The Criminal Careers of Chronic Offenders in Vancouver, British Columbia

by

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Abstract

Typically, research on "chronic offenders" employs a cohort design with general population or higher risk samples. These designs tend to include a small number of high frequency offenders. This dissertation examines the conviction histories of 152 pre-identified high frequency offenders who are supervised by the Chronic Offenders Program (COP) at the Vancouver Police Department in Vancouver, British Columbia. The lifetime conviction histories and other background variables of the 152 offenders were coded from official police data repositories to examine the parameters from the criminal career paradigm. The results indicate that the COP offenders participate in many types of less serious and serious crime. They have long average criminal careers with an average of 47 total convictions accrued in their lifetimes. Moreover, the age of onset of the COP sample is in the late teens and early adulthood and they typically start offending with a property crime. The analysis of age-crime curves of the COP offenders indicates that their offending increases significantly after the typical drop in the mid to late twenties. The analysis of three lambda estimates shows that the COP offenders have high yearly conviction rates. Moreover, the inclusion of incapacitation time in the estimate of lambda has important ramifications for both the lambda score and the distribution of scores. The analysis of lambda over time shows that it is not constant over time. The multivariate models predicting lifetime lambda scores indicate that lambda estimates for total convictions are positively influenced by ethnicity and residential instability. In contrast, the models predicting serious conviction lambdas show that ethnicity is positively related, while age of onset and gender are inversely related to these estimates of lambda. The analysis of specialization, using the diversity index, shows that COP offenders as a group are not specialized over the life course. However, an analysis of diversity over time indicates that COP offenders become less versatile as they age. Tobit regressions predicting lifetime diversity scores indicate that females are more specialized than males and that age of onset is

positively related to specialization. The significance of the results to research and DLC theory is discussed.

Keywords: Criminal Careers; Developmental and Life Course Theory; Lambda; Incapacitation Time; Specialization; High Frequency Offenders

Dedication

This work is dedicated to my lifelong friend and cousin Jeffery Giles, who left this world while protecting others from violence. He is my hero. Jeff is loved and missed by his family, friends and the many people whose lives he touched. This work is my small way of honouring his memory. We love you big guy.

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Chapter 1: Introduction

> The riddle of crime is so puzzling that to arrive at adequate explanations calls for the collaboration of many sciences. Unless we keep an open mind and dig for facts in all areas that may reasonably be expected to throw some light upon it, we are likely to repeat the classic error of the blind men and the elephant of the fable; each of them believed the elephant to be formed like the particular piece of that animal which he happened to have touched. (Glueck & Glueck, 1952, p. 9)

This quote is an apt description of much of the historical research on offending in criminology. Traditional criminological research has attempted to understand the etiology of offending behaviour by comparing characteristics of offenders to non-offenders. This is evident in the static theories that have dominated the sociological and criminological landscape, including variants of strain, social disorganization, control theory, social learning theory, and differential association. The classic works of Glueck and Glueck (1974; 1930; 1937; 1966) prompted criminologists to re-examine their static understanding of offending as the Gluecks noted etiological differences not only between offenders, but within offenders over time. Their work made numerous discoveries pertaining to several dimensions of criminal careers including age of onset, incidence, participation, and causal mechanisms linked to offending. Their innovative approach to the analysis of offending is often connected to the emergence of the criminal career paradigm.

This pivotal body of work, in part, inspired an immense body of empirical and theoretical study that became central to Western criminology in the latter half of the 20th and the turn of the 21st centuries. In the past four decades a substantial portion of academic work in criminology has directed attention to the study of changes in offending over the life course. This work is dominated by general population samples in the form of birth cohorts. It is evident in the proliferation of longitudinal variants of cohort studies on within-individual offending in the United States (Huizinga, Weiher, & Espiritu, 2003; Loeber, Farrington, & Stouthamer-Loeber, 1998; Shannon, 1988, 1991; Thornberry, Lizotte, & Krohn, 1994; Tracy,

Wolfgang, & Figlio, 1990; Wolfgang, Figlio, & Sellin, 1972; Wolfgang, Thornberry, & Figlio, 1987), Canada (Carrington, 2007; Carrington, Matarazzo, & de Souza, 2005; Le Blanc & Frechette, 1989), England (Farrington, 2003a; Farrington & West, 1990; Tarling, 1993; West & Farrington, 1973), New Zealand (Moffitt, Caspi, & Harrington, 2002; Moffitt & Silva, 1988), Puerto Rico (Nevares, Wolfgang, & Tracy, 1990), the Netherlands (Blokland, Nagin, & Nieuwbeerta, 2005; Blokland & Nieuwbeerta, 2005), Switzerland (Haas, Farrington, & Killias, 2004), and Sweden (Stattin & Magnusson, 1991).

The importance of this research cannot be overstated. It challenges commonly held conceptions of male and female criminality, the age-crime nexus and the contribution of ethnicity as explanations for criminality (Blumstein, Cohen, Roth, & Visher, 1986). One of the most important outcomes of this research is the remarkable consistency of the results pertaining to parameters of offending in the general population across countries. Research into criminal careers consistently finds that a small portion of offenders, often termed *chronic*, *persistent*, *prolific* or *habitual,*[1] is responsible for a disproportionate amount of crime. This finding is so ubiquitous that it is widely accepted in academic and professional domains as a criminological "fact" (Blumstein et al., 1986; Farrington, 2005b; Farrington, Coid, & Harnett, 2006; Tracy et al., 1990). The pervasiveness of this finding has moved beyond the academic realm as civil-service personnel and legislators have incorporated the findings into public policy. Evidence for this is apparent in policing shifts, selective incapacitation policies, habitual offender legislation and other targeted programs that have proliferated in the United States (Kovandzic, 2001; Rodriguez, 2003; Spelman, 1994), and to a lesser extent other Western societies, including the United Kingdom (Her Majesty's Chief Inspector of Constabulary, 2004; Townsley & Pease, 2002) and Canada (Chase, 1993).

Although the criminal career paradigm is not without its discontents and critics (see Gottfredson & Hirschi, 1986, 1987, 1988, 1990; Rowe, Osgood, &

[1] This dissertation uses the term "high frequency offenders" to indicate high volume offenders with a long history of offending. This is done to minimize the conceptual confusion associated with different terms that seek to categorize chronicity.

Nicewander, 1990), the breadth and depth of this research led Farrington (2005b, p. 5) to claim that there are ten "widely accepted conclusions about the development of offending" that emerge from the research, irrespective of the research era, method or indicator of offending. Farrington (2005b, pp. 5-6) asserts that:

1. The age of onset is most typically between ages 8 and 14, earlier with self-report data and later with official records, while the age of desistance from offending is typically between 20 and 29.
2. The prevalence of offending peaks in the late teenage years: between ages 15 and 19.
3. An early age of onset predicts a relatively long criminal career duration and the commission of relatively more offences.
4. There is marked continuity in offending and antisocial behaviour from childhood to the teenage years and adulthood. In other words, there is relative stability of the ordering of people on some measure of antisocial behaviour over time, and people who commit relatively many offences during one age range have a high probability of also committing many offences during a later age range.
5. A small fraction of the population ("chronic offenders") commit a large fraction of all crimes; chronic offenders tend to have an early onset, a high individual offending frequency, and a long criminal career.
6. Offending is more versatile than specialized; violent offenders in particular appear to offend frequently in other kinds of offences.
7. The types of acts defined as offences are elements of a larger syndrome of antisocial behaviour that includes heavy drinking, reckless driving, promiscuous sex, and so forth.
8. It appears that, as people enter adulthood, they change from group to lone offending. In fact, most offences up to the late teenage years are committed with others, whereas most offences from age 20 onwards are committed alone.
9. The reasons given for offending up to the late teenage years are quite variable, including excitement/enjoyment, boredom, and/or emotional utilitarian reasons. From age 20 onward, utilitarian motives become increasingly dominant.
10. Different types of offences tend to be first committed at distinctly different ages. This sort of progression is such that shoplifting tends to be committed before burglary, burglary before robbery, and so forth. In general diversification increases up to age 20; but after age 20, diversification decreases and specialization increases.

While criminal career research, through general population samples and other variants of the cohort design (e.g., a cohort of prison intakes), has contributed

to the overall understanding of offending, these studies are not without limitations.[2] The most important of these limitations is that a cohort design precludes the possibility of including a substantial number of chronic offenders (Piquero et al., 2007). Cernkovich and Giordano (1985), in their research comparing self-reported offending of institutionalized youth to youth in the general population, state the problem succinctly:

> Previous self-report research based upon samples of apples (the general youth population) has been used to generalize to the population of oranges (chronic offenders)….the validity of such generalizations is questionable because of the omission or under-representation of chronic offenders in general youth samples. (1985)

Chronic offenders are analogous to the rare event problem that challenges criminologists in the understanding of specific crime-related issues (i.e., serial homicide). Some longitudinal research in this area has attempted to achieve a larger sample of youth or adults who commit "serious" crime as a proxy for chronicity (DeLisi, 2006; Ezell & Cohen, 2005; Haapanen, 1990; Laub & Sampson, 2003). However, this research defines its sample inclusion criteria based on seriousness of an offence, not its frequency. These types of substantive issues have led some academics to assert the need to focus on the "extreme case" (Cernkovich & Giordano, 1985) in addition to the general population (Wilson & Herrnstein, 1985). Given the prevalence of official crime and its socially constructed backdrop, Wilson and Herrnstein (1985) argue for an almost exclusive focus on the serious high rate offender. They suggest that serious crimes are characteristically different than other less serious crimes, and:

> By focusing on high-rate offenders, we do not need to distinguish between those who never break the law and those who (for perhaps chance reasons) break it only once or twice. And if we assume (as we do) that our criminal statistics are usually good enough to identify persons who commit a lot of crimes even if these data are poor at identifying accurately those who

[2] It is important to note that there is still no consensus on the conceptual definition of a "chronic" offender. The most widely used operational definition is rooted in the one advanced by Wolfgang and his colleagues (1972). This conceptual ambiguity has prompted some researchers to call for a clearer conceptual definition that incorporates a bounded time period and the count of offences (Piquero, Farrington, & Blumstein, 2003; Piquero, Farrington, & Blumstein, 2007; Piquero & Moffitt, 2005).

> commit only one or two, then we can be less concerned about measurement errors. (Wilson & Herrnstein, 1985, pp. 21-22)

There are additional limitations in the cohort design that pertain to an analysis of chronic offenders. Most of the cohort research on which Farrington's ten tenets are based focuses on adolescents and young adults (Huizinga et al., 2003; Le Blanc & Frechette, 1989; Loeber, Farrington, & Stouthamer-Loeber, 2003; Shannon, 1988; Thornberry, Lizotte, & Krohn, 2003; Tracy & Kempf-Leonard, 1996; Tracy et al., 1990; Wolfgang et al., 1972). This is a potential problem as one of the benefits of longitudinal research and the developmental life course theories that arise from this work are the propositions tied to adulthood and late adulthood that relate specifically to offending patterns of chronics over time.

The present research is a step towards addressing the limitations of research on chronictiy and the critiques of Cernkovich and Giordano (1985) and Wilson and Herrnstein (1985). It centres on an analysis of the offending patterns of a pre-identified sample of high frequency offenders. The emphasis of the current study is to provide greater understanding of the criminal careers of high frequency offenders and how certain of the general offending tenets of life course research advanced by Farrington (2005b) relate to this sample.

Little is known about high frequency offenders and their offending patterns because they occupy such a small portion of cohort samples. This dissertation provides an overview of the dimensions and correlates of criminal careers, examines patterns of lambda and patterns of specialization in a sample of high frequency offenders. The analysis of lambda and specialization are ideally suited to a sample of high frequency offenders because they provide a large sample of data points in which to analyse criminal careers and related constructs. Moreover, this dissertation shows the importance of distinguishing between lambda estimates that do not incorporate time at-risk and lambda estimates that incorporate free time for high frequency offenders. By doing so, this research provides some insight to some of the eight "contentious developmental/life course issues" discussed by Farrington (Farrington, 2005b, pp. 7-9) including whether offending frequency is stable over

time, the relationship age of onset and offending frequency, and specialization as it relates to age and offending frequency.

To accomplish this task the ramifications of lambda and specialization must be contextualized within the academic and non-academic environments. The remainder of this introductory chapter situates the importance of the criminal career paradigm, in regard to high frequency offenders, to the operational branches of government, especially the police. It describes the local context of the research and data through an overview of the Chronic Offender Program at the Vancouver Police Department. Additionally, this chapter provides an overview of one of the main policy and legislative responses to the perceived chronic offender problem: selective incapacitation. Finally, the chapter outlines the remainder of the dissertation.

Context of the Research and the Response to Chronic Offenders

One of the more substantive outcomes of the research into offending careers is the widespread adoption of the findings by practitioners, legislators, courts, corrections and the police. The idea that a small proportion of offenders are responsible for the majority of crime is one of the most consistent findings within this research domain. This finding has been incorporated into criminal justice policy since the 1970s, albeit differently, depending on the specific country of interest. The United States, where most of the research originates, opted in many states (Kovandzic, 2001) for habitual offender legislation (i.e., three strikes) and the increased use of correctional incapacitation (Blumstein et al., 1986; Greenwood & Abrahamse, 1982; Spelman, 1994). Recently, the United Kingdom implemented a holistic approach that includes intensive supervision, needs-assessment and incapacitation where necessary (Dawson, 2005, 2007). Canada, with a uniform Criminal Code, has implemented little federally and has left the provinces to deal with the issue according to their perceived requirements. The Vancouver Police Department (VPD) implemented a program to address chronic offending called the Chronic Offender Program (COP).

In response to the finding that Vancouver had the second highest total crime rate and the highest property crime rate for a major urban centre in Canada, the Street Crime Working Group (2004) drafted a report in 2004 to provide the government with detailed information on the nature and scope of the problem. The report attributed a disproportionate volume of the property and drug-related crime to repeat offenders who have clusters of maladaptive social, psychological and physiological characteristics. It asserts that high needs offenders consume a disproportionate amount of police, court, correctional (i.e., pre-sentence custody), health, mental health and other social service resources in British Columbia. A central theme of the report is the integration of criminal justice and other social service responses to high needs offenders, instead of the autonomous operation of each service. Moreover, the authors recommend that adequate resources be devoted to an integrated needs-based response (Street Crime Working Group, 2004).

In response to the Street Crime Working Group report, and in light of their own internal assessment of the problem as first responders, the Vancouver Police Department initiated the Chronic Offenders Program (COP) in 2004. Originally, this program was accorded "pilot"[3] status. It included four Detective-Constables, one civilian member, and a part-time Staff Sergeant. The mandate of COP is "to reduce property crime by managing persistent criminals" (Pitt-Payne, 2006). To accomplish this goal COP directed its resources to:

1. Focused intelligence gathering,
2. Monitoring and targeting, and
3. Purposeful sentencing (Pitt-Payne, 2006, p. 3).

Consistent with these goals, COP provides for rapid intra- and inter-departmental dissemination of information pertaining to the offenders in the program to criminal justice personnel. COP members created several information repositories shared within the department and with other affiliated agencies (i.e., prosecutors). COP liaises with individual patrol officers and District Commanders.

[3] This means that all the COP members were on temporary loan from other units. In 2008, COP was accorded "unit" status, with dedicated full-time staff.

Consequently, they monitor the custody status of the offenders and disseminate this information to relevant parties within the department, such as general investigation officers, patrol officers and surveillance teams. Moreover, they share the information they glean from police personnel and offenders with the appropriate social service agencies in hopes of dealing with the problem clusters of the offenders, while concurrently ensuring offender accountability (i.e., through rapid arrest and prosecution).

Prior to implementing their three main goals, COP had to determine the criteria of inclusion for the offenders in the program. Originally, COP members consulted the academic literature for guidance and adopted the commonly used five or more offences definition[4] introduced by Wolfgang, Figgio and Sellin (1972). This definition proved to be unsuitable for operational purposes in this unit, as it produced a group size that was unmanageable for four officers. After an analysis of their records management system COP specified the following criteria for inclusion:[5]

1. A property criminal with twelve or more charges in twelve months and/or,
2. An offender identified by the Operations Division as a significant property offender and/or,
3. A property criminal with a history of non-compliance with court orders (Pitt-Payne, 2007).

Although the incapacitation of frequent offenders is one of the objectives of the program, COP members recognized that this is one means to reduce offending, but that, in isolation, it is unlikely to create long-term behavioural change. Consistent with recommendations of the Street Crime Working Group, COP has attempted to liaise with other social service groups to deal with the etiology of the offending behaviour of the individuals in the program. There is recognition that

[4] In this case of the COP program the indicator was an arrest where a charge was laid.
[5] These selection criteria produced an offender pool of approximately 380 offenders in April of 2007. It is important to note that almost all of the approximately 380 offenders in COP met criterion one. Criterion two was included in the definition in order to allow flexibility to avoid focusing solely on what Chaiken and Chaiken (1985) refer to as "high-rate losers" and instead increase the probability of including "high-rate winners". Criterion three was incorporated into the definition in order to increase the probability of pre-sentence incarceration. At the time of this research none of the offenders in the program met criterion three only.

many of these offenders have multiple constraints that limit the probability of desistance, such as mental health, physical health, housing, employment and victimization-related issues. COP members, as part of their offender management role, use incarceration either in pre-sentence custody or during a custodial sentence, as an opportunity to conduct needs-based interviews (Pitt-Payne, 2006, 2007). As indicated in Figure 1.1 below, information gleaned from these interviews and other communication with the offenders assist in the coordination of offenders with one or more social service agencies.

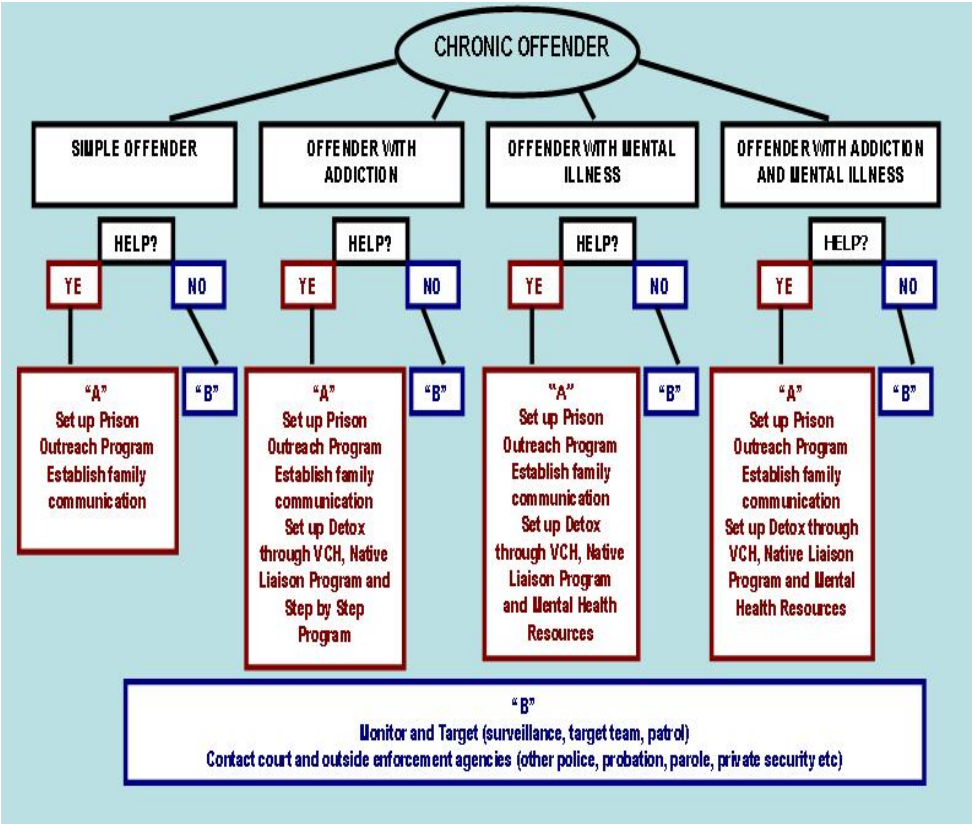


Figure 1.1: COP Offender Management Process.

Note. Pitt-Payne (2007); used with permission.

Selective Incapacitation

The primary criminal justice policy response to the results of research on criminal careers is selective incapacitation. Incapacitation is a long-standing

strategy of crime control that rose to prominence, most notably during the 1970s in the United States, as policy-makers and practitioners became disenchanted with the results of rehabilitative interventions. After a period of unprecedented spending on social welfare projects within communities and prison environments, criminal justice practitioners and some academics shifted their focus from rehabilitation to a focus on accountability, just deserts and offender rationality. In conjunction with academic work that showed the ineffective nature of the rehabilitation effort (Martinson, 1974), the emphasis of criminal justice shifted from rehabilitative to just deserts with an emphasis on deterrence and offender accountability (Blumstein & Nagin, 1978). The paradigm shift of politicians, policy makers, the public and academics prompted an analysis of the "incapacitative effect" of prison (Blumstein, 1983; Blumstein & Nagin, 1978). Blumstein notes that "the incapacitative effect refers to the crimes averted in the general society by isolation of the identified offenders during periods of incapacitation" (Blumstein, 1983, p. 93).

The paradigm shift in criminal justice, in part, led to a severe capacity problem within correctional institutions (Blumstein, 1983). It is during this period that criminal career research began to report the consistent finding that a small proportion of the offending population accounted for the majority of both official criminal contacts and self-reported crime (Blumstein & Cohen, 1979; Chaiken & Chaiken, 1982; Petersilia, Greenwood, & Lavin, 1977; Peterson, Braiker, & Polich, 1980; Wolfgang et al., 1972). This discovery, although not completely novel,[6] prompted academics to focus on the constructs of lambda, specialization and the idea of selective incapacitation.

Selective incapacitation involves "individualized sanctioning based on similarly individualized predictions of future offending" (Gottfredson & Gottfredson, 1994, p. 443). Researchers began to turn their attention to the prospective identification of high frequency offenders prior to the start of their offending careers or at some point prior to desistence. It was thought that if prediction methods were valid and reliable it was possible to incapacitate offenders and reduce

[6] The high frequency offender received detailed attention in the classic ethnographic work of the Chicago School (for examples see Conwell & Sutherland, 1956; Shaw, 1966).

crime and its associated issues. Forecasting the effects of selective incapacitation necessitates accurate estimates of lambda, specialization, criminal career length and other criminal career parameters for high frequency offenders (see Blumstein & Cohen, 1987).

The central premise of selective incapacitation is to minimize the impact of a high frequency offender by removing them during periods of high offending. This requires matching a sentence length outcome to an estimate of criminal career length (Blumstein & Cohen, 1987). Accurate estimates of criminal career lengths are fundamental to calculating the effect of selective incapacitation. If incapacitation does not co-occur with periods of high criminality in the career, then the sentence becomes counterproductive. In cases where a sentence is longer than required a constrained resource is over-utilized. If the sentence is shorter in duration the resource is under-utilized. Either of these outcomes is undesirable because it does not conform to the central theme of selective incapacitation, which is to reduce crime through incapacitation during criminally active periods (Blumstein & Kadane, 1983; Spelman, 1994).

Specialization is another construct linked to selective incapacitation. If there is a significant amount of specialization, the construct provides a means to estimate of the incapacitative effect for specific crime types (Blumstein et al., 1986; Piquero et al., 2003) or for overall crime if there is a significant amount of generality or versatility. If high frequency offenders display little specialization over time it is difficult to estimate the effects of a selective incapacitation policy on specific crime types. This is the case even if it is assumed that offending frequency is stable and that criminal career lengths are known.

Determining whether or not these constructs are stable over time is particularly relevant to an assessment of the effect of any incapacitative policy. It is problematic if lambda estimates and specialization indices change during a criminal career because this impacts the "incapacitative effect" of any selective incapacitation policy. The fact that selective incapacitation policy is so dependent on the accuracy of prediction has prompted an analysis of lambda and specialization in models of selective incapacitation (Blumstein & Nagin, 1978; Cohen, 1983; Greenberg, 1975;

Greenwood, 1983; Greenwood & Abrahamse, 1982; Haapanen, 1990; Shinnar & Shinnar, 1975), methods for prospectively predicting the high-rate offender (Barnett, Blumstein, & Farrington, 1989; Greenwood & Abrahamse, 1982) and criticisms of the criminal career paradigm and the related parameters (Gottfredson & Hirschi, 1986, 1990; Greenberg, 1991).

Outline of Chapters

As stated previously, the main goal of this research is to provide an analysis of high frequency offenders and their offences into adulthood in order to gain a more detailed understanding of how different estimates of lambda and specialization apply to these offenders. The remaining chapters in this dissertation present the justifications, background and strategy to accomplish this goal.

Chapter Two begins with a review of the developmental and life course theories that explain criminal careers and within-individual offending over time. These theories are evaluated in terms of their explanations for the chronic offender and the "invariant" age-crime curve. The chapter continues with an examination of the major findings on the criminal career parameters of participation, age of onset and criminal career length. These parameters are discussed in relation to the chronic offender.

Chapter Three focuses on a review of the construct of lambda. The chapter begins with a discussion of the different operational definitions of lambda. This is followed by an analysis of the importance of lambda to theory and practice. The chapter continues with an assessment of research that estimates lambda and analyses correlates of lambda in a variety of different populations (general populations and prison intakes) using different indicators of offending (self-report, police contacts and convictions).

Chapter Four provides an analysis of the construct of specialization and focuses on its importance to theory and practice, and the ambiguity surrounding the conceptual definition of specialization. The chapter situates the dominant theories of the high frequency offender and their explanation for patterns of specialization. The chapter concludes with a review of the dominant operational definitions of

specialization to ground the selection of the diversity index (McGloin, Sullivan, & Piquero, 2007; Piquero & Chung, 2001; Sullivan, McGloin, & Pratt, 2006) as the appropriate operational measure for this dissertation, while simultaneously discussing the known correlates of specialization.

Chapter Five contains a detailed summary of the method used for this research. The prevailing research questions and hypotheses that guide this dissertation are presented. The sample used in this study, the procedure employed for data collection, and the operationalization of all indicators are discussed in detail.

Chapters Six through Eight present the results of this research on high frequency offenders. Chapter Six examines specific parameters of criminal careers for the COP sample. These include: participation in crime, incidence, age of onset, age-crime curves and criminal career length. Chapter Seven presents lambda estimates for the COP offenders and compares estimates that incorporate time at-risk against lambda estimates without time at-risk. It continues with an analysis of the stability of lambda estimates over time. Chapter Eight presents an analysis of specialization within the COP sample. This analysis focuses on the stability of specialization over time, as well as the correlates of specialization, including an analysis of the association between specialization and estimates of lambda.

Chapter Nine presents the overall conclusions, recommendations and directions for future research that arise from the results of this dissertation. The results of this research are connected to life course theory and suggestions for future research are discussed. In addition, the major limitations to this study are reviewed, including the use of official data.

Chapter 2: Theory in Criminal Career Research

Introduction

This chapter situates current research on high frequency offenders within the broader theoretical and empirical context of the criminal career paradigm. To accomplish this the chapter discusses theory related to an explanation of chronicity and provides a review of specific parameters and correlates of chronic offending.[7] Although there is substantial debate and ambiguity around the validity of parameters used in modeling criminal careers (Barnett, Blumstein, Cohen, & Farrington, 1992; Barnett et al., 1989; Greenberg, 1991; Osgood & Rowe, 1994; Rowe et al., 1990), the purpose of this chapter is solely to present findings related to the parameters commonly analysed in criminal career research.

Theory in the Criminal Career Paradigm

This section provides an exposition of theories pivotal to the emergence and proliferation of research and the resultant controversy within the criminal career paradigm. It starts with a review of the general theory of crime (GTC), proposed by Gottfredson and Hirschi (1990). Next, developmental and life course (DLC) explanations of chronic offending are reviewed, including Moffitt's (1993) adolescent-limited/life course persistent taxonomy, Sampson and Laub's (see Laub & Sampson, 2003; 1993, 2005a) age-graded theory of informal social control, Thornberry's (1987, 1996) interactional theory of offending, and Le Blanc's (see Le Blanc & Frechette, 1989; Le Blanc & Loeber, 1998; Loeber & Le Blanc, 1990) process view of offending.

Prior to analysing these theories and their explanations of chronicity it is useful to understand how they are structured in terms of their fundamental treatment of criminality in the population. This is possible through a classification

[7] Throughout this chapter the term chronic offender and high frequency offender are used interchangeably.

of theories of offending into static versus dynamic perspectives while simultaneously assessing whether they assume state dependence or population heterogeneity for their explanation of the etiology of criminality.

Classifying Theory in Criminal Career Research

A static approach to analysing the etiology of crime asserts that measurement can occur at one point in time and generally emphasizes criminogenic variables that differentiate offenders from non-offenders. In contrast, dynamic theories emphasize the importance of change over time within individual offenders. Tests of dynamic theories focus on the changes within individuals and their impact on offending over time. Most of the theories in criminology are static (see Ezell & Cohen, 2005; Nagin & Paternoster, 1991).

Many static theories are based in the assumption of population heterogeneity, which assumes that criminality does not directly relate to past conditions, but rather that criminal potential has a specific distributional form in the general population. In general, the distribution of crime causing traits neither changes in the population nor does the level or intensity of the trait change in individuals over the life course. Once the trait is present in an individual it is fixed over time. Therefore, experience with crime and other factors, such as group involvement and drug use, has no or little effect on subsequent criminality. Traditional criminogenic variables and offending are caused by the latent trait and are not direct causes in isolation of this trait (Ezell & Cohen, 2005; Nagin & Paternoster, 1991). The general theories of Gottfredson and Hirschi (1990), and Wilson and Herrnstein (1985), and many other personality-based theories, such as psychopathy (Hare, 1996), serve as examples of latent criminogenic traits that are heterogeneously distributed within the population.

In contrast, theories of crime based on the assumption of state dependence emphasize the importance of past events or states on the probability of crime occurrence. According to Nagin and Paternoster (1991, p. 166), theories rooted in state dependence maintain "that the act of committing a crime has a genuine behavioral influence in the sense that the experience of crime commission increases

the likelihood of future offending by changing something about the offender's personal characteristics or life chances". From this standpoint, involvement with crime and the causal factors that prompt participation in crime changes the nature of those members of the population. A large portion of the theory developed within the field of criminology assumes state dependence, including strain theories (Cloward & Ohlin, 1960; Cohen, 1955; Merton, 1938), social disorganization theory (Shaw & McKay, 1969), differential association theory (Sutherland & Cressey, 1999), labeling theory (Lemert, 1999), social bonding theory (Hirschi, 1969) and social learning theory (Akers & Sellers, 2009).

Many of these theories are static because they centre on the variation in offending between individuals (i.e., offenders and non-offenders) at specific points in time. They rarely explain the process by which offending changes within an offender over time. In instances where these theories allow inferences on within-individual changes there is little specification on the ordering and the processes that cause change. However, these theories, in certain cases, can be extended to include a dynamic treatment of individual offending over time.

More recently, developmental and life course theories emerged to explain formal processes of within-individual offending. In the past two decades, as a result of the proliferation of research within the criminal career paradigm, developmental and life course (DLC) theories of offending emerged. Examples of dynamic state dependence theories include Thornberry's (1987) interactional theory. Sampson and Laub's (2003) age-graded theory of social control and Moffit's (1993) adolescent limited/life course persistent taxonomy are examples of dynamic hybrid theories that emphasize state dependence and persistent heterogeneity, albeit differently.

General Theories of Crime

Recently, criminologists have proposed general theories of crime to explain both crime and deviance. This paradigm shift is an attempt to address the issue of partiality within most of the traditional theories in their explanation of criminality

(see Hirschi & Selvin, 2002). General theories emphasize that the purpose of any theory of crime is to account for all types of deviant and criminal behaviour in all types of settings. Criminal behaviour in many of these theories is a more extreme class of deviance than other non-normative behaviour determined by the intensity of a latent trait. Since the 1980s, several general theories emerged to provide a unified account of criminality and deviance. In certain cases these theories are integrative, such as the reformulation of social learning theory by Akers (1998) which combines elements of operant conditioning, social learning and differential association. Other general theories of crime focus more of their attention on unobserved latent traits, which once present early remain stable over time. This view of causality is evident in the work of Wilson and Herrnstein (1985), who focus on impulsivity, reinforcement and personality, and Gottfredson and Hirschi (1990), who posit the importance of self-control.

No other single general theory has spawned such intense theoretical and empirical debate within criminology as the general theory of crime (GTC) originally proposed by Gottfredson and Hirschi in a series of seminal papers (Gottfredson & Hirschi, 1988; Hirschi & Gottfredson, 1983), a book (Gottfredson & Hirschi, 1990) and a series of elaborations (Gottfredson & Hirschi, 2003; Hirschi & Gottfredson, 2002b, 2002c). Unlike other theories assessed in this chapter, the GTC is diametrically opposed to longitudinal research and to developmental theories of crime and high frequency offending. It is perhaps the most parsimonious theory within criminology and bases the etiology of all crime and deviance on the single latent trait of self-control. Gottfredson and Hirschi assert that the GTC comprises three inter-related constructs: self-control, maturational reform and opportunity structures. Echoing a rational choice perspective, these authors posit that crime specifically, and deviance (i.e., smoking, drug use, promiscuity) more generally, "involves the pursuit of immediate pleasure" (Gottfredson & Hirschi, 1990, p. 90). In addition, they argue that crime provides gratification by "relieving momentary irritation" (Gottfredson & Hirschi, 1990, p. 90) or by providing instant access to rewards. The rewarding outcomes of criminal behaviours enable the GTC to account for instrumental (i.e., break and enter), expressive (i.e., assault) and

victimless crimes (i.e., prostitution). The authors derive much of their theory from two important observations in past research. The first is that all positivistic theories offer a partial and inaccurate explanation for crime. This includes all biological, psychological and sociological theories of crime (Gottfredson & Hirschi, 1990). Second, they observe that the age-crime curve is invariant across time, across cultures and other traditional categorizations, such as ethnicity and gender. The aggregate age-crime curves consistently show that crime peaks after mid-adolescence and decreases dramatically following young adulthood. Gottfredson and Hirschi assert that criminological theory must focus on and explain these "facts" in order to be considered valid explanations of criminality (Gottfredson & Hirschi, 1990; 1983).

According to Gottfredson and Hirschi (1990), the primary determinant of crime and deviance that incorporates gratification within the robust consistency of age-crime curves are heterogeneous levels of self-control. They argue that the nature of criminal and deviant acts are consistent with the concept of self-control because "people who lack self-control will tend to be impulsive, insensitive, physical (as opposed to mental), risk-taking, short-sighted and non-verbal" (Gottfredson & Hirschi, 1990, p. 90). These authors do not allow for the possibility that crime is complex or organized and instead view the opportunities for crime as ubiquitous and the behavioural repetoire for committing a crime as simple. In addition, they assert that group-based delinquency, which is a prominent feature of adolescent offending, reflects a process of selection of people with similar levels of self-control as opposed to the influence of group composition and structure on the behaviour of members (Gottfredson & Hirschi, 1990; Warr, 2002).

Gottfredson and Hirschi (1990, p. 108) assert that variations in self-control between individuals "appear early and remain stable over much of the life course". As a result, they contend that low self-control results from "ineffective child-rearing" practices (Gottfredson & Hirschi, 1990, p. 97). Ineffective child rearing is characterized by a failure to "monitor the child's behavior," a failure to "recognize deviant behavior when it occurs" and a failure to properly "punish such behavior" (Gottfredson & Hirschi, 1990, p. 97). It is evident that this theory places heavy

emphasis on the role of early primary agents of socialization; to a great extent the parents and family and to a lesser extent the school system. They focus on socialization practices and not additional exogenous constraints, such as family size, parental criminality, single parent households or endogenous factors, such as gender and ethnicity. This allows Gotfredson and Hirschi to postulate that the consistently reported relationships between crime and these variables are at best moderating and at worst spurious (Gottfredson & Hirschi, 1990; Hirschi & Selvin, 2002). Low self-control, and as a consequence delinquency and crime, is caused by deficient socialization practices that manifest differently when non-causal moderating variables are introduced.

The second major aspect of the GTC, described by Gottfredson and Hirschi (1990; Hirschi & Gottfredson, 1983) is the effect of maturational reform or "aging out" of crime. They propose a different conceptual foundation than other researchers (Glueck & Glueck, 1974; Matza, 1964) that interconnects self-control and maturational reform:

> Maturational reform is just that, change in behavior that comes with maturation; it suggests that spontaneous desistence is just that, change in behavior that cannot be explained, change that occurs regardless of what else happens. (Hirschi & Gottfredson, 2002b, p. 189)

Given their assertion that self-control is the primary cause of crime and deviance, Gottfredson and Hirschi argue that life changes in the maturation process, such as employment, children, significant others and bonds to conventional society, are inconsistent with low self-control and do not account for this reform process. Instead of true behavioural reform, people with low self-control have unsuccessful marriages, and sporadic employment because of the need for immediate gratification. They assert that overt criminal acts become replaced with less overt criminality and other age appropriate deviance as an offender enters adulthood. This translates into a shift towards drinking, drug addiction and familial abuse (Gottfredson & Hirschi, 1990). According to Hirschi and Gottfredson (1983), maturational reform effects all groups of offenders. This means that the age-crime

curve reflects a process of maturation for chronic and non-chronic offenders evidenced in a rapid decline in official criminality in early adulthood.

The last major component of GTC is the influence of opportunity structures (Brantingham & Brantingham, 1984; Cohen & Felson, 1979). Gottfredson and Hirschi assert "that opportunities for crime are ubiquitous" (2003, p. 9) and as such are an "ever-present possibility in human affairs" (1990, p. 4). They note that these statements do not apply to specific types of crime, but to the totality of criminal opportunities. Gottfredson and Hirschi (2003) clarify their position in regard to the importance of opportunity structures:

> To say that everyone is capable of crime is not to say that everyone is capable of *every* crime. Indeed, opportunities for *particular* crimes may vary immensely over time and place, and from one individual to another….It is apparent that opportunities for crime are affected by technological, political, and economic factors, and by properties of the individual other than self-control. Age matters, and so does sex….and do size and strength matter. (Gottfredson & Hirschi, 2003, p. 10)

This assumption in the theory of self-control provides a means to reject any patterning in the criminal careers of chronic offenders. Any perceived patterns, such as specialization, are spurious and the result of the combination of low self-control and the mix of opportunities within a society that are contingent on the characteristics (i.e., make-up) of an offender.

The explicit assumptions of this theory make it simple to delineate the predictions of Gottfredson and Hirschi in respect to chronic offenders. GTC predicts that chronic offenders are characterized by extremely low levels of self-control, caused by early experiences of poor socialization. As a result of their low levels of self-control, at an early age these offenders engage in a variety of deviance and criminality, a portion of which is expressed in the form of legally defined criminal events. Any perceived patterning in crime is spurious and is caused by variations in opportunity. Chronic offenders must show dramatic decreases in their official offending behavior in young adulthood, although their deviant behaviors (i.e., drinking, promiscuity, gambling) continue to occur at high levels into adulthood. The unmalleable nature of low self-control and its fixed causes precludes the

possibility of adult onset criminality or chronic offending exclusively in adulthood. This assertion is challenged by recent research that suggests a significant portion of offenders begin their offending careers in adulthood (see Eggleston & Laub, 2002).

Developmental and Life Course Theories of Crime

In contrast to the GTC, developmental and life course (DLC) theorists emphasize the dynamic nature of criminal offending throughout the life course. In order to assess the malleable nature of offending, these theorists advocate the use of longitudinal methods of study. Accordingly, DLC theories have three aims. The first is to assess within-individual variability in offending over time that requires analyses of individuals over time (Loeber & Le Blanc, 1990). Second, DLC research and theory is focused on "the identification of explicative or causal factors which predate behavioral development and have an impact on its course" (Loeber & Stouthamer-Loeber, 1996, p. 13). This allows for the explanation of the parameters of a criminal career from age of onset, duration and desistence, instead of only focusing on their description. The third goal of DLC theories is an analysis of transitions and trajectories in life course offending (Loeber & Le Blanc, 1990; Loeber & Stouthamer-Loeber, 1996). Given the dynamic foundation, theories falling under the DLC heading are in some cases hybrid theories incorporating elements of state dependence and population heterogeneity. Interactional theory is the only exclusively state dependence-oriented developmental theory reviewed in this chapter (Thornberry, 1987; Thornberry & Krohn, 2005). Sampson and Laub's (Laub & Sampson, 2003; Sampson & Laub, 1993, 2005a) age-graded theory of informal social control and Moffitt's (1993, 1997; Piquero & Moffitt, 2005) adolescent-limited/life-course persistent taxonomy are presented as examples of dominant DLC hybrid theories that incorporate population heterogeneity and state dependence. Last, the process view of offending originally posited by Le Blanc and Frechette (1989) and its extensions (Le Blanc & Loeber, 1998; Loeber & Le Blanc, 1990) are presented as a framework for analysing different parameters of offending across the life course.

Sampson and Laub's Age-Graded Theory of Informal Social Control

Sampson and Laub's (2005a) age graded theory of informal social control, developed through a re-analysis of the data from Glueck and Glueck (1930, 1937) subjects to age 70, is an influential and widely tested theory in DLC criminology. The theory was originally formulated in 1993 (Sampson & Laub, 1993) and expanded in 2003 (Laub & Sampson, 2003). Much of their theory is based on providing an explanation of persistence and desistence, which they emphasize explains the invariance of the age-crime curve in the life course. One of their more critical conclusions, much like those of Gotfredson and Hirschi, is that regardless of risk factors, prospective or retrospective identification and past offending intensity, all offending careers display a sharp desistence process over the life course (Sampson & Laub, 2003; Sampson & Laub, 2005b). However, the desistance process differs markedly from the maturational reform discussed by Gotffredson and Hirschi. They argue that a DLC theory must be able to account for persistence and desistence, as it is the latter that characterizes all offending careers (Laub & Sampson, 2003). They assert that:

> Persistence and desistence can be meaningfully understood within the same theoretical framework. In its strong form, our argument is that persistence in crime is explained by a lack of social controls, few structured routine activities, and purposeful human agency. Simultaneously, desistence from crime is explained by a confluence of social controls, structured routine activities, and purposeful human agency. (Sampson & Laub, 2005a, p. 166)

The first part of their theory focuses on mechanisms of informal social control. Much like the concept of self-control, informal social control is heterogeneously distributed in the general population, and is tied to early childhood processes of socialization. In contrast to Gottfredson and Hirschi, Sampson and Laub assert that the significance of the institutions of informal social control change for people over time in specific stages of the life course. In childhood and adolescence special import is relegated to the family and school as institutions of social control. Although they emphasize the possibility of change in these bonds over time, their ramifications tend to persist from childhood and adolescence to

adulthood. Sampson and Laub (1993) posit that the processes by which informal social control is achieved through bonds is best understood in conjunction with the concepts of trajectories, transitions and turning points. According to Sampson and Laub (1993):

> A *trajectory* is a pathway or line of development over the life-span, such as work life, marriage, parenthood, self-esteem, or criminal behavior. Trajectories refer to long-term patterns of behavior and are marked by a series of transitions. *Transitions* are marked by life events (such as first job or first marriage) that are embedded in trajectories and evolve over shorter time spans….Some transitions are age-graded and some are not; hence, what is often assumed to be important are the normative timing and sequencing of role transitions. The interlocking nature of trajectories and transitions may generate turning points or a change in the life course. Adaptation to life events is crucial because the same event or transition followed by different adaptations can lead to different trajectories….They can re-direct paths. (Sampson & Laub, 1993, p. 8)

Sampson and Laub contend that the primary sources of informal social control stem from the family, the school environment and peer groups. In contrast, traditional criminogenic variables, such as poverty, age, intelligence, gender and educational attainment, are best characterized as mediating variables interacting with informal social control. While not direct causes of criminality these variables are associated with offending because they make the acquisition of informal social control more or less difficult (Laub & Sampson, 1993, 2003; Sampson & Laub, 1993, 2005a). In essence, these informal control mechanisms produce potential for stability or instability in a life course trajectory.

Sampson and Laub incorporate the possibility of change over the life course by emphasizing the importance of several age-graded transitions and turning points in young adulthood that produce changes to informal social control. Marital attachment, stable employment and military service act as mechanisms that "re-order short-term situational inducements to crime, and, over time, redirects long-term commitments to conformity" (Sampson & Laub, 2005a, p. 175). Sampson and Laub assert, through their re-analysis of the history of the 500 delinquents, that none of the childhood predictors of chronicity are strong predictors of high-rate

offending in adulthood. Instead, the data underscores the critical importance of turning points (i.e., change) in the life-course, because:

> They all involve, to varying degrees: (1) New situations that knife off the past from the present; (2) New situations that provide both supervision and monitoring as well as new opportunities of social support and growth; (3) New situations that change and structure routine activities; (4) New situations that provide the opportunity for identity transformation. (Sampson & Laub, 2005a, p. 172)

The qualitative analysis of the fifty-two life histories of the Glueck and Glueck delinquents prompted Sampson and Laub to propose the last component of their theory of informal social control: human agency (see Laub & Sampson, 2003; Sampson & Laub, 2005a). They found that offenders actively constructed their identities as they progressed through transitions and turning points in their lives. Sampson and Laub (2003) assert that many of the offenders engaged in 'transformative action,' where they constructed their identities based on future identities consistent with their turning points. Human agency confounds the prediction of persistence in adulthood to some extent. The interaction of the concepts of informal social control, trajectories, transitions, turning-points and human agency in the age-graded theory of informal social control create a backdrop against which prediction is difficult and the validity of the risk factor approach in childhood is challenged (Laub & Sampson, 2003; Sampson & Laub, 2005a).

Sampson and Laub's theory provides significant insight into the phenomenon of high frequency youth and adult offenders. Given the interactive and complex nature of their theory, it is apparent that analysis must focus on the individual offender. Many constellations of variables can produce the high frequency adult offender, but the primary mechanism is low attachment to institutions of informal social control in adulthood, such as work, family and marriage. Low attachment combines with unstable routine activities, which are defined as activities that are not pro-social or structured. These crime-inducing activities, such as hard drug abuse, motivate involvement with others (i.e., other offenders) who have similar worldviews and identities. These non-normative identities centre on the present and the gains achieved from crime. This constellation may lead to a high-rate

offending trajectory, which subsequently results in further isolation from the legitimate society through repeated contact with criminal justice personnel. This in turn reduces the likelihood of achieving an age-graded transition or a positive turning point. It is interesting to note that this theory is entirely consistent with late or adult onset offending recently found in research (Eggleston & Laub, 2002; Gomez-Smith & Piquero, 2005), due to the possibility of negative turning points in the life course, that other theories (see Gottfredson & Hirschi, 1990; Moffitt, 1993) have difficulty addressing.

Moffitt's Life Course Persistent/Adolescent-Limited Taxonomy

Moffitt's (Moffitt, 1993, 1997; Piquero & Moffitt, 2005) life course persistent/adolescent-limited (AL/LCP) taxonomy is one of the most influential typological theories of criminality. Typological approaches to the study of crime and deviance are prevalent in criminology and are based on the assumption that there are distinct groups and types of offenders (see Clinard, Quinney, & Wildeman, 1994; Mayhew, 1968; Patterson, Forgatch, & Yoerger, 1998) whose life course trajectories are distinct and require unique causal explanations. Moffitt's dual taxonomy posits that there are two distinct groups within the general population: adolescent-limited (AL) offenders and life course persistent offenders (LCP).[8] According to Moffitt (1993, 1997), explanations for the shape of the age-crime curve are problematic because they fail to adequately account for continuation of crime over the life course (i.e., not all offenders are subject to maturational reform). This theory argues that the invariance of the age-crime curve is in reality the result of the aggregation of two distinct trajectories of criminality, "concealed within the curve of crime over age" (Moffitt, 1997, p. 12). According to Moffitt, the bulk of the offending population is appropriately categorized as adolescent-limited offenders, whose criminal careers are short and sporadic. A much smaller proportion of offenders are life course persistent offenders. These offenders continue to offend at a stable and high rate late into their lives (Moffitt, 1993, 1997; Piquero & Moffitt, 2005). As individuals

[8] Piquero and Moffitt (2005) note that subsequent revisions of the original theory have included two additional trajectories: a non-offender population and low-rate mentally disordered offenders.

enter young and mid-adulthood, the non-adjusted summation of these two trajectories accounts for the dramatic decrease in offending observed in the aggregate.

Moffitt contends that adolescent-limited (AL) offenders comprise the largest proportion of the offending population and are a "ubiquitous" feature of the developmental period of adolescence (Moffitt, 1993, p. 685). According to Moffitt (1993, 1997), the criminal behaviour of AL offenders is sporadic and manifests from the instability in their offending intensity over time. Moffitt believes that a substantial portion of males, and to a lesser extent females, become adolescent-limited offenders (Moffitt & Caspi, 2001). The cause is posited as the effect of the interaction of the maturity gap, social learning and social mimicry (Moffitt, 1993, 1997; Piquero & Moffitt, 2005).

The maturity gap is an important process that underlies offending for ALs and stresses the disjuncture between biological maturation and socially proscribed roles. In Western nations rites of passage that secure adult-based roles are delayed by approximately 5 to 10 years from biological maturation manifested in puberty. The ensuing discord caused by the maturity gap creates strain for adolescents that they are motivated to resolve through the actualization of adult roles (Moffitt, 1993, 1997; Piquero & Moffitt, 2005).

At the same time that a large portion of adolescents are experiencing maturity gap induced strain, Moffitt proposes they observe LCP offenders who do not seem to experience the strain associated with the maturity gap. ALs observe LCPs engaging in adult oriented roles evidenced through their sexual experiences, detachment from families, material possessions and alcohol and drug use unattainable for most youth (Moffitt, 1993). Moffitt posits that ALs observe the positive consequences (i.e., immediate gratification) and the negative results of LCPs anti-social behavior, such as autonomy from parents and independence to pursue adult-like activities. As a result, ALs are hypothesized to learn and mimic some of the adult-like offending behaviors modeled by LCPs and are subsequently reinforced (Moffitt, 1993, 1997; Piquero & Moffitt, 2005).

It is apparent that the offending trajectory of AL offenders is based in state dependence. Moreover, Moffitt asserts that offending of ALs is often predicated on their being involved in peer groups with LCP offenders. In these groups during the adolescence stage of development "life-course-persistents serve as core members of revolving networks, by virtue of being role models or trainers for new recruits" (Moffitt, 1993, p. 688). Moffitt contends that this process explains the predominantly group-based nature of AL offending.

In contrast, life course persisters in Moffitt's taxonomy constitute a small group of offenders ranging from 5 to 8 percent of the population. They are theorized to show stability in their offending throughout their life course (Piquero & Moffitt, 2005). Moffitt posits that the etiology of LCPs is tied to abnormal neural development in infancy and childhood. Abnormalities are linked to deprivation in prenatal processes, such as "maternal drug abuse, poor prenatal nutrition, or prenatal exposure to toxic agents" (Moffitt, 1993, p. 680). In addition, this deprivation may occur after birth through inadequate affection and stimulation. Neural deficiencies are manifested in neuropsychological problems impacting "temperament, behavioral development, or all three" simultaneously (Moffitt, 1993, p. 681). Essentially, these neuropsychological problems of the child impact the ability of caretakers to cope with the child. This outcome is exacerbated in marginalized families where the casual mechanisms underlying the neuropsychological deficits are more acute and accounts for the higher prevalence of LCPs in marginalized areas.

The intersection of neuropsychological deficits and poor parental socialization produces an environmental context devoid of pro-social interaction, resulting in children who are impulsive and focused on immediate gratification. As these children enter the school setting the process is intensified and they become further isolated from pro-social development (Moffitt, 1997). LCPs become entrenched in deviance and crime at an early age because they "have few (if any) opportunities to learn and practice prosocial behavior and limited opportunities for change" (Piquero & Moffitt, 2005, pp. 53-54). This theory is considered a hybrid because it incorporates dynamic traits (i.e., the substantial change in behaviour of

AL offenders into adulthood) with static traits (i.e., the stability of LCP personality and behavior after childhood).

LCP offenders are expected to have an early onset of offending preceded by other anti-social behaviors. In addition, they are likely to commit more serious crime and acts of violence (Bartusch, Lynam, & Moffitt 1997; Moffitt et al., 2002). According to Moffitt (1993, 1997), peer associations are not a causal factor in the offending behavior of LCPs, as LCPs commit a substantial amount of crime in non-group settings. The neuropsychological deficits lead to a lack of pro-social behaviors, which in turn is impacted by the environment through social isolation and negative labeling. These additional environmental constraints "are snares that diminish the probabilities of later success by eliminating opportunities for breaking the chain of cumulative continuity" in antisocial behavior (Moffitt, 1997, p. 23). This aspect of the theory accounts for the lack of desistance with age in the LCP offender group.

The interaction between the maturity gap and social learning process prompts Moffitt to view the behavior of ALs as a normal part of the adolescent development process, while the behavior of LCPs is viewed as pathological. This normative and pathological division is extended in other propositions. First, in general terms, the offending behavior of ALs tends to be less serious in nature than that of the LCP group. Second, AL offenders tend to start their offending careers in adolescence, while the age of onset of LCP offenders is much earlier with serious deviance occurring in childhood. Third, the offending trajectories of ALs are short in duration over the life course. Desistence occurs when ALs transition into legitimate adult roles, such as gainful employment, post-secondary schooling and marriage. In contrast, the trajectories of LCP offenders are marked by stability in offending, and other associated anti-social behavior tied to their neuropsychological deficits and the interaction with negative environmental influences (Moffitt, 1993, 1997; Piquero, Brame, & Moffitt, 2005). It is apparent that Moffitt's dual taxonomy, with its distinct behavioral trajectories and associated etiologies, defines a high frequency offender exclusively as a life course persistent offender. Given the rigidity of the developmental trajectories tied to unique causes, Moffitt makes no

substantive allowance for a high frequency adult who was AL offender. In addition, this theory does not provide a substantive explanation for high frequency adult-onset offending.

Thornberry's Interactional Theory

Interactional theory was originally proposed by Thornberry (1987) then later revised (Thornberry & Krohn, 2005) as a dynamic theory of reciprocal causation of offending over time. The theory incorporates reciprocal effects in its explanation of the continuity and change in offending patterns over the life course to account for the finding that "the relationship between early onset and later persistence" is appropriately described "as moderate" (Thornberry & Krohn, 2005, p. 185). Specifically, interactional theory focuses on how reciprocal relationships promote onset, persistence and desistence of delinquency and crime in the life course. This is accomplished through a developmental elaboration of Hirschi's (1969) social control theory combined with social learning, structural effects and a detailed treatment of interaction effects, most notably the effect of delinquent peer group membership. According to Thornberry (1987, p. 864), the influence of interactions is key to an understanding of criminality as "human behavior occurs in social interaction and can therefore best be explained by models that focus on interactive processes".

The core of interactional theory is grounded in social control theory. It explains both crime and delinquency by exploring how "weakened social constraints" increase the range of acceptable behaviors that can be "channeled into delinquent patterns" (Thornberry, 1987, p. 866). The theory focuses on the interaction of three types of bonds that restrict the behavioral repertoire of individuals: attachment to parents, commitment to school and belief in conventional values (Thornberry, 1987, p. 866). Interactional theory, like many of the other DLC theories, asserts the pivotal role of parents as the primary mechanism of social control for children. In instances where attachment to parents is low, the probability of delinquent behavior increases dramatically. Children with strong

parental attachments are much more likely to have a strong "belief in conventional values" (Thornberry, 1987, p. 874) and are more likely to be committed to succeeding in the transition to the school setting. Thornberry (1987, p. 875) asserts that belief is not a strong precursor to delinquency, but that it has a strong impact on "commitment to school". Commitment to success in school has a direct influence on delinquent behavior, attachment to parents and participation in delinquent peer groups. Thornberry's model is recursive and iterative, meaning that the social control variables react and build on each other. For example, low attachment to parents may increase the probability of low commitment to school, delinquency and the presence of negative peer groups. Subsequently these processes further reduce the attachment of individuals to their parents.

Thornberry (1987) asserts that his elaboration of control theory described above offers only a partial explanation for crime. Initially, it explains the lessening of social controls that allows for a wider behavioral repertoire, a portion of which is labeled delinquent. According to Thornberry, delinquency evolves into criminality in "an interactive setting" where "delinquency is learned, performed, and reinforced" (Thornberry, 1987, p. 865). The delinquent peer group acts as the primary mechanism where the three aspects of social learning occur. According to Thornberry, "regardless of where one enters the loop," peer groups create a setting in which delinquent peer values and behavior are "embedded in a causal loop, each reinforcing the others over time" (Thornberry, 1987, p. 873). The presence of these components in delinquent peer groups have negative reciprocal impacts on the social control variables of attachment, commitment and belief.

Thornberry (1987) notes that structural variables (i.e., ethnicity, class, gender and neighbourhood environment) traditionally linked to crime are important moderators in interactional theory. Consequently, interactional theory emphasizes that structural variables are not direct causal variables, but variables that moderate the intensity of social control and social learning. This is evident in his analysis of social class where Thornberry (1987) posits:

> As compared to children from a middle-class background, children from a lower-class background are more apt to have (1) disrupted family processes

> and environments; (2) poorer preparation for school; (3) belief structures influenced by the traditions of the American lower class; and (4) greater exposure to neighborhoods with high rates of crime….We would expect children from lower-class families to be *initially* less bonded to conventional society and more exposed to delinquent values, friends and behaviors. (Thornberry, 1987, pp. 884-885)

Interactional theory is able to account for a variety of ages of onset for crime, and for continuity and change in offending patterns over the life course. Early onset is related to parental attachment and the lack of support structures. Moreover, the concentration of delinquent peer groups in deprived neighborhoods explains the higher overall prevalence and incidence in these areas. Individuals in these areas with the lowest levels of attachment are unlikely to desist because of the degenerative nature of the accumulation of negative reciprocal influences on bonds through delinquent peer groups.

Interactional theory provides an explanation for the form of the age-crime curve. The typical age of onset for a large portion of youth in mid-adolescence occurs when teenagers form social groups and at the same time learn deviant values during a period of separation from the parents. These offenders generally tend to commit less serious forms of crime and are likely to desist as they re-establish bonds through commitment to other institutions, like the military, college or the workforce (Thornberry & Krohn, 2005). It is the individuals with the lowest levels of attachment that continue offending past young adulthood.

Interactional theory is able to explain late-teen and adult onset offending. Thornberry and Krohn (2005) propose that late-onset and adult onset offenders tend to have criminal careers demarcated by serious offending. They contend that there are two reasons for the emergence of the late onset offender. The first is that the offender has "reduced human capital, especially lower intelligence and lower academic competence" (Thornberry & Krohn, 2005, p. 195). The authors believe that the family plays a key role as a buffer for these offenders in childhood and adolescence, but during adulthood the buffer is removed. The second is the criminogenic nature of drug and alcohol abuse, which contribute to adult onset and continuity in serious criminality over the life course. The authors assert that

offenders who commit crime stemming from excessive hard drug use have a much lower probability of desistence.

Thornberry and Krohn (2005) posit several trajectories for the emergence of adult high frequency offenders. The first path is the chronic youth offender who becomes an adult offender. This trajectory results from the cumulative effect of poor parental socialization and attachment and involvement with delinquent groups. This constitutes the largest group of high frequency adult offenders. The second path is the offender who is incapable of attachment to conventional roles in society as a result of biological and psychosocial deficits. The third trajectory results from the impact of adult onset hard drug abuse. Regardless of the type of chronic offender, interactional theory posits that stability in offending is tied to the reciprocal interaction of attachment, commitment, belief and the influence of deviant peers.

Le Blanc's Process View of Offending

In response to the critique from some criminological theorists that the criminal career paradigm was largely atheoretical (Gottfredson & Hirschi, 1988), Le Blanc and Frechette (1989) developed a process view of offending. The primary criticism was that the field focused on the empirical description of the dimensions of a criminal career devoid of a unified casual explanation for variations in within-individual offending. The revised perspective (Le Blanc & Loeber, 1998; Loeber & Le Blanc, 1990) proposes a series of developmental concepts that emerge sequentially to synthesize empirical findings in the criminal career paradigm. The primary goal of the process view of offending is to remove the static nature of criminal career concepts such as age of onset, participation, frequency and variety, and locate them within dynamic concepts in a sequential developmental framework by focusing on the processes of activation, aggravation and desistance (Le Blanc & Loeber, 1998; Loeber & Le Blanc, 1990). By reframing static concepts into dynamic concepts within a developmental framework, Le Blanc and Loeber believe it is

possible to construct theories that account for continuity and change within offenders over the life course.

The first stage in the developmental sequence is activation, which refers to "the process by which development of criminal activities is initiated and stimulated" (Le Blanc & Loeber, 1998, p. 131). Activation as a developmental stage is composed of three sub-processes: acceleration, stabilization and diversification, which incorporate onset, frequency, duration and variety, respectively (Le Blanc & Loeber, 1998, p. 123). The activation stage allows developmental theories to address the link between onset and each of the static concepts and to address the sequencing of deviance and crime types. In addition, it provides a framework for analysing the general increase in seriousness of offending with age, the age-graded onset for specific offence types and the resultant trajectories for different types of offenders (Le Blanc & Loeber, 1998, pp. 133-136).

The second developmental stage in the process is aggravation. The aggravation stage focuses on the two related processes of developmental sequencing and escalation of offence types over time. Le Blanc and Loeber (1998) contend that there is sequencing within deviance (i.e., problem behaviors as a child, drug use) as well as within offending. They assert that offenders begin with less serious forms of behavior and progressively move towards more serious offending over time. The authors believe that these developmental sequences "occur in a hierarchical rather than an embryonic sequence" (Le Blanc & Loeber, 1998, p. 159). Given the hierarchical proposition in the framework, the authors specify the low probability that more serious forms of crime occur in isolation of other deviance and less serious criminal behavior. For example, an armed robber is likely to have had conduct problems in childhood and likely was involved with assault, weapons and theft offences in the past.

The third developmental stage is desistence, which "refers to the processes that lead to a cessation of deviant behavior, either entirely or in part" (Le Blanc & Loeber, 1998, p. 159). This stage is composed of three related processes: deceleration, specialization and de-escalation. Each of these processes is tied to the desistance stage through reductions in the frequency of offences, variety of offences

and seriousness of offences, until offending stops entirely (Le Blanc & Loeber, 1998, p. 159). Regardless of when in the life course it occurs, Le Blanc and Loeber (1998) assert that all offenders go through these processes where reductions in their offending occurs until desistence is complete. However, they contend that the variability in the timing of this stage for offenders is related to processes within both the activation and aggravation stages of the developmental framework.

It is important to note that the developmental framework of Le Blanc and Frechette (1989), Loeber and Le Blanc (1990) and Le Blanc and Loeber (1998) is not truly a theory of within-individual delinquency and crime as it does not make explicit predictions about causes of offending. It specifies concepts and an explanatory structure that need to be addressed by DLC theory to adequately explain the nature of continuity and change in offending patterns over the life course. Le Blanc (2005) proposed an integrative personal control theory of deviant behaviour that is based on this developmental framework. The theory incorporates biological variables, social environment, social control and social learning variables in a complex non-linear recursive framework based within a chaos-order paradigm.

It is apparent that all the DLC theories and the general theory of crime share certain commonalities. They each offer a reasonable explanation for the invariance of the age-crime curve, they contain propositions based in control theory with a specific view on the importance of early socialization processes and they have explanations for continuity and change in crime and deviance over the life course. However, they differ on the importance of specific causal processes relating to crime and the way they are structured to explain the continuity and change in crime and deviance over the life course. For Gottfredson and Hirshi (1990; Hirschi & Gottfredson, 2002c) the locus of causation is centered on the distribution of the latent trait of self-control interacting with maturational reform. Laub and Sampson (1993, 2003) argue that informal social control is paramount in the development of criminal behaviour, which can evolve into offending trajectories. However, a positive or negative trajectory is mutable as a result of transitions and turning points. Similarly, Thornberry (1987; 2005) posits the reciprocal impact of social control variables interacting with delinquent peer associations. In contrast, Moffitt

(1993, 1997) asserts the existence of two different offending groups each with distinct etiologies. The explanation for the LCP group is focused on early childhood biological and socialization deficiencies, while the AL group is explained through a combination of the maturity gap and delinquent peer associations. The conceptual overlap evident in these theories makes it difficult to determine which position has more empirical support because the research results are often contradictory and ambiguous (Nagin & Farrington, 1992a, 1992b; Nagin & Paternoster, 1991; Paternoster & Brame, 1997; Paternoster, Dean, & Piquero, 1997).

It is important to recall that each of the aforementioned theories emerged to explain the empirical results of criminal career research. The empirical, and largely atheoretical, work focused on an analysis of participation, incidence, frequency and age of onset. Moreover, correlates of these parameters were analysed in the atheoretical research paradigm. After a series of critiques advanced by Gottfredson and Hirschi (1986, 1987, 1988) that lambasted the criminal career paradigm and the longitudinal approach to research, the developmental life course explanations of offending emerged to account for the empirical findings. Given the importance of these empirical findings in the development of life course criminology the chapter continues with a review of research on the parameters of criminal careers with a focus on chronic offending.

Parameters of Criminal Careers and the High Frequency Offender

This section of the chapter presents empirical findings pertaining to several parameters commonly reported in criminal career research, with respect to general offending samples, and in regard to more serious offending samples.[9] The parameters examined in this section are participation and prevalence, age of onset, criminal career duration and additional correlates of high-rate and chronic

[9] It is important to note that a small portion of research on criminal careers has sampled "serious offenders" at some point in their life course. Generally, this classification is a result of a specification of offence seriousness or as a result of a criminal justice sanction (i.e., incarceration). This does not necessarily mean that these offenders are high-rate or chronic, although it has been discovered that the probability of high-rate offenders being included in the sample is increased (see Canela-Cacho, Blumstein, & Cohen, 1997; Chaiken & Chaiken, 1982; DeLisi, 2006; Ezell & Cohen, 2005; Haapanen, 1990; Horney & Marshall, 1991; Laub & Sampson, 2003; Petersilia et al., 1977; Peterson et al., 1980; Spelman, 1994).

offending.[10] This section focuses on research that includes an analysis of the criminal career parameters for high-rate, serious and chronic offenders and compares these to general offending samples. It is important to note that the findings on each of these parameters differ in relation to the type of metric used for offending (i.e., self-report, charge, arrest or conviction) and the types of offences included (i.e., administrative vs. street crimes).

Participation/Prevalence and the High Frequency Offender

In global terms, participation and prevalence[11] are "the fraction of a population that is criminally active" (Blumstein et al., 1986, p. 17) in a defined time period (i.e., the entire criminal career and specific age intervals). One of the most comprehensive reviews of prevalence was undertaken by Visher and Roth (1986) as part of the *Panel of Research on Criminal Careers*. In the specific case of chronic offending samples it is used to indicate the proportion of the sample that engage in certain types of crime during a specific range of time. The aggregate age-crime curve is a global representation of population prevalence at each age or age group.

Cumulative prevalence indices in criminal career research derived from cohort studies are used to determine the proportion of the sample that has participated in crime one or more times during their criminal careers. Prevalence measures vary widely in this body of research depending on the time frame (i.e., juvenile only versus adult only versus both) and offending metric used (Farrington, Jolliffe, & Hawkins, 2003). Using self-reports, Farrington, Coid and Harnett (2006) found that 96 percent of the sample reported committing a criminal offence to age 50, while at the same time only 41 percent had been convicted of an offence. Tarling (1993) found that of three distinct birth cohorts (1963, 1958, 1953) to age 20, 25.4

[10] It important to consider the conceptual confusion regarding the high-rate, chronic offender when reviewing this section. Currently, there is no consensus definition of what constitutes a chronic offender (Piquero et al., 2003; Piquero et al., 2007; Piquero & Moffitt, 2005). As a result, no differentiation is used in this review in regards to the specification of "chronic" offenders in the individual studies included here.

[11] The term "participation" is critiqued for being conceptually ambiguous (see Visher & Roth, 1986). As a result, many authors began using the term "prevalence" to address the ambiguity associated with the term participation. Both terms have the same meaning as a parameter of a criminal career. From this point forward the term prevalence is used in this chapter.

percent had been convicted of an offence, compared to 30.9 percent at age 25 and 32.6 percent by age 30. Hawkins, Smith and Hill (2003) found significantly higher cumulative prevalence rates in the Seattle Social Development Project. From age 11 to 17 these authors report that 33.8 percent of the sample had a court referral and 86.3 percent self-reported an offence. Tracy Wolfgang and Figlio (1990) found that the cumulative prevalence of negative police contacts for juveniles in the 1945 Philadelphia cohort was 32.8 percent and that in the 1958 cohort the prevalence increased to 34.9 percent. In Canada, Carrington (2007) found that only 18.5 percent of the cohort had been charged with an offence to their 18th birthday, while 28 percent had been referred to court and 21 percent were convicted by their 21st birthday (Carrington et al., 2005). Moreover, Kyvsgaard (2003) showed that to age 26, 27.8 percent of the offenders had offences registered in the Danish Crime Statistics Register, but only 9 percent of the cohort had recorded a penal law offence.

Despite considerable variability in cumulative prevalence in much of the cohort research to date, there is considerable consistency in specific covariates of cumulative prevalence. Each of the aforementioned studies that included males and females found a strong relationship between cumulative prevalence and gender. Research has noted a large discrepancy between the ratio of males to females, regardless of the indictor of offending (Carrington, 2007; Carrington et al., 2005; Kyvsgaard, 2003; Tarling, 1993; Tracy & Kempf-Leonard, 1996; Tracy et al., 1990). Moreover, several studies have reported that minority and lower economic status groups tend to have higher cumulative participation rates than Caucasians and middle and upper class individuals (Visher & Roth, 1986). However, the ratios based on ethnicity and social class tend to be less than that of males and females (Carrington et al., 2005; Kyvsgaard, 2003; Tracy & Kempf-Leonard, 1996; Tracy et al., 1990). Taken as a whole, these findings have prompted a debate around whether gender, ethnicity and socio-economic status help explain differences in aggregate prevalence solely, while being unrelated to the offending frequencies of high-rate offenders (Blumstein, Cohen, & Farrington, 1988a; Blumstein et al., 1986; Farrington, 1986).

Prevalence measures are used to identify the proportion of high frequency or chronic offenders in a cohort or other offending sample. The most seminal pieces of research that analyse prevalence are the Wolfgang, Figlio and Sellin (1972) 1945 Birth Cohort and the 1958 Birth Cohort undertaken by Tracy, Wolfgang and Figlio (1990). These studies found that of the cohort of juveniles, chronic offenders (i.e., with 5+ negative police contacts) comprised 6.3 percent of the sample in the 1945 cohort and 7.5 percent in the 1958 cohort.[12]

The prevalence of chronicity is relatively stable across offending metrics and across cultures. Research on the prevalence of chronicity in general offending samples typically reports a range from around five to six percent of adolescents (see Shannon, 1988; Tracy et al., 1990; West & Farrington, 1973; Wolfgang et al., 1972) to 13 to 14 percent (Farrington et al., 2006) of adults in a sample classified as chronic. The differences are the result of the indicators of offending and the time frame of the research. In specific samples of serious offenders the percentage of offenders designated as chronic or high frequency increases substantially (Chaiken & Chaiken, 1982; DeLisi, 2006; Ezell & Cohen, 2005; Haapanen, 1990; Horney & Marshall, 1991) regardless of the indicator used in the study.

Research that focuses on serious offenders expresses prevalence in a slightly different manner. Generally the focus on prevalence is with respect to the prevalence of different crime types committed by the sample of known offenders. These offenders are generally recruited from a sample of individuals who have been incarcerated at some point in their criminal careers. Haapanen (1990) reported, in his analysis of 1282 former California Youth Authority (CYA) wards, that to age 33 the prevalence of chronicity of the adults with five or more offences was 54.3 percent, 30.7 percent and 10 percent, as measured by arrests in serious crime, property crime and violent-aggressive crime, respectively. In a follow-up to this study, Ezell and Cohen (2005) found that to age 37, 83 percent of the wards had a

[12] The significance of this finding has been challenged (Blumstein et al., 1986; Blumstein, Farrington, & Moitra, 1985). The challenge relates to the inclusion of all sample members, the majority of whom do not have recorded offences. If these sample members are excluded and the delinquent sub-sample is considered, chronic offenders represent eighteen percent of the sample in the 1945 cohort and twenty-three percent of the 1958 cohort sample.

serious violent arrest, 94 percent had a serious property arrest, while 63.1 percent had a serious drug arrest. It is notable that across the three cohorts of CYA wards (i.e., 1981-2, 1986-7 and 1991-2), there was consistency in the participation rates even though the maximum age differed substantially.

Age of Onset and the High Frequency Offender

Age of onset, which refers to the age of the first reported criminal or deviant behavior (Blumstein et al., 1986), is one of the more critical parameters of a criminal career in most longitudinal research. Age of onset differs widely depending on the type of conceptual definition used for crime (delinquency versus a law violation), the type of indicator used to measure crime (self-reports, arrests and convictions), the time frame of the research and the population of interest (incarcerated samples versus cohort samples). Age of onset is a critical concept for theories reviewed in this chapter because it is tied to the propositions in early childhood and termination of criminal careers. This section reviews some of the major findings pertaining to age of onset using different indicators and incarcerated and non-incarcerated samples.

Age of onset is often presented in cohort research as the percentage of the cohort with a first offence at a specific age. Classic examples of this are found in the 1945 (Wolfgang et al., 1972) and 1958 (Tracy et al., 1990) Philadelphia Birth Cohort studies. Both studies show a peak onset for police contacts at the age of 17 and then a consistent decrease thereafter. Tracy and Kempf-Leonard (1996) found, in an extension of the 1958 cohort study that followed participants age 26, that the average age of onset for a police contact was 14.37 years.

Generally, these findings are consistent across samples, although the peak ages differ depending on the indictor of offending used in the study. Carrington (2007), using police-initiated charges, found a peak age of onset in the 15 to 16 year range, while court referrals and convictions peaked at the age of 18 (Carrington et al., 2005). Kyvsgaard (2003) found through an analysis of the Danish Crime Statistics Register that the peak age of onset for any offence was 16 years, while the peak age of onset for penal code offence was 15 years. The use of convictions leads

to higher age of onset estimates. This is evident in the Cambridge Study in Delinquent Development (CSDD), where Piquero, Farrington and Blumstein (2007) show that the mean age of first conviction was approximately 18 years (median = 16).

In contrast, self-report research has found, for a more restricted range of offences, that age of onset tends to be lower and in many cases markedly lower than official indicators. For a subset of offences Piquero, Farrington and Blumstein (2007) found that the average self-reported age of onset for the CSDD was 11.6 years. The mean age of onset in self-reports tends to be higher in the United States. Loeber, Farrington and Stouthamer-Loeber (2003) reported that the peak self-reported age of onset in the Pittsburg Youth Study was 15. Often, the difference between officially reported and self-reported age of onset is only a few years in age (see Hawkins et al., 2003), but it has lead many authors to argue for increased validity of self-report data in an understanding of onset in life course research.

Some research provides age of onset estimates for different crime types. This has led to the contention that there is a sequencing of offending that materializes in an age-graded onset pattern linked to offence seriousness (Le Blanc & Frechette, 1989; Le Blanc & Loeber, 1998; Loeber & Le Blanc, 1990; Svensson, 2002). Fundamentally, these researchers assert that less serious offences precede more serious offences. Piquero, Farrington and Blumstein (2007), in their re-analysis of the CSDD offenders to age 40, found substantial differences in age of onset for types of crime and differences related to the indicator used to assess offending. Self-reports showed that vandalism had the lowest age of onset (age 10.7), followed by shoplifting (age 12.5), theft from vehicles and machines (age 14) and burglary (age 14.2). Theft of vehicles had the highest age of onset (age 15.2). In contrast, conviction data revealed a different pattern that included a different sequential order for offence types and a higher overall age of onset for each crime type. Motor vehicle theft had the earliest age (16.8 years), followed by burglary (17.8 years), theft from vehicles and machines (18.4 and 18.8 years), shoplifting (20.4 years) and vandalism (22.7 years). Piquero, Farrington and Blumstein (2007)

reported distinct onset sequences in offending in self-report data that were not apparent in the conviction analyses.

Le Blanc and Frechette's (1989) study of delinquent[13] boys in Montreal is perhaps the most explicit analysis of age of onset for crime types in conjunction with crime sequences. They found that to age 23, offenders in their sample started their criminal careers with minor theft behaviors at age 8, progressed to shoplifting and vandalism at approximately age 11 and then moved to common theft and break and enter around age 13 and 14. Crimes that involved violence and the combination of violence and theft occurred much later at age 16 and 17, while drug trafficking and sexual offences occurred at age 17. Notably, fraud offences and homicide peaked at approximately age 20 and 21, respectively. Based on these results, Le Blanc and Frechette (1989) suggest that young offenders generally progress through a series of stages in a criminal career. This view of offence sequences specifies that offenders begin with less serious property-based crimes, move to serious property crime and then progress to serious violent, property and drug crimes (Le Blanc & Frechette, 1989; Le Blanc & Loeber, 1998; Loeber & Le Blanc, 1990).

Age of onset is associated with several variables linked to criminality, including gender, social class and ethnicity. Gender is a notably excluded covariate of age of onset in much of the criminal career research. However, more recent research examines the offending patterns of females. Kyvsgaard (2003) concludes that females in her Danish sample tended to begin their offending careers much later than males, with a peak at age 18 for both registered offences and penal code. In contrast, Carrington (2007) found that the peak age of onset for female delinquents was between the age of 14 and 15, which was a full year less than males in the sample. Given the paucity of research on females it is not surprising that results are inconsistent.

Criminal career research has analysed age of onset with respect to socio-economic status (SES) and ethnicity, two variables used to represent the concept of marginalized status. Wolfgang, Figlio and Sellin (1972) and Tracy, Wolfgang and

[13] The delinquent sample in this study included 470 adolescents who were either adjudicated or were wards of the court.

Figlio (1990) note that low SES offenders and minority offenders had a lower age of onset than other groups. Moreover, non-white offenders who were from a low SES had the lowest age of onset. The age of onset for negative police contacts in the majority of this group occurred prior to the age of 14. This finding supports research in Denmark using registered offences (Kyvsgaard, 2003) and in England using convictions (Farrington et al., 2006). Farrington, Coid and Harnett (2006) note that a low age of onset is connected to several childhood risk factors, including familial criminality, low education and poverty.

A large amount of criminal career research explores the link between age of onset and chronicity. Regardless of the indicator of offending and the duration of the study, research consistently shows a strong negative relationship between age of onset and chronicity. Wolfgang, Figlio and Sellin (1972) were the first to report this association directly. They found that there was a strong negative relationship between age of onset and chronicity as juveniles for non-white delinquents and to a lesser extent for white delinquents. This finding was replicated in the 1958 Philadelphia Birth Cohort study, with whites following a similar pattern except that the age of onset that was most strongly related to chronicity occurred for white chronic offenders 2 years later than the non-white group (Tracy et al., 1990). Tracy and Kempf-Leonard (1996), in an extension to the 1958 Philadelphia study, found that a significant amount of continuity existed between offending as a juvenile and offending as an adult, and that persistence in adult offending was related to a lower age of onset. This relationship was apparent in the CSDD where chronic offenders had an average age of onset more than 3.5 years lower than recidivist offenders and 8 years less than one-time offenders (Piquero et al., 2007).

More recently, criminal career research has moved from the group-based designation of chronicity to an analysis of age of onset and offending frequency. Piquero, Farrington and Blumstein (2007), in their analysis of the CSDD data, found a strong negative relationship between age of onset and the average number of convictions accumulated to age 40. Individuals who were convicted at age 10 to 11 averaged 12 lifetime convictions, while those individuals convicted after age 20 averaged only 1.6 convictions. The notion that more frequent offenders have an

earlier age of onset is found in the work of Kyvsgaard (2003) in Denmark, in New Zealand (Moffitt et al., 2002), in Canada (Carrington et al., 2005) and in the cohort studies in the United States (Huizinga et al., 2003; Loeber et al., 2003; Piquero, 2000b). However, research in Puerto Rico did not find an association between age of onset and the number of offences committed, except for males who committed specific serious forms of crime (Nevares et al., 1990).

Some research categorizes groups by seriousness instead of crime frequency. Le Blanc and Frechette's (1989) analysis of delinquent boys in Montreal serves as an example of the approach that ties seriousness of the offender to age of onset. They found that the age of onset for adjudicated boys was over four years earlier in official records than adolescent boys. Another important consideration that has received little attention is whether the total number of offences related to age of onset is a result of the larger time window available to commit crime once an offending career begins.

A noticeable limitation of most of the cohort research is that it has tended to neglect offending that begins in adulthood because it was assumed to be an aberration or extremely rare[14] (Piquero et al., 2007). As a result, adult onset offending is neglected in most theories and analysis (Loeber, Stouthamer Loeber, & Green Stephanie, 1991; Paternoster, Brame, & Farrington, 2001). Until recently, most of the research that examined offending careers in a longitudinal manner focused on juveniles or offenders who were selected for inclusion based on their status as an offender. As a consequence, many of the cohort studies did not possess a sufficient time-window to investigate the phenomenon of adult onset offending. Moreover, most of the research in this field has reported continuity between juvenile offending and adult offending (Blumstein et al., 1986; Kempf, 1990; Kempf-Leonard, Tracy, & Howell, 2001; Tracy & Kempf-Leonard, 1996; Wolfgang et al., 1987). Consequently, except for a few notable exceptions, adult onset offending and its possible relationship to adult chronicity has not been subjected to detailed

[14] It is important to differentiate adult onset offending from what is commonly termed "late-onset" or "late-starter" offending in a great deal of cohort research (Patterson et al., 1998; Piquero et al., 2007) where a distinction is made between individuals who begin their criminal careers later in the juvenile period.

analyses even though it was noted as an important empirical issue for the criminal career paradigm by Blumstein, Cohen, Roth and Visher (1986) and some 17 years later by Piquero, Farrington and Blumstein (2003).

These issues notwithstanding, a small amount of research has found that a non-negligible proportion of offending begins in adulthood, as documented in officially recorded offending. In an extension of the 1945 Philadelphia cohort study to age 30, Wolfgang, Thornberry and Figlio (1987) found that 24.2 percent of their sample of offenders had an arrest exclusively in adulthood and that 17.1 percent of the adult only offenders were classified as chronic offenders. In addition, evidence for adult onset is present in the analysis of the 1958 Philadelphia cohort study to age 26. Tracy and Kempf-Leonard (1996) found that overall, 6 percent of the cohort and 44 percent of the adult criminals began their official criminal careers in adulthood. Their analysis shows that adult onset offenders are less frequent and less serious than offenders who committed offences both as a juvenile and as an adult.

In a re-analysis of the 1942 and 1949 Racine cohort data, Eggleston and Laub (2002) found that 11.3 percent of the sample had police contacts only in adulthood. This finding led them to suggest that "adult onset offending is not a rare event" and as such requires explanation in developmental criminology (Eggleston & Laub, 2002, p. 614). Moreover, the results indicate that the predictors of adult onset offending and persistent offending (during both juvenile and adult years) are similar and included educational attainment, delinquent peers and drug use.

Adult onset offending is examined in detail by Gomez-Smith and Piquero (2005) using conviction and police contact data from the Philadelphia National Collaborative Perinatal Project (NCPP). They found that 7.6 percent of the sample offended solely in adulthood. In addition, the authors showed that males, individuals whose mothers had smoked during pregnancy, and people who scored lower on the California achievement test were more likely to be adult onset offenders. Similar to Eggleston and Laub (2002), Gomez-Smith and Piquero (2005) conclude that there are no statistically significant predictors that differentiated persistent offenders from adult onset offenders.

Although it is known that adult onset is important, almost no research examines adult onset of high frequency offenders. This is perhaps a function of the sample in most cohort research that lacks a sufficient number of chronic or serious offenders. In an attempt to understand the dimensions of a more serious offending sample DeLisi (2006) analysed the offending histories of 500 frequent offenders[15] involved with a bond commissioner unit in Colorado. This study reports that the vast majority (62 percent) of these offenders were not arrested until adulthood. Moreover, DeLisi asserts that a curvilinear relationship exists between age of onset and the average number of arrests. In this sample early starters (age 8 and 9) had the most lifetime arrests followed by individuals arrested first at age 28.

The review in this section on age of onset and its relation to chroncity demonstrates that demographic differences exist related to onset and that different indicators of offending produce different estimates for onset. Moreover, different crime types have different ages of onset with less serious crimes preceding more serious crime. Cohort research links early onset with chronicity in the juvenile period and to a lesser extent with continuity in adult offending. The current literature reveals that the phenomenon of adult onset offending is not well understood, but it is an important test of the tenets of several DLC theories in criminology and the GTC. Given the paucity of research on adult onset offending, it is difficult to draw strong conclusions except to acknowledge that it is significant and an important priority of future research, especially with regard to high frequency adult offenders.

Criminal Career Duration and the High Frequency Offender

Criminal career length is an important dimension of offending, but is difficult to estimate given that age of termination is often unknown and is tied directly to the time frame of the research. This construct is especially important due to its use as a fundamental parameter in models of criminal careers (Barnett, Blumstein, & Farrington David, 1987; Copas & Tarling, 1988; Flinn, 1986; Greenberg, 1991;

[15] This designation was accorded to defendants with 30 or more arrest charges.

Lehoczky, 1986; Osgood & Rowe, 1994) and in models of the effects of incapacitation (Cohen, 1983; Gottfredson & Gottfredson, 1986b; Greenberg, 1975; Shinnar & Shinnar, 1975; Spelman, 1994). It is calculated as the "interval between initiation and termination" (Piquero et al., 2003, p. 379). In many studies the time interval is partial and the duration of a residual criminal career is estimated as a recidivism probability tied to an offence appearing in a sequence (Kazemian & Farrington, 2006; Piquero, Brame, & Lynam, 2004; Rhodes, 1989). Little research presents a direct measurement of duration. This section is dedicated to a review of criminal career duration, either as a direct measure or as estimated from a residual probability.

In general offending samples criminal career duration for repeat offenders into adulthood is estimated between 7 years (Kyvsgaard, 2003; 1993) and 12 years (Prime, White, & Liriano, 2001) in length. The estimates of duration change depending on the sample. In the CSDD, a sample of working class boys, Piquero, Farrington and Blumstein (2007) found a mean length 10.2 years to age 40. Le Blanc and Frechette (1989) found larger average career length estimates. Using self-report data to age 25 they noted an average length of 10.8 years, while official records for the sample of delinquent boys lowered this estimate to an average of 5.2 years.

Not surprisingly, research on duration reports a consistent relationship between chronicity and the duration of criminal careers (Piquero et al., 2007; Tracy & Kempf-Leonard, 1996). Piquero, Farrington and Blumstein (2007) found that the average career length for chronics to age 40 was 15 years. In their study of habitual felons, Petersilia, Greenwood and Lavin (1977) found that their subjects had a mean career length of 21 years. Spelman (1994), in his re-analysis of the second RAND Inmate Survey, found that the average inmate who was classified as a property offender had a career length from 7 to 10 years, while inmates classified as personal offenders had a career ranging from 7 to 9 years. Although this sample focused on inmates in jails and prisons, Spelman (1994) noted that frequent offenders had criminal careers that averaged 2 to 3 years longer than the careers of an average inmate.

Piquero, Brame and Lynam (2004) provided a detailed treatment of criminal career duration in a 20-year follow-up of parolees from the California Youth Authority. This sample of serious and in most cases frequent offenders had an average criminal career length of 17.27 years. Almost no ethnicity effect was observed, but longer criminal careers were associated with early onset, shorter imprisonment sentences and lower cognitive functioning.

Correlates of the High Frequency Offender

Criminal career research has uncovered additional variables associated with chronic offending. The most prominent covariates reported in criminal career research are delinquent peer groups and drug use. Other variables associated with chronicity and offending frequency that have received less attention in research include: sporadic employment (Blumstein et al., 1986; Chaiken & Chaiken, 1982; Farrington, 2003a), familial criminality (Farrington et al., 2006; Farrington, Gundry, & West, 1975; Rowe & Farrington, 1997) and educational attainment (Elliott & Voss, 1974; Gomez-Smith & Piquero, 2005). The intent of this section is to review the relationship between delinquent peer groups and drug use as they relate to offending frequency and the chronic offender because the other covariates have not been subjected to a significant amount of analysis with regard to high frequency offending.

The importance of delinquent peer associations to offending frequency and chronicity has received widespread academic attention (Reiss, 1988; Warr, 2002). Sarnecki (2001) in his analysis of co-offending networks in Stockholm found that in the general offending network there was a weak correlation between the number of criminal associates and the mean number of offences committed by individuals. However, when he examined the individuals who comprised the core of the 'Central Network', he found that those members had greater numbers of associates and a higher average number of offences. Moreover, one of the street gangs identified in the delinquent network had a high offending frequency as compared to other offender dyads in the network.

Warr (1993, 1996; Warr & Stafford, 1991), using data from waves of the National Youth Study, analysed the impact of offending frequency on delinquent peer associations and group organization. He found that delinquent peer associations in youth were a stronger predictor of self-reported offending than the effect of age (Warr, 1993). Warr and Stafford (1991) assert that delinquent peer behaviour, more so than delinquent peer attitudes, is the important variable in the production of increased self-reported offending. Moreover, Warr (1996) contends that the most frequent offenders in a delinquent group are more likely to instigate delinquent behaviour and are the individuals with the greatest number of additional accomplice networks. These general findings were supported in research on the CSDD by Farrington and Reiss (1991) who noted that the highest frequency offenders tended to have multiple accomplice networks and acted as recruiters for delinquent groups. These results seem to support the delinquent group dynamics discussed by Moffitt (1993; Piquero & Moffitt, 2005) and Thornberry (1987; Thornberry & Krohn, 2005).

The association between delinquent groups and offending frequency has prompted an assessment of the impact of membership in different types of criminal groups. The most widely researched groups with regard to offending frequency are youth or street gangs. It has long been recognized that gang membership is related to increased involvement in crime (Huff, 1996). More recently, as part of the *Research on the Causes and Correlates of Delinquency Program* of Office of Juvenile Justice and Delinquency Prevention, the systematic study of gangs in general population samples in the United States has received a substantial amount of attention in the Rochester Youth Development Study (Thornberry & Burch, 1997; Thornberry, Krohn, & Lizotte, 1993; Thornberry, Krohn, Lizotte, Smith, & Tobin, 2003; Thornberry et al., 1994), the Denver Youth Study (Esbensen & Huizinga, 1993) and the Seattle Social Development Project (Battin-Pearson, Gill, Abbott, Catalano, & Hawkins, 1998; Battin-Pearson, Thornberry, Hawkins, & Krohn, 1998). These studies consistently indicate gang members have significantly higher offending rates than youth belonging to serious delinquent and delinquent groups. The key issue of debate surrounds the causal sequence of the gang and crime nexus.

On one side are those who assert the selection hypothesis, where the apparent increase in criminality of members is the result of the association and mutual selection of already frequent offenders (Gottfredson & Hirschi, 1990; Matsueda & Anderson, 1998). Conversely, those that adhere to the facilitation hypothesis argue that gang structure, composition and behaviour of the members increase offending of all members. At present, research findings primarily support the latter hypothesis (Battin-Pearson, Thornberry et al., 1998; Thornberry, Krohn, & Lizotte, 1992; Thornberry, Krohn et al., 2003).

Drug and alcohol abuse, especially hard drug and poly drug abuse, and their link to chronicity and offending frequency have received a substantial amount of attention in criminal career research. Wish and Johnson (1986) provide an extensive review of the literature on the link between hard drug use and chronicity. They conclude that hard drug use is connected to frequency of offending in both juvenile and adult samples. This effect seemed to hold across sample types, including arrestees and incarcerated offenders, and suggests that poly drug users were the most dangerous offender group. Shannon (1989) examined the association between drug and alcohol use in the 1942, 1949 and 1955 Racine cohorts. He found that self-reported drug use was related to longer and more serious offending careers. Moreover, he reported that drug use was related to greater frequency of police contacts for serious crime types.

The link between serious and frequent offending by juveniles and drug use is well documented in analyses of the National Youth Study (Elliott, Huizinga, & Ageton, 1985; Elliott, Huizinga, & Menard, 1989). This research has demonstrated that alcohol and drug use is consistently related to serious delinquency and a high rate of offending for youth. The authors found that regular alcohol consumption and marijuana consumption were related to high rates of offending. Moreover, poly drug use was related to the highest rates of offending in the most serious offence types (Elliott et al., 1989).

The connection between drugs, especially heroin, and crime frequency was reported by Petersilia, Greenwood and Lavin (1977) in the RAND study of 49 convicted robbers. Furthermore, the hard drug use crime connection was assessed

by Peterson and Braiker (1980) in the First RAND Inmate Survey. After controlling for other factors, the researchers found that offenders addicted to heroin had more self-reported property crimes. Chaiken and Chaiken (1982, p. 1) found, in the Second RAND Inmate Survey, that the most frequent and dangerous offender group, labeled violent predators, were the most likely to report heavy daily hard drug use. Moreover, in their analysis of sample drug use, Chaiken and Chaiken (1982, p. 1) found that juvenile drug abuse was associated with high rates of burglary, robbery and assault as an adult, and that chronic poly drug use was positively related to criminal career length and offending frequency.

Conclusion

This chapter reviews the major DLC theories of offending and where applicable discusses their propositions in relation to high frequency offenders. The review notes differences in their structure, the locus of causation and whether the theory posits distinct offending groups. However, they all share certain similarities. The general theory of crime, the age-graded theory of informal social control, interactional theory and the AL/LCP taxonomy all stress the importance of early childhood socialization processes in the family and in the school. In addition, they are all to some extent, based in control theory. This may account for the difficulty in establishing rigid tests of any specific theory. In some instances the same models on different cohort data sets yield vastly different results that support two opposing theoretical positions (Nagin & Farrington, 1992a, 1992b; Nagin & Paternoster, 1991; Paternoster & Brame, 1997; Paternoster et al., 1997).

This chapter reviews the parameters of prevalence, age of onset and duration for general offending samples and for high frequency offenders. The literature shows that chronic offenders participate in more types of crime and a greater degree of serious crimes than do other offender groups. Moreover, it is apparent that chronic offenders have a much earlier age of onset, especially for serious forms of crime. Last, the review notes that chronic offenders have long criminal career durations and tend to show continuity in offending in adulthood.

The last section of this chapter presents a brief summary of research that examines the impact of two covariates of chronicity. Substance abuse, including alcohol, is related to offending frequency in adolescence. Moreover, hard drug abuse and poly drug abuse are related to the highest rates of offending in youth and adulthood. Delinquent peer associations are another important factor linked to offending frequency, especially for adolescents and young adults. Street gang involvement, as a specific class of delinquent groups, impacts the offending frequency of group members to a greater extent than delinquent peer associations. Furthermore, higher frequency offenders are more likely to instigate offending in a group setting, and have a larger network of co-offenders than do other members. Although a substantial amount of information is known about chronic offending, it is important to note that most of this research does not contain large numbers of high frequency offenders and that the bulk of this research focuses on younger offenders.

The development of DLC theory is based on the empirical findings on parameters discussed in the chapter. Each of the theories explains early onset, participation and criminal career duration. Moreover, most of the DLC and general theories of crime contain tenets that relate specifically to a high frequency offending population. However, most of the findings that pertain to frequent offenders are based on small subsamples. This in part explains the inconsistent findings on correlates of these parameters. Therefore, it is prudent to examine frequent offenders to understand how the findings and resultant theoretical tenets hold against larger samples.

Chapter 3: Criminal Lambda and the High Frequency Offender

Introduction

The focus of this chapter is on individual offending frequency, also referred to as criminal lambda (λ), an important parameter in criminal career research for estimating offending. The 1986 Panel on Research on Criminal Careers (Blumstein et al., 1986; Cohen, 1986) placed primary importance on lambda as an under researched construct. This is clearly emphasized by Blumstein, Cohen, Roth and Visher (1986) in their assertion:

> The most important criminal career dimension is individual frequency *(criminal lambda)*, particularly of serious offenses….Research should focus especially on the path of λ over time as offenders age, the variation in λ with age for active offenders, the factors associated with intermittent spurts of high-rate and low-rate offending, and differences in λ by crime type. (Blumstein et al., 1986, p. 10)

The construct of lambda has received widespread attention since the 1945 (Wolfgang et al., 1972) and 1958 (Tracy et al., 1990) Philadelphia Birth Cohort studies, and the Cambridge Study in Delinquent Development (West & Farrington, 1977). One of the more important findings in these longitudinal studies is with regards to repeat offending. These studies found that there are a small proportion of chronic offenders who account for a disproportionate percentage of all offences committed by the cohort (Farrington & West, 1990; Tracy et al., 1990; Wolfgang et al., 1972). The results of the 1945 Birth Cohort study showed that chronic delinquents (i.e., those with 5 or more police contacts) who represented six percent of the total sample and 18 percent of the delinquent sub-sample, accounted for 52 percent of all delinquent acts and, more significantly, 63 percent of the serious offences as defined by UCR Index offences (Wolfgang et al., 1972). Moreover, this finding was replicated in the 1958 Philadelphia cohort study (Tracy et al., 1990). All other longitudinal and cross-sectional research into criminal careers supports the finding that a small proportion of delinquents and criminals account for a disproportionate amount of criminal acts and deviance (for reviews see Blumstein

et al., 1986; Cohen, 1986; Petersilia, 1980; Piquero et al., 2003; Spelman, 1994). The consistency of the findings, in respect to the chronic offender sub-population across longitudinal research in different time periods, using different offending indicators and across different samples, has prompted developmental and life course criminologists to conclude that chronic offenders "commit a large fraction of all crimes…tend to have an early onset, a high individual offending frequency, and a long criminal career" (Piquero et al., 2007, p. 3). However, Piquero, Farrington and Blumstein (2007, p. 4) assert that there are certain aspects of lambda which are not well understood, including "whether early onset predicts a high individual offending frequency" and whether the offending of chronic offenders is "more serious on average" than non-chronic offenders.

This chapter reviews the methods used to estimate lambda to demonstrate its value to the field criminology and criminal justice practice. First, an overview of the conceptual and operational definitions of criminal lambda (λ) is provided. Second, the importance of lambda to theory and practice is discussed. Third, the major criticisms voiced by Gottfredson and Hirschi (1986, 1987, 1988, 1990) of criminal lambda are evaluated. Fourth, research findings on criminal lambda from major longitudinal studies, using self-report and official records data are examined. Fifth, the group trajectory analysis of lambda over the criminal career is reviewed. Additionally, specific correlates of criminal lambda are discussed.

The Concept of Lambda

The consistent finding that a small group of frequent offenders is responsible for a large proportion of offences has led researchers to introduce a concept to examine the careers of active offenders, both as juveniles and adults. This is often termed *criminal lambda*, which is a standard measure of offending frequency for active offenders per unit of time (Blumstein & Cohen, 1987; Blumstein et al., 1986; Cohen, 1983, 1986; Piquero et al., 2003; Spelman, 1994). Since the 1970s, research on lambda has studied different offending populations, such as general offending populations, arrestees and prison intakes. Additionally, the concept of lambda is measured and estimated using a variety of data sources, including self-reports,

arrest and negative police contact statistics and convictions. Given the different nature of each of the data sources, the assumptions inherent in the data and the assumptions inherent in criminal career research (such as the homogeneity of offending rates over time and the length of criminal careers), it is not surprising that different models with different assumptions and parameters (see Blumstein & Cohen, 1979; Canela-Cacho et al., 1997; Flinn, 1986; Lehoczky, 1986; Rolph, Chaiken, & Houchens, 1981) exist for the calculation and estimation of lambda.

The most general equation calculates lambda for each individual offender who is criminally active. In these instances lambda is calculated for overall offending. In other instances lambda is calculated for offenders active in specific offence types. Lambda estimates are calculated in a defined period of time, which can include the life course or stages within the life course. The equation for estimating lambda scores is:

$$\lambda_i = O_i / T_{years}$$

Where:

λ_i = Yearly lambda estimate for person *i*.

O_i = Total number of offences for person *i*.

T_{years} = The time interval of the study in years.

The basic formula in this equation for estimating lambda has serious issues in the T_{years} term. In the equation, the T_{years} term does not adjust for time where the offender is unable to commit further offences. The adjustment for available time is called incapacitation time. The adjustment for incapacitation time is usually some estimate of incarcerated time, although it can include other factors such as long-term hospitalization (see Blumstein et al., 1986).

In the late 1970s and early 1980s, the idea of including incapacitation time in the calculation of available time in the denominator gained prominence (see Blumstein & Cohen, 1979; Chaiken & Chaiken, 1982; Petersilia et al., 1977; Peterson et al., 1980; Rolph et al., 1981). This research tends to focus on known felons and incarcerated populations of offenders. It found extremely high lambdas for the 90th

percentile of their offending sample. The formula for lambda for an offender who commits offences of type *j* based on available time is shown in the equation:

$$\lambda_i = O_i t_k / [\frac{Lt_k - I_i t_k}{365.25}]$$

Where:

λ_i = Yearly lambda estimate for offender *i* of conviction type *j*.

$O_i t_k$ = Total number of convictions of type *j* for offender *i* in time period *k*.

Lt_k = Total number of days in time period *k*.

$I_i t_k$ = Total number of days of incapacitation for offender *i* in time period *k*.

The inclusion of the adjustment term in the denominator is more important for serious and high rate offenders. It is these types of offenders that have a higher likelihood of repeat contacts with the criminal justice system and a higher likelihood of several incarceration periods over their offender careers. The use of the non-adjusted equation to calculate lambda is problematic when the sample has a substantial amount of incarceration periods. In these instances, the equation underestimates lambda scores for high-rate offenders. In fact, a priori, it is not possible to determine whether these two quantities of lambda are similar with regard to high frequency offenders, or if they are characteristically different quantities.

In research generally, the individual yearly estimates of λ are aggregated for the specific sample of active offenders as a whole. Regardless of the population of interest or the data source used in the calculations, lambda is usually presented as a mean and/or median to represent the average where the top n^{th} percentile (usually the top 10 percent or 90th percentile) is extracted from the total study sample to offender (Blumstein et al., 1986; Chaiken & Chaiken, 1982; Cohen, 1986; Horney & Marshall, 1991; Peterson et al., 1980; Spelman, 1994; Visher, 1986). Criminal lambda is usually presented as an average over a given time period to provide a means of comparing samples and to assist with the identification of high rate offenders within the samples. The presentation of multiple descriptive statistics is necessary as a result of the skewed nature of lambda distributions in various

populations (Blumstein et al., 1986; Chaiken & Chaiken, 1982; Cohen, 1986; Horney & Marshall, 1991; Peterson et al., 1980; Spelman, 1994; Visher, 1986). An understanding of lambda is important given the recent focus of the criminal justice system on high frequency, habitual and chronic offenders (Auerhahn, 1999, 2002; Dawson, 2005, 2007; Dawson & Cuppleditch, 2008; Her Majesty's Chief Inspector of Constabulary, 2004; Street Crime Working Group, 2004).

The construct of lambda and the differing methods of calculating lambda fueled an ongoing debate between life course criminologists and latent trait theorists about the value of the construct. Criminal career research, generally, and criminal lambda research specifically, has been the subject of critique by the academic community, most notably Michael Gottfredson and Travis Hirschi. In a series of papers (Gottfredson & Hirschi, 1986, 1987, 1988; Hirschi & Gottfredson, 1983) and a book (Gottfredson & Hirschi, 1990), these authors have questioned the utility of the criminal career paradigm and the concept of lambda, arguing that this paradigm lacks a coherent theoretical and methodological basis. The remainder of this section of the chapter reviews their criticisms of research on criminal lambda and presents responses to these criticisms.

Gottfredson and Hirschi (1990) in their rejection of biological, psychological, economic and sociological positivism, propose that crime is the result of low self-control. They argue that "self-control is the only enduring personal characteristic predictive of criminal (and related) behavior" (Gottfredson & Hirschi, 1990, p. 111). In their development of a general theory of crime, they claim that low-self-control combined with differing opportunity structures produces variation in crime (Gottfredson & Hirschi, 1990). From this standpoint the authors reject the basis of criminal career research, including criminal career concepts (i.e., onset, incidence, persistence, desistence and specialization). In particular they oppose the concept of lambda.

Gottfredson and Hirschi (1987, 1988, 1990; 1986b) continue their critique of criminal career paradigm by examining the concepts used to describe criminal careers. They argue that incidence (I), participation (P) and lambda (λ) are not distinct entities, but are all related to the same underlying cause. To support this

contention, they present data from the Richmond Youth Survey where they purport to show that incidence measures and lambda measures are the same. In addition, they argue that a focus on lambda is not relevant to criminology because crime is a function of the widely accepted age-crime curve, which peaks in late adolescence and declines into adulthood as offenders mature out of crime. They conclude that for selective incapacitation to be effective justice personnel must incarcerate youth at high rates.

Blumstein, Cohen and Farrington (1988a; 1988b) have responded to many of the Gottfredson and Hirschi critiques of the criminal career paradigm. First, they note that the "construct of the criminal career is not a theory of crime" per se, but a "way of structuring and organizing knowledge about certain key features of offending for observation and measurement," that provides for the development of a theory (Blumstein, Cohen et al., 1988a, p. 4). Second, these authors argue that Gottfredson and Hirschi misunderstand the concepts of lambda, participation, and incidence. Lambda is a rate that is estimated for offenders in a standard unit of free time, while incidence is a sum total of crime committed by individuals over the study period, without any adjustment for time spent incapacitated (Blumstein, Cohen et al., 1988a, 1988b). Offenders with similar incidence rates may have dramatically different values of lambda.

Presently, the Gottfredson and Hirschi criticism is valid in respect to most of the criminal career research that presents data on offending. Much of the criminal career research calculates offending frequencies for active offenders, but does not include estimates for street time availability, which makes these estimates appear more as individual incidence rates (see Carrington et al., 2005; Kyvsgaard, 2003; Loeber & Snyder, 1990; Piquero et al., 2003). However, the basic issue with analyses presented by Gottfredson and Hirschi is that they apply general findings, such as the invariant age-crime curve, to all aspects of crime and offending. Blumstein and his colleagues (1988a, 1988b) note that due to their general approach to an understanding of offending, Gottfredson and Hirschi are unable to propose an adequate cause for the invariant age-crime curve. These authors propose that the age-crime curve represents a decrease in participation with age,

while lambda rates for active offenders remain relatively stable or increase. This proposition has been supported by several quantitative (Blokland et al., 2005; Laub & Sampson, 2003; Loeber & Snyder, 1990) and qualitative studies (Cromwell, Olson, & Avary, 1991; Jacobs, 2000; Wright & Decker, 1994, 1997) of active offenders.

The Importance of Lambda to Theory and Practice

This part of the chapter addresses the importance of the construct of lambda to substantive theory in criminology and applied criminal justice practice. The review then draws attention to the importance of lambda to the prevailing theoretical debate within the criminal career paradigm. The discussion of policy focuses explicit attention on the connection between lambda, selective incapacitation, and offender-focused treatment.

Lambda and Public Policy

Offending frequency and, to some extent, seriousness are the basis for the most severe criminal justice interventions in North America. Incapacitation interventions, most notably selective incapacitations strategies, are a prevalent criminal justice intervention in the United States (see Auerhahn, 1999, 2002). At present, the idea of lambda underlies the Three Strikes legislation that gained prominence in American policy since the late 1970s.

Accurate estimates of lambda are critical in determining the effectiveness of incapacitation interventions. Determining whether lambda is stable over time is particularly relevant to an assessment of the effect of any incapacitative policy. It is problematic if lambda estimates change during a criminal career because such a change impacts the "incapacitative effect" of any selective incapacitation policy. The fact that selective incapacitation policy is so dependent on the accuracy of prediction of lambda has prompted an analysis of lambda in models of selective incapacitation (Blumstein & Nagin, 1978; Cohen, 1983; Greenberg, 1975; Greenwood, 1983; Greenwood & Abrahamse, 1982; Haapanen, 1990; Shinnar & Shinnar, 1975) and an analysis of methods for predicting the high-rate offender (Barnett et al., 1989; Greenwood & Abrahamse, 1982).

The legal and moral implications of selective incapacitation require an assessment of critiques of selective incapacitation as it relates to crime control. The critiques are numerous and generally focus on three inter-connected problems with selective incapacitation. The first critique is directed at the philosophy of crime control. The second centres on the models and the specific assumptions in models of selective incapacitation, such as the stability of lambda. The third focuses on the error inherent to the prospective prediction of chronicity.

The primary critique of selective incapacitation is a philosophical one, nested in the due process model of criminal justice. Due process protections are contained in all Western systems of justice. According to Packer (1968, p. 165), "the combination of stigma and loss of liberty that is embodied in the end result of the criminal process is viewed as being the heaviest deprivation that government can inflict on the individual". The inherent error in the justice process, from the gathering of evidence to the assessment of an offender and the adversarial nature of process itself, dictates that Western justice systems "must be subjected to controls that prevent it from operating with maximal efficiency," (Packer, 1968, p. 166). In essence, the philosophical underpinnings of selective incapacitation take the focus of the sentence away from the crime and place the emphasis on the offender. This is one of the more extreme violations of the due process concept of equality found in Western justice systems.

Moving beyond philosophical critiques are those directed at the models of selective incapacitation. The mathematical models used to show the benefit of selective incapacitation and their assumptions have come under increased scrutiny. In order for selective incapacitation to be effective two conditions need to exist. According to Haapanen (Haapanen, 1990, p. 5):

> Incapacitated offenders would, in fact, commit crimes during the period of incapacitation were they free to do so, and that the crimes prevented by incapacitating these offenders would not be committed by others instead. (Haapanen, 1990, p. 5)

Currently, research has not been able to effectively assess whether chronic offenders show patterns of "spurting" in offending frequency (Blumstein et al.,

1986; Cohen, 1986; Horney & Marshall, 1991), and little is known about co-offending patterns relating to chronic offenders (Reiss, 1988; Reiss & Farrington, 1991).

More specifically, the models used to estimate the benefits have been critiqued in regards to the assumptions on specific criminal career parameters (Mathiesen, 1998). In general, models seeking to ascertain the extent of the incapacitative effect have assumed a constant rate of offending for individuals over the life course (Blumstein, 1983; Greenwood & Turner, 1987).

In the 1970s and early 1980s, a constant rate of offending was used as a simplification in the models because little was known about lambda. However, recently attention and debate has centered on the stability of offending frequency and how it is calculated. At present, the results are ambiguous, with some research showing stability (Loeber & Snyder, 1990) and other research contesting this finding and asserting that other concepts, such as life course transitions (Laub & Sampson, 2003; Sampson & Laub, 1993) and maturational reform (Gottfredson & Hirschi, 1990; Hirschi & Gottfredson, 2002a) produce instability in lambda.

In addition, models that estimate lambda assume fixed probabilities for arrest, conviction and incarceration that are conditional on the type of crime (Blumstein & Cohen, 1979; Blumstein & Nagin, 1978; Cohen, 1983; Greenberg, 1975; Greenwood, 1983; Greenwood & Abrahamse, 1982, p. 1; Shinnar & Shinnar, 1975). Often there is no account of variability in the responses of criminal justice system personnel to an offender who becomes known to the system (i.e., increased sentence length) or who is in the system itself over time. Moreover, adjustments are not made for the discretionary practices of criminal justice system actors, such as police charging a chronic offender instead of issuing a warning. Not only are the assumptions used to estimate the parameters for the incapacitative effect limited, but generally the models assume fixed offender populations (i.e., sampling with no replacement) are responsible for crime in society. More recent models that incorporate some dynamic parameters for individual offending frequency have produced more conservative estimates of the impact of selective incapacitation. One such researcher reports that "the hopes of significantly reducing crime through

incapacitation, whether collective or selective, would appear remote" (Haapanen, 1990, pp. 136-137).

Additional formidable critiques of selective incapacitation focus on the validity of assessment tools for predicting chronicity. Supporters of this approach contend that actuarial tools allow for the selective incapacitation of high-rate or chronic offenders based on the indetification of combinations of offender characteristics. This risk-assessment debate has been a staple of psychology and has centered on personality disorders linked to criminality (Hare, 1996; Hare, McPherson, & Forth, 1988) and more recently in criminology with regard to chronic and high-rate offenders (Auerhahn, 1999; Decker & Salert, 1986; Greenwood & Abrahamse, 1982; Miranne & Geerken, 1991; Visher, 1987; Visher, 1986). One of the most controversial prediction tools for determining candidacy for selective incapacitation is the Greenwood Scale (Greenwood & Abrahamse, 1982). This seven point composite scale is a sum of seven dichotomous variables associated with offending frequency. These indicators are "prior conviction for the instant offence type, incarcerated more than 50 percent of the preceding two years, conviction before age 16, served time in a state juvenile facility, drug use in preceding two years, drug use as a juvenile and employed less than 50 percent of the preceding two years" (Greenwood & Abrahamse, 1982, p. 50). Originally, the scale was tested on a sub-sample of inmates from the Second RAND Inmate Survey (Chaiken & Chaiken, 1982) who had been incarcerated for a burglary or robbery offence (N = 781). As a proxy for offending frequency the offenders were categorized into low, medium and high-rate offenders. Results from the application of the scale indicated that high frequency offenders were often misclassified (Greenwood & Abrahamse, 1982).

Other tests of the Greenwood Scale have yielded less promising results. Decker and Salert (1986) found that the Greenwood Scale was highly inaccurate in predicting high-rate offenders and argued that assessment tools should avoid incorporating measures that are exogenous to the offender. Visher (1986), in a re-analysis of the Second RAND Inmate Survey, noted several deficiencies in the Greenwood Scale. She found that the scale tended to predict low-rate offenders

more accurately then high-rate offenders. Moreover, Visher (1987) examined the validity of incorporating information from criminal records of high-rate offenders and concluded that this information does not improve the predictive ability of the scale.

This section provides a brief review of selective incapacitation, models used to estimate the effect of selective incapacitation and actuarial tools used to prospectively identify the high frequency offender. Overall, the review is not positive. One may speculate that some of the issues arise because little is known about lambda and that the different methods for calculating lambda for high frequency offenders produce distinct quantities that may represent different variables. There are important ramifications for models of incapacitation and criminological theory if lambda scores not including free time and including free time are different variables for high frequency offenders.

Lambda and Criminological Theory

Counts of offending, lambda scores that do not include incapacitation and lambda scores that include street time are of fundamental importance for criminological theory. These estimates are the primary outcome variable in general theories and in developmental and life course theories in criminology. However, if the three methods to measure offending produce characteristically different quantities, then it is reasonable to consider which of the outcomes variables is the most appropriate or valid indicator of offending. This has special importance in theories that explain frequent offenders, where a standardized estimate to promote comparability is desirable. This section reviews the major theoretical positions of the general theorists and the DLC theorists in relation to offending frequency.

Gottfredson and Hirschi (1990) posit that offending frequency is a direct function of levels of self-control. They assert that less self-control of an individual is linked to a greater offending frequency. Moreover, offending frequency for all offenders is tied to the aggregate age-crime curve and the maturation effect. Gottfredson and Hirschi (1990) argue that all offenders follow the form of the age-

crime curve where offenders, including frequent offenders, mature out of official offending in young adulthood. The theory posits that frequent offenders offend more than a typical offender but that desistance in official offending is the norm after young adulthood.

In contrast, the adolescent limited and life course persistence taxonomy proposed by Moffitt (1993, 1997) takes a different position on the connection between offending frequency and the age-crime curve. Her theory suggests that LCPs have relatively constant rates of offending throughout the life course. The aggregate age-crime curve is thus a reflection of the sum of the frequency of two populations. The first is the adolescent limited offender. This group, which is the largest, conforms to the age-crime curve and generally desists in offending in early adulthood. The second population is the life course persistent population that has a high offending frequency throughout the life course. The offending frequency of life course persistent offenders is tied to neuropsychological deficits in early childhood, which necessitates an early age of onset for LCPs. This group is a small proportion of the population.

Sampson and Laub's (1993, 2003) age-graded theory of informal social control ties offending frequency to criminogenic trajectories and turning points. The intensity of the trajectories that lead to low attachment and low personal agency are positively related to offending frequency. Although Sampson and Laub (1993, 2003) suggest that low attachment and negative trajectories begin in early childhood, there is nothing that precludes late onset high frequency offending. The authors contend that the negative trajectories relate to offending frequency but that there is constant movement towards desistance as offenders age. The movement towards desistance is not the same as the maturation effect advanced by Gottfredson and Hirschi.

Thornberry's (1987; 1994) interactional theory ties offending frequency to low attachment to conventional institutions of social control. The effect of lowered controls combined with the interactive setting produces reciprocal effects where the offender is more likely to increase offending. The effect of offending combined with deteriorating bonds produces a negative spiral that increases the propensity

towards future criminality. The interactive setting in this theory is the delinquent group. The reciprocal effects of the negative setting combined with increasingly low controls suggests that age of onset is related to offending frequency, but does not preclude the high frequency adult onset offender.

An Overview of Criminal Lambda

This section of the chapter examines studies that derive estimates of criminal lambda. Since the 1970s, there has been a great deal of research into this concept with different populations, including prisoners, arrestees and the general offending population. Additionally, this concept is measured and is estimated using a variety of data sources, including self-reports, arrest statistics and convictions.

Self-Report Studies of Lambda

When the focus of the analysis is the incarcerated offender, self-report studies of criminal lambda have discovered high mean offending rates (Peterson et al., 1980). Several studies of criminal lambda were undertaken by the RAND Corporation (Chaiken & Chaiken, 1982; Petersilia et al., 1977; Peterson et al., 1980). In the First RAND Inmate Survey (Peterson et al., 1980) 624 randomly sampled inmates from five California prisons were asked to report on their offending frequency for eleven offence types during a three-year time period preceding their current incarceration. During the three-year period street time was calculated by excluding incarceration and hospitalization periods. Peterson and Braiker (1980) calculated the mean offending rates per year of free time for resident prisoners. Subsequently, they estimated lambdas for incoming prisoners and street offenders using the probability of arrest and incarceration for a crime and the average time spent in prison for an offence. Their analysis revealed that resident prisoners and incoming prisoners had high lambdas in each crime type as compared to their estimates for street offenders. Additionally, the authors found that the distribution of lambdas for each offence was highly skewed with a large proportion of inmates reporting little to no offences within the three-year period. The reliability of this study was criticized for several reasons, including the use of a three-year time period, the imprecise method of

counting offences, low response rates and the fact that the survey was completed anonymously by inmates (Cohen, 1986).

In response to these criticisms the Second RAND Inmate Survey was undertaken by Chaiken and Chaiken (1982). This inmate survey was significantly larger (n = 2,190) and more diverse as it included both prison (considered more serious offenders) and jail (considered less serious offenders) inmates from Michigan, California and Texas. This was done to assess differences between offender groups with respect to lambda. In addition, the sample was selected to emulate an incoming cohort of inmates with the time frame restricted to two years prior to the current incarceration. Street months were determined using an event calendar. The procedure for assessing high counts of crime in a given year was modified. As a result of these methodological changes Chaiken and Chaiken (1982) derived estimates for lambda that were substantially higher than those found in the first RAND survey (see Table 3.1: Estimates of Lambda from RAND Inmate Surveys). These authors found that offending frequency is highly skewed in each of the states and in both of the different incarceration settings. Moreover, they discovered that inmates in prisons had higher average lambda estimates than did jail inmates, and that lambda estimates for property and drug offenders were substantially higher than for violent offenders. The Second RAND Inmate Survey received considerable criticism from the academic community. First, there was considerable ambiguity and complexity[16] for respondents who indicated high frequency offending patterns.[17] Additionally, high frequency offenders who could not remember the exact number of offences they committed during their street time were given a minimum and maximum value (see Table 3.1 for the mean ranges of active offenders in California, Michigan and Texas). Included in this limitation is the problem of recall, especially for high frequency offenders, most of whom had serious drug and alcohol problems (Chaiken & Chaiken, 1982; Cohen, 1986; Visher, 1986; Weis, 1986). Second, there were indications that offending was irregular, referred

[16] See Chaiken and Chaiken (1982) and Visher (1986) for a discussion of the instrument used to collect data from high frequency offenders.
[17] High frequency was defined as 11 or more self-reported crimes of a specific type in a day.

to as crime spurting, over free time rather than constant. This finding was prominently observed with high-rate offenders immediately prior to their current incarceration. Extrapolation from short time periods and the procedures for assessing high frequency offenders inevitably led to overestimation of lambdas for high rate populations of inmates (Cohen, 1986; Horney & Marshall, 1991; Visher, 1986).

Offence Type	Statistic	1st RAND Inmate Survey (Peterson & Braiker, 1980)	2nd RAND Inmate Survey (Chaiken & Chaiken, 1982)	2nd RAND Inmate Survey (Chaiken & Chaiken, 1982)	2nd RAND Inmate Survey (Chaiken & Chaiken, 1982)	2nd RAND Inmate Survey (Chaiken & Chaiken, 1982)	2nd RAND Inmate Survey (Chaiken & Chaiken, 1982)	2nd RAND Inmate Survey (Visher, 1986)	2nd RAND Inmate Survey (Visher, 1986)	2nd RAND Inmate Survey (Visher, 1986)
		California	*California Prison*	*California Jail*	*Michigan Prison*	*Michigan Jail*	*Texas Weighted Prison*	*California*	*Michigan*	*Texas*
Burglary	Mean	14.15	116-204	63-97	84-122	89-144	44-58	98.8	82.7	34.1
	Median		9.8	6.3	6.2	4.9	3.6	6.2	4.8	3.1
	90th Percentile		**384.0**	**189.0**	**400.0**	**213.0**	**112.0**	**199.9**	**258.0**	**76.1**
Robbery	Mean	5.16 (armed robbery)	49-74	31-51	75-108	17-37	10-16	42.4	45.4	13.1
	Median		8.0	5.5	5.7	4.8	3.2	5.1	3.6	2.5
	90th Percentile		**155.0**	**118.0**	**155.0**	**97.0**	**22.0**	**107.1**	**86.1**	**15.2**
Auto Theft	Mean	3.90	38-102	49-56	214-248	82-86	7-10			
	Median		6.0	3.1	4.8	4.9	2.0			
	90th Percentile		**99.0**	**56.0**	**413.0**	**43.0**	**10.0**			
Forgery	Mean	4.87	62-94	90-132	84-106	66-152	29-49			
	Median		4.8	4.5	4.5	3.3	4.3			
	90th Percentile		**197.0**	**269.0**	**344.0**	**77.0**	**110.0**			
Theft	Mean		185-326	173-236	97-125	87-203	122-150			
	Median		16.0	9.0	7.0	6.0	5.7			
	90th Percentile		**724.0**	**583.0**	**296.0**	**384.0**	**387.0**			

Table 3.1: Estimates of Self-Reported Lambda from the RAND Inmate Surveys.

Offence Type	Statistic	1st RAND Inmate Survey (Peterson & Braiker, 1980)	2nd RAND Inmate Survey (Chaiken & Chaiken, 1982)	2nd RAND Inmate Survey (Chaiken & Chaiken, 1982)	2nd RAND Inmate Survey (Chaiken & Chaiken, 1982)	2nd RAND Inmate Survey (Chaiken & Chaiken, 1982)	2nd RAND Inmate Survey (Chaiken & Chaiken, 1982)	2nd RAND Inmate Survey (Visher, 1986)	2nd RAND Inmate Survey (Visher, 1986)	2nd RAND Inmate Survey (Visher, 1986)
		California	*California Prison*	*California Jail*	*Michigan Prison*	*Michigan Jail*	*Texas Weighted Prison*	*California*	*Michigan*	*Texas*
Assault	Mean Median **90th Percentile**		7.1-7.6 3.6 **18.0**	6.0-6.9 2.8 **12.0**	4.8-5.3 2.8 **12.0**	4.7-5.7 1.9 **16.0**	3.2-3.4 1.5 **7.6**			
Drug Dealing	Mean Median **90th Percentile**	115.00	927-1,681 166.0 **4,013**	1,081-1,487 103.0 **3,251**	994-1,287 122.0 **3,612**	714-1,275 92.0 **3,054**	664-810 36.0 **2,508**			
Total (excl. Drug Dealing)	Mean Median **90th Percentile**		258-455 42.0 **989.0**	221-288 17.0 **735.0**	222-302 17.0 **645.0**	147-242 9.0 **438.0**	107-141 9.0 **338.0**			
Total	Mean Median **90th Percentile**		794-1,390 135.0 **3,004**	794-1,121 72.0 **2,305**	257-683 104.0 **2,005**	479-948 24.0 **2,200**	385-489 15.0 **1,288**			

Table 3.1 (Continued): Estimates of Self-Reported Lambda from the RAND Inmate Surveys.

Visher (1986) undertook a re-analysis of the Second RAND Inmate Survey focusing on burglary and robbery offenders and dealt with ambiguous data in a more conservative manner. She calculated a 'best estimate' for inmates who provided ambiguous crime count estimates (for a discussion of these methods see Visher, 1986, p. 180), instead of the minimum and maximum estimate method used by Chaiken and Chaiken (1982). Visher's (1986) re-analysis estimates of lambda were comparable to the minimum estimates of Chaiken and Chaiken (1982), and supported the finding of a highly skewed distribution of offending for both robbery and burglary. Moreover, she found a strong inverse relationship between active street months and high estimates of lambda. This supports the criticism that some criminals commit crime in spurts and that the assumption of stable offending patterns in the Second RAND Inmate Survey is erroneous.

Horney and Marshall (1991) conducted a study of criminal lambda that attempted to deal with several of the limitations of the RAND surveys. They analysed the offending patterns of 403 convicted male offenders in Nebraska for eight offence types. They used individual interviews to deal with ambiguity and two event calendars (life history and crime calendars) to facilitate respondent recall. Street months were determined for a three-year period prior to the current arrest. The respondents were asked to indicate in which months they had committed each of the eight crimes and the number of crimes committed in each month of street time. Horney and Marshall (1991) found that only a small proportion of offenders were active in all street months, indicating that offending behaviour is not constant. Additionally, they found that the distribution of lambda for active offenders was highly skewed with most inmates committing few crimes per year, versus a small proportion committing more than 100 times the number of crimes of the median offender. The authors note that estimates of lambda based on high rate street months, a criticism of Chaiken and Chaiken (1982), drastically overestimate lambda calculations. This finding supports the assertions of Visher (1986) and Cohen (1986).

Spelman (1994) re-analysed data from the Second RAND Inmate Survey. His analysis indicated that the estimates of the Second RAND Inmate Survey were not as

inflated as previously claimed by Visher (1986). Moreover, Spelman estimated the lambda rates of different offender populations. He concludes that:

> Although currently available estimates of the offence rate vary widely, most of the variation can be attributed to real differences in the populations sampled. The average offender commits something like 8 crimes per year; offenders who are incarcerated sometime during their careers typically commit 30 to 50; the average member of an incoming cohort commits 60 to 100 crimes per year, depending on the state. (Spelman, 1994, p. 79)

In a novel analysis of lambda, using data from the Second RAND Inmate Survey, Canela-Cacho, Blumstein and Cohen (1997), noted that imprisoned offenders are not representative of free active offenders. They derived estimates of lambda for free offenders using models fitted to the RAND data. The models depend upon calculating imprisonment risk (Q) for each crime type from "the ratio of prison admissions (A) to the number of crimes reported to the police (C)," weighted by "the average number of offenders per crime-incident (M) and the proportion of all crimes committed that are reported to the police" (Canela-Cacho et al., 1997, p. 146). The estimates showed that lambdas are substantially less for active free offenders, but that in all three states the 90th percentile of free offenders showed considerably higher mean offending rates than did other street offenders. In addition, they identified a process of "stochastic selectivity," where high-rate offenders were more likely to be incarcerated, than lower-rate offenders (Canela-Cacho et al., 1997, p. 152). According to the authors, the criminal justice system is operating under a haphazard process of selective incapacitation (Canela-Cacho et al., 1997).

Official Statistics and Lambda

Due to the limitations of self-report studies on lambda and their limited applicability to the general offending population of free offenders several attempts were made to estimate lambda through the use of official statistics, most notably arrest statistics (Blumstein & Cohen, 1979, 1987; Blumstein et al., 1986; Carrington, 2007; Cohen, 1986), registry statistics (Kyvsgaard, 2003) and conviction statistics (Barnett et al.,

1987; Blokland et al., 2005; Blokland & Nieuwbeerta, 2005; Carrington et al., 2005; Piquero et al., 2007).

Blumstein and Cohen[18] (1979, 1987) examined adult arrestees for six serious crimes in Washington, D.C. and the Detroit Standard Metropolitan Statistical Area (SMSA). The samples were large with 5,338 arrestees in Washington and 18,610 arrestees in Detroit. Blumstein and Cohen (1979, 1987) estimated mean individual annual arrest frequencies (μ) for each of the cohorts included in their sample in each metropolitan area. They then estimated (q), the mean probability of arrest per crime from official data on reported arrests divided by reported crimes for each specific area. Lambda was estimated by dividing μ by q for the samples (those who participated in each offence) as a whole. These authors found that the average arrestee in Washington committed 25.9 crimes per year while the average offender in Detroit committed 14.6 crimes per year. In addition, property offenders had higher mean estimates than did violent offenders in both regions. One major criticism of this study was the use of a single estimate for the arrest probability per crime (q) for all offenders. This assumption dictates a uniform arrest probability for all offenders (Cohen, 1986). Several authors have contested this assumption (see Chaiken & Chaiken, 1985; Cohen, 1986) and have shown that age, number of prior arrests and race have an impact on this measure (see Tracy, 1987).

Barnett, Blumstein and Farrington (1987) used lambda estimates to differentiate between populations of offenders in the Cambridge Study of Delinquent Development to age 25. Their results show that a two-population model fit the data. This yielded a division of offenders into frequents and occasionals. The frequent population had an average lambda of 1.14 convictions per year and a low probability of desistance. In contrast, the occasionals had an average lambda of 0.41 and a high probability of desistance after each subsequent conviction.

Kyvsgaard (2003) undertook a large scale study of criminal careers using the Danish Crime Statistics Register from 1979 to 1991. This registry contains information on charges, dispositions and confinement as well as offender

[18] The 1987 study incorporated data from the analysis of (Cohen, 1983).

characteristics. Her sample was exceptionally large and included 44,698 offenders and 179,368 offences. Kyvsgaard (2003) argued that the use of registered charges is more accurate then the use of arrest statistics because registered charges do not pass through the filter involved in the decision to arrest a suspect and are thus more representative of the general offending population. She found that lambda in her sample was skewed, although to a lesser degree than American studies. Overall, Kyvsgaard (2003) found that for penal code violations, the mean lambda scores were about four offences per year (median = one offence per year). One significant limitation with this study is the lack of a clear definition of her method for calculating lambda and it was not apparent if she estimated street time.

Regardless of the study design, the methodology adopted, or the data source used in the calculation of criminal lambda, some significant findings have emerged. First, lambda estimates using official or self-report data for every type of offending population, such as prisoners, jail inmates, arrestees and general offender populations, are highly skewed. This supports the contention that a small percentage of offenders are responsible for the bulk of street crime. Second, lambda estimates vary with the population under consideration; it being the highest on average for incarcerated offenders, moderately high for arrestees and the lowest for the average free offender. Third, there is a difference between the offending rates of acquisitive/property offender and violent/expressive offenders.

This section has shown that lambda is a concept that needs further exploration. More research needs to be undertaken in this area to examine some of the limitations of lambda, especially, but not exclusively, the finding of intermittent offending behavior. Another important limitation in most research on λ is that many studies do not estimate street time (Carrington, 2007; Carrington et al., 2005; Farrington et al., 2003; Kyvsgaard, 2003). This limitation makes it difficult to draw comparisons among offenders with varying volumes of offences with different amounts of incarceration time. This limitation aside, the chapter turns to an examination of factors that are associated with high frequency offenders.

Trajectories of Offending: Lambda and Age

More recently researchers have begun to group individualized estimates of lambda over stages in the life course. This approach to understanding the variation of lambda over time arose to assist with the exploration of the age-crime curve to determine whether there are separate trajectories, based on offending frequency over age. To facilitate this new approach, Nagin and Land (1993) developed a semi-parametric mixed Poisson model. The approach allows for the estimation of different groups of offenders based on varying levels of lambda, and other covariates. Since the advent of the method in 1993, there has been a plethora of research that has adopted the trajectory method. For a review of the findings of trajectory models refer to Piquero (2008). This method is amenable to any of the indicators of offending, although official data is used most frequently. It is commonly used as a test for the predictions of Gottfredson and Hirschi (1990) and Moffitt (1993) on offending over time.

Laub and Sampson (2003) used trajectory analysis to determine if their sample of offenders exhibited heterogeneity in offending. Their analysis provided a six-group solution for all crime types. Compared to other groups, their analysis revealed two groups of chronic offenders (high rate and moderate rate) that offend the most frequently. The moderate rate chronics tended to offend into mid-adulthood, while the high rate chronic offenders offended into late adulthood. The offending trajectories for violent and drug offenders yielded different patterns when compared to other groups, but the trajectories of high and moderate rate chronics were similar to the trajectories for total crime.

Piquero, Brame, Mazerole and Haapanen (2002) used trajectory modeling to analyse the offending of CYA wards who were followed 7 years post release to approximately age 28. This study used future arrests as the indicator of offending and found that the optimal solution produced four offending groups. The group partitions indicated two of the trajectories had high levels of non-violent crime and violent crime. One trajectory had a high amount of non-violent crime and little violent crime, and one trajectory had moderate levels of non-violent and violent

crime. To further the analysis, the authors included additional covariates (drug use, ethnicity and alcohol use) in the models and found that very few of the predictors were related to the four identified trajectories.

Ezzel and Cohen (2005a) extended the analysis of the CYA wards to age 33. They found a six-group solution for arrest lambdas over the life course. Only one of the trajectory groups displayed a high arrest lambda post age 30, and another showed a relatively stable moderately low arrest lambda over time. The remaining four groups displayed a significant trend towards desistance by age 30.

One of the most comprehensive studies that used trajectory modeling is the Criminal Career and Life-Course Study (CCLS) in the Netherlands (Blokland et al., 2005). This study analysed conviction data and other correlates on 4,615 offenders to age 72. The analysis yielded a four-group solution. The high rate persister group had high and relatively stable conviction lambdas from about age 27 to age 72. Each of the other three groups had much lower conviction lambdas over time and all three of these groups displayed a distinct process of desistance. The existence of the high-rate persister group is cited as support for the life course persistent offender predicted by Moffitt (1993).

In an extension of the CCLS, Blokland and Nieuwbeerta (2005) examined the relationship of local life circumstance to both conviction trajectories and self-reported offending trajectories. Unlike the four-group model for convictions, the self-report trajectories produced a two-group solution that did not yield a high-rate persister group. Moreover, local life circumstances, such as marriage and parenting, were not significantly related to any of the self-reported trajectories. In contrast, three of the four conviction trajectory groups showed significant relationships between offending and individual local life circumstances (LLCs). LLCs like marriage reduced the offending in the three non-high rate persister trajectory groups. The offending of high-rate persisters was not affected by LLCs.

Although the group-based trajectory approach has received much attention and use in the past 20 years, little research has approached the issue of whether the estimate of the denominator for lambda is an important determinant of group partitions produced in trajectory models. Piquero, Blumstein, Bram, Haapanen,

Mulvey and Nagin (2001) addressed this issue in the trajectories of CYA wards to age 33. The results indicate that neglecting to adjust for incapacitation time underestimates lambda by a constant and significant amount. Moreover, when the trajectory groups for lambdas with and without incapacitation time were contrasted several important findings emerged. The first is that for the desisting trajectory groups incapacitation time had little effect because they all displayed a trend towards desistance by age 33. However, the lambda estimates for the high-rate chronic group changed markedly when incapacitation time was not included. The results indicated that without exposure time seven percent of the sample was classified in high-rate persister group. In contrast, accounting for incapacitation time increased the proportion of the offending population classified as persisters to 28 percent. These results indicate that failure to account for incapacitation time changes the classification of high rate offenders.

The trajectory approach to analyzing maximally different groups based on lambda and other covariates over age is a novel technique for assessing predictions about the age-crime curve in theory. However, in part as a result of the popularity of this approach, it is criticized beyond its technical limitations (see Nagin & Tremblay, 2005). Notably, Sampson and Laub (2005c, 2005d) emphasize that caution is needed in the interpretation of trajectory output. They assert that the technique facilitates the reification of groups whether they exist or are theoretically relevant.

Correlates of the High Frequency Offender

This section of the chapter presents some of the factors that are related to the high frequency offender. First, it should be noted that several of the common offender characteristics that have been related to crime at the aggregate level (age, ethnicity, socio-economic status and gender) are not strongly related to high lambda estimates (Blumstein et al., 1986; Cohen, 1986; Piquero, 2000b). Although delinquent group membership has received less attention in criminal career research as a correlate to criminal lambda, it is reviewed in this section.

Age of onset has been related to higher offending frequency. This proposition is the basis of Moffitt's (1993) taxonomy of adolescent-limited (AL) and adult life course persistent (LCP) offending. Cohen (1986) derived lambda rates from the 1945 Philadelphia birth cohort and the London cohort and found that the younger the age of onset the greater the lambda scores. Piquero (2000a) reports that chronic offenders in a Philadelphia birth cohort are more likely to have an early age of onset, especially for violence. This finding applies to both juvenile and adult samples (Blumstein & Cohen, 1979; Blumstein et al., 1986; Cohen, 1986; Piquero et al., 2003). However, due to issues in measurement, there has been some debate about this relationship (see for example Kyvsgaard, 2003).

Another factor strongly correlated with high lambda scores is drug use. Chaiken and Chaiken (1982) found that the most serious high-rate offenders tended to use hard drugs at a young age. Additionally, they found that current hard drug users, especially heroin users, and multi-drug users tended to have higher lambda rates. Hard drug use was an underlying component of their violent predators classification, designated as offenders who committed robbery, burglary and assault at high rates. Additionally, Cohen (1986) found that lambda estimates increased significantly for property offenders who reported daily drug use, as opposed to regular and irregular users. This finding is supported by research on drug use and criminal careers, especially frequent hard-drug use (see Elliott et al., 1989; Shannon, 1989; Wish & Johnson, 1986) and qualitative research conducted with active robbers (Jacobs, 2000; Wright & Decker, 1997) and active burglars (Cromwell et al., 1991; Wright & Decker, 1994).

Employment and frequent criminal involvement as a youth are two additional factors have been correlated with high lambdas as an adult. Chaiken and Chaiken (1982) found that a low level of employment in their sample prior to incarceration was associated with high lambdas for property crime. In addition, the classification of "violent predator" was associated with a sporadic employment history. Kyvsgaard (2003) found that employment status for all age groups was inversely related to offending frequency. Those individuals classified as "outside the workforce" had higher lambdas than did the unemployed, which had the second

highest lambdas as compared to the employed. Not surprisingly, both self-report studies and research using official data have shown that offenders who have high past offending rates tend to have high future offending rates (Blumstein and Cohen, 1979; Cohen, 1983; Chaiken and Chaiken, 1982; Wolfgang et al., 1987). However, there is a significant decline in participation rates by young adults because some high frequency offenders desist (Wolfgang et al., 1987).

One area of research that has received less attention in relation to criminal lambda within the framework of criminal career research is the impact and nature of co-offending (Reiss, 1986; Reiss, 1988). This is critical given that co-offending and other group offending are asserted as fundamental in the etiology of crime and deviance, specifically for juveniles (Klein, 1995). Reiss (1986; 1988) emphasized that co-offending patterns must be integrated into criminal career research for several reasons. First, co-offending patterns change throughout the life course, with juveniles more likely to engage in group-related crime. Second, different types of crime are more likely to be engaged in by groups, especially robbery and assault. Third, offences in co-offending networks are more likely to be stranger-based. In addition, Reiss (1986; 1988) asserts that the nature and extent of co-offending must be taken into consideration prior to the estimation of benefits of selective incapacitation. Co-offending and group membership need to be the focus of further research to assess their contribution to criminal lambda for diverse offending populations and for the high frequency offender.

The impact of group membership on self-reported and officially recorded crime has recently become a focus of study within life course research. The contribution, facilitation and intensification of gang membership in respect to crime frequency is documented in several studies using self-report and official offence indictors with gang-involved youth, serious delinquent group involved youth, crime involved youth and at-risk youth.

Huff (1996) examined the self-reported offending patterns of 50 gang youth and 50 at-risk youth in Cleveland. As a whole, gangs were more likely to be involved in robbery, drug sales, weapons offences, auto theft and theft offences than were at-risk peer groups. Esbensen and Huizinga (1993) support the gang-crime facilitation

argument in their longitudinal study of 1,527 gang members and at-risk youth in Denver. They found that gang members had higher prevalence rates and lambdas for street offences, serious offences and drug use than at-risk youth.

Some longitudinal studies have shown that gang membership intensifies offending frequency in self-reports and official records (court and arrest statistics) of youth, as compared to youth with delinquent peers and youth without delinquent peers. The Rochester Youth Study, which over-sampled high-risk youth, followed a sample of 1,000 junior high school students and found that gang members reported higher participation levels in all categories of crime (violent, property and drug sales), and greater frequencies in past years, even while controlling for several risk factors (Battin-Pearson, Thornberry et al., 1998; Thornberry & Burch, 1997; Thornberry, Krohn et al., 2003). This increase in participation and crime frequency was prevalent in crimes of violence. Thornberry and his colleagues (2003) observed that gang members report significantly higher levels of violence than do youth with highly delinquent peers, but that the difference becomes more prominent as these offenders age. Highly delinquent peers reported significantly less violence over successive interviews in the Rochester Youth Study; there was less of a decrease in gang-reported violence (Thornberry, Krohn et al., 2003).

The gang intensification results are mirrored in the outcomes of the Seattle Social Development Project, which used a longitudinal design to trace the life histories of 808 grade five students. A substantial proportion of the sample resided in at-risk neighborhoods (Battin-Pearson, Gill et al., 1998; Battin-Pearson, Thornberry et al., 1998). This study noted that gang members, as indicated in self-reports, committed approximately two times the violent and non-violent crime than youth with delinquent peers. This pattern was evident in court records of the sample where gang members committed on average two times the non-violent crime and almost three times the violent crime than youth with delinquent peers (Battin-Pearson, Gill et al., 1998; Battin-Pearson, Thornberry et al., 1998). Moreover, Battin-Pearson, Gill, Abbott, Catalano and Hawkins (1998, p. 104) used structural equation modeling to assess “the contribution of gang membership to delinquency above and beyond associations with delinquent friends”, by

"controlling for prior delinquency and the proportion of delinquent friends". Their analysis showed that gang membership was predictive of frequency beyond the "contribution of having delinquent peers" and prior delinquency (Battin-Pearson, Gill et al., 1998, p. 105).

It is apparent from the longitudinal and cross-sectional research on gang membership that gang membership has a discernable effect on lambda rates above the association with delinquent peers. Research on criminal lambda research should strive to account for this correlate when focusing on high frequency offenders. This review has shown that on average gang members tend to be a class of high frequency offenders themselves.

Conclusion

This chapter has reviewed the state of the knowledge on criminal lambda within the broader context of criminal career research. In addition, it has discussed some of the limitations of lambda and has argued for a broader research program to address some of these issues. Further research into the areas of crime spurting, the impact of group involvement, and comparing the same samples drawn across several different data sources is required. However, the question still remains as to the value of lambda. Starting from the perspective of a practitioner, the value of lambda lies in its ability to assist with the identification of high frequency offenders for an intervention, such as selective incapacitation (Blumstein, 1983) or treatment interventions, such as the emergence of community courts (Government of British Columbia, 2008; Karafin, 2008). However, efforts to predict the high frequency offender have been fraught with difficulties, especially a high false positive rate (Visher, 1986). The lack of predictive precision is common in the field of criminal justice (Gottfredson & Gottfredson, 1986a). In order to advance the knowledge on lambda an accurate understanding of patterns of criminal lambda over the life course that is adjusted for street time is required. It is important that further research focuses on lambda, specifically the lambdas of high frequency offenders, to determine additional correlates of this concept.

The value of lambda is evident in theory and research centered on the high frequency offender. Failure to account for incapacitation time has a dramatic impact on estimates of frequency overall and over discrete time units in particular. The effect of incapacitation time in the estimation of lambda is so extreme that it changes group membership in trajectory models (see Piquero et al., 2001).

Chapter 4: Offence Specialization and the High Frequency Offender

Introduction

Specialization and versatility are constructs at the forefront of the debate within the criminal career paradigm, substantive criminological theory and criminal justice practice. These constructs date back to the formative years of sociological explanations of crime and deviance from the Chicago School in the early 1900s (see Conwell & Sutherland, 1956; Shaw, 1966; Sutherland & Cressey, 1999) and in early descriptions of criminals (Mayhew, 1968). The debate surrounding these constructs continues in contemporary criminological theory, most notably between developmental life course criminologists (Blumstein, Cohen, Das, & Moitra, 1988; Farrington, Snyder, & Finnegan, 1988; Le Blanc & Loeber, 1998; Loeber & Le Blanc, 1990) and those who advance a general or latent trait explanation for criminality (see Armstrong & Britt, 2002; Gottfredson & Hirschi, 1990; Lussier, 2005).

The idea that specialization exists is inherent in much of the work on offenders now common-place in the criminological arena (see Clinard et al., 1994; Soothill, Francis, & Fligelstone, 2002). The tendency to believe that specialization exists is evident in much of the ethnographic work on active robbery, burglary and drug offenders (Bennett & Wright, 1984; Cromwell et al., 1991; Decker & Chapman, 2008; Jacoby, 2004; Wright & Decker, 1994, 1997). Moreover, certain rational choice theories and empirical work within the field of environmental criminology imply a tendency towards specialization (Brantingham & Brantingham, 1978, 1984; Clarke & Cornish, 1985; Cornish & Clarke, 1986; Guerette, Stenius, & McGloin, 2005) based on learning and decision making processes. Consistent with the typological studies, some specialization research focuses on specific offender subgroups including sex offenders (Langan, Schmitt, & Durose, 2003; Lussier, 2005; Miethe, Olson, & Mitchell, 2006; Simon, 1997b; Soothill, Francis, & Sanderson, 2000), arsonists (Soothill, Ackerley, & Francis, 2004) and robbery offenders (Schwaner, 2000).

This chapter provides an overview of specialization within the context of criminal career research. The first section of the chapter examines the policy and theoretical import of the debate on specialization. The second section reviews the conceptual definition issues within the specialization debate. The third section of the chapter examines the prevailing techniques used for assessing specialization and the related findings for each respective operational definition. The fourth section reviews specialization research that uses alternative modeling techniques. The argument in this chapter is that the construct of specialization and its measurement are most applicable to frequent offenders, which constitute only a small portion of the general population samples in traditional criminal career research.

Implications of Specialization for Theory and Policy

This part of the chapter addresses the importance of the construct of specialization to substantive theory in criminology and applied criminal justice practice. Next, the review highlights specialization as it pertains to the prevailing theoretical debate within the criminal career paradigm. The discussion of policy draws attention to the connection between specialization and selective incapacitation and offender focused treatment.

Specialization and Criminological Theory

Specialization is a construct critical to the underpinnings of past criminological theory. Differential association theory and social learning theory are two prominent examples that focus on the processes of learning and reinforcement applied to offending. Some of the more important tenets of these two theories are directly relevant to the concept of specialization. This is apparent in Sutherland's assertion that "when criminal behavior is learned, the learning includes techniques of committing the crime, which are sometimes very complicated and sometimes very simple" (Sutherland & Cressey, 1978, p. 81). The existence of specialization as a fundamental component of criminal groups is evident in Sutherland's study of professional thieves, where "selection and tutelage" are fundamental group

determined selection criteria (Conwell & Sutherland, 1956, p. 212). Although the work of Sutherland is often cited, much of it has been criticized for centering on more organized forms of crime, such as organized theft (see Conwell & Sutherland, 1956) and white-collar crime (see Sutherland, 1940), where specialization is more probable as compared to the typical street offender.

Target selection theory is a more recent example that implies some probability of specialization, where offenders incorporate cues and templates of acceptable victims that are successively reinforced over time with successful outcomes. Although there is no explicit mention of specialization, the development of a number of reinforcing templates as the experience of offenders increases does imply an increase in the probability of specialization over time (Brantingham & Brantingham, 1978).

The importance of specialization is most evident in the ongoing debate among the latent trait theorists and the developmental life course (DLC) criminologists. Some of these theories of criminality make explicit predictions concerning specialization in the life course. Gottfredson and Hirschi (1990; 2002c) assert in their general theory of crime that specialization is not possible because it is counter to the latent trait of self-control. Accordingly, these authors assert that individuals with low self-control engage in a diverse set of deviant acts of which a proportion are defined as criminal. The criminal manifestations of low self-control are based, almost entirely, on opportunities encountered by individuals where formal control mechanisms are absent. The authors note that criminal behaviour is pleasurable and in relative terms simple to accomplish. Their underlying causal structure of crime makes any empirical findings of specialization spurious. This is clearly emphasized in the assertion:

> Much evidence confirms that those committing any given criminal act are likely to commit other criminal acts as well, that tendencies among offenders to specialize in particular crimes are, to put it mildly, weak. As a result, it is misleading to speak of thieves, robbers, rapists, or burglars. In official data, the offender's prior and subsequent offences are as likely as not to differ from the instant offence, with no apparent trend in sequences of offences towards greater seriousness, sophistication, or specialization. (Hirschi, 2002, p. 169)

Much of the latent trait research that posits low self-control as the latent causal variable shows that versatility is the norm in offending sequences in general offending samples. Britt (1996) concluded, in an analysis of Uniform Crime Report arrest statistics, the Bail Decision Making Study and the Seattle Youth Study, that "there were virtually no findings here that support the specialization in offending notion, regardless of how specialization was operationalized or tested," and that his analyses "clearly support the control theory view of criminal offending" (Britt, 1996, p. 190).

The construct of specialization is of mixed importance in developmental and life course theories of offending. For some theories, including the adolescent limited/life course persistent taxonomy of Moffit, specialization is central while others, such as Sampson and Laub's age-graded theory of informal social control specialization is not an important construct.

Moffitt's AL/LCP developmental taxonomy is perhaps the most explicit in defining the importance of specialization (see Moffitt, 1993, 1997; Piquero & Moffitt, 2005). Her two-population model proposes that adolescent limited offenders exhibit specialization, while life course persistent offenders are versatile. Adolescent limited offenders are likely to exhibit specialization because their offence range is restricted to offence types that are a manifestation of the maturity gap and expression of adult roles. These offenders are likely to avoid person-oriented crimes (Piquero & Moffitt, 2005) and instead are likely to commit minor property and other victimless offences, such as drug use. In contrast, life course persistent offenders are predicted to exhibit high levels versatility and seriousness in offending patterns. As a consequence of neuropsychological deficits and the resultant marginalization and poor adaptation skills, these offenders are prone to serious offending, including acts of violence within a mix of frequent offending (Moffitt, 1993, 1997; Piquero & Moffitt, 2005).

The process view of offending espoused by Le Blanc and Leober (1998; 1990) places explicit importance on the construct of specialization within a sequential developmental framework of offending. The framework indicates that specialization is tied to the desistance stage. In this stage, specialization is "a

narrowing down of the crime mix over time" that occurs in conjunction with deceleration (Le Blanc & Loeber, 1998, p. 164). Offenders who reach the third stage of desistance are likely to be young adults.

The depth of research within developmental criminology on specialization seems to indicate that the construct is central to DLC theory, but many theories in this field make no explicit mention of specialization. This is the case with Sampson and Laub's age-graded informal social control theory and Thornberry's interactional theory. Laub and Sampson (2003) debate the importance of the construct in the context of offender typologies and assert that much of the work on specialization has led to the development of groups "defined atheoretically and reified as substantively real without prospective or external validation" (2003, p. 289).

The Importance of Specialization in Public Policy

In environments, such as policing and corrections, specialization has important policy ramifications. In a policing environment the existence of offence specialization exists means that police can effectively allocate resources to emerging crime problems and utilize strategies that prioritize offenders based on crime type preferences. Moreover, the existence of specialization allows for more directed correctional interventions in the form of treatment and incapacitation strategies (Spelman, 1994).

Specialization is a construct inherent to specific types of offender treatment and intervention based on crime types, such as domestic violence and sex offending. However, in the event that offenders are generalists who commit crimes based on opportunities available to them in society, offender focused treatment based on offence type is problematic because it neglects the fundamental underlying causes of the behaviour. Research on sex offenders, violent offenders and property offenders typify the belief that offenders are specialists (see Simon, 1997a). As a result, offence specific treatments continue to expand for these offender types, especially for sex offenders (Perkins, Hammond, Coles, & Bishopp, 1998; see Simon, 1997a; Simon, 1997b). In addition, the advent of specialized criminal justice systems for specialized offenders have emerged, including drug courts (Werb et al.,

2007) and domestic violence courts (Tsai, 2000). Other interventions that have gained prominence in North America, most notably for sex offenders, are offender registries and notifications (Adams, 2002). Each of these criminal justice and mental health interventions is grounded in the belief that there are groups of offenders who specialize in offence types where the underlying cause of their offending is to some extent different from other offender groups.

Recently, the view that specialization exists and necessitates tailored interventions is being challenged generally (Simon, 1997a; Simon, 1997b) and more specifically for sex offenders (Lussier, 2005; Lussier, Le Blanc, & Proulx, 2005; Miethe et al., 2006). The argument presented is that over the entire sequence of offending most offenders exhibit a high degree of versatility. Simon (1997a, p. 35) lambasts the practitioners and interventions that operate under "the myth of specialization" suggesting that:

> Mental health treatment for certain types of offenders needs to be questioned. If the majority of offenders are generalists, does it make sense to treat offenders who commit domestic violence crimes or sex crimes in separate treatment programs that do not address their other crimes and victims? (Simon, 1997a, p. 46)

The most contentious debate surrounds the connection between specialization and selective incapacitation. Selective incapacitation policies are the most controversial criminal justice interventions that have gained prominence in the United States (see Auerhahn, 1999, 2002). An understanding of specialization or the degree of specialization assists in estimating the incapacitative effect for specific crime types, if there is a significant amount of specialization (Blumstein et al., 1986; Piquero et al., 2003) or with overall crime if there is a significant amount of versatility. If high frequency offenders display little specialization over time it is difficult to estimate the effects of a selective incapacitation policy on specific crime types. In order to achieve maximal efficiency it is appropriate for selective incapacitation policies to target more dangerous or serious offenders.

Determining whether or not specialization is stable over time is particularly relevant to an assessment of the effect of any incapacitative policy. It is problematic if specialization indices change during a criminal career, because this impacts the

'incapacitative effect' of any selective incapacitation policy aiming to prevent specific crime types (see Spelman, 1994). Drawing on data from the Second RAND Inmate Study, Spelman (1994) provides a detailed analysis of the effect of specialization and versatility on policies of selective incapacitation. He asserts that selective incapacitation policies are only effective in reducing crime rates if they focus on generalists. His analysis shows that a substantial portion specialize in either property or violent crimes, but he asserts:

> The typical generalist---an offender who commits crimes of both types---is 3 to 5 times more dangerous as the typical specialist. The most frequent offenders are also the most likely to be versatile. As a result, selective methods that predict high-rate generalists are likely to be especially effective at reducing crime. (Spelman, 1994, p. 109)

According to Spelman (1994), versatile offenders and not specialists, should be the primary focus of selective incapacitation policies. He asserts that a selective incapacitation policy that focuses on specialists has less effect on the aggregate crime problem, because they offend less frequently. Consequently, for specialists in property offences, the cost-effectiveness of incapacitation weighed against the harm caused by their offending is disproportionate to the direct costs of incarceration.

The preceding review demonstrates the importance of the concepts of specialization and versatility as they apply to the treatment, intervention and criminal justice sanctions applied to offenders. In the event that most offenders, and specifically frequent offenders, are versatile, the use of offence specific treatment and interventions are unnecessary. In contrast, if frequent offenders are versatile, and as some research has suggested more dangerous, selective incapacitation becomes a more attractive possibility for alleviating the effect of crime on society. Specialization is a contentious issue not only because of the possible policy ramifications it entails, but because there is no consensus on its conceptual or operational definition. Moreover, there is no consistent standard for grouping offence types into meaningful categories of social behaviour.

Definitions of Specialization

One of the more contentious issues surrounding the specialization and versatility debate is the conceptual definition of specialization. The criminological research focusing on specialization lacks a commonly accepted definition for the term. As a result, the construct is defined and measured in several different ways. Moreover, depending on the definition of specialization that is employed, research utilizes a variety of categorization schemes for grouping crime types. This section provides an overview of the commonly employed definitions of specialization within the context of a criminal career. In addition, the issue of grouping crimes, which are socio-legal constructs, is discussed.

In the extant criminal career literature definitions of specialization are generally subsumed in one of three categories. The first focuses on the degree of sequential specialization over offence intervals. The second conceptualization of specialization uses short time periods in the measurement of specialization. The third definition views specialization as a preference for certain crime types.

The majority of research has focused attention on the degree of specialization using a sequential approach during a criminal career. The pivotal First and Second Philadelphia Birth Cohorts (Tracy et al., 1990; Wolfgang et al., 1972) and the 1970 Puerto Rico Cohort study (Nevares et al., 1990) adopt this definition. In explicit terms the definition of specialization in these studies is sequential and is "the tendency to repeat the same offence type on successive" events (Blumstein et al., 1986, p. 81). Research adopting this definition tends to use transition matrices.

A different definition of specialization is advanced by Sullivan, McGloin and Pratt (2006) that focuses on short term offending. Moreover, Le Blanc and Frechette (1989) developed a definition of specialization that incorporates a more developmental perspective. These authors argue that specialization is a time-varying dimension of offending related to "deceleration" and desistence in a criminal career. The authors assert that "specialization is the adoption of criminal activities that with time become increasingly less heterogeneous, so that the closer

to the age of desistance the more the degree of variety is curtailed" (Le Blanc & Frechette, 1989, p. 126). These studies suggest differences in specialization over time such that the time frame in which specialization is assessed is critical. Research on time and specialization indicates that the length of the time interval inversely relates to the degree of specialization (see Sullivan et al., 2006). A variety of techniques are used to explore this definition of specialization, including the diversity index and correlational designs.

The third definition of specialization incorporates the notion of a proportion of offences being within a specific crime type. Wikstrom (1987) defines the existence of specialization when two-thirds of the offences of an offender are within a particular category of crime. Similarly, Tracy and Kempf-Leonard (1996) advocate that specialists are offenders with 50 percent or more of their offences in a crime category. This definition of specialization is used in research that adopts the diversity index or the binomial probability.

A difficult and unresolved issue in measuring and defining specialization is the issue of meaningful crime categorization and the number of offence categories used to measure specialization. Criminal acts are legally defined constructs that are abstractions of human behaviour. Moreover, the legally defined acts are filtered though the criminal justice system. The filtering process changes the legal definition of an offence in two ways. First, practitioners can modify the offence types in the system as an offender proceeds through the criminal justice system. Second, offences that exist in the official record are often categorized under a most serious offence or a most serious sentence rule. These are critical issues for research that uses official indicators for offending. This means that offenders commit certain acts that can be radically different from a legal standpoint, but can be linked together under a different attribute, such as motivation. This approach underlies much of the offence type clustering work, most notably using latent class analysis, undertaken in the United Kingdom (see Francis, Soothill, & Fligelstone, 2004; Soothill, Francis, Ackerley, & Humphreys, 2007; Soothill et al., 2002).

In criminal career research, offence groups are typically defined according to some criterion such as ranked offence type severity and harm (see Tracy & Kempf-

Leonard, 1996) or natural offence groupings (see Blumstein, Cohen, Das et al., 1988; Kempf, 1987). In most instances the division of crime groups is based on the notion that the groups are characteristically different from each other, such as property offences, drug offences or violent offences. However, the justification for the categorization scheme presented by most research does not provide any underlying reasoning, beyond the idea that the offence types are different, for the group divisions. As a result, meaningful theoretical crime group divisions are difficult to develop. This makes the interpretation and comparison of results between studies problematic.

The interpretation of specialization results must be viewed in relation to the number of offence groups. Research that provides support for specialization tends to use a small number of offence categories. Some studies use as few as four (Tracy et al., 1990; Wolfgang et al., 1972) or five (Kempf, 1987) offence categories to examine specialization. As the number of categories increase the evidence for specialization decreases (Blumstein, Cohen, Das et al., 1988). Each technique for measuring specialization is dependent on the number of offence groups. As the number of offence groups decrease the techniques are, by restricting the variability of the individual and sample, more likely to find evidence for specialization as compared to a larger number of crime categories. At present, no research has attempted to provide an optimal number of categories to test specialization.

Overview of Specialization in Criminal Career Research

This section reviews the techniques by which specialization is measured and operationalized. The focus, where possible, is on the measurement procedure as applied to high frequency offenders. The techniques reviewed in this section include transition matrices, the binomial probability and the diversity index. Each technique is described in detail and is followed by a summary of related specialization findings and criticisms of the technique.

Transition Matrices and the FSC

The majority of research on specialization within the criminal career paradigm uses transition matrices to assess specialization. The analysis of transition matrices was originally proposed by Wolfgang, Figlio and Sellin (1972) in the First Philadelphia Birth Cohort study. The analysis of transition matrices is based on offending sequences conforming to a first order Markov chain. The assumption of a stationary first order Markov process means that an offence occurring at time *t* is related solely to the offence at *t-1*. A typical transition matrix is presented in Figure 4.1.

Offence at *t*	**Offence at *t + 1***				
	Violent	**Property**	**Drug**	**Damage**	**Other**
Violent					
Property					
Drug					
Damage					
Other					

Figure 4.1: An example of a transition matrix. The diagonal (shaded gray) cells are used for the assessment of specialization.

Some researchers challenge the assumption of a stationary Markov process on which the analysis of transition matrices is based (see Lynam, Piquero, & Moffitt, 2004; Stander, Farrington, Hill, & Altham, 1989). The analysis of specialization within a transition matrix involves assessing the diagonals of the matrix to determine the proportion of the sample that show consistency from the offence at *t* to *t+1*. It is apparent that this technique is a sample level analysis of specialization that adheres to the narrowest sequential conceptual definition of specialization.

Although the diagonals of transition matrices provide indications of the degree of specialization within a sample of offenders, the issue of whether the diagonals are statistically different than chance and the associated strength of the

relationship is not readily determinable. The use of the traditional Chi-Square statistic is not possible because only the cell frequencies in the diagonal are relevant. Since the use of transition matrices in the Philadelphia cohort studies several test statistics have been developed. These include the Adjusted Standardized Residual (ASR) and the Forward Specialization Coefficient (FSC). Both of these statistics are calculated on the diagonals of the matrix.

The use of the ARS early in specialization research (Bursik, 1980; Rojek & Erickson, 1982) was replaced with the FSC (Blumstein, Cohen, Das et al., 1988; Farrington et al., 1988; Kempf, 1987). The interpretation of the ASR is difficult because ASRs are affected by "the absolute frequency of offending" (Farrington et al., 1988, p. 473). This means that the ASRs decrease as the sample size of the offending population decreases in each transition matrix. The FSC was originally proposed by Farrington (see Farrington, 1986; Farrington et al., 1988) as an alternative approach to assessing specialization between successive offence events that is not affected by different sample sizes in successive transition matrices. The FSC for each diagonal cell in the matrix is given by:

$$FSC_{jk} = \frac{O_{jk} - E_{jk}}{R_j - E_{jk}}$$

Where O_{jk} is the observed offences in cell (*j, k),* E_{jk} is the expected number of offences in cell (*j, k)*, and R_j is the total number of offences in row *j*. Research shows that the sampling distribution of the FSC is approximately normal, which allows the average FSCs to be calculated across transition matrices (see Paternoster, Brame, & Piquero, 1998). The FSC varies from 0 to 1 where 0 indicates complete versatility and 1 indicates complete specialization across one or more transition matrices for offence types. Although the FSC continuum resembles a typical bivariate association statistic, it is criticized for lacking specificity regarding a threshold that constitutes specialization (Britt, 1996; Paternoster et al., 1998).

Specialization Findings and Transition Matrices

This section reviews the major findings on the degree of specialization using transition matrices and either ASRs or FSCs as the associated test statistic. As mentioned above, the vast majority of early specialization research uses transition matrices and either ASRs or FSCs as the standardized measure of the degree of specialization in an offending sample across successive offence events. The bulk of this research focuses on the offending careers of male youth and young adults, is over a limited time frame, focuses on the offending portion of general population samples and uses official records data. Official records data are used almost exclusively because of the requirement for date markers for each offence.

The most pivotal series of studies of criminal careers on specialization of youth are the Philadelphia Birth Cohort Studies in 1945 (Wolfgang et al., 1972) and 1958 (Tracy et al., 1990). These studies assess the extent and nature of specialization using transition matrices under the assumption of a first-order Markovian process. The sample of offenders is large in both of the studies. The 1945 cohort includes 3,475 males and analyses specialization of negative police contacts from age 10 to 18, categorized into non-index, injury, theft, damage and combination offences. The 1958 study is structured in a similar fashion, except the sample size is somewhat larger (n = 4315), it includes females and analyses offending to age 26. In both studies, the authors found little evidence for specialization when examining the overall offending sequences of the subjects. There is some evidence of specialization for recidivists in non-index offences and to a lesser extent, theft and injury offences (Tracy et al., 1990; Wolfgang et al., 1972). These findings are consistent with those obtained in a replication undertaken in Puerto Rico (Nevares et al., 1990). The authors note that the matrix probabilities indicated that young offenders are slightly more likely to exhibit intra-offence transitions than inter-offence transitions. Moreover, they note that regardless of the offence type at *t*, offenders were more likely to commit a non-index offence at *t+1*. The authors conclude that there is a "weak propensity towards offence type

specialization" in youth recidivists across all transitions (Wolfgang et al., 1972, p. 249).

Bursik (1980) assessed the prevalence of specialization in 750 adjudicated delinquents in Cook County. He found that offenders who commit personal property offences have the highest probability of committing the same offence in a subsequent transition. After assessing the effect of ethnicity on the level of specialization, he notes that white offenders are more likely to specialize in personal property offences than non-white offenders. Bursik (1980, p. 860) concludes that specialization "is not a dominant feature of a youth's offence history".

Rojeck and Erickson (1982) assessed specialization in the criminal careers of 868 randomly selected repeat offending youth in the Pima County Juvenile Court. Their analysis suggests that there is some evidence for stability within certain offence types, such as property, but there is little evidence for specialization in juvenile court careers. Regardless of the initial offence type, the results show that a transition to a property offence is more likely except for runaway and other status offences. Moreover, the finding holds when the effects of gender and ethnicity are included.

Farrington, Snyder and Finnegan (1988) used the FSC to test for specialization in a large sample (N = 70,000) of juvenile court referrals in Utah and Arizona. The authors focus their analysis on offenders with two or more referrals and ten or more referrals for 21 different offence categories. Overall, they show that the sample averaged an FSC of 0.1, which they interpret as "a small but significant degree of specialization" (Farrington et al., 1988, p. 483). Moreover, they found that offenders who commit robbery, drugs and liquor offences are more likely to exhibit specialization as the number of transitions increased. The authors assert that age and gender have little impact on specialization and that juvenile offenders exhibit the highest degree of specialization in runaway, liquor, burglary, motor vehicle theft and drug offences.

Lattimore, Visher and Linster (1994) assessed specialization in arrest careers of a sample of California Youth Authority parolees. One of the main foci of this research, beyond testing for specialization, is that they tested whether the

assumption of a first order Markov process is applicable to offenders with varying numbers of transitions. The authors note that in the sample there is evidence of specialization. Furthermore, they challenge the assumption of a first order Markov process for offence sequences. Their results suggest that offender frequency is significantly related to the order of the Markov process. For offenders with 2 or more and 10 or more offences a second order Markov process is required. In addition, they found that a transition to a violent offence is more likely for offenders with 10 or more arrests, and ethnicity is related to the transition to robbery offences.

Armstrong and Britt (2002; 2004) tested the effect of race, age and other background characteristics on specialization in arrests of two California Youth Authority samples. Initially, they found that there is some evidence for specialization in the sample. However, controlling for ethnicity, substance use, prior violent behaviour and other background factors virtually eliminated evidence of specialization. These findings prompted Armstrong and Britt (2002; 2004) to conclude that background characteristics are determinants of an arrest of a specific type and not specialization.

Little specialization research centres on Canadian youth. In response to the paucity of Canadian research, Williams and Arnold (2002) assessed the impact of criminal career correlates, including age of onset and offence frequency, on specialization in police contacts. Their sample totals 191 serious habitual young offenders in Canada. First, they note that early and late starters have distinct patterns of specialization. Early starters are more likely to specialize in general delinquency, burglary and violence. In contrast, late-starters tend to exhibit a higher degree of specialization than early starters in burglary and other property offences. In addition, as offending frequency increases for certain offence types, including violence and theft, the authors found that specialization increases across transitions of police contacts.

Sullivan, McGloin, Ray and Caudy (2009) compared several techniques for analysing specialization with a sample of repeat offenders from the California Youth Authority for 16 offence types across 14 offence transitions. They found low levels

of specialization in the sample. However, across transitions offenders who commit drug offences, alcohol offences and various property offences (robbery, burglary, auto theft and forgery) have higher FSCs on average than other offence types, especially violent offences.

Although there is a substantial amount of research on specialization in the criminal careers of youth, there is much less research that assesses specialization in the criminal careers of adults. Holland and McGarvey (1984) examined the existence of specialization in a sample of 300 adult male felony offenders referred to the California Department of Corrections. Their research assesses specialization in violent and non-violent offences. Their analysis shows a high degree of specialization in non-violent offences. This is not surprising given that all non-violent offences are subsumed within one offence category. In contrast, there is little evidence of specialization in violent offences.

Wolfgang, Thornberry and Figlio (1987) extended the First Philadelphia Birth Cohort Study to age 30 in order to analyse specialization in adulthood. The study shows that trends in specialization in adulthood mirror the findings of juveniles. Little if any evidence for specialization is present in the adult sample and the offence type that is transitioned to in successive arrests is a non-index offence. This finding holds when juvenile and adult offending periods are combined.

Kempf (1987) used transition matrices and the FSC to examine specialization in a subsample of offenders in the Second Philadelphia Birth Cohort that had a minimum of five police contacts to age 26. Consistent with research on youth, the observed pattern is a tendency to commit the same type of offence in successive transitions. However, the same offence-to-offence transitions are not large. Kempf (1987, p. 416) concludes that the adult sample displays "minimal levels of specialization in the criminal career" evident "amid more random, general, or versatile behavior".

Blumstein, Cohen, Das and Moitra (1988) undertook a study that examines specialization exclusively in adulthood. They analyse specialization in arrests in a large sample of repeat adult offenders (N = 20,373) in Detroit and Southern Michigan over a four-year period. The results indicate that the sample exhibits

significant levels of specialization, as compared to youth samples, especially in the case of drug, fraud and auto theft offences. In contrast, violent offenders exhibit extremely low levels of specialization. Moreover, when only persistent offenders are included in the analysis, lower but similar levels of specialization emerged. Persistent offenders are more likely to show increased levels of specialization in later transitions, for drug, fraud and auto theft offences. The researchers extend the analysis by demarcating four groups of offences: violent, property, robbery and drugs. Using these four clusters, Blumstein, Cohen, Das and Moitra (1988) assert that adult offenders are significantly more likely to re-offend within clusters than between clusters in successive transitions.

Stander, Farrington, Hill and Altham (1989) used transition matrices to study patterns of specialization in a sample of 698 adult English prisoners. They began by testing the assumption of a first-order Markov process across eleven conviction transitions and found that the assumptions of a first order Markov process are violated. Across the eleven transitions the researchers discovered that a significant amount of specialization exists in their sample. This is the case for the sex offence category, which has an average FSC of 0.45, followed by fraud (0.27) and burglary (0.21) offences. The authors assert that the average FSCs of persistent offenders, defined as those who participated in all eleven transitions, are lower on average for most offence types as compared to non-persistent offenders. However, Stander, Farrington, Hill and Altham (1989) show that persistent offenders become more specialized in later transitions.

The large Danish study of criminal careers of offenders using registered offending was undertaken by Kyvsgaard (2003) to examine the longitudinal patterns of specialization to age 65. The duration of the study enabled Kyvsgaard to examine specialization across age and assess the influence of gender for eleven offence groups. Overall, Kyvsgaard (2003) found high FSCs for other property offences (0.71), sexual offences (0.67), and burglary (0.55). Moreover, she examined the impact of age and found that offenders become more specialized as they age in drug, sex, burglary and theft offences. However, Kyvsgaard notes that the trend toward increased specialization with age did not hold when the number of

offence transitions is included as a control variable. This indicates that specialization is less likely for high frequency offenders. In addition, Kyvsgaard (2003) emphasizes that females have much larger average FSCs than males in many offence types, most notably drug and other property offences.

The Binominal Probability

To a far lesser extent, specialization is assessed through the use of the binominal probability. The binominal probability assesses, within a sample of offences from a sample of offenders, if any offence type is distributed randomly in each offence sequence. This measure tests for the existence of specialization at the level of the sample (see Piquero et al., 2003; Piquero et al., 2007). It is calculated by determining the fraction of offences of type *i*:

$$P_i = \frac{N_i}{N_{total}}$$

Where N_i is the total number of offences of type *i* and N_{total} is the total number of offences in the sample. The second step in the calculation is the determination of the fraction of offences that are not equal to P_i at time *t*:

$$P_{\neq i} = (1 - P_i)$$

The third step in the calculation is to determine the expected number of offenders, defined as offenders with one or more offences of type *i* in each sequence by:

$$E_i = [1 - (P_{\neq i})^n] \times O_n$$

Where E_i is the expected number of offenders with offence type *i*, $P_{\neq i}$ is the fraction of offences not equal to offence type *i,* the exponent *n* is the offence sequence number and O_n is the number of offenders who have committed exactly *n* offences. The E_i value is compared to the observed number of offenders to determine the χ^2 goodness-of-fit.

This approach to assessing specialization is proportional and has some important limitations. The measure applies to the overall sample to assess the existence of non-random offence counts as indicative of specialization. Unlike other measures of specialization, the binominal probability does not indicate the

magnitude of specialization in the sample. Moreover, it is only useful when examining one type of crime, most commonly violent offences (see Brennan, Mednick, & John, 1989; Lynam et al., 2004; Piquero, 2000a; Piquero et al., 2007).

Specialization Findings and the Binominal Probability

This section provides an overview of major findings on the existence of specialization using the binominal probability. In contrast to the transition matrices approach, there is very little research that uses the binominal probability to measure specialization. The bulk of this research centres on an analysis of whether there is evidence for specialization in violence. Official records data are used almost exclusively because of the requirement for date sequences.

Brennan, Mednick and John (1989) analysed the binominal probability for violence and property offending across ten offending sequences to age 30 using data from the Danish National Police Registry. The results indicate that the differences between the expected and observed counts for violence are statistically significant for offenders with 4 to 6 and 7 to 10 arrests. In contrast to most research, the results show some specialization in violence for more frequent offenders. Their analysis of specialization in property offending yields similar results except that all offending groups show significant differences between expected and observed values. However, unlike violent offending, offenders with fewer arrests have higher levels of property specialization.

Piquero (2000a) used the binominal probability to examine specialization in violence for a sample of 220 offenders in the Collaborative Perinatal Project. The focus of this research is to analyse the relationship between offending frequency and violence. Piquero (2000a) asserts that there is a statistically significant mean difference between frequency and violent offending. Violent offenders have higher mean offence counts than non-violent offenders. Moreover, he found little tendency to specialize in violent offending, regardless of the frequency of the sample of offenders.

Lynam, Piquero and Moffitt (2004) assessed specialization in violence for a sample of offenders in the Dunedin Multidisciplinary Health and Development Study

to age 26. In contrast to past work, the authors use the binominal probability to analyse specialization in violence across official records and self-reported offending. The official data indicate no tendency for offenders to specialize in violence. Although not conclusive, the results for the self-report data suggest that there was a tendency towards increased specialization in violence for repeat offenders.

Piquero, Farrington and Blumstein (2007) extended the analysis of specialization in violence into adulthood using data from the Cambridge Study in Delinquent Development that tracked 52 males from South London who had committed at least one violent offence. The study has two main findings. The first is that there is no tendency to specialize in violence in any of the offence transitions. Second, the authors assert that the appearance of violent offences in an offender record is directly related to overall offending frequency. Piquero, Farrington and Blumstein (2007) contend that violence is a part of the diverse offending repertoire of high frequency offenders.

The Diversity Index

The diversity index is reviewed in detail by Agresti and Agresti (1978) and is used extensively as a metric to study population segregation (Reardon & Firebaugh, 2002). Recently, the diversity index (*D*) is adopted to study the degree to which individual offenders vary in their offending patterns (Mazerolle, Brame, Paternoster, Piquero, & Dean, 2000; McGloin et al., 2007; Piquero, Paternoster, & Mazerolle, 1999; Sullivan et al., 2006). This novel application of the diversity index has advantages to past research on specialization. The first is that, unlike transition matrices, (*D*) is a proportional measure that it is not restricted to offences with distinct date markers and as such does not focus on the explicit ordering of offences (Sullivan et al., 2006). Second, unlike both the FSC and the binominal probability which provide estimates of specialization within the overall sample, (*D*) "captures the overall amount of offending versatility" at the level of the individual offender (Mazerolle et al., 2000, p. 1154). As a result, it is possible to allow for the analysis of predictors of (*D*) and make statistical comparisons across other meaningful categories, including age groups.

The diversity index for any individual is computed (see Mazerolle et al., 2000; McGloin et al., 2007; Piquero et al., 1999; Sullivan et al., 2006) according to the equation:

$$d_i = 1 - \sum_{m=1}^{M} p_m^2$$

Where d_i = the diversity score for offender *i* in period *t*, p_m = the proportion of offences in each of *m* (1, 2, 3....n) offence groups. The minimum value of D ($d_{(\min)}$) is always equal to 0 and is interpreted as complete specialization, while the maximum value of D ($d_{(\max)}$) is dependent on *M*. It is given by the equation:

$$d_{(\max)} = (k-1)/k$$

Where *k* = the number of offence groups.

Sullivan, McGloin and Pratt (2006, p. 211) caution that traditional parametric measures of association are problematic for the analysis of (*D*), which in general is a skewed dependent variable. In order to convert *D* into a standardized value *I,* with a minimum bound of 0 and a maximum bound of 1, it is converted (see Agresti & Agresti, 1978; McGloin et al., 2007) using the equation:

$$I_i = d_i[k/(k-1)]$$

As a measure of specialization the diversity index is not without criticisms. Some researchers have criticized the index for being difficult to interpret (see Osgood & Shreck, 2007). The issue is that the coefficient, which varies from 0 to 1 is not directly interpretable as a correlation coefficient. At present, there is no threshold of the coefficient that dictates specialization. Related to the interpretation of the coefficient are three additional issues. First, Osgood and Schreck (2007) note the underlying individual offence rate is related to the diversity index. In instances where an individual offence rate is high, there is a greater chance that the individual commits offences of a certain type. The number of offences that each individual commits influences the index. At present, there is no established minimum number of offences for use with this index. Second, the diversity index does not control for offence base rates in the sample, unlike the FSC and binominal probability. This

means that it does not account for the higher incidence of certain offence types in offending populations, most notably less serious theft offences. Third, the diversity index is a general measure of specialization that does not indicate offences in which an individual offender specializes, but only that a lack of complete versatility exists (Osgood & Shreck, 2007, pp. 279-280).

Specialization Findings and the Diversity Index

This section reviews the major findings on the degree of specialization using the diversity index. The use of the diversity index is a more recent innovation in specialization research. The research uses several different types of offending indicators (self-report, police contacts and convictions) to study specialization in adults and youth, different offender types (e.g., sex offenders), and is employed to study specialization in short and long time periods.

Much of the work on specialization that employs the diversity index has surfaced in the past decade. In a reanalysis of the 1958 Philadelphia Cohort data, Piquero, Paternoster and Mazerolle (1999) used the diversity index to test whether age of onset is related to specialization. Initially, the authors found an inverse relationship between age of onset and diversity scores, which increases in strength with offending frequency. However, when age is controlled for, the inverse relationship ceased to exist. The authors conclude that versatility declines with age, which is inconsistent with the predictions of LCP in Moffitt's dual taxonomy but supports the propositions of Gottfredson and Hirschi on the maturation effect.

In a follow-up to the Piquero, Paternoster and Mazerolle (1999) study, Mazerolle, Brame, Paