital Status	1.03	(0.58 - 1.86)	0.79	(0.45 - 1.38)	1.17	(0.64 - 2.13)
DTES Resident	0.22***	(0.11 - 0.43)	0.34**	(0.19 - 0.63)	0.50*	(0.25 - 1.00)
Regular Job	1.85	(0.86 - 3.99)	1.82	(0.89 - 3.71)	1.02	(0.41 - 2.54)
Temporary Job	0.63	(0.29 - 1.34)	0.78	(0.45 - 1.35)	1.06	(0.56 - 2.00)
Nonlegal Income	0.50	(0.24 - 1.03)	1.51	(0.78 - 2.95)	0.54	(0.24 - 1.18)
Social Assistance	1.89	(0.91 - 3.92)	0.80	(0.41 - 1.54)	0.82	(0.38 - 1.76)
Sex Trade Involvement (6 mo)	2.74*	(1.19 - 6.32)	1.03	(0.44 - 2.37)	2.44	(0.91 - 6.52)
Unstable housing (6 mo)	1.82*	(1.01 - 3.26)	0.96	(0.54 - 1.69)	1.44	(0.76 - 2.75)
Incarceration (6mo)	1.64	(0.91 - 2.94)	1.12	(0.60 - 2.09)	2.46**	(1.32 - 4.61)
Binge Drug Use (6 mo)	1.16	(0.62 - 2.17)	0.53	(0.27 - 1.03)	2.31*	(1.15 - 4.65)
Shooting Gallery Use (6 mo)	3.28**	(1.47 - 7.07)	1.17	(0.50 - 2.76)	0.87	(0.34 - 2.21)
Fix with other People (6 mo)	1.01	(0.54 - 1.91)	0.67	(0.37 - 1.21)	1.45	(0.64 - 3.30)
Non-Frequent injection (6 mo)	0.73	(0.35 - 1.55)	1.58	(0.78 - 3.19)	0.74	(0.30 - 1.83)
Frequent injection (6 mo)	0.44*	(0.19 - 0.99)	0.93	(0.42 - 2.04)	0.44	(0.16 - 1.25)
Non-frequent Crack Use (6 mo)	0.54	(0.27 - 1.08)	1.10	(0.62 - 1.94)	0.47*	(0.23 - 0.97)
Frequent Crack Use (6 mo)	0.99	(0.49 - 2.00)	0.90	(0.43 - 1.91)	0.61	(0.28 - 1.32)
MMT enrolment (6mo)	0.78	(0.42 - 1.45)	0.70	(0.38 - 1.30)	1.52	(0.81 - 2.86)
Non-MMT treatment (6mo)	0.58	(0.28 - 1.21)	1.06	(0.60 - 1.86)	0.80	(0.36 - 1.80)
HIV Positive	0.52*	(0.28 - 0.96)	0.84	(0.49 - 1.43)	0.94	(0.52 - 1.71)
N	1015		925		871	
R-squared	0.134		0.114		0.107	
Log Likelihood	-238.270		-257.440		-201.880	
LR Chi2 test (p-value)	73.80 (<0.001)		66.49(<0.001)		48.51 (<0.001)	

Table A.1 (4) Wave-by-wave logistic regression predicting the start of an observation gap at next wave

Variable	Wave 8		Wave 9		Wave 10	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% C
Age	0.95**	(0.92 - 0.98)	0.98	(0.95 - 1.02)	0.99	(0.95 - 1.02)
Female Gender	1.11	(0.59 - 2.10)	0.79	(0.40 - 1.55)	1.01	(0.54 - 1.86)
Aboriginal Ethnicity	1.28	(0.70 - 2.33)	0.58	(0.29 - 1.19)	0.70	(0.38 - 1.31)
Marital Status	1.01	(0.53 - 1.95)	1.30	(0.70 - 2.40)	1.60	(0.88 - 2.90)
DTES Resident	0.34**	(0.17 - 0.67)	0.41*	(0.19 - 0.88)	0.54	(0.27 - 1.07)
Regular Job	0.85	(0.36 - 2.01)	0.85	(0.35 - 2.08)	0.99	(0.42 - 2.37)
Temporary Job	0.61	(0.31 - 1.20)	0.91	(0.49 - 1.69)	0.58	(0.28 - 1.20)
Nonlegal Income	1.00	(0.49 - 2.05)	0.19**	(0.06 - 0.60)	1.73	(0.88 - 3.40)
Social Assistance	0.68	(0.33 - 1.40)	0.57	(0.25 - 1.28)	0.53	(0.24 - 1.13)
Sex Trade Involvement (6 mo)	0.67	(0.26 - 1.71)	1.47	(0.47 - 4.59)	0.67	(0.28 - 1.63)
Unstable housing (6 mo)	1.74	(0.91 - 3.33)	0.62	(0.30 - 1.25)	0.89	(0.46 - 1.71)
Incarceration (6mo)	1.14	(0.57 - 2.26)	1.33	(0.60 - 2.94)	1.49	(0.74 - 2.97)
Binge Drug Use (6 mo)	0.82	(0.36 - 1.85)	0.28*	(0.10 - 0.80)	1.49	(0.75 - 2.95)
Shooting Gallery Use (6 mo)	1.37	(0.62 - 3.03)	1.83	(0.78 - 4.31)	1.67	(0.83 - 3.36)
Fix with other People (6 mo)	0.72	(0.35 - 1.46)	1.11	(0.49 - 2.52)	1.63	(0.70 - 3.77)
Non-Frequent injection (6 mo)	1.09	(0.46 - 2.60)	1.39	(0.57 - 3.39)	0.35*	(0.13 - 0.94)
Frequent injection (6 mo)	0.90	(0.34 - 2.39)	0.93	(0.31 - 2.78)	0.45	(0.16 - 1.24)
Non-frequent Crack Use (6 mo)	1.95	(0.99 - 3.84)	1.55	(0.80 - 2.99)	0.77	(0.38 - 1.53)
Frequent Crack Use (6 mo)	1.62	(0.71 - 3.70)	0.80	(0.29 - 2.22)	0.94	(0.44 - 1.99)
MMT enrolment (6mo)	1.43	(0.73 - 2.80)	0.96	(0.50 - 1.84)	1.45	(0.79 - 2.66)
Non-MMT treatment (6mo)	2.41**	(1.25 - 4.65)	1.38	(0.64 - 2.99)	2.65**	(1.31 - 5.37)
HIV Positive	0.87	(0.48 - 1.57)	0.78	(0.41 - 1.49)	1.49	(0.85 - 2.62)
N	841		785		745	
R-squared	0.098		0.141		0.100	
Log Likelihood	-204.240		-184.180		-213.080	
LR Chi2 test (p-value)	44.21 (0.003)		60.45 (<0.001)		47.14(0.001)	

Table A.1 (5) Wave-by-wave logistic regression predicting the start of an observation gap at next wave

Variable	Wave 11		Wave 12		Wave 13	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% C
Age	0.95*	(0.91 - 0.99)	0.96	(0.92 - 1.01)	0.99	(0.95 - 1.03)
Female Gender	0.66	(0.29 - 1.48)	0.63	(0.26 - 1.52)	1.48	(0.63 - 3.47)
Aboriginal Ethnicity	0.84	(0.39 - 1.83)	0.99	(0.43 - 2.31)	0.29*	(0.09 - 0.90)
Marital Status	0.67	(0.29 - 1.54)	1.07	(0.47 - 2.45)	0.41	(0.15 - 1.17)
DTES Resident	0.36*	(0.16 - 0.83)	0.33*	(0.13 - 0.82)	0.32*	(0.12 - 0.84)
Regular Job	1.20	(0.44 - 3.27)	0.83	(0.26 - 2.65)	2.90	(0.98 - 8.56)
Temporary Job	1.05	(0.49 - 2.23)	1.58	(0.73 - 3.43)	0.45	(0.14 - 1.42)
Nonlegal Income	0.63	(0.26 - 1.53)	1.39	(0.54 - 3.55)	1.47	(0.48 - 4.57)
Social Assistance	1.31	(0.49 - 3.54)	0.51	(0.21 - 1.24)	0.50	(0.18 - 1.39)
Sex Trade Involvement (6 mo)	2.39	(0.80 - 7.11)	0.73	(0.17 - 3.22)	0.36	(0.06 - 2.01)
Unstable housing (6 mo)	0.72	(0.33 - 1.58)	1.19	(0.51 - 2.76)	1.39	(0.55 - 3.48)
Incarceration (6mo)	1.83	(0.75 - 4.48)	1.97	(0.77 - 5.02)	0.59	(0.15 - 2.37)
Binge Drug Use (6 mo)	1.29	(0.55 - 2.99)	0.55	(0.18 - 1.64)	1.84	(0.62 - 5.49)
Shooting Gallery Use (6 mo)	1.15	(0.49 - 2.70)	2.08	(0.73 - 5.96)	1.20	(0.38 - 3.76)
Fix with other People (6 mo)	0.73	(0.30 - 1.78)	0.60	(0.20 - 1.82)	0.95	(0.32 - 2.83)
Non-Frequent injection (6 mo)	1.06	(0.36 - 3.08)	0.67	(0.21 - 2.16)	1.66	(0.49 - 5.56)
Frequent injection (6 mo)	1.86	(0.63 - 5.54)	1.62	(0.47 - 5.61)	1.19	(0.28 - 5.11)
Non-frequent Crack Use (6 mo)	1.10	(0.47 - 2.59)	0.83	(0.35 - 2.00)	0.54	(0.16 - 1.82)
Frequent Crack Use (6 mo)	1.56	(0.64 - 3.79)	0.44	(0.16 - 1.21)	0.94	(0.36 - 2.48)
MMT enrolment (6mo)	0.61	(0.30 - 1.26)	0.67	(0.30 - 1.48)	0.65	(0.28 - 1.53)
Non-MMT treatment (6mo)	0.72	(0.26 - 1.99)	0.88	(0.29 - 2.63)	1.05	(0.33 - 3.36)
HIV Positive	0.71	(0.33 - 1.52)	0.90	(0.40 - 2.05)	0.65	(0.26 - 1.64)
N	658		623		593	
R-squared	0.096		0.127		0.160	
Log Likelihood	-146.020		-127.330		-111.770	
LR Chi2 test (p-value)	30.99 (0.096)		36.99 (0.024)		42.45 (0.006)	

Table A.1 (6) Wave-by-wave logistic regression predicting the start of an observation gap at next wave

Variable	Wave 14		Wave 15	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Age	1.03	(0.98 - 1.07)	0.98	(0.93 - 1.02)
Female Gender	1.00	(0.47 - 2.16)	0.79	(0.30 - 2.05)
Aboriginal Ethnicity	1.51	(0.68 - 3.37)	0.97	(0.37 - 2.51)
Marital Status	1.48	(0.67 - 3.28)	1.12	(0.42 - 2.93)
DTES Resident	0.19**	(0.08 - 0.50)	0.26*	(0.09 - 0.75)
Regular Job	0.80	(0.15 - 4.22)	0.46	(0.10 - 2.19)
Temporary Job	1.10	(0.49 - 2.46)	0.36	(0.04 - 3.03)
Nonlegal Income	1.83	(0.71 - 4.72)	1.06	(0.32 - 3.54)
Social Assistance	0.45	(0.11 - 1.85)	1.21	(0.33 - 4.36)
Sex Trade Involvement (6 mo)	0.20	(0.02 - 1.78)	0.56	(0.09 - 3.60)
Unstable housing (6 mo)	1.66	(0.69 - 3.99)	2.52	(0.91 - 7.00)
Incarceration (6mo)	0.85	(0.23 - 3.05)	0.19	(0.02 - 1.70)
Binge Drug Use (6 mo)	2.23	(0.70 - 7.05)	0.62	(0.12 - 3.19)
Shooting Gallery Use (6 mo)	0.30	(0.06 - 1.49)	1.65	(0.39 - 6.94)
Fix with other People (6 mo)	4.27*	(1.04 - 17.53)	0.51	(0.14 - 1.87)
Non-Frequent injection (6 mo)	0.31	(0.08 - 1.29)	0.72	(0.17 - 3.12)
Frequent injection (6 mo)	0.09**	(0.02 - 0.48)	1.76	(0.48 - 6.48)
Non-frequent Crack Use (6 mo)	0.57	(0.22 - 1.48)	0.43	(0.13 - 1.49)
Frequent Crack Use (6 mo)	1.09	(0.44 - 2.72)	0.77	(0.29 - 2.06)
MMT enrolment (6mo)	1.65	(0.74 - 3.67)	0.70	(0.27 - 1.78)
Non-MMT treatment (6mo)	1.44	(0.43 - 4.87)	2.45	(0.77 - 7.80)
HIV Positive	2.98**	(1.41 - 6.32)	0.28	(0.09 - 0.89)
N	552		490	
R-squared	0.157		0.136	
Log Likelihood	-125.230		-95.160	
LR Chi2 test (p-value)	46.64 (0.002)		29.90 (0.121)	

Appendix 3.2 Competing hazards discrete time event history analysis using multinomial logit models

Allison (1982) and Hill et al. (1993) outline a situation where there are m possible ways to exit the base state, giving $m + 1$ alternative states including the base state that are indexed by $j = 0, \ldots, m$. If J is defined as a variable indicating the particular state in time T, the discrete time hazard rate for exiting the base state by means j at time t is

$$P_{tj} = \Pr(T = t, J = j | T \geq t) \quad j > 0. \tag{2.16}$$

indicating that the hazard of exiting via means J at time T is the probability of doing so given survival up to time T. The likelihood function for a sample of n individuals is

$$L = \prod_{i=1}^{n} \prod_{j=1}^{m} \left[\frac{P_{t_i j_i}}{(1 - P_t)} \right]^{\delta_{jt}} \prod_{k=1}^{t_i} (1 - P_k), \tag{2.17}$$

where δ_{jt} is a dummy variable indicating whether or not individual i exits via means j. The form of P is specified with the discrete time multinomial logit model (MNLM):

$$P_{tj} = \frac{\exp(\alpha_{jt+} \boldsymbol{\beta}_j \, \mathbf{X}_t)}{1 + \sum_l \exp(\alpha_{lt+} \boldsymbol{\beta}_l \, \mathbf{X}_t)}, \tag{2.18}$$

which can also be formulated as an odds model, where the odds Ω of outcome m versus outcome n given a vector of covariates $\mathbf{x}$ can be expressed as

$$\Omega_{m|n}(\mathbf{x_i}) = \frac{\frac{\exp(\mathbf{x}_i \boldsymbol{\beta}_m)}{\sum_{j=1}^{J} \exp(\mathbf{x}_i \boldsymbol{\beta}_j)}}{\frac{\exp(\mathbf{x}_i \boldsymbol{\beta}_n)}{\sum_{j=1}^{J} \exp(\mathbf{x}_i \boldsymbol{\beta}_j)}} = \frac{\exp(\mathbf{x}_i \boldsymbol{\beta}_m)}{\exp(\mathbf{x}_i \boldsymbol{\beta}_n)} = \exp(\mathbf{x}_i [\boldsymbol{\beta}_m - \boldsymbol{\beta}_n]). \tag{2.19}$$

Note that the difference, $\boldsymbol{\beta}_m - \boldsymbol{\beta}_n$ is identified by Long (1997) as a contrast, which is the effect of $\mathbf{x}$ on the logit of outcome m versus the logit of outcome n. This identifies that the association of a variable on an outcome may vary by outcome. It is also plausible that time dependency may vary across event types, and therefore all covariates of interest are included in the models as outcome specific covariates.

Appendix 3.3 Comparative factor change in odds of censorship, death or attrition

Table A.2 (1) Factor change in the odds of study exits: Age (per additional year)			
Comparison of Outcomes		Odds	P-value
d	-a	1.09	0.000
d	-c	1.04	0.000
a	-d	0.91	0.000
a	-c	0.95	0.000
c	-d	0.96	0.000
c	-a	1.05	0.000

Table A.2 (2) Factor change in the odds of study exits: Gender (female vs. male)			
Comparison of Outcomes		Odds	P-value
d	-a	1.67	0.008
d	-c	1.19	0.275
a	-d	0.60	0.008
a	-c	0.71	0.003
c	-d	0.84	0.275
c	-a	1.40	0.003

Table A.2 (3) Factor change in the odds of study exits: Aboriginal ancestry (Aboriginal vs. other)			
Comparison of Outcomes		Odds	P-value
d	-a	2.03	0.000
d	-c	1.26	0.134
a	-d	0.49	0.000
a	-c	0.62	0.000
c	-d	0.79	0.134
c	-a	1.61	0.000

Table A.2 (4) Factor change in the odds of study exits: Marital status (married/common law vs. other)			
Comparison of Outcomes		Odds	P-value
d	-a	0.98	0.914
d	-c	0.74	0.078
a	-d	1.02	0.914
a	-c	0.75	0.018
c	-d	1.36	0.078
c	-a	1.33	0.018

Table A.2 (5) Factor change in the odds of study exits: Downtown Eastside residency (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-a	2.88	0.000
d	-c	1.23	0.216
a	-d	0.35	0.000
a	-c	0.43	0.000
c	-d	0.81	0.216
c	-a	2.34	0.000

Table A.2 (6) Factor change in the odds of study exits: Employed (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-a	0.25	0.002
d	-c	0.36	0.016
a	-d	3.94	0.002
a	-c	1.41	0.017
c	-d	2.80	0.016
c	-a	0.71	0.017

Table A.2 (7) Factor change in the odds of study exits: Temporary work (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-a	0.83	0.386
d	-c	0.74	0.091
a	-d	1.20	0.386
a	-c	0.89	0.353
c	-d	1.35	0.091
c	-a	1.12	0.353

Table A.2 (8) Factor change in the odds of study exits: Illegal income generation (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-a	0.59	0.010
d	-c	0.57	0.002
a	-d	1.71	0.010
a	-c	0.97	0.769
c	-d	1.76	0.002
c	-a	1.03	0.769

Table A.2 (9) Factor change in the odds of study exits: Receives social assistance (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-a	2.75	0.002
d	-c	1.43	0.252
a	-d	0.36	0.002
a	-c	0.52	0.000
c	-d	0.70	0.252
c	-a	1.92	0.000

Table A.2 (10) Factor change in the odds of study exits: Sex work (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-a	1.11	0.719
d	-c	1.06	0.824
a	-d	0.90	0.719
a	-c	0.95	0.744
c	-d	0.95	0.824
c	-a	1.05	0.744

Table A.2 (11) Factor change in the odds of study exits: Unstable housing (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-c	1.45	0.027
a	-c	1.46	0.000
c	-d	0.69	0.027
c	-a	0.68	0.000

Table A.2 (12) Factor change in the odds of study exits: Recent incarceration (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-a	0.71	0.089
d	-c	0.93	0.700
a	-d	1.42	0.089
a	-c	1.32	0.008
c	-d	1.07	0.700
c	-a	0.76	0.008

Table A.2 (13) Factor change in the odds of study exits: Binge drug use (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-a	1.67	0.007
d	-c	1.25	0.157
a	-d	0.60	0.007
a	-c	0.75	0.008
c	-d	0.80	0.157
c	-a	1.33	0.008

Table A.2 (14) Factor change in the odds of study exits: Shooting gallery attendance (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-a	0.77	0.297
d	-c	0.90	0.635
a	-d	1.29	0.297
a	-c	1.17	0.206
c	-d	1.11	0.635
c	-a	0.86	0.206

Table A.2 (15) Factor change in the odds of study exits: Injects with others (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-c	0.90	0.528
a	-c	0.78	0.022
c	-d	1.12	0.528
c	-a	1.28	0.022

Table A.2 (16) Factor change in the odds of study exits: Non-frequent injection (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-a	1.17	0.579
d	-c	1.05	0.846
a	-d	0.86	0.579
a	-c	0.90	0.468
c	-d	0.96	0.846
c	-a	1.11	0.468

Table A.2 (17) Factor change in the odds of study exits: Frequent injection (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-a	1.03	0.903
d	-c	0.89	0.615
a	-d	0.97	0.903
a	-c	0.86	0.310
c	-d	1.12	0.615
c	-a	1.16	0.310

Table A.2 (18) Factor change in the odds of study exits: Non-frequent crack use (yes vs. no)

Comparison of Outcomes		Odds	P-value
d	-a	1.26	0.225
d	-c	1.18	0.288
a	-d	0.80	0.225
a	-c	0.94	0.562
c	-d	0.85	0.288
c	-a	1.06	0.562

Table A.2 (19) Factor change in the odds of study exits: Frequent crack use (yes vs. no)			
Comparison of Outcomes		Odds	P-value
d	-a	0.84	0.434
d	-c	0.76	0.157
a	-d	1.19	0.434
a	-c	0.91	0.447
c	-d	1.31	0.157
c	-a	1.10	0.447

Table A.2 (20) Factor change in the odds of study exits: Methadone maintenance therapy enrolment (yes vs. no)			
Comparison of Outcomes		Odds	P-value
d	-a	1.12	0.580
d	-c	0.68	0.016
a	-d	0.89	0.580
a	-c	0.61	0.000
c	-d	1.47	0.016
c	-a	1.65	0.000

Table A.2 (20) Factor change in the odds of study exits: Non-methadone treatment enrolment (yes vs. no)			
Comparison of Outcomes		Odds	P-value
d	-a	0.55	0.031
d	-c	0.60	0.043
a	-d	1.82	0.031
a	-c	1.09	0.475
c	-d	1.66	0.043
c	-a	0.91	0.475

Table A.2 (21) Factor change in the odds of study exits: HIV seropositivity (yes vs. no)			
Comparison of Outcomes		Odds	P-value
d	-a	8.50	0.000
d	-c	3.40	0.000
a	-d	0.12	0.000
a	-c	0.40	0.000
c	-d	0.29	0.000
c	-a	2.50	0.000

Appendix 4.1 Variables used in multiple imputation procedures

Table A.3 List of variables used by Amelia II in imputation procedures		
Variable	**Description**	**Role in imputation**
id	Participant id number	Cross section variable
wave	Folllow up wave id number	Time specification
data	Binary indicator that time variant data were observed	Indicator used to determine which data were to be imputed
basewave2	Wave of baseline interview	Indicator used to determine time point to begin imputation
a10drug	Monthly expenditure on drugs	Included in MI model
a9income	Monthly income from all sources	Included in MI model
abor	Aboriginal ethnicity	Included in MI model
aborhiv	Interaction: aboriginal ethnicity and hiv status	Included in MI model
aborpj_c	Interaction: Aboriginal ethnicity and previous job	Included in MI model
age	Age	Included in MI model
agecat	Categorical Age Variable	Included in MI model
alt	Alternative/temporary income generating activity	Included in MI model
alt_c	Alternative/temporary income generating activity excluding l.h. censored spells	Included in MI model
altdur	Duration of alt income generation measured in observation periods	Included in MI model
anytreat	Enrollment in any drug treatment	Included in MI model
base0	Participant baseline wave=0	Included in MI model
base1	Participant baseline wave=1	Included in MI model
base10	Participant baseline wave=10	Included in MI model
base11	Participant baseline wave=11	Included in MI model
base12	Participant baseline wave=12	Included in MI model
base13	Participant baseline wave=13	Included in MI model
base14	Participant baseline wave=14	Included in MI model
base15	Participant baseline wave=15	Included in MI model
base17	Participant baseline wave=16	Included in MI model
base2	Participant baseline wave=2	Included in MI model
base3	Participant baseline wave=3	Included in MI model
base4	Participant baseline wave=4	Included in MI model
base5	Participant baseline wave=5	Included in MI model
base6	Participant baseline wave=6	Included in MI model
base7	Participant baseline wave=7	Included in MI model
base8	Participant baseline wave=8	Included in MI model
base9	Participant baseline wave=9	Included in MI model
binge	Binge drug use L6M	Included in MI model
borrow	Borrowed syringes L6M	Included in MI model
c6street	Public injection L6M	Included in MI model
c7fixother	Injected with others L6M	Included in MI model
coke	Cocaine injection L6M	Included in MI model
coke_nf	Non-frequent cocaine use	Included in MI model
coke_s	Single drug cocaine user	Included in MI model
cokebinge	Interaction: cocaine injection and binge drug use	Included in MI model
cokeborrow	Interaction: cocaine injection and syringe borrowing	Included in MI model
cokedtes	Interaction: cocaine injection and DTES residency L6M	Included in MI model
cokefreq	Frequent cocaine injection L6M	Included in MI model
cokegallery	Interaction: cocaine injection and shooting gallery use L6M	Included in MI model

Table A.3 List of variables used by Amelia II in imputation procedures		
Variable	**Description**	**Role in imputation**
cokehouse	Interaction: cocaine injection and unstable housing L6M	Included in MI model
cokejail	Interaction: cocaine injection and incarceration L6M	Included in MI model
cokelend	Interaction: cocaine injection and syringe	Included in MI model
cokeodose	Interaction: cocaine injection and overdose L6M	Included in MI model
cokepub	Interaction: cocaine injection and public injection L6M	Included in MI model
coketrade	Interaction: cocaine injection and sex work L6M	Included in MI model
cracfreq	Frequent crack use L6M	Included in MI model
crack	Crack use L6M	Included in MI model
crack_nf	Non-frequent crack use	Included in MI model
crack_s	Single drug crack use	Included in MI model
crackbinge	Interaction: crack use and binge drug use	Included in MI model
crackborrow	Interaction: crack use and syringe borrowing	Included in MI model
crackdtes	Interaction: crack use and DTES residency L6M	Included in MI model
crackgallery	Interaction: crack use and shooting gallery use L6M	Included in MI model
crackhouse	Interaction: crack use and unstable housing L6M	Included in MI model
crackjail	Interaction: crack use and incarceration L6M	Included in MI model
cracklend	Interaction: crack use and syringe	Included in MI model
crackodose	Interaction: crack use and overdose L6M	Included in MI model
crackpub	Interaction: crack use and public injection L6M	Included in MI model
cracktrade	Interaction: crack use and sex work L6M	Included in MI model
cryfreq	Frequent crystal methamphetamine use L6M	Included in MI model
cryst	Crystal methamphetaime use L6M	Included in MI model
dtes	DTES residency L6M	Included in MI model
ed_hseq	High school or equivalent	Included in MI model
ed_lhs	Less than hs education	Included in MI model
ed_trdcol	Trade or college education	Included in MI model
ed_uni	University or more	Included in MI model
edbin	Binary educational attainment (<hs vs ≥hs	Included in MI model
edcat	Categorical educational attainment	Included in MI model
ethcat	Categorical ethnicity	Included in MI model
ethother	Other ethnicity	Included in MI model
fem_mmt	Interaction: female gender (female) and MMT	Included in MI model
freq	Frequent injection	Included in MI model
gallery	Shooting gallery use L6M	Included in MI model
gender	Female gender	Included in MI model
genhouse	Interaction: gender and unstable housing	Included in MI model
gentrade	Interaction: gender and sex trade involvement in prior 6 months	Included in MI model
hcv	HCV seropositive	Included in MI model
hero	Heroin injection L6M	Included in MI model
hero_nf	Non-frequent heroin use	Included in MI model
hero_s	Single drug heroin use	Included in MI model
herobinge	Interaction: heroin injection and binge drug use	Included in MI model
heroborrow	Interaction: heroin injection and syringe borrowing	Included in MI model
herodtes	Interaction: heroin injection and DTES residency L6M	Included in MI model
herofreq	Frequent heroin injection L6M	Included in MI model
herogallery	Interaction: heroin injection and shooting gallery use L6M	Included in MI model
herohouse	Interaction: heroin injection and unstable housing L6M	Included in MI model
herojail	Interaction: heroin injection and incarceration L6M	Included in MI model
herolend	Interaction: heroin injection and syringe	Included in MI model
heroodose	Interaction: heroin injection and overdose L6M	Included in MI model
heropub	Interaction: heroin injection and public injection L6M	Included in MI model
herotrade	Interaction: heroin injection and sex work L6M	Included in MI model
hiv	HIV seropositive	Included in MI model

Table A.3 List of variables used by Amelia II in imputation procedures		
Variable	**Description**	**Role in imputation**
hivevent	HIV seroconversion	Included in MI model
house	Unstable housing L6M	Included in MI model
inj_nf	Non-frequent injection	Included in MI model
inj6m	Injection L6M	Included in MI model
injcry_nf	Non-frequent use of injection crystal meth	Included in MI model
injcryst	Crystal methamphetamine injection L6M	Included in MI model
injcryst_s	Single drug crystal methamphetamine use	Included in MI model
jail6m	Incarceration L6M	Included in MI model
lend	Lent syringes L6M	Included in MI model
marry	Marital status	Included in MI model
methcur	Methadone maintenance therapy enrollment L6M	Included in MI model
n1miss	Next observation is the first missing	Included in MI model
nattrite	Attrite at next wave	Included in MI model
noinj6m	Has not injected in the past 6 months	Included in MI model
nonlegal	Non-legal income L6M	Included in MI model
notbase0	Participant not recruited during original baseline	Included in MI model
odose	Non-fatal overdose L6M	Included in MI model
other_nf	Non-frequent injection of speedballs or meth	Included in MI model
otherbinge	Interaction: speedball or meth injection and binge drug use	Included in MI model
otherborrow	Interaction: speedball or meth injection and syringe borrowing	Included in MI model
otherdtes	Interaction: speedball or meth injection and DTES residency L6M	Included in MI model
otherfreq	Frequent injection of speedballs or meth	Included in MI model
othergallery	Interaction: speedball or meth injection and shooting gallery use L6M	Included in MI model
otherhouse	Interaction: speedball or meth injection and unstable housing L6M	Included in MI model
otherjail	Interaction: speedball or meth injection and incarceration L6M	Included in MI model
otherlend	Interaction: speedball or meth injection and syringe	Included in MI model
otherodose	Interaction: speedball or meth injection and overdose L6M	Included in MI model
otherpub	Interaction: speedball or meth injection and public injection L6M	Included in MI model
othertrade	Interaction: speedball or meth injection and sex work L6M	Included in MI model
othertreat	Non-methadone treatment enrollment L6M	Included in MI model
polydrug	Poly-drug use	Included in MI model
polyfreq	Interaction: poly substance use and frequent injection	Included in MI model
polyfreqbinge	Interaction: poly substance use, frequent injection and binge drug use	Included in MI model
polyfreqborrow	Interaction: poly substance use, frequent injection and syringe borrowing	Included in MI model
polyfreqdtes	Interaction: poly substance use, frequent injection and DTES residencey L6M	Included in MI model
polyfreqgallery	Interaction: poly substance use, frequent injection and shooting gallery use L6M	Included in MI model
polyfreqhouse	Interaction: poly substance use, frequent injection and unstable housing L6M	Included in MI model
polyfreqjail	Interaction: poly substance use, frequent injection and incarceration L6M	Included in MI model
polyfreqlend	Interaction: poly substance use, frequent injection and syringe lending	Included in MI model
polyfreqodose	Interaction: poly substance use, frequent injection and overdose L6M	Included in MI model

Table A.3 List of variables used by Amelia II in imputation procedures		
Variable	**Description**	**Role in imputation**
polyfreqpub	Interaction: poly substance use, frequent injection and public injection L6M	Included in MI model
polyfreqtrade	Interaction: poly substance use, frequent injection and sex work L6M	Included in MI model
regular	Regular employment L6M	Included in MI model
sian	Asian	Included in MI model
social	Social assistance receipt L6M	Included in MI model
speed	Speedball injection L6M	Included in MI model
speed_nf	Non-frequent speed use	Included in MI model
speed_s	Single drug speed use	Included in MI model
speedbinge	Interaction: speedball injection and binge drug use	Included in MI model
speedborrow	Interaction: speedball injection and syringe borrowing	Included in MI model
speeddtes	Interaction: speedball injection and DTES residency L6M	Included in MI model
speedgallery	Interaction: speedball injection and shooting gallery use L6M	Included in MI model
speedhouse	Interaction: speedball injection and unstable housing L6M	Included in MI model
speedjail	Interaction: speedball injection and incarceration L6M	Included in MI model
speedlend	Interaction: speedball injection and syringe	Included in MI model
speedodose	Interaction: speedball injection and overdose L6M	Included in MI model
speedpub	Interaction: speedball injection and public injection L6M	Included in MI model
speedtrade	Interaction: speedball injection and sex work L6M	Included in MI model
speefreq	Frequent speedball injection L6M	Included in MI model
t2deny	Denied treatment L6M	Included in MI model
tempor	Temporary work L6M	Included in MI model
trade6m	Sex work L6M	Included in MI model
white	Caucasian	Included in MI model

References

Abbring, J. H., Berg, G. J., & Ours, J. C. (2005). The effect of unemployment insurance sanctions on the transition rate from unemployment to employment*. *The Economic Journal*, *115*(505), 602-630.

Adams, P., Hurd, M. D., McFadden, D. L., Merrill, A., & Ribeiro, T. (2003). Healthy, wealthy, and wise? Tests for direct causal paths between health and socioeconomic status. *Journal of Econometrics*, *112*, 3-56.

Addison, J. T., & Portugal, P. (1998). Some specification issues in unemployment duration analysis. *Labour Economics*, *5*(1), 53-66.

Addison, J. T., & Portugal, P. (2003). Short- and long-term unemployment: A discrete duration model with time-varying covariate effects. In J. T. Addison & P. J. J. Welfens (Eds.), *Labor markets and social security: Issues and policy options in the US and Europe* (2nd ed.) (pp. 105-18). New York: Springer Verlag.

Adlaf, E. M., Begin, P., & Sawka, E. (2005). *Canadian addiction survey (CAS): A national survey of canadians' use of alcohol and other drugs: Prevalence of use and related harms: Detailed report*. Ottawa: Canadian Centre for Substance Abuse.

Adler, N. E., & Ostrove, J. M. (1999). Socioeconomic status and health: What we know and what we don't. *Annals of the New York Academy of Sciences*, *896*(1), 3-15.

Adler, P. (1985). *Wheeling and dealing: An ethnography of an upper-level drug dealing and smuggling community*. New York: Columbia University Press.

Adler, P. A., & Adler, P. (2011). *Constructions of deviance: Social power, context, and interaction* (7th ed.). Belmont, CA: Wadsworth Publishing.

Afifi, A. A., & Elashoff, R. M. (1966). Missing observations in multivariate statistics: I. Review of the literature. *Journal of the American Statistical Association*, *61*(315), 595-604.

Agar, M. (1973). *Ripping and running: A formal ethnography of urban heroin users*. New York: Academic Press.

Akers, R., & Sellers, C. (2009). *Criminological theories: Introduction, evaluation, and application* (5th ed.). Oxford: Oxford University Press.

Akers, R. L. (1968). Problems in the sociology of deviance: Social definitions and behavior. *Social Forces*, *46*(4), 455-465.

Akers, R. L., Krohn, M. D., Lanza-Kaduce, L., & Radosevich, M. (1979). Social learning and deviant behavior: A specific test of a general theory. *American Sociological Review*, *44*(4), 636-55.

Alexander, B. (2010). *The globalization of addiction: A study in the poverty of the spirit*. Oxford: Oxford University Press.

Alexandre, P. K., & French, M. T. (2004). Further evidence on the labor market effects of addiction: Chronic drug use and employment in metropolitan Miami. *Contemporary Economic Policy*, *22*(3), 382-393.

Allen, C. (2007). *Crime, drugs and social theory: A phenomenological approach*. London: Ashgate.

Allison, P. D. (1982). Discrete-time methods for the analysis of event histories. *Sociological Methodology*, *13*, 61-98.

Allison, P. D. (1984). *Event history analysis: Regression for longitudinal event data*. London: Sage.

Allison, P. D. (2002). *Missing data: Quantitative applications in the social sciences* London: Sage.

Almond, S. (2010). *Environments for health: Understanding the correlates of stable housing among injection drug users*. Thesis, M.Sc. in Applied Statistics, University of Oxford.

Altheide, D. L., & Johnson, J. M. (1994). Criteria for assessing interpretive validity in qualitative research. In N. K. Denzin & Y. S. Loncoln (Eds.), *Handbook of qualitative research* (pp. 485-99). Thousand Oaks, CA: Sage .

Altonji, J. G., & Blank, R. M. (1999). Race and gender in the labor market. *Handbook of Labor Economics*, *3*, 3143-3259.

Amato, L., Davoli, M., Perucci, C. A., Ferri, M., Faggiano, F., & Mattick, R. P. (2005). An overview of systematic reviews of the effectiveness of opiate maintenance therapies: Available evidence to inform clinical practice and research. *Journal of Substance Abuse Treatment*, *28*(4), 321-329.

Ambert, A. M., Adler, P. A., Adler, P., & Detzner, D. F. (1995). Understanding and evaluating qualitative research. *Journal of Marriage and the Family*, *57*, 879-893.

Amemiya, T. (1981). Qualitative response models: A survey. *Journal of Economic Literature*, *19*(1483-1536).

Ames, G. M., & Grube, J. W. (1999). Alcohol availability and workplace drinking: Mixed method analyses. *Journal of Studies on Alcohol*, *60*(3), 383-393.

Amick, B. C., & Lavis, J. (1999). Labour markets and health: A framework and set of applications. In A. R. Tarlov & R. F. St. Peter (Eds.), *The society and population health reader: A state and community perspective* (pp. 178-210). New York: Free Press.

Andersen, R., & van de Werfhorst, H. G. (2010). Education and occupational status in 14 countries: The role of educational institutions and labour market coordination. *The British Journal of Sociology*, *61*(2), 336-55.

Anderson, J. F., & Warren, L. D. (2004). Client retention in the British columbia methadone program, 1996-1999. *Canadian Journal of Public Health*, *95*(2), 104-109.

Anthony, J. C., & Helzer, J. E. (1991). Syndromes of drug abuse and dependence. In D. Regier & L. Robins (Eds.), *Psychiatric disorders in america: The epidemiologic catchment area study* (pp. 116-54). New York: Free Press.

Arranz Muñoz, J. M., & Garcia-Serrano, C. (2004). The influence of previous labour market experiences on subsequent job tenure. *Hacienda Pública Española*, (168), 47-68.

Atkinson, A. B., & Micklewright, J. (1991). Unemployment compensation and labor market transitions: A critical review. *Journal of Economic Literature*, *29*(4), 1679-1727.

Atkinson, J. S., Montoya, I. D., Trevino, R. A., & Richard, A. J. (2000). Labor force participation in a sample of substance users. *The American Journal of Drug and Alcohol Abuse*, *26*(3), 355-367.

Atkinson, P., & Silverman, D. (1997). Kundera's immortality: The interview society and the invention of the self. *Qualitative Inquiry*, *3*(3), 304-325.

Baker, S. G. (1995). Marginal regression for repeated binary data with outcome subject to non-ignorable non-response. *Biometrics*, *51*(3), 1042-1052.

Baker, S. G., Rosenberger, W. F., & Dersimonian, R. (1992). Closed-form estimates for missing counts in two-way contingency tables. *Statistics in Medicine*, *11*(5), 643-657.

Ball, J. C. (1967). The reliability and validity of interview data obtained from 59 narcotic drug addicts. *American Journal of Sociology*, *72*(6), 650-654.

Bambra, C. (2011). Work, worklessness and the political economy of health inequalities. *Journal of Epidemiology and Community Health*, *65*(9), 746-50.

Banfield, E. C. (1968). *The unheavenly city*. Boston: Little, Brown and Company.

Barnard, M., & Frischer, M. (1995). Combining quantitative and qualitative approaches: Researching hiv-related risk behaviours among drug injectors. *Addiction Research & Theory*, *2*(4), 351-362.

Barnas, C., Rossmann, M., Roessler, H., & Riemer, Y. (1992). Benzodiazepines and other psychotropic drugs abused by patients in a methadone maintenance program: Familiarity and preference. Journal of Clinical Psychopharmacology, 12, 397-402

Bartley, M. (1994). Unemployment and ill health: Understanding the relationship. *Journal of Epidemiology and Community Health*, *48*(4), 333-337.

Bartley, M., Ferrie, J., & Montgomery, S. M. (2006). Health and labour market disadvantage: Unemployment, non-employment, and job insecurity. In R. G. Wilkinson & M. M. Marmot (Eds.), *Social determinants of health* (2nd ed.) (pp. 78-96). Oxford: Oxford University Press.

Bastos, F. I., & Strathdee, S. A. (2000). Evaluating effectiveness of syringe exchange programmes: Current issues and future prospects. *Social Science & Medicine*, *51*(12), 1771-1782.

BC Statistics. (2006). *Labour market characteristics of the off-reserve aboriginal population in British columbia*. Retrieved from www.bcstats.gov.bc.ca/pubs/eet/ eet0605.pdf

Beardsley, M., Clatts, M. C., Deren, S., & Davis, W. R. (1992). Homelessness and hiv-risk behaviors in a sample of New York City drug injectors. *AIDS and Public Policy Journal*, *7*(3), 162-169.

Beck, N., Katz, J. N., & Tucker, R. (1998). Taking time seriously: Time-series-cross-section analysis with a binary dependent variable. *American Journal of Political Science*, *42*(4), 1260-1288.

Becker, H. (1953). Becoming a marijuana user. *American Journal of Sociology*, *59*, 235-242.

Becker, H. (1963). *Outsiders: Studies in the sociology of deviance*. New York: Free Press.

Bennett, T. (1986). A decision-making approach to opioid addiction. In R. V. Clarke & D. B. Cornish (Eds.), *The reasoning criminal: Rational choice perspectives on offending* (pp. 83-102). Springer-Verlag. New York.

Ben-Shlomo, Y., & Kuh, D. (2002). A life course approach to chronic disease epidemiology: Conceptual models, empirical challenges and interdisciplinary perspectives. *International Journal of Epidemiology*, *31*(2), 285-293.

Bergeron, H. (2001). Drug addiction: Sociological aspects. In N. Smelser & P. B. Baltes (Eds.), *International encyclopedia of the social & behavioural sciences* (pp. 3852-6). Oxford: Pergamon.

Berthoud, R. (2003). *Multiple disadvantage in employment: A quantitative analysis*. York: York Publishing Services.

Beunckens, C., Molenberghs, G., Thij, H., & Verbeke, G. (2007). Incomplete hierarchical data. *Statistical Methods in Medical Research*, *16*, 457-492.

Biemer, P. P., Groves, R. M., Lyberg, L. E., Mathiowetz, N. A., & Sudman, S. (2011). *Measurement errors in surveys*. New York: Wiley.

Biernacki, P. (1986). *Pathways from heroin addiction: Recovery without treatment*. Philadelphia: Temple University Press .

Biewen, M., & Steffes, S. (2010). Unemployment persistence: Is there evidence for stigma effects? *Economics Letters*, *106*(3), 188-190.

Binswanger, I. A., Stern, M. F., Deyo, R. A., Heagerty, P. J., Cheadle, A., Elmore, J. G., & Koepsell, T. D. (2007). Release from prison—a high risk of death for former inmates. *New England Journal of Medicine*, *356*(2), 157-165.

Blalock, A. C., McDaniel, J. S., & Farber, E. W. (2002). Effect of employment on quality of life and psychological functioning in patients with HIV/AIDS. *Psychosomatics: Journal of Consultation Liaison Psychiatry*, *43*(5), 400-404.

Blankenship, K. M., & Koester, S. (2002). Criminal law, policing policy, and HIV risk in female street sex workers and injection drug users. *Journal of Law, Medicine & Ethics*, *30*(4), 548-559.

Blankenship, K. M., Bray, S. J., & Merson, M. H. (2000). Structural interventions in public health. *AIDS*, *14*, S11-21.

Blankertz, L., Magura, S., Staines, G. L., Madison, E. M., Spinelli, M., Horowitz, E., . . . Young, R. (2004). A new work placement model for unemployed methadone maintenance patients. *Substance Use & Misuse*, *39*(13-14), 2239-2260.

Bloemen, H., & Stancanelli, E. F. (2001). Individual wealth, reservation wages, and transitions into employment. *Journal of Labor Economics*, *19*(2), 400-439.

Blossfeld, H. P., & Rohwer, G. (2002). *Techniques of event history modeling: New approaches to causal analysis*. Mahwah, NJ: Lawrence Erlbaum.

Blossfeld, H. P., Golsch, K., & Rohwer, G. (2007). *Event history analysis with STATA*. Mahwah, NJ: Lawrence Erlbaum Associates.

Bourgois, P. (1996). *In search of respect: Selling crack in El Barrio*. Cambridge: Cambridge University Press.

Bourgois, P. (1998). The moral economies of homeless heroin addicts: Confronting ethnography, HIV risk, and everyday violence in San Francisco shooting encampments. *Substance Use & Misuse*, *33*(11), 2323-2351.

Bourgois, P., & Schonberg, J. (2009). *Righteous dopefiend*. Berkeley: University of California Press.

Bover, O., Arellano, M., & Bentolila, S. (2002). Unemployment duration, benefit duration and the business cycle. *The Economic Journal*, *112*(479), 223-265.

Box-Steffensmeier, J. M., & Jones, B. S. (2004). *Event history modeling: A guide for social scientists*. Cambridge: Cambridge University Press.

Böheim, R., & Taylor, M. P. (2002). The search for success: Do the unemployed find stable employment? *Labour Economics*, *9*(6), 717-735.

Bradley, S., Crouchley, R., & Oskrochi, R. (2003). Social exclusion and labour market transitions: A multi-state multi-spell analysis using the BHPS. *Labour Economics*, *10*(6), 659-679.

Braveman, B., Levin, M., Kielhofner, G., & Finlayson, M. (2006). HIV/AIDS and return to work: A literature review one-decade post-introduction of combination therapy (HAART). *Work (Reading, Mass.)*, *27*(3), 295-303.

Bray, J. W., Zarkin, G. A., Dennis, M. L., & French, M. T. (2000). Symptoms of dependence, multiple substance use, and labor market outcomes. *The American Journal of Drug and Alcohol Abuse*, *26*(1), 77-95.

Breen, R., & Jonsson, J. O. (2005). Inequality of opportunity in comparative perspective: Recent research on educational attainment and social mobility. *Annual Review of Sociology*, *31*, 223-243.

Breslau, N., Davis, G. C., Andreski, P., & Peterson, E. (1991). Traumatic events and posttraumatic stress disorder in an urban population of young adults. *Archives of General Psychiatry*, *48*(3), 216-223.

Brethour, P. (2009, February 13). Exclusive demographic picture: A comparison of key statistics in the DTES, Vancouver, B.C. And Canada. *Globe and Mail*,

Briggs, C. L. (1986). *Learning how to ask: A sociolinguistic appraisal of the role of the interview in social science research*. Cambridge University Press.

Broadhead, R. S., Kerr, T. H., Grund, J. P. C., & Altice, F. L. (2002). Safer injection facilities in north america: Their place in public policy and health initiatives. *Journal of Drug Issues*, *32*(1), 329-356.

Brooks, R. A., Martin, D. J., Ortiz, D. J., & Veniegas, R. C. (2004). Perceived barriers to employment among persons living with HIV/AIDS. *AIDS Care*, *16*(6), 756-766.

Brown, P. D., & Levine, D. P. (2002). Infective endocarditis in the injection drug user. *Infectious Disease Clinics of North America*, *16*(3), 645.

Brown, P. J., & Wolfe, J. (1994). Substance abuse and post-traumatic stress disorder comorbidity. *Drug and Alcohol Dependence*, *35*(1), 51-59.

Browning, C. R., & Cagney, K. A. (2002). Neighborhood structural disadvantage, collective efficacy, and self-rated physical health in an urban setting. *Journal of Health and Social Behavior*, *43*(4), 383-399.

Buchanan, J., & Young, L. (2000). The war on drugs – a war on drug users? *Drugs: Education, Prevention, and Policy*, *7*(4), 409-422.

Buchmueller, T. C., & Zuvekas, S. H. (1998). Drug use, drug abuse, and labour market outcomes. *Health Economics*, *7*(3), 229-245.

Bukten, A., Skurtveit, S., Stangeland, P., Gossop, M., Willersrud, A. B., Waal, H., . . . Clausen, T. (2011). Criminal convictions among dependent heroin users during a 3-year period prior to opioid maintenance treatment: A longitudinal national cohort study. *Journal of Substance Abuse Treatment*, *41*(4), 407-414.

Burgess, R. L., & Akers, R. L. (1966). A differential association-reinforcement theory of criminal behavior. *Social Problems*, *14*(2), 128-147.

Burns, S. M., Young, L. R. L., & Maniss, S. (2006). Predictors of employment and disability among people living with HIV/AIDS. *Rehabilitation Psychology*, *51*(2), 127-134.

Calvó-Armengol, A., Verdier, T., & Zenou, Y. (2007). Strong and weak ties in employment and crime. *Journal of Public Economics*, *91*(1-2), 203-233.

Cameron, A. C., Gelbach, J. B., & Miller, D. L. (2008). Bootstrap-based improvements for inference with clustered errors. *Review of Economics and Statistics*, *90*, 414-427.

Campbell, L., Boyd, N., & Culbert, L. (2009). *A thousand dreams: Vancouver's Downtown Eastside and the fight for its future*. Toronto: Greystone.

Caplovitz, D. (1976). The working addict. *International Journal of Sociology*, *6*(4), 1-136.

Carpenter, J. R., Goldstein, H., & Kenward, M. G. (2011). REALCOM-IMPUTE software for multilevel multiple imputation with mixed response types. *Journal of Statistical Software*, *45*(5), 1-14.

Cartwright, S., & Holmes, N. (2006). The meaning of work: The challenge of regaining employee engagement and reducing cynicism. *Human Resource Management Review*, *16*(2), 199-208.

Castel, R., & Coppel, A. (1991). Les contrôles de la toxicomanie. In A. Ehrenberg (Ed.), *Individus sous influence* (pp. 237-56). Paris: Editions Esprit.

Castellani, B., Wedgeworth, R., Wootton, E., & Rugle, L. (1997). A bi-directional theory of addiction: Examining coping and the factors related to substance relapse. *Addictive Behaviors*, *22*(1), 139-144.

Castells, M., & Portes, A. (1989). World underneath: The origins, dynamics, and effects of the informal economy. In A. Portes, M. Castells, & L. E. Benton (Eds.), *The informal economy* (pp. 11-37). Baltimore: Johns Hopkins University Press.

Celentano, . D., Vlahov, D., Cohn, S., Shadle, V., Obasanjo, O., & Moore, R. D. (1998). Self-reported antiretroviral therapy in injection drug users. *Journal of the American Medical Association*, *280*(6), 544-546.

Celentano, D. D., Galai, N., Sethi, A. K., Shah, N. G., Strathdee, S. A., Vlahov, D., & Gallant, J. E. (2001). Time to initiating highly active antiretroviral therapy among hiv-infected injection drug users. *AIDS*, *15*(13), 1707-1715.

Chen, C. Y., & Lin, K. M. (2009). Health consequences of illegal drug use. *Current Opinion in Psychiatry*, *22*(3), 287-292.

Cheng, S., & Long, . S. (2007). Testing for IIA in the multinomial logit model. *Sociological Methods & Research*, *35*(4), 583-600.

Chisholm, D., Doran, C., Shibuya, K., & Rehm, J. (2006). Comparative cost-effectiveness of policy instruments for reducing the global burden of alcohol, tobacco and illicit drug use. *Drug and Alcohol Review*, *25*(6), 553-565.

Chitwood, D. D., McCoy, C. B., Inciardi, J. A., McBride, D. C., Comerford, M., Trapido, E., . . . Fletcher, M. A. (1990). HIV seropositivity of needles from shooting galleries in south florida. *American Journal of Public Health*, *80*(2), 150-152.

City of Vancouver. (2006). *2005/06 Downtown Eastside community monitoring report*. Vancouver: City of Vancouver.

Clark, H. W., Masson, C. L., Delucchi, K. L., Hall, S. M., & Sees, K. L. (2001). Violent traumatic events and drug abuse severity. *Journal of Substance Abuse Treatment*, *20*(2), 121-127.

Clatts, M. C., Giang, L. M., Goldsamt, L. A., & Yi, H. (2007). Novel heroin injection practices: Implications for transmission of HIV and other bloodborne pathogens. *American Journal of Preventive Medicine*, *32*(6S), S226-233.

Cloward, R. A. (1959). Illegitimate means, anomie, and deviant behavior. *American Sociological Review*, *24*(2), 164-176.

Cloward, R. A., & Ohlin, L. E. (1960). *Delinquency and opportunity: A theory of delinquent gangs*. London: Routledge & Kegan Paul.

Cohen, A. K. (1955). *Delinquent boys: The culture of the gang* Glencoe: Free Press.

Cohen, A. K. (1965). The sociology of the deviant act: Anomie theory and beyond. *American Sociological Review*, *30*(1), 5-14.

Cohen, M. S., Chen, Y. Q., McCauley, M., Gamble, T., Hosseinipour, M. C., Kumarasamy, N., . . . Pilotto, J. H. S. (2011). Prevention of HIV-1 infection with early antiretroviral therapy. *New England Journal of Medicine*.

Collins, L. M., Schafer, J. L., & Kam, C. M. (2001). A comparison of inclusive and restrictive strategies in modern missing data procedures. *Psychological Methods*, *6*(4), 330-51.

Conaway, M. R. (1992). The analysis of repeated categorical measurements subject to nonignorable nonresponse. *Journal of the American Statistical Association*, *87*(419), 817-824.

Conyers, M. (2004). Expanding understanding of HIV/AIDS and employment: Perspectives of focus groups. *Rehabilitation Counseling Bulletin*, *48*(1), 5-18.

Conyers, M. (2008). HIV/AIDS and employment research: A need for an integrative approach. *Counseling Psychologist*, *36*(1), 108-117.

Cook, D. A., Patrick, D. M., Rekart, M. L., Middleton, P. J., Strathdee, S. A., Spencer, D., . . . Marcin, K. (1996). Enhanced surveillance for HIV infection in British columbia, Canada. In *XI international conference on AIDS* (pp. 36-abstract).

Corcoran, M., & Hill, M. S. (1985). Reoccurrence of unemployment among adult men. *The Journal of Human Resources*, *20*(2), 165-183.

Corneil, T., Kuyper, L., Shoveller, J., Hogg, R., Li, K., Spittal, P., . . . Wood, E. (2006). Unstable housing, associated risk behaviour, and increased risk for HIV infection among injection drug users. *Health & Place*, *12*(1), 79-85.

Cox, D. R., & Oakes, D. (1984). *Analysis of survival data*. London: Chapman and Hall.

Côté, F., Godin, G., Mercure, S. -A., Noël, L., & Alary, M. (2006). Preventing HIV transmission among marginalized injection drug users: New insights from a québec city based research. *International Journal of Drug Policy*, *17*(5), 411-417.

Craib, K. J. P., Spittal, P. M., Wood, E., Laliberte, N., Hogg, R. S., Li, K., . . . Schechter, M. T. (2003). Risk factors for elevated HIV incidence among aboriginal injection drug users in Vancouver. *Canadian Medical Association Journal*, *168*(1), 19-24.

Creswell, J., & Plano Clark, V. (2007). *Designing and conducting mixed method research*. Thousand Oaks: Sage.

Creswell, J. W. (2007). *Qualitative inquiry & research design: Choosing among five approaches* (2nd ed.). London: Sage.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage Publications, Inc.

Crisp, A. H., Gelder, M. G., Rix, S., Meltzer, H. I., & Rowlands, O. J. (2000). Stigmatisation of people with mental illnesses. *The British Journal of Psychiatry*, *177*(1), 4-7.

Curtis, R., & Wendel, T. (2000). Toward the development of a typology of illegal drug markets. In M. Natarajan & M. Hough (Eds.), *Illegal drug markets: From research to policy* (pp. 121-52). Monsey, NJ: Criminal Justice Press.

Cutcliffe, J. R., & Ramcharan, P. (2002). Leveling the playing field? Exploring the merits of the ethics-as-process approach for judging qualitative research proposals. *Qualitative Health Research*, *12*(7), 1000.

Cutler, D. M., Lleras-Muney, A., & Vogl, T. (2008). *Socioeconomic status and health: Dimensions and mechanisms*. NBER working paper 14333. Cambridge, MA: National Bureau of Economic Research.

Darke, S. (1998). Self-report among injecting drug users: A review. *Drug and Alcohol Dependence*, *51*(3), 253-263.

Darke, S., Ross, J., & Hall, W. (1996). Overdose among heroin users in sydney, Australia: I. Prevalence and correlates of non-fatal overdose. *Addiction*, *91*(3), 405-411.

Darke, S., Sims, J., McDonald, S., & Wickes, W. (2000). Cognitive impairment among methadone maintenance patients. *Addiction*, *95*(5), 687-695.

David, H. A., & Moeschberger, M. L. (1978). *The theory of competing risks*. London: Griffin.

DeBeck, K., Shannon, K., Wood, E., Li, K., Montaner, J., & Kerr, T. (2007). Income generating activities of people who inject drugs. *Drug and Alcohol Dependence*, *91*(1), 50-6.

Debeck, K., Wood, E., Qi, J., Fu, E., McArthur, D., Montaner, J., & Kerr, T. (2011). Interest in low-threshold employment among people who inject illicit drugs: Implications for street disorder. *The International Journal on Drug Policy*, *22*(5), 376-84.

Deci, E. L. (1972). The effects of contingent and noncontingent rewards and controls on intrinsic motivation. *Organizational Behavior and Human Performance*, *8*(2), 217-229.

Degenhardt, L., & Hall, W. (2012). Extent of illicit drug use and dependence, and their contribution to the global burden of disease. *Lancet*, *379*(9810), 55-70.

DeMaria Jr, P. A., Sterling, R., & Weinstein, S. P. (2000). The effect of stimulant and sedative use on treatment outcome of patients admitted to methadone maintenance treatment. *The American Journal on Addictions*, 9(2), 145-153.

Dempster, A. P., Laird, N. M., & Rubin, D. B. (1977). Maximum likelihood from incomplete data via the EM algorithm. *Journal of the Royal Statistical Society*. *Series B (Methodological)*, *39*(1), 1-38.

DeSimone, J. (2002). Illegal drug use and employment. *Journal of Labor Economics*, *20*(4), 952-977.

Des Jarlais, D. C., & Friedman, S. R. (1990). Shooting galleries and AIDS: Infection probabilities and 'tough' policies. *American Journal of Public Health*, *80*(2), 142-144.

Devereux, P. (2008). *The long trip : A prehistory of psychedelia*. Brisbane: Daily Grail.

Devine, T. J., & Kiefer, N. M. (1991). *Empirical labor economics: The search approach*. Oxford: Oxford University Press.

Devine, T. J., & Kiefer, N. M. (1993). The empirical status of job search theory. *Labour Economics*, *1*(1), 3-24.

Diez Roux, A. V. (2001). Investigating neighborhood and area effects on health. *American Journal of Public Health*, *91*(11), 1783-1789.

Diggle, P., & Kenward, M. G. (1994). Informative drop-out in longitudinal data analysis. *Journal of the Royal Statistical Society*. *Series C (Applied Statistics)*, *43*(1), 49-93.

Dillon, E. M. (2004). Addressing persistent and intractable employment problems in individuals with histories of drug addiction. *Substance Use & Misuse*, *39*(13-14), 2621-2623.

Dillon, E. M., Wong, C. J., Sylvest, C. E., Crone-Todd, D. E., & Silverman, K. (2004). Computer-based typing and keypad skills training outcomes of unemployed injection drug users in a therapeutic workplace. *Substance Use & Misuse*, *39*(13-14), 2325-2353.

DiPrete, T. A., & Eirich, G. M. (2006). Cumulative advantage as a mechanism for inequality: A review of theoretical and empirical developments. *Annual Review of Sociology*, *32*(1), 271-297.

Dixon, L., Goldberg, R., Lehman, A., & McNary, S. (2001). The impact of health status on work, symptoms, and functional outcomes in severe mental illness. *The Journal of Nervous and Mental Disease*, *189*(1), 17-23.

Donders, A. R., van der Heijden, G. J., Stijnen, T., & Moons, K. G. (2006). Review: A gentle introduction to imputation of missing values. *Journal of Clinical Epidemiology*, *59*(10), 1087-1091.

Donoghoe, M. C., Dolan, K. A., & Stimson, G. V. (1992). Life-style factors and social circumstances of syringe sharing in injecting drug users. *British Journal of Addiction*, *87*(7), 993-1003.

Dooley, D., Fielding, J., & Levi, L. (1996). Health and unemployment. *Annual Review of Public Health*, 17(1), 449-465

Dorgelo, A., Pos, S., Vevoordeldonk, J., Jansen, J., & Vervoordeldonk, J. (2011). *Reasons for a differential impact of policies and interventions on the social gradient of health: A literature review*. Netherlands Institute for Health Promotion and Disease Prevention.

Draus, P. J., Roddy, J., & Greenwald, M. (2010). "I always kept a job": Income generation, heroin use and economic uncertainty in the 21st century Detroit. *Journal of Drug Issues*, *40*(4), 841-869.

Dray-Spira, R., Gueguen, A., Lert, F., & VESPA Study Group. (2008). Disease severity, self-reported experience of workplace discrimination and employment loss during the course of chronic HIV disease: Differences according to gender and education. *Occupational and Environmental Medicine*, *65*(2), 112-9.

Dray-Spira, R., Gueguen, A., Ravaud, J. F., & Lert, F. (2007). Socioeconomic differences in the impact of HIV infection on workforce participation in France in the era of highly active antiretroviral therapy. *American Journal of Public Health*, *97*(3), 552-8.

Dray-Spira, R., Legeai, C., Le Den, M., Boué, F., Lascoux-Combe, C., Simon, A., . . . ANRS-COPANA Cohort Study Group. (2012). Burden of HIV disease and comorbidities on the chances of maintaining employment in the era of sustained combined antiretoviral therapies use. *AIDS*, *26*(2), 207-215.

Dray-Spira, R., Persoz, A., Boufassa, F., Gueguen, A., Lert, F., Allegre, T., . . . Primo Cohort Study Group. (2006). Employment loss following HIV infection in the era of highly active antiretroviral therapies. *European Journal of Public Health*, *16*(1), 89-95.

Drobnič, S., Beham, B., & Präg, P. (2010). Good job, good life? Working conditions and quality of life in europe. *Social Indicators Research*, *99*(2), 205-225.

Duff, C. (2007). Towards a theory of drug use contexts: Space, embodiment and practice. *Addiction Research & Theory*, *15*(5), 503-519.

Duncan, G. J., & Brooks-Gunn, J. (1999). *Consequences of growing up poor*. New York: Russell Sage Foundation.

Dyer, J. L., Twillman, N., & Sequeira, N. (2006). Determining the barriers to employment of HIV+ clients. *Journal of Social Work in Disability & Rehabilitation*, *5*(1), 21-43.

Eden, D., & Aviram, A. (1993). Self-efficacy training to speed reemployment: Helping people to help themselves. *Journal of Applied Psychology*, *78*(3), 352-360.

Eisner, E. (1991). *The enlightened eye: Qualitative inquiry and the enhancement of educational practices*. New York: MacMillan.

Elliott, D. S., Ageton, S. S., & Huizinga, D. (1985). *Explaining delinquency and drug use*. Beverly Hills: Sage.

Enberg, J., Gottschalk, P., & Wolf, D. (1990). A random-effects logit model of work-welfare transitions. *Journal of Econometrics*, *43*(1-2), 63-75.

Escohotado, A. (1998). *Histoire des drogues: Des origines au xviie siècle*. Paris: Lezard.

Ezzy, D., De Visser, R., Grubb, I., & McConachy, D. (1998). Employment, accommodation, finances and combination therapy: The social consequences of living with HIV/AIDS in Australia. *AIDS Care*, *10*(2), 189-199.

Fagan, J. (1989). The social organization of drug use and drug dealing among urban gangs. *Criminology*, *27*(4), 633-670.

Farré, M., Mas, A., Torrens, M., Moreno, V., & Camí, J. (2002). Retention rate and illicit opioid use during methadone maintenance interventions: A meta-analysis. *Drug and Alcohol Dependence*, *65*(3), 283-290.

Fast, D., Shoveller, J., Shannon, K., & Kerr, T. (2010). Safety and danger in downtown Vancouver: Understandings of place among young people entrenched in an urban drug scene. *Health & Place*, *16*(1), 51-60.

Fast, D., Small, W., Krüsi, A., Wood, E., & Kerr, T. (2010). 'I guess my own fancy screwed me over': Transitions in drug use and the context of choice among young people entrenched in an open drug scene. *BMC Public Health*, *10*, 126.

Fast, D., Small, W., Wood, E., & Kerr, T. (2009). Coming 'down here': Young people's reflections on becoming entrenched in a local drug scene. *Social Science & Medicine*, *69*(8), 1204-1210.

Faupel, C. E. (1987). Drug availability, life structure, and situational ethics of heroin addicts. *Journal of Contemporary Ethnography*, *15*(3-4), 395-419.

Feldman, H. W. (1968). Ideological supports to becoming and remaining a heroin addict. *Journal of Health and Social Behavior*, *9*(2), 131-139.

Feldman, H. W., & Aldrich, M. R. (1990). The role of ethnography in substance abuse research and public policy: Historical precedent and future prospects. In E. Y. Lambert (Ed.), *The collection and interpretation of data from hidden populations* (pp. 12-30). National Institute on Drug Abuse Research Monograph.

Fendrich, M., Johnson, T. P., Sudman, S., Wislar, J. S., & Spiehler, V. (1999). Validity of drug use reporting in a high-risk community sample: A comparison of cocaine and heroin survey reports with hair tests. *American Journal of Epidemiology*, *149*(10), 955.

Ferri, M., Davoli, M., & Perucci, C. A. (2011). Heroin maintenance for chronic heroin-dependent individuals. *Cochrane Database of Systematic Reviews (Online)*, *12*, CD003410.

Fielding, J. (1993). Coding and managing data. . In N. Giolbert (Ed.), *Researching social life*. London: Sage.

Fine, J. P., & Gray, R. J. (1999). A proportional hazards model for the subdistribution of a competing risk. *Journal of the American Statistical Association*, *94*(446), 496-509.

Finestone, H. (1957). Cats, kicks, and color. *Social Problems*, *5*, 3-13.

Finnie, R. (2000). From school to work: The evolution of early labour market outcomes of Canadian postsecondary graduates. *Canadian Public Policy/Analyse De Politiques*, 197-224.

Fischer, B., Chin, A. T., Kuo, I., Kirst, M., & Vlahov, D. (2002). Canadian illicit opiate users' views on methadone and other opiate prescription treatment: An exploratory qualitative study. *Substance Use & Misuse*, *37*(4), 495-522.

Fountain, J., Strang, J., Gossop, M., Farrel, M., & Griffiths, P. (2000). Diversion of prescribed drugs by drug users in treatment: Analysis of the UK market and new data from London. *Addiction*, *95*(3), 393-406.

Fraser, S., & Moore, D. (2008). Dazzled by unity? Order and chaos in public discourse on illicit drug use. *Social Science & Medicine*, *66*(3), 740-752.

Freese, J., & Long, J. S. (2006). *Regression models for categorical dependent variables using stata*. College Station: Stata Press.

Freidson, E., & Sussman, M. B. (1965). Disability as social deviance. In *Sociology and rehabilitation* (pp. 71-99). Washington, D.C.: American Sociological Association.

French, M. T., Roebuck, M. C., & Alexandre, P. K. (2001). Illicit drug use, employment, and labor force participation. *Southern Economic Journal*, *68*(2), 349-368.

Fry, C., & Dwyer, R. (2001). For love or money? An exploratory study of why injecting drug users participate in research. *Addiction*, *96*(9), 1319-25.

Fuller, C. M., Vlahov, D., Latkin, C. A., Ompad, D. C., Celentano, D. D., & Strathdee, S. A. (2003a). Social circumstances of initiation of injection drug use and early shooting gallery attendance: Implications for HIV intervention among adolescent and young adult injection drug users. *Journal of Acquired Immune Deficiency Syndromes*, *32*(1), 86-93.

Fuller, C. M., Vlahov, D., Latkin, C. A., Ompad, D. C., Celentano, D. D., & Strathdee, S. A. (2003b). Social circumstances of initiation of injection drug use and early shooting gallery attendance: Implications for HIV intervention among adolescent and young adult injection drug users. *Journal of Acquired Immune Deficiency Syndromes*, *32*(1), 86-93.

Furlong, A., & Cartmel, F. (2004). *Vulnerable young men in fragile labour markets: Employment, unemployment and the search for long-term security*. York: Joseph Rowntree Foundation.

Gabe, J., & Bury, M. (1991). Drug use and dependence as a social problem: Sociological approaches. In I. B. Glass (Ed.), *The international handbook of addiction behaviour*. London: Tavistock/Routledge.

Galea, S., & Vlahov, D. (2002). Social determinants and the health of drug users: Socioeconomic status, homelessness, and incarceration. *Public Health Reports*, *117*(S1), S135-S145.

Gandossy, R. P., Williams, J. R., Cohen, J., & Harwood, H. J. (1980). *Drugs and crime: A survey and analysis of the literature*. Washington, DC: National Institute of Justice.

Geertz, C. (1974). From the native's point of view": On the nature of anthropological understanding. In K. H. Basso & H. A. Selby (Eds.), *Meaning in anthropology* (pp. 221-37). Albuquerque, NM: University of New Mexico Press.

Gershuny, J. I. (1979). The informal economy: Its role in post-industrial society. *Futures*, *11*(1), 3-15.

Ghezzi, S., & Mingione, E. (2007). Embeddedness, path dependency and social institutions. *Current Sociology*, *55*(1), 11-23.

Gibson, D. R., Flynn, N. M., & McCarthy, J. J. (1999). Effectiveness of methadone treatment in reducing HIV risk behavior and HIV seroconversion among injecting drug users. *AIDS*, *13*(14), 1807.

Gill, A. M., & Michaels, R. J. (1992). Does drug use lower wages? *Industrial & Labour Relations Review*, *45*(3), 419-434.

Glynn, R. J., Laird, N. M., & Rubin, D. B. (1993). Multiple imputation in mixture models for nonignorable nonresponse with follow-ups. *Journal of the American Statistical Association*, *88*(423), 984-993.

Goffman, E. (1963). *Stigma: Notes on the management of spoiled identity*. New York: Simon and Schuster.

Goffmann, E. (1961). *Asylums: Essays on the social situation of mental patients and other inmates*. London: Doubleday.

Gold, P. (2004). Some obstacles to employment for persons with chronic substance use disorders. *Substance Use & Misuse*, *39*(13), 2631-2636.

Goldenberg, S. M., Strathdee, S. A., Gallardo, M., Nguyen, L., Lozada, R., Semple, S. J., & Patterson, T. L. (2011). How important are venue-based HIV risks among male clients of female sex workers? A mixed methods analysis of the risk environment in nightlife venues in Tijuana, Mexico. *Health & Place*, *17*(3), 748-756.

Goldman, D. P., & Bao, Y. (2004). Effective HIV treatment and the employment of HIV+ adults. *Health Services Research*, *39*(6p1), 1691-1712.

Goldthorpe, J. H. (2007). *On sociology*. Stanford: Stanford University Press.

Goode, E., & Ben-Yehuda, N. (2009). *Moral panics: The social construction of deviance*. Blackwell Pub.

Gossop, M. (2007). *Living with drugs*. London: Ashgate.

Gossop, M., Griffiths, P., Powis, B., & Strang, J. (1994). Cocaine: Patterns of use, route of administration, and severity of dependence. *The British Journal of Psychiatry : The Journal of Mental Science*, *164*(5), 660-4.

Gossop, M., Griffiths, P., Powis, B., Williamson, S., & Strang, J. (1996). Frequency of non-fatal heroin overdose: Survey of heroin users recruited in non-clinical settings. *BMJ* , *313*(7054), 402.

Gossop, M., Marsden, J., Stewart, D., & Rolfe, A. (2000). Reductions in acquisitive crime and drug use after treatment of addiction problems: 1-year follow-up outcomes. *Drug and Alcohol Dependence*, *58*(1-2), 165-172.

Gourlay, J., Ricciardelli, L., & Ridge, D. (2005). Users' experiences of heroin and methadone treatment. *Substance Use & Misuse*, *40*(12), 1875-1882.

Graetz, B. (1993). Health consequences of employment and unemployment: Longitudinal evidence for young men and women. *Social Science & Medicine*, *36*(6), 715-724.

Graham, J. W. (2009). Missing data analysis: Making it work in the real world. *Annual Review of Psychology*, *60*, 549-76.

Graham, J. W., & Donaldson, S. I. (1993). Evaluating interventions with differential attrition: The importance of nonresponse mechanisms and use of follow-up data. *The Journal of Applied Psychology*, *78*(1), 119-128.

Graham, J. W., & Schafer, J. L. (1999). On the performance of multiple imputation for multivariate data with small sample size. In M. Windle, S. West, & K. Bryant (Eds.), *Statistical strategies for small sample research* (pp. 1-29). Thousand Oaks: Sage.

Graham, J. W., Cumsille, P. E., & Elek-Fisk, E. (2003). Methods for handling missing data. In J. A. Schinka & W. F. Vlicer (Eds.), *Comprehensive handbook of psychology*. New York: Wiley.

Graham, J. W., Hofer, S. M., Donaldson, S. I., MacKinnon, D. P., & Schafer, J. L. (1997). Analysis with missing data in prevention research. In M. Windle, S. West, & K. Bryant (Eds.), *The science of prevention: Methodological advances from alcohol and substance abuse research* (pp. 325-66). Washington, D.C.: American Psychological Association.

Granfield, R., & Cloud, W. (1996). The elephant that no one sees: Natural recovery among middle-class addicts. *Journal of Drug Issues*, *26*(1), 45-61.

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, 481-510.

Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, *78*(6), 1360-1380.

Grant, A. M. (2008). The significance of task significance: Job performance effects, relational mechanisms, and boundary conditions. *The Journal of Applied Psychology*, *93*(1), 108-124.

Greenberg, E. S., & Grunberg, L. (1995). Work alienation and problem alcohol behavior. *Journal of Health and Social Behavior*, *36*(1), 83-102.

Groves, W. B., & Sampson, R. J. (1987). Traditional contributions to radical criminology. *Journal of Research in Crime and Delinquency*, *24*(3), 181-214.

Gruenberg, B. (1980). The happy worker: An analysis of educational and occupational differences in determinants of job satisfaction. *American Journal of Sociology*, *86*(2), 247-271.

Hackman, J. R., & Oldham, G. R. (1976). Motivation through the design of work: Test of a theory. *Organizational Behavior and Human Performance*, *16*(2), 250-279.

Hammer, T. (1992). Unemployment and use of drug and alcohol among young people: A longitudinal study in the general population. *British Journal of Addiction*, *87*(11), 1571-1581.

Hammersley, M. (1992). *What's wrong with ethnography?: Methodological explorations*. London: Routledge.

Hanson, B., Beschner, G., Walters, J. M., & Bovelle, E. (1985). *Life with heroin: Voices from the inner city*. Lexington: Free Press.

Harding, G. (1988). *Opiate addiction, morality, and medicine: From moral illness to pathological disease*. Basingstoke: Macmillan.

Harling, M. R. (2007). The place and meaning of 'controlled', illicit substance use in the private lives of a group of individuals. *Journal of Substance Use*, *12*(1), 1-12.

Hartley, H. O., & Hocking, R. R. (1971). The analysis of incomplete data. *Biometrics*, *27*(4), 783-823.

Hartwell, S. W. (2000). Not all work is created equal: Homeless substance abusers and marginal employment. *Research in the Sociology of Work*, 115-128.

Hausman, J., & McFadden, D. (1984). Specification tests for the multinomial logit model. *Econometrica*, 1219-1240.

Hawkins, K. (2001). *Building effective community led responses to HIV/AIDS*. London: John Snow Institute Centre for Sexual and Reproductive Health.

Heckman, J. J., & Borjas, G. J. (1980). Does unemployment cause future unemployment? Definitions, questions and answers from a continuous time model of heterogeneity and state dependence. *Economica*, *47*(187), 247-283.

Hedeker, D., & Gibbons, R. D. (1997). Application of random-effects pattern-mixture models for missing data in longitudinal studies. *Psychological Methods*, *2*(1), 64-78.

Heitjan, D. F., & Rubin, D. B. (1991). Ignorability and coarse data. *Annals of Statistics*, 2244-2253.

Helzer, J. E., Robins, L. N., & McEvoy, L. (1987). Post-traumatic stress disorder in the general population. *New England Journal of Medicine*, *317*(26), 1630-1634.

Henkel, D. (2011). Unemployment and substance use: A review of the literature (1990-2010). *Current Drug Abuse Reviews*, *4*(1), 4-27.

Hergenrather, K. C., Rhodes, S. D., & Clark, G. (2006). Windows to work: Exploring employment-seeking behaviors of persons with HIV/AIDS through photovoice. *AIDS Education & Prevention*, *18*(3), 243-258.

Hermalin, J. A., Steer, R. A., Platt, J. J., & Metzger, D. S. (1990). Risk characteristics associated with chronic unemployment in methadone clients. *Drug and Alcohol Dependence*, *26*(2), 117-125.

Hernaes, E., & Strøm, S. (1996). Heterogeneity and unemployment duration. *Labour*, *10*(2), 269-296.

Herron, M. C. (1999). Postestimation uncertainty in limited dependent variable models. *Political Analysis*, *8*(1), 83-98.

Hill, . D., Ross, . E., & Angel, . J. (2005). Neighborhood disorder, psychophysiological distress, and health. *Journal of Health and Social Behavior*, *46*(2), 170-186.

Hill, A. B. (1965). The environment and disease: Association or causation? *Proceedings of the Royal Society of Medicine*, *58*, 295-300.

Hill, D. H., Axinn, W. G., & Thornton, A. (1993). Competing hazards with shared unmeasured risk factors. *Sociological Methodology*, *23*, 245-277.

Hirschi, T. (1969). *Causes of delinquency*. Berkeley: University of California Press.

Ho, G. H. C., Shih, M., Walters, D. J., & Pittinsky, T. L. (2011). The stigma of unemployment: When joblessness leads to being jobless. *Working Papers of the Institute for Research on Labor and Employment, UCLA*, *8*.

Hoffman, J. A., Klein, H., Eber, M., & Crosby, H. (2000). Frequency and intensity of crack use as predictors of women's involvement in hiv-related sexual risk behaviors. *Drug and Alcohol Dependence*, *58*(3), 227-36.

Hoffman, M. A. (1997). HIV disease and work: Effect on the individual, workplace, and interpersonal contexts. *Journal of Vocational Behavior*, *51*(2), 163-201.

Hogan, J. W., & Laird, N. M. (1997). Model-based approaches to analysing incomplete longitudinal and failure time data. *Statistics in Medicine*, *16*(3), 259-272.

Hogan, J. W., Roy, J., & Korkontzelou, C. (2004). Handling drop-out in longitudinal studies. *Statistics in Medicine*, *23*(9), 1455-1497.

Hogg, R. S., Strathdee, S., Kerr, T., Wood, E., & Remis, R. (2005). HIV prevalence among aboriginal British columbians. *Harm Reduction Journal*, *2*, 26.

Holzer, H. (2007). Collateral costs: The effects of incarceration on the employment and earnings of young workers. *IZA Discussion Paper No 3118*, Available at: www.ssrn.com/abstract=1031709.

Honaker, J., & King, G. (2010). What to do about missing values in time-series cross-section data. *American Journal of Political Science*, *54*(2), 561-581.

Honaker, J., King, G., & Blackwell, M. (2011). *Amelia II: A program for missing data* [Computer Software]. Cambridge, Mass.

Hough, M., & Natarajan, M. (2000). Introduction: Illegal drug markets, research and policy. In *Illegal drug markets: From research to policy* (pp. 1-18). Mosey, NJ: Criminal Justice Press.

Hoyle, R. H., Harris, M. J., & Judd, C. M. (2002). *Research methods in social relations* (7th ed.). London: Thomson Learning.

Hoyle, R. H., Stephenson, M. T., Palmgreen, P., Lorch, E. P., & Donohew, R. L. (2002). Reliability and validity of a brief measure of sensation seeking. *Personality and Individual Differences*, *32*(3), 401-414.

Hser, Y. I., Grella, C., Chou, C. P., & Anglin, M. D. (1998). Relationships between drug treatment careers and outcomes. *Evaluation Review*, *22*(4), 496-519.

Hser, Y. I., Hoffman, V., Grella, C. E., & Anglin, M. D. (2001). A 33-year follow-up of narcotics addicts. *Archives of General Psychiatry*, *58*(5), 503-508.

Hser, Y. I., Huang, D., Teruya, C., & Anglin, M. (2003). Gender comparisons of drug abuse treatment outcomes and predictors. *Drug and Alcohol Dependence*, *72*(3), 255-264.

Hser, Y. I., Longshore, D., & Anglin, M. D. (2007). The life course perspective on drug use: A conceptual framework for understanding drug use trajectories. *Evaluation Review*, *31*(6), 515-47.

Hubbard, R. L., Marsden, M. E., Rachal, J. V., Harwood, H. J., Cavanaugh, E. R., & Ginzburg, H. M. (1989). *Drug abuse treatment: A national study of effectiveness*. Chapel Hill: University of North Carolina Press.

Hughes, J. A. (1976). *Sociological analysis: Methods of discovery*. London: Nelson.

Hughes, P. (1977). *Behind the walls of respect: Community experiments in heroin addiction control*. Chicago: University of Chicago Press.

Hunter, G. M., Donoghoe, M. C., Stimson, G. V., & Rhodes, T. (1995). Changes in the injecting risk behaviour of injecting drug users in London, 1990-1993. *AIDS*, *9*, 493-501.

Ibrahim, J. G. (1990). Incomplete data in generalized linear models. *Journal of the American Statistical Association*, *85*, 765-769.

Jackson, B. (1978). Deviance as success: The double inversion of stigmatised roles. In B. A. Babcock (Ed.), *The reversible world: Symbolic inversion in art and society*. Ithaca: Cornell University Press.

Jahoda, M. (1982). *Employment and unemployment: A social-psychological analysis*. Cambridge: Cambridge University Press.

Jahoda, M. (1987). Unemployed men at work. In D. Dryer & P. Ullah (Eds.), *Unemployed people: Social and psychological perspectives* (pp. 1-73). Milton Keynes: Open University Press. (Original work published 1938)

Jahoda, M., Lazarsfeld, P., & Zeisel, H. (1971). *Marienthal: The sociography of an unemployed community*. London: Transaction Publishers. (Original work published 1932)

Jansen, I., HensS, N., Molenberghs, G., AertsS, M., Verbeke, G., & KenwardD, M. (2006). The nature of sensitivity in monotone missing not at random models. *Computational Statistics & Data Analysis*, *50*(3), 830-858.

Jay, M. (2010). *High society: The central role of mind-altering drugs in history, science and culture*. Toronto: Park Street Press.

Jenkins, S. P. (1995). Easy estimation methods for discrete-time duration models. *Oxford Bulletin of Economics and Statistics*, *57*(1), 129-136.

Jenkins, S. P., & García-Serrano, C. (2004). The relationship between unemployment benefits and re-employment probabilities: Evidence from spain. *Oxford Bulletin of Economics and Statistics*, *66*(2), 239-260.

Johnson, B. D., Goldstein, P. J., Preble, E., Schmeidler, J., Lipton, D. S., Spunt, B., & Miller, T. (1985). *Taking care of business: The economics of crime by heroin abusers*. Lexington, MA: Lexington Books .

Johnson, B. D., Williams, T., Dei, K. A., & Sanabria, H. (1990). Drug abuse in the inner city: Impact on hard-drug users and the community. *Crime and Justice*, *13*, 9-67.

Johnson, M. (1999). Observations on positivism and pseudoscience in qualitative nursing research. *Journal of Advanced Nursing*, *30*(1), 67-73.

Johnson, M. E., Reynolds, G. L., & Fisher, D. G. (2001). Employment status and psychological symptomatology among drug users not currently in treatment. *Evaluation and Program Planning*, *24*(2), 215-220.

Johnson, R. E., Chutuape, M. A., Strain, E. C., Walsh, S. L., Stitzer, M. L., & Bigelow, G. E. (2000). A comparison of levomethadyl acetate, buprenorphine, and methadone for opioid dependence. *The New England Journal of Medicine*, *343*(18), 1290-1297.

Joseph, H., Stancliff, S., & Langrod, J. (2000). Methadone maintenance treatment (MMT): A review of historical and clinical issues. *The Mount Sinai Journal of Medicine*.

Jurajda, S., & Tannery, F. J. (2002). Unemployment durations and extended unemployment benefits in local labor markets. *Industrial and Labour Relations Review*, *56*(2), 324-348.

Kaestner, R. (1991). The effect of illicit drug use on the wages of young adults. *Journal of Labor Economics*, *9*, 381-412.

Kaestner, R. (1994). The effect of illicit drug use on the labor supply of young adults. *Journal of Human Resources*, *29*, 126-155.

Kaestner, R. (1998). Illicit drug use and labor market outcomes: A review of economic theory and its empirical implications. *Journal of Drug Issues*, *28*(3), 663-680.

Kalbfleisch, J. D., & Prentice, R. L. (1980). *The statistical analysis of failure time data*. New York: John Wiley & Sons.

Kandel, D., Chen, K., & Gill, A. (1995). The impact of drug use on earnings: A life-span perspective. *Social Forces*, *74*(1), 243-270.

Kandel, D. B. (1991). The social demography of drug use. *The Milbank Quarterly*, *69*, 365-414.

Kandel, D. B., & Davies, M. (1990). Labor force experiences of a national sample of young adult men: The role of drug involvement. *Youth and Society*, *21*(4), 411-45.

Kandel, D. B., & Yamaguchi, K. (1987). Job mobility and drug use: An event history analysis. *American Journal of Sociology*, *92*(4), 836-878.

Karasek Jr., R. A. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly*, *24*(2), 285-308.

Kazempiur, A., & Halli, S. S. (2000). Neighbourhood poverty in Canadian cities. *The Canadian Journal of Sociology*, *25*(3), 369-381.

Kelliher, C., & Anderson, D. (2008). For better or for worse? An analysis of how flexible working practices influence employees' perceptions of job quality. *The International Journal of Human Resource Management*, *19*(3), 419-431.

Kelly, E., Darke, S., & Ross, J. (2004). A review of drug use and driving: Epidemiology, impairment, risk factors and risk perceptions. *Drug and Alcohol Review*, *23*(3), 319-344.

Kemp, P., Bradshaw, J., Dornan, P., Finch, N., & Mayhew, E. (2004). *Routes out of poverty: A research review*. York: Joseph Rowntree Foundation.

Kemp, P. A., & Neale, J. (2005). Employability and problem drug users. *Critical Social Policy*, *25*(1), 28-46.

Kempson, E. (1996). *Life on a low income*. York: York Publishing Services.

Kendall, J. (2001). Circles of disadvantage: Aboriginal poverty and underdevelopment in Canada. *American Review of Canadian Studies*, *31*(1-2), 43-59.

Kenward, M. G., & Molenberghs, G. (1998). Likelihood based frequentist inference when data are missing at random. *Statistical Science*, *13*(3), 236-247.

Kerr, T., & Palepu, A. (2001). Safe injection facilities in Canada: Is it time? *CMAJ: Canadian Medical Association Journal*, *165*(4), 436-437.

Kerr, T., Kimber, J., & Rhodes, T. (2007). Drug use settings: An emerging focus for research and intervention. *The International Journal on Drug Policy*, *18*(1), 1-4.

Kerr, T., Small, W., & Wood, E. (2005). The public health and social impacts of drug market enforcement: A review of the evidence. *International Journal of Drug Policy*, *16*(4), 210-220.

Kerr, T., Small, W., Johnston, C., Li, K., Montaner, J. S. G., & Wood, E. (2008). Characteristics of injection drug users who participate in drug dealing: Implications for drug policy. *Journal of Psychoactive Drugs*, *40*(2), 147-152.

Kertesz, S. G., Mullins, A. N., Schumacher, J. E., Wallace, D., Kirk, K., & Milby, J. B. (2007). Long-term housing and work outcomes among treated cocaine-dependent homeless persons. *The Journal of Behavioral Health Services and Research*, *34*(1), 17-33.

Kettunen, J. (1997). Education and unemployment duration. *Economics of Education Review*, *16*(2), 163-170.

Kidorf, M., Neufeld, K., & Brooner, R. K. (2004). Combining stepped-care approaches with behavioral reinforcement to motivate employment in opioid-dependent outpatients. *Substance Use & Misuse*, *39*(13-14), 2215-2238.

Kimber, J., Dolan, K., van Beek, I., Hedrich, D., & Zurhold, H. (2003). Drug consumption facilities: An update since 2000. *Drug and Alcohol Review*, *22*(2), 227-233.

Kleber, H. D. (2008). Methadone maintenance 4 decades later. *JAMA: The Journal of the American Medical Association*, *300*(19), 2303-2305.

Klein, H., & Levy, J. A. (2003). Shooting gallery users and HIV risk. *Journal of Drug Issues*, *33*(3), 751-767.

Knipe, E. (1995). *Culture, society, and drugs: The social science approach to drug use*. Prospect, Heights, IL: Waveland Press.

Koester, S. K. (1994). Copping, running and paraphernalia laws: Contextual variables and needle risk behavior among injection drug users in denver. *Human Organization*, *53*(3), 287-295.

Koo, D. J., Chitwood, D. D., & Sánchez, J. (2007). Factors for employment: A case-control study of fully employed and unemployed heroin users. *Substance Use & Misuse*, *42*(7), 1035-1054.

Kornhauser, R. R. (1978). *Social sources of delinquency: An appraisal of analytic models*. Chicago: University of Chicago Press .

Krieger, N., Chen, J. T., Waterman, P. D., Hartman, C., Stoddard, A. M., Quinn, M. M., . . . Barbeau, E. M. (2008). The inverse hazard law: Blood pressure, sexual harassment, racial discrimination, workplace abuse and occupational exposures in US low-income black, white and Latino workers. *Social Science & Medicine*, *67*(12), 1970-1981.

Lahelma, E., Martikainen, P., Laaksonen, M., & Aittomäki, A. (2004). Pathways between socioeconomic determinants of health. *Journal of Epidemiology and Community Health (1979-)*, *58*(4), 327-332.

Latkin, C., Mandell, W., Oziemkowska, M., Celentano, D., Vlahov, D., Ensminger, M., & Knowlton, A. (1995). Using social network analysis to study patterns of drug use among urban drug users at high risk for HIV/AIDS. *Drug and Alcohol Dependence*, *38*(1), 1-9.

Latkin, C. A., Mandell, W., & Vlahov, D. (1996). The relationship between risk networks' patterns of crack cocaine and alcohol consumption and hiv-related sexual behaviors among adult injection drug users: A prospective study. *Drug and Alcohol Dependence*, *42*(3), 175-181.

Lavanchy, D. (2009). The global burden of hepatitis C. *Liver International : Official Journal of the International Association for the Study of the Liver*, *29 Suppl 1*, 74-81.

Lavori, P. W., Dawson, R., & Shera, D. (1995). A multiple imputation strategy for clinical trials with truncation of patient data. *Statistics in Medicine*, *14*(17), 1913-1925.

Layte, R., & Callan, T. (2001). Unemployment, welfare benefits and the financial incentive to work. *Economic and Social Review*, *32*(2), 103-130.

Leddin, G. (2012). The story of a junkie. *Crime.Ie*. Retrieved from: http://crime.ie/crimes/20120211/the-story-of-a-junkie/#.T1ZOdZjODvw

Lem, M., Moore, D., Marion, S., Bonner, S., Chan, K., O'Connell, J., . . . Hogg, R. (2005). Back to work: Correlates of employment among persons receiving highly active antiretroviral therapy. *AIDS Care*, *17*(6), 740-6.

Letourneau, N., & Allen, M. (1999). Post-positivistic critical multiplism: A beginning dialogue. *Journal of Advanced Nursing*, *30*(3), 623-630.

Lincoln, Y. S. (1995). Emerging criteria for quality in qualitative and interpretive research. *Qualitative Inquiry*, *1*(3), 275-289.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.

Lindesmith, A. R. (1938). A sociological theory of drug addiction. *American Journal of Sociology*, *43*(4), 593-613.

Lindesmith, A. R. (1947). Opiate addiction. Bloomington, IN: Principia Press.

Lindesmith, A. R., & Gagnon, J. H. (1964). Anomie and drug addiction. In M. B. Clinard (Ed.), *Anomie and deviant behavior: A discussion and critique* (pp. 158-88). New York: Free Press.

Little, A. (2007). Inactivity and labour market attachment in Britain. *Scottish Journal of Political Economy*, *54*(1), 19-54.

Little, R. A. (1993). Pattern-mixture models for multi-variate incomplete data. *Journal of the American Statistical Associated*, *88*, 125-134.

Little, R. J. A., & Rubin, D. B. (1987). *Statistical analysis with missing data*. New York: Wiley.

Little, R. J. A., & Rubin, D. B. (2002). *Statistical analysis with missing data* (2nd ed.). New York: Wiley.

Lloyd, C. (2010). Sinning and sinned against: The stigmatisation of problem drug users. London: UK Drug Policy Commission.

Long, J. S. (1997). *Regression models for categorical and limited dependent variables*. Thousand Oaks: Sage Publications.

Lovell, A. M. (2002). Risking risk: The influence of types of capital and social networks on the injection practices of drug users. *Social Science & Medicine*, *55*(5), 803-821.

Lundgren, L. M., Schilling, R. F., Ferguson, F., Davis, K., & Amodeo, M. (2003). Examining drug treatment program entry of injection drug users: Human capital and institutional disaffiliation. *Evaluation and Program Planning*, *26*(2), 123-132.

Lunn, M., & McNeil, D. (1995). Applying cox regression to competing risks. *Biometrics*, *51*(2), 524-532.

Lurie, P., & Drucker, E. (1997). An opportunity lost: HIV infections associated with lack of a national needle-exchange programme in the USA. *Lancet*, *349*(9052), 604-608.

Lynch, J. W., Smith, G. D., Kaplan, G. A., & House, J. S. (2000). Income inequality and mortality: Importance to health of individual income, psychosocial environment, or material conditions. *BMJ: British Medical Journal*, 320(7243), 1200-1204.

Lynch, L. M. (1989). The youth labor market in the eighties: Determinants of re-employment probabilities for young men and women. *The Review of Economics and Statistics*, *71*(1), 37-45.

MacDonald, Z., & Pudney, S. (2000a). Illicit drug use, unemployment, and occupational attainment. *Journal of Health Economics*, *19*(6), 1089-1115.

MacDonald, Z., & Pudney, S. (2000b). The wages of sin? Illegal drug use and the labour market. *Labour*, *14*(4), 657-673.

MacDonald, Z., & Pudney, S. (2001). Illicit drug use and labour market achievement: Evidence from the UK. *Applied Economics*, *33*(13), 1655-1668.

Machin, S., & Marie, O. (2006). Crime and benefit sanctions. *Portuguese Economic Journal*, *5*(2), 149-165.

Magura, S. (2003). The role of work in substance dependency treatment: A preliminary overview. *Substance Use & Misuse*, *38*(11-13), 1865-76.

Magura, S., & Kang, S. Y. (1996). Validity of self-reported drug use in high risk populations: A meta-analytical review. *Substance Use & Misuse*, *31*(9), 1131-1153.

Magura, S., & Staines, G. L. (2004). Introduction: New directions for vocational rehabilitation in substance user treatment: Rebuilding damaged lives. *Substance Use & Misuse*, *39*(13-14), 2157-2164.

Magura, S., Staines, G. L., Blankertz, L., & Madison, E. M. (2004). The effectiveness of vocational services for substance users in treatment. *Substance Use & Misuse*, *39*(13-14), 2165-2213.

Maher, L. (1997). *Sexed work: Gender, race and resistance in a brooklyn drug market*. New York: Oxford University Press.

Maher, L. (2004). Drugs, public health and policing in indigenous communities. *Drug and Alcohol Review*, *23*(3), 249-251.

Marmor, T. R., Evans, R. G., & Barer, M. L. (1994). *Why are some people healthy and others not?: The determinants of health of populations*. New York: Aldine de Gruyter.

Marmot, M., Friel, S., Bell, R., Houweling, T. A. J., & Taylor, S. (2008). Closing the gap in a generation: Health equity through action on the social determinants of health. *The Lancet*, *372*(9650), 1661-1669.

Marmot, M. G., & Wilkinson, R. G. (2006). *Social determinants of health*. Oxford: Oxford University Press.

Marshall, C. (1990). Goodness criteria: Are they objective or judgement calls? In E. G. Guba (Ed.), *The paradigm dialog* (pp. 188-97). Newbury Park, CA: Sage.

Martin, A., & Stenner, P. (2004). Talking about drug use: What are we (and our participants) doing in qualitative research? *International Journal of Drug Policy*, *15*(5), 395-405.

Mason, J. (2002). Qualitative interviewing. In T. May (Ed.), *Qualitative research in action*. London: Sage.

Mathers, B. M., Degenhardt, L., Phillips, B., Wiessing, L., Hickman, M., Strathdee, S. A., . . . 2007 Reference Group to the UN on HIV and Injecting Drug Use. (2008). Global epidemiology of injecting drug use and HIV among people who inject drugs: A systematic review. *Lancet*, *372*(9651), 1733-45.

Mathers, C. D., & Schofield, D. J. (1998). The health consequences of unemployment: The evidence. *Medical Journal of Australia*, *168*, 178-185.

Matthews, K. A., Gallo, L. C., & Taylor, S. E. (2010). Are psychosocial factors mediators of socioeconomic status and health connections? A progress report and blueprint for the future. *Annals of the New York Academy of Sciences*, *1186*, 146-73.

Mattick, R. P., Kimber, J., Breen, C., & Davoli, M. (2008). Buprenorphine maintenance versus placebo or methadone maintenance for opioid dependence. *Cochrane Database of Systematic Reviews (Online)*, (2), CD002207.

Maxwell, J. A. (1992). Understanding and validity in qualitative research. *Harvard Educational Review*, *62*(3), 279-301.

Mayock, P. (2002). Drug pathways, transitions and decisions: The experiences of young people in an inner-city Dublin community. *Contemporary Drug Problems*, *29*, 117-156.

McCoy, C. B., Comerford, M., & Metsch, L. R. (2007). Employment among chronic drug users at baseline and 6-month follow-up. *Substance Use & Misuse*, *42*(7), 1055-1067.

McElrath, K., Chitwood, D. D., Griffin, D. K., & Comerford, M. (1994). The consistency of self-reported HIV risk behavior among injection drug users. *American Journal of Public Health*, *84*(12), 1965-1970.

McFadden, D. (1973). Conditional logit analysis of qualitative choice behavior. In P. Zaermbka (Ed.), *Frontiers of econometrics* (pp. 105-42). New York: Academic Press.

McInnes, C. W., Druyts, E., Harvard, S. S., Gilbert, M., Tyndall, M. W., Lima, V. D., . . . Hogg, R. S. (2009). HIV/AIDS in Vancouver, British columbia: A growing epidemic. *Harm Reduction Journal*, *6*, 5.

McKeganey, N. (1995). Quantitative and qualitative research in the addictions: An unhelpful divide. *Addiction*, *90*(6), 749-751.

McKeganey, N. (2001). To pay or not to pay: Respondents' motivation for participating in research. *Addiction*, *96*(9), 1237-1238.

McKnight, I., Maas, B., Wood, E., Tyndall, M. W., Small, W., Lai, C., . . . Kerr, T. (2007). Factors associated with public injecting among users of Vancouver's supervised injection facility. *The American Journal of Drug and Alcohol Abuse*, *33*(2), 319-325.

McKnight, P. E., McKnight, K. M., Sidani, S., & Figueredo, A. J. (2007). *Missing data: A gentle introduction*. London: Guilford Press.

McLachlan, G. J., & Krishnan, T. (2008). *The EM algorithm and extensions*. New York: John Wiley and Sons.

McQuaid, R. W. (2006). Job search success and employability in local labor markets. *The Annals of Regional Science*, *40*(2), 407-421.

Mealli, F., & Pudney, S. (1999). Specification tests for random-effects transition models: An application to a model of the British youth training scheme. *Lifetime Data Analysis*, *5*(3), 213-237.

Meneses, . A., & Akers, . L. (2011). A comparison of four general theories of crime and deviance: Marijuana use among american and bolivian university students. *International Criminal Justice Review*, *21*(4), 333-352.

Merton, R. K. (1938). Social structure and anomie. *American Sociological Review*, *3*(5), 672-682.

Merton, R. K. (1988). The matthew effect in science, II: Cumulative advantage and the symbolism of intellectual property. *Isis*, *79*(4), 606-623.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded source book* (2nd ed.). Sage: London.

Miller, C. L., Kerr, T., Frankish, J. C., Spittal, P. M., Li, K., Schechter, M. T., & Wood, E. (2006a). Binge drug use independently predicts HIV seroconversion among injection drug users: Implications for public health strategies. *Substance Use & Misuse*, *41*(2), 199-210.

Miller, C. L., Strathdee, S. A., Spittal, P. M., Kerr, T., Li, K., Schechter, M. T., & Wood, E. (2006b). Elevated rates of HIV infection among young aboriginal injection drug users in a Canadian setting. *Harm Reduction Journal*, *3*, 9.

Miller, W. B. (1958). Lower class culture as a generating milieu of gang delinquency. *Journal of Social Issues*, *14*(3), 5-19.

Milloy, M. J., Kerr, T., Buxton, J., Rhodes, T., Guillemi, S., Hogg, R., . . . Wood, E. (2011). Dose-response effect of incarceration events on nonadherence to HIV antiretroviral therapy among injection drug users. *The Journal of Infectious Diseases*, *203*(9), 1215-1221.

Mills, K. L., Teesson, M., Ross, J., & Darke, S. (2007). The impact of post-traumatic stress disorder on treatment outcomes for heroin dependence. *Addiction*, *102*(3), 447-454.

Mintzer, M. Z., Copersino, M. L., & Stitzer, M. L. (2005). Opioid abuse and cognitive performance. *Drug and Alcohol Dependence*, *78*(2), 225-230.

Mintzer, M. Z., & Stitzer, M. L. (2002). Cognitive impairment in methadone maintenance patients. *Drug and Alcohol Dependence*, 67(1), 41-51.

Molenberghs, G. (2007). What to do with missing data? *Journal of the Royal Statistical Society*, *170*(4), 861-863.

Molenberghs, G., & Verbeke, G. (2001). A review on linear mixed models for longitudinal data, possibly subject to dropout. *Statistical Modelling*, *1*(4), 235.

Montagne, M. (2002). Appreciating the user's perspective: Listening to the "methadonians". *Substance Use & Misuse*, *37*(4), 565-570.

Montgomery, J. D. (1992). Job search and network composition: Implications of the strength-of-weak-ties hypothesis. *American Sociological Review*, *57*(5), 586-596.

Moore, D. (2005). Key moments in the ethnography of drug-related harm: Reality checks for policy-makers? In T. Stockwell, P. J. Gruenewald, J. W. Toumbourou, & W. Loxley (Eds.), *Preventing harmful substance use* (pp. 433-42). Sydney: Wiley & Sons.

Morris, J. K., Cook, D. G., & Shaper, A. G. (1994). Loss of employment and mortality. *BMJ* , *308*(6937), 1135-1139.

Morse, N. C., & Weiss, R. S. (1955). The function and meaning of work and the job. *American Sociological Review*, *20*(2), 191-198.

Morton-Williams, J. (1985). Making qualitative research work: Aspects of administration. In R. Walker (Ed.), *Applied qualitative research* (pp. 27-42). Aldershot: Gower.

Mottaz, C. J. (1985). The relative importance of intrinsic and extrinsic rewards as determinants of work satisfaction. *The Sociological Quarterly*, *26*(3), 365-385.

Moustakas, C. E. (1994). *Phenomenological research methods*. California: Sage.

Muñoz de Bustillo Llorente, R., & Fernández Macías, E. (2005). Job satisfaction as an indicator of the quality of work. *Journal of Socio-Economics*, *34*(5), 656-673.

Murphy, S., & Irwin, J. (1992). "Living with the dirty secret": Problems of disclosure for methadone maintenance clients. *Journal of Psychoactive Drugs*, *24*(3), 257-64.

Narendranathan, W., & Nickell, S. (1985). Modelling the process of job search. *Journal of Econometrics*, *28*(1), 29-49.

Narendranathan, W., & Stewart, M. B. (1993). Modelling the probability of leaving unemployment: Competing risks models with flexible base-line hazards. *Applied Statistics*, 63-83.

Neale, J. (2004). Gender and illicit drug use. *British Journal of Social Work*, *34*(6), 851-870.

Neale, J., & Kemp, P. A. (2009). Employment and problem drug use. In J. Barlow (Ed.), *Substance misuse: The implications of research, policy and practice* (pp. 94-101). London: Jessica Kingsley Publishers.

Neale, J., Allen, D., & Coombes, L. (2005). Qualitative research methods within the addictions. *Addiction*, *100*(11), 1584-93.

Nelson, P. K., Mathers, B. M., Cowie, B., Hagan, H., Des Jarlais, D., Horyniak, D., & Degenhardt, L. (2011). Global epidemiology of hepatitis B and hepatitis C in people who inject drugs: Results of systematic reviews. *Lancet*, *378*(9791), 571-83.

Neyman, J. (1937). Outline of a theory of statistical estimation based on the classical theory of probability. *Philosophical Transactions of the Royal Society of London*, *Series A*(236), 333-380.

Neyman, J., & Pearson, E. S. (1933). On the problem of most efficient tests of statistical hypotheses. . *Philosophical Transactions of the Royal Society of London*, *Series A*(231), 289-337.

Norris, F. H. (1992). Epidemiology of trauma: Frequency and impact of different potentially traumatic events on different demographic groups. *Journal of Consulting and Clinical Psychology*, *60*(3), 409-418.

Nosyk, B., Marsh, D. C., Sun, H., Schechter, M. T., & Anis, A. H. (2010). Trends in methadone maintenance treatment participation, retention, and compliance to dosing guidelines in British columbia, Canada: 1996-2006. *Journal of Substance Abuse Treatment*, *39*(1), 22-31.

Nunkoosing, K. (2005). The problems with interviews. *Qualitative Health Research*, *15*(5), 698-706.

Nutt, D., King, L. A., Saulsbury, W., & Blakemore, C. (2007). Development of a rational scale to assess the harm of drugs of potential misuse. *The Lancet*, *369*(9566), 1047-1053.

Nutt, D. J., King, L. A., Phillips, L. D., & Independent Scientific Committee on Drugs. (2010). Drug harms in the UK: A multicriteria decision analysis. *Lancet*, *376*(9752), 1558-1565.

Nyberg, A., Alfredsson, L., Theorell, T., Westerlund, H., Vahtera, J., & Kivimäki, M. (2009). Managerial leadership and ischaemic heart disease among employees: The swedish WOLF study. *Occupational and Environmental Medicine*, *66*(1), 51-55.

Oetting, E. R., & Donnermeyer, J. F. (1998). Primary socialization theory: The etiology of drug use and deviance. *Substance Use & Misuse*, *33*(4), 995-1026.

Orcutt, J. D. (1976). Ideological variations in the structure of deviant types: A multivariate comparison of alcoholism and heroin addiction. *Social Forces*, *55*(2), 419-437.

O'Reilly, C. A., Caldwell, D. F., & Barnett, W. P. (1989). Work group demography, social integration, and turnover. *Administrative Science Quarterly*, *34*(1), 21-37.

O'Brien. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity*, *41*(5), 673-690.

Padavic, I., & Reskin, B. F. (2002). *Women and men at work*. Thaousand Oaks, CA: Pine Forge Press.

Pager, D. (2003). The mark of a criminal record. *American Journal of Sociology*, *108*(5), 937-975.

Pahl, R. E. (1987). Does jobless mean workless? Unemployment and informal work. *Annals of the American Academy of Political and Social Science*, *493*, 36-46.

Parker, R. G., Easton, D., & Klein, C. H. (2000). Structural barriers and facilitators in HIV prevention: A review of international research. *AIDS*, *14 (S1)*, S22-S323.

Parran, T. V., Adelman, C. A., Merkin, B., Pagano, M. E., Defranco, R., Ionescu, R. A., & Mace, A. G. (2010). Long-term outcomes of office-based buprenorphine/naloxone maintenance therapy. *Drug and Alcohol Dependence*, *106*(1), 56-60.

Paterson, D. L., Swindells, S., Mohr, J., Brester, M., Vergis, E. N., Squier, C., . . . Singh, N. (2000). Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. *Annals of Internal Medicine*, *133*(1), 21-30.

Patrick, D. M., Strathdee, S. A., Archibald, C. P., Ofner, M., Craib, K. J., Cornelisse, P. G., . . . O'Shaughnessy, M. V. (1997). Determinants of HIV seroconversion in injection drug users during a period of rising prevalence in Vancouver. *International Journal of STD & AIDS*, *8*(7), 437-445.

Pearson, G. (1987). Deprivation, unemployment and heroin use. In N. Dorn & N. South (Eds.), *A land fit for heroin?: Drug policies, prevention and practice*. London: MacMillan Education.

Peck, D. F., & Plant, M. A. (1986). Unemployment and illegal drug use: Concordant evidence from a prospective study and national trends. *British Medical Journal (Clinical Research Ed.)*, *293*(6552), 929-32.

Pelissier, B., & Jones, N. (2005). A review of gender differences among substance abusers. *Crime & Delinquency*, *51*(3), 343-372.

Peterson, J. A., Schwartz, R. P., Mitchell, S. G., Reisinger, H. S., Kelly, S. M., O'Grady, K. E., . . . Agar, M. H. (2010). Why don't out-of-treatment individuals enter methadone treatment programmes? *The International Journal on Drug Policy*, *21*(1), 36-42.

Petrongolo, B. (2001). Reemployment probabilities and returns to matching. *Journal of Labor Economics*, *19*(3), 716-741.

Petrongolo, B. (2009). The long-term effects of job search requirements: Evidence from the UK JSA reform. *Journal of Public Economics*, *93*(11-12), 1234-1253.

Pierce, T. G. (1999). Gen-X junkie: Ethnographic research with young white heroin users in Washington, DC. *Substance Use & Misuse*, *34*(14), 2095-2114.

Platt, J. J. (1995). Vocational rehabilitation of drug abusers. *Psychological Bulletin*, *117*(3), 416-433.

Popay, J., Rogers, A., & Williams, G. (1998). Rationale and standards for the systematic review of qualitative literature in health services research. *Qualitative Health Research*, *8*(3), 341-351.

Pope, C., & Mays, N. (1995). Qualitative research: Reaching the parts other methods cannot reach: An introduction to qualitative methods in health and health services research. *BMJ* , *311*(6996), 42-45.

Preble, E., & Casey, J. J. (1969). Taking care of business-the heroin user's life on the street. *Substance Use & Misuse*, *4*(1), 1-24.

Price, R. H., Burke, A. C., D'Aunno, T. A., Klingel, D. M., McCaughrin, W. C., Rafferty, J. A., & Vaughn, T. E. (1991). Outpatient drug abuse treatment services, 1988: Results of a national survey. In *Improving drug abuse treatment (NIDA research monograph 106)* (pp. 63-92). Rockville, MD: National Institute on Drug Abuse.

Raphael, D. (2009). *Social determinants of health* (2nd ed.). Toronto: Canadian Scholars' Press.

Rehm, J. (2006). *The costs of substance use in Canada*. Ottawa: Canadian Centre for Substance Abuse.

Reif, S., Horgan, C. M., Ritter, G. A., & Tompkins, C. P. (2004). The impact of employment counseling on substance user treatment participation and outcomes. *Substance Use & Misuse*, *39*(13-14), 2391-2424.

Reuter, P. H., MacCoun, R. J., Murphy, P., Abrahamse, A., & Simon, B. (1990). *Money from crime: A study of the economics of drug dealing in Washington, D.C*. Santa Monica, CA: Rand.

Rhodes, T. (2000). The multiple roles of qualitative research in understanding and responding to illicit drug use. In G. Greenwood & K. Robertson (Eds.), *Understanding and responding to drug use: The role of qualitative research* (pp. 21-36). Luxembourg: European Monitoring Centre for Drugs and Drug Addiction (EMCDDA).

Rhodes, T. (2002). The 'risk environment': A framework for understanding and reducing drug-related harm. *International Journal of Drug Policy*, *13*(2), 85-94.

Rhodes, T. (2009). Risk environments and drug harms: A social science for harm reduction approach. *International Journal of Drug Policy*, *20*(3), 193-201.

Rhodes, T., & Moore, D. (2001). On the qualitative in drugs research: Part one. *Addiction Research & Theory*, *9*(4), 279-297.

Rhodes, T., Kimber, J., Small, W., Fitzgerald, J., Kerr, T., Hickman, M., & Holloway, G. (2006). Public injecting and the need for 'safer environment interventions' in the reduction of drug-related harm. *Addiction*, *101*(10), 1384-1393.

Rhodes, T., Singer, M., Bourgois, P., Friedman, S. R., & Strathdee, S. A. (2005). The social structural production of HIV risk among injecting drug users. *Social Science & Medicine*, *61*(5), 1026-1044.

Richardson, L., Sherman, S. G., & Kerr, T. (2012). Employment amongst people who use drugs: A new arena for research and intervention? *The International Journal on Drug Policy*, *23*(1), 3-5.

Richardson, L., Wood, E., Li, K., & Kerr, T. (2010). Factors associated with employment among a cohort of injection drug users. *Drug and Alcohol Review*, *29*(3), 293-300.

Richardson, L., Wood, E., Montaner, J., & Kerr, T. (2012). Addiction treatment-related employment barriers: The impact of methadone maintenance. *Journal of Substance Abuse Treatment (in press)*. DOI: http://dx.doi.org/10.1016/j.jsat.2011.12.008

Riddell, W. C., & Song, X. (2011). The impact of education on unemployment incidence and re-employment success: Evidence from the U.S. Labour market. *Labour Economics*, *18*(4), 453-463.

Rigg, J., & Sefton, T. (2006). Income dynamics and the life cycle. *Journal of Social Policy*, *35*(03), 411-435.

Ritter, A., & Di Natale, R. (2005). The relationship between take-away methadone policies and methadone diversion. *Drug and Alcohol Review*, *24*(4), 347-352.

Robins, J. M., Rotnitzky, A., & Zhao, L. P. (1995). Analysis of semiparametric regression models for repeated outcomes in the presence of missing data. *Journal of the American Statistical Association*, *90*, 106-121.

Robins, L. N., Helzer, J. E., & Davis, D. H. (1975). Narcotic use in southeast asia and afterward: An interview study of 898 vietnam returnees. *Archives of General Psychiatry*, *32*(8), 955-961.

Roed, K., Raaum, O., & Goldstein, H. (1999). Does unemployment cause unemployment? Micro evidence from Norway. *Applied Economics*, *31*(10), 1207-1218.

Rosenbaum, M., & Murphy, S. (1984). Always a junkie? The arduous task of getting off methadone maintenance. *Journal of Drug Issues*, *14*(3), 527-552.

Rosenbaum, M., Washburn, A., Knight, K., Kelley, M., & Irwin, J. (1996). Treatment as harm reduction, defunding as harm maximization: The case of methadone maintenance. *Journal of Psychoactive Drugs*, *28*(3), 241-9.

Roulston, K., deMarrais, K., & Lewis, J. B. (2003). Learning to interview in the social sciences. *Qualitative Inquiry*, *9*(4), 643-668.

Rowlett, J. K., Negus, S. S., Shippenberg, T. S., Mello, N. K., Walsh, S. L., & Spealman, R. D. (1997). Combined cocaine and opioid abuse: From neurobiology to the clinic. *NIDA Research Monograph*, *178*, 55-57.

Rubin, D. B. (1976). Inference and missing data. *Biometrika*, *63*(3), 581-592.

Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys* New York: Wiley.

Rubin, D. B. (1996). Multiple imputation after 18+ years. *Journal of the American Statistical Association*, *91*(434), 473-489.

Rusch, M., Nixon, S., Schilder, A., Braitstein, P., Chan, K., & Hogg, R. S. (2004). Prevalence of activity limitation among persons living with HIV/AIDS in British columbia. *Canadian Journal of Public Health. Revue Canadienne De Santé Publique*, *95*(6), 437-40.

Sampson, R. J., & Laub, J. H. (1995). *Crime in the making: Pathways and turning points through life*. Cambridge: Harvard University Press.

Sandelowski, M. (1986). The problem of rigor in qualitative research. *Advances in Nursing Science*, *8*(3), 27-37.

Schafer, J. L. (1997). *Analysis of incomplete multivariate data*. London: Chapman & Hall.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, *7*(2), 147-177.

Schafer, J. L., & Olsen, M. K. (1998). Multiple imputation for multivariate missing-data problems: A data analyst's perspective. *Multivariate Behavioral Research*, *33*(4), 545-571.

Schaufeli, W. B., & Vanyperen, N. W. (1993). Success and failure in the labour market. *Journal of Organizational Behavior*, *14*(6), 559-572.

Schottenfeld, R. S., Pascale, R., & Sokolowski, S. (1992). Matching services to needs: Vocational services for substance abusers. *Journal of Substance Abuse Treatment*, *9*(1), 3-8.

Seddon, T. (2006). Drugs, crime and social exclusion: Social context and social theory in British drugs-crime research. *British Journal of Criminology*, *46*(4), 680-703.

Sees, L. (2000). Methadone maintenance vs 180-day psychosocially enriched detoxification for treatment of opioid dependence: A randomized controlled trial. *JAMA: The Journal of the American Medical Association*, *283*(10), 1303-1310.

Sen, A. (1985). A sociological approach to the measurement of poverty: A reply to professor peter townsend. *Oxford Economic Papers*, *37*(4), 669-676.

Sen, A. (1992). *Inequality reexamined*. Oxford: Clarendon Press.

Shannon, K., Ishida, T., Lai, C., & Tyndall, M. W. (2006). The impact of unregulated single room occupancy hotels on the health status of illicit drug users in Vancouver. *International Journal of Drug Policy*, *17*(2), 107-114.

Shannon, K., Kerr, T., Allinott, S., Chettiar, J., Shoveller, J., & Tyndall, M. W. (2008). Social and structural violence and power relations in mitigating HIV risk of drug-using women in survival sex work. *Social Science & Medicine*, *66*(4), 911-21.

Shannon, K., Strathdee, S. A., Shoveller, J., Rusch, M., Kerr, T., & Tyndall, M. W. (2009). Structural and environmental barriers to condom use negotiation with clients among female sex workers: Implications for hiv-prevention strategies and policy. *American Journal of Public Health*, *99*(4), 659-65.

Shavelson, L. (2001). *Hooked: Five addicts challenge our misguided drug rehab system*. New York: The New Press.

Shavit, Y., & Muller, W. (1998). *From school to work: A comparative study of educational qualifications and occupational destinations*. Oxford: Oxford University Press.

Shaw, V. N. (2002). *Substance use and abuse: Sociological perspectives*. London: Praeger.

Sheerin, I., Green, T., Sellman, D., Adamson, S., & Deering, D. (2004). Reduction in crime by drug users on a methadone maintenance therapy programme in New Zealand. *The New Zealand Medical Journal*, *117*(1190), U795.

Shepard, D. S., & Reif, S. (2004). The value of vocational rehabilitation in substance user treatment: A cost-effectiveness framework. *Substance Use & Misuse*, *39*(13-14), 2581-2609.

Sherman, S. G., & Latkin, C. A. (2002). Drug users' involvement in the drug economy: Implications for harm reduction and HIV prevention programs. *Journal of Urban Health*, *79*(2), 266-277.

Sherman, S. G., German, D., Cheng, Y., Marks, M., & Bailey-Kloche, M. (2006). The evaluation of the JEWEL project: An innovative economic enhancement and HIV prevention intervention study targeting drug using women involved in prostitution. *AIDS Care*, *18*(1), 1-11.

Silverman, K., & Robles, E. (1999). Employment as a drug abuse treatment intervention: A behavioral economic analysis. In F. J. Chaloupka, M. Grossman, W. K. Bickel, & H. Saffer (Eds.), *The economic analysis of substance use and abuse* (pp. 311-26). Chicago: University of Chicago Press.

Silverman, K., Wong, C. J., Needham, M., Diemer, K. N., Knealing, T., Crone-Todd, D., . . . Higgins, S. (2007). A randomized trial of employment-based reinforcement of cocaine abstinence in injection drug users. *Journal of Applied Behavior Analysis*, *40*(3), 387-410.

Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. Oxford: Oxford University Press, USA.

Singer, M., & Weeks, M. R. (1996). Preventing AIDS in communities of color: Anthropology and social prevention. *Human Organization*, *55*(4), 488-492.

Singh, N., Berman, S. M., Swindells, S., Justis, J. C., Mohr, J. A., Squier, C., & Wagener, M. M. (1999). Adherence of human immunodeficiency virus— infected patients to antiretroviral therapy. *Clinical Infectious Diseases*, *29*(4), 824-830.

Small, K. A., & Hsiao, C. (1985). Multinomial logit specification tests. *International Economic Review*, *26*(3), 619-627.

Small, W., Kerr, T., Charette, J., Schechter, M. T., & Spittal. P. (2006). Impacts of intensified police activity on injection drug users: Evidence from an ethnographic investigation. *International Journal of Drug Policy*, *17*(2), 85-95.

Small, W., Rhodes, T., Wood, E., & Kerr, T. (2007). Public injection settings in Vancouver: Physical environment, social context and risk. *The International Journal on Drug Policy*, *18*(1), 27-36.

Small, W., Wood, E., Jürgens, R., & Kerr, T. (2005, December). Injection drug use, HIV/AIDS and incarceration: Evidence from the Vancouver injection drug users study. *HIV/AIDS policy & law review / Canadian HIV/AIDS Legal Network*, pp. 1, 5-10.

Smith, H. A. (2003). Planning, policy and polarisation in Vancouver's downtown eastside. *Tijdschrift Voor Economische En Sociale Geografie*, *94*(4), 496-509.

Smith, M. W., Schnurr, P. P., & Rosenheck, R. A. (2005). Employment outcomes and PTSD symptom severity. *Mental Health Services Research*, *7*(2), 89-101.

Snyder, R., & Durán-Martínez, A. (2009). Does illegality breed violence? Drug trafficking and state-sponsored protection rackets. *Crime, Law and Social Change*, *52*(3), 253-273.

Sommers, I., & Baskin, D. R. (1997). Situational or generalized violence in drug dealing networks. *Journal of Drug Issues*, *27*, 833-850.

Sorenson, A. M., & Brownfield, D. (1995). Adolescent drug use and a general theory of crime: An analysis of a theoretical integration. *Canadian Journal of Criminology*, *37*, 19-37.

Spector, . E. (1986). Perceived control by employees: A meta-analysis of studies concerning autonomy and participation at work. *Human Relations*, *39*(11), 1005-1016.

Spiezia, V. (2000). The effects of benefits on unemployment and wages: A comparison of unemployment compensation systems. *International Labour Review*, *139*(1), 73-90.

Spittal, P. M., Craib, K. J. P., Wood, E., Laliberté, N., Li, K., Tyndall, M. W., . . . Schechter, M. T. (2002). Risk factors for elevated HIV incidence rates among female injection drug users in Vancouver. *Canadian Medical Association Journal*, *166*(7), 894-899.

Stasny, E. A. (1986). Estimating gross flows using panel data with nonresponse: An example from the Canadian labour force survey. *Journal of the American Statistical Association*, *81*(393), 42-47.

StataCorp. (2011). *Statistical software: Release 12* [Computer Software]. College Station, TX: Stata Corporation.

Statistics Canada. (1998). *1996 Census of Population*.

*S*tatistics Canada. (2008). Forward sortation area. *Census 2006 Reference Material*. Retrieved from http://www12.statcan.ca/census-recensement/2006/ref/notes/ FSA-RTR-eng.cfm.

Steele, F., Goldstein, H., & Browne, W. (2004). A general multilevel multistate competing risks model for event history data, with an application to a study of contraceptive use dynamics. *Statistical Modelling*, *4*(2), 145-159.

Stephens, R. C. (1991). *The street addict role: A theory of heroin addiction*. Albany, NY: State University of New York Press.

Sterling, R. C., Gottheil, E., Glassman, S. D., Weinstein, S. P., Serota, R. D., & Lundy, A. (2001). Correlates of employment: A cohort study. *The American Journal of Drug and Alcohol Abuse*, *27*(1), 137-146.

Stimson, G. V., & Oppenheimer, E. (1982). *Heroin addiction: Treatment and control in Britain*. London: Travistock/Routledge.

Strathdee, S. A., & Stockman, J. K. (2010). Epidemiology of HIV among injecting and non-injecting drug users: Current trends and implications for interventions. *Current HIV/AIDS Reports*, *7*(2), 99-106.

Strathdee, S. A., Hallett, T. B., Bobrova, N., Rhodes, T., Booth, R., Abdool, R., & Hankins, C. A. (2010). HIV and risk environment for injecting drug users: The past, present, and future. *Lancet*, *376*(9737), 268-84.

Strathdee, S. A., Palepu, A., Cornelisse, P. G. A., Yip, B., O'Shaughnessy, M. V., Montaner, J. S. G., . . . Hogg, R. S. (1998). Barriers to use of free antiretroviral therapy in injection drug users. *JAMA: The Journal of the American Medical Association*, *280*(6), 547-549.

Strathdee, S. A., Patrick, D. M., Currie, S. L., Cornelisse, P. G. A., Rekart, M. L., Montaner, J. S. G., . . . O'Shaughnessy, M. V. (1997). Needle exchange is not enough: Lessons from the Vancouver injecting drug use study. *AIDS*, *11*(8), F59-65.

Suffet. (1999). Some sex-neutral and sex-specific factors related to employment among substance abuse clients. *The American Journal of Drug and Alcohol Abuse*, *25*(3), 517-527.

Suffet, F., & Brotman, R. (1976). Employment and social disability among opiate addicts. *The American Journal of Drug and Alcohol Abuse*, *3*(3), 387-95.

Sutherland, E. H. (1947). *Principles of criminology*. Philidelphia: JP Lippincott.

Sutter. (1966). The world of the righteous dopefiend. *Issues in Criminology*, *2*, 177-222.

Svikis, D. S., Keyser-Marcus, L., Stitzer, M., Rieckmann, T., Safford, L., Loeb, P., . . . Zweben, J. (2012). Randomized multi-site trial of the job seekers' workshop in patients with substance use disorders. Drug and Alcohol Dependence, 120(1-3), 55-64.

Theodossiou, I., & White, M. J. (1994). Unemployment propensity and unemployment duration. *LABOUR*, *8*(3), 445-454.

Theorell, T., Karasek, R. A., & Eneroth, P. (1990). Job strain variations in relation to plasma testosterone fluctuations in working men--a longitudinal study. *Journal of Internal Medicine*, *227*(1), 31-36.

Thorne, S. (1997). The art (and science) of critiquing qualitative research. In J. M. Morse (Ed.), *Completing a qualitative project: Details and dialogue* (pp. 117-32). Thousand Oaks, CA: Sage.

Trocme, N., Knoke, D., & Blackstock, C. (2004). Pathways to the overrepresentation of aboriginal children in Canada's child welfare system. *Social Service Review*, *78*(4), 577-600.

Trovato, F. (2001). Aboriginal mortality in Canada, the United States and New Zealand. *Journal of Biosocial Science*, *33*(1), 67-86.

Tsebelis, G., & Stephen, R. (2001). Why unemployment benefits have no effect on unemployment, but unemployment duration does. In B. Grofman (Ed.), *Political science as puzzle solving* (pp. 103-41). Ann Arbor: University of Michigan Press.

Tucker, R. (1998). BTSCS: A binary time-series cross-section data analysis utility. *Political Science*, *42*, 1260-1288.

Tyndall, M. W., Craib, K. J. P., Currie, S., Li, K., O'Shaughnessy, M. V., & Schechter, M. T. (2001). Impact of HIV infection on mortality in a cohort of injection drug users. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, *28*(4), 351-357.

Tyndall, M. W., Currie, S., Spittal, P., Li, K., Wood, E., O'Shaughnessy, M. V., & Schechter, M. T. (2003). Intensive injection cocaine use as the primary risk factor in the Vancouver HIV-1 epidemic. *AIDS*, *17*(6), 887-93.

Tyndall, M. W., Patrick, D., Spittal, P., Li, K., O'Shaughnessy, M. V., & Schechter, M. T. (2002). Risky sexual behaviours among injection drugs users with high HIV prevalence: Implications for STD control. *Sexually Transmitted Infections*, *78 Suppl 1*, i170-5.

UKDP. (2008). *Working towards recovery: Getting problem drug users into jobs*. London: UK Drug Policy Commission.

UNAIDS. (2004). Substitution maintenance therapy in the management of opioid dependence and HIV/AIDS prevention. In *UNAIDS position paper*. Geneva: United Nations.

UNAIDS, W. H. O. (2010). UNAIDS report on the global AIDS epidemic. *Geneva: UNAIDS and world health organization*.

UNODC. (2012). *World drug report 2011*. Vienna: United Nations Office on Drugs and Crime.

Vaillant, G. E. (1973). A 20-year follow-up of New York narcotic addicts. *Archives of General Psychiatry*, *29*(2), 237-241.

Vaillant, G. E. (1988). What can long-term follow-up teach us about relapse and prevention of relapse in addiction? *British Journal of Addiction*, *83*(10), 1147-1157.

Vancouver/Richrmond Health Board. (1997). *Action plan to combat HIV/AIDS in the Downtown Eastside* [Press Release] (Press Release). Vancouver. Retrieved from http://edocs.lib.sfu.ca/projects/chodarr/documents/chodarr0483.pdf

van den Berg, G. J. (1990). Search behaviour, transitions to non-participation and the duration of unemployment. *The Economic Journal*, *100*(402), 842-865.

van der Doef, M., & Maes, S. (1999). The job demand-control (-support) model and psychological well-being: A review of 20 years of empirical research. *Work & Stress*, *13*(2), 87-114.

van Dijk, J. (2007). Mafia markers: Assessing organized crime and its impact upon societies. *Trends in Organized Crime*, *10*(4), 39-56.

van Rossum, C. T., Shipley, M. J., van de Mheen, H., Grobbee, D. E., & Marmot, M. G. (2000). Employment grade differences in cause specific mortality. A 25 year follow up of civil servants from the first whitehall study. *Journal of Epidemiology and Community Health*, *54*(3), 178-84.

van Steen, K., Molenberghs, G., Verbeke, G., & Thijs, H. (2001). A local influence approach to sensitivity analysis of incomplete longitudinal ordinal data. *Statistical Modelling*, *1*(2), 125-142.

Varenbut, M., Teplin, D., Daiter, J., Raz, B., Worster, A., Emadi-Konjin, P., . . . Snider-Adler, M. (2007). Tampering by office-based methadone maintenance patients with methadone take home privileges: A pilot study. *Harm Reduction Journal*, *4*, 15.

Vaughn, M. G., Beaver, K. M., DeLisi, M., Perron, B. E., & Schelbe, L. (2009). Gene-environment interplay and the importance of self-control in predicting polydrug use and substance-related problems. *Addictive Behaviors*, *34*(1), 112-116.

Verbeke, G., & Molenberghs, G. (2000). *Linear mixed models for longitudinal data*. New York: Springer Verlag.

Vetter, C. J., & Donnelly, J. P. (2006). Living long-term with HIV/AIDS: Exploring impact in psychosocial and vocational domains. *Work (Reading, Mass.)*, *27*(3), 277-286.

Virtanen, P., Vahtera, J., Kivimäki, M., Liukkonen, V., Virtanen, M., & Ferrie, J. (2005). Labor market trajectories and health: A four-year follow-up study of initially fixed-term employees. *American Journal of Epidemiology*, *161*(9), 840-846.

Vitry-Henry, L., Penalba, C., Beguinot, I., & Deschamps, F. (1999). Relationships between work and HIV/AIDS status. *Occupational Medicine*, *49*(2), 115-116.

Voltaire, F. (1991). *Candide*. London: Dover. (Original work published 1759)

Ward, J., Hall, W., & Mattick, R. P. (1999). Role of maintenance treatment in opioid dependence. *The Lancet*, *353*(9148), 221-226.

Ward, J., Mattick, R. P., & Hall, W. (1994). The effectiveness of methadone maintenance treatment: An overview. *Drug and Alcohol Review*, *13*(3), 327-335.

Warr, P. (1994). A conceptual framework for the study of work and mental health. *Work & Stress*, *8*(2), 84-97.

Watters, J. K., & Biernacki, P. (1989). Targeted sampling: Options for the study of hidden populations. *Social Problems*, *36*(4), 416-430.

Weatherby, N. L., Needle, R., Cesari, H., Booth, R., McCoy, C. B., Watters, J. K., . . . Chitwood, D. D. (1994). Validity of self-reported drug use among injection drug users and crack cocaine users recruited through street outreach. *Evaluation and Program Planning*, *17*(4), 347-355.

Weiss, F., Ciccocioppo, R., Parsons, L. H., Katner, S., Liu, X., Zorrilla, E. P., . . . Richter, R. R. (2001). Compulsive drug-seeking behavior and relapse. *Annals of the New York Academy of Sciences*, *937*(1), 1-26.

Weitzer, R. (2009). Sociology of sex work. *Annual Review of Sociology*, *35*(1), 213-234.

Werb, D., Debeck, K., Kerr, T., Li, K., Montaner, J., & Wood, E. (2010). Modelling crack cocaine use trends over 10 years in a Canadian setting. *Drug and Alcohol Review*, *29*(3), 271-7.

West, S. L. (2008). The utilization of vocational rehabilitation services in substance abuse treatment facilities in the US. *Journal of Vocational Rehabilitation*, *29*(2), 71-75.

Whittemore, R., Chase, S. K., & Mandle, C. L. (2001). Validity in qualitative research. *Qualitative Health Research*, *11*(4), 522-537.

Williams, R. L. (2000). A note on robust variance estimation for cluster-correlated data. *Biometrics*, *56*(2), 645-646.

Wilson, W. J. (1996). *When work disappears: The world of the new urban poor*. New York: Knopf.

Wilson, W. J. (1999). When work disappears: New implications for race and urban poverty in the global economy. *Ethnic and Racial Studies*, *22*(3), 479-499.

de Wit, H. (2009). Impulsivity as a determinant and consequence of drug use: A review of underlying processes. *Addiction Biology*, *14*(1), 22-31.

Wood, E., Lloyd-Smith, E., Li, K., Strathdee, S. A., Small, W., Tyndall, M. W., . . . Kerr, T. (2007). Frequent needle exchange use and HIV incidence in Vancouver, Canada. *The American Journal of Medicine*, *120*(2), 172-179.

Wood, E., Milloy, M. J., & Montaner, J. S. (2012). HIV treatment as prevention among injection drug users. *Current Opinion in HIV and AIDS*.

Wood, E., Schechter, M. T., Tyndall, M. W., Montaner, J. S., O'Shaughnessy, M. V., & Hogg, R. S. (2000). Antiretroviral medication use among injection drug users: Two potential futures. *AIDS*, *14*(9), 1229-1235.

Wood, E., Tyndall, M. W., Montaner, J. S., & Kerr, T. (2006). Summary of findings from the evaluation of a pilot medically supervised safer injecting facility. *CMAJ: Canadian Medical Association Journal*, *175*(11), 1399-1404.

Wood, E., Tyndall, M. W., Spittal, P. M., Li, K., Hogg, R. S., Montaner, J. S., . . . Schechter, M. T. (2002). Factors associated with persistent high-risk syringe sharing in the presence of an established needle exchange programme. *AIDS*, *16*(6), 941-3.

Wood, E., Tyndall, M. W., Spittal, P. M., Li, K., Kerr, T., Hogg, R. S., . . . Schechter, M. T. (2001). Unsafe injection practices in a cohort of injection drug users in Vancouver: Could safer injecting rooms help? *CMAJ: Canadian Medical Association Journal*, *165*(4), 405-10.

Worthington, C., O'Brien, K., Zack, E., McKee, E., & Oliver, B. (2012). Enhancing labour force participation for people living with HIV: A multi-perspective summary of the research evidence. *AIDS and Behavior*, *16*(1), 231-43.

Wrzesniewski, A. (2003). Finding positive meaning in work. In J. E. Dutton, K. S. Cameron, & R. Quinn (Eds.), *Positive organizational scholarship: Foundations of a new discipline* (pp. 296-308). San Francisco: Berrett-Koehler Publishers.

Yamaguchi, K. (1991). *Event history analysis*. London: Sage.

Yamaguchi, K., & Kandel, D. B. (1985). Dynamic relationships between premarital cohabitation and illicit drug use: An event-history analysis of role selection and role socialization. *American Sociological Review*, 530-546.

Zanis, D. A., Coviello, D., Alterman, A. I., & Appling, S. E. (2001). A community-based trial of vocational problem-solving to increase employment among methadone patients. *Journal of Substance Abuse Treatment*, *21*(1), 19-26.

Zarkin, G. A., Mroz, T. A., Bray, J. W., & French, M. T. (1998). The relationship between drug use and labor supply for young men. *Labour Economics*, *5*(4), 385-409.

Zimmerman, D. H., & Wieder, D. L. (1977). You can't help but get stoned: Notes on the social organization of marijuana smoking. *Social Problems*, *25*(2), 198-207.

Zinberg, N. E. (1984). *Drug, set, and setting: The basis for controlled intoxicant use*. New Haven: Yale University Press.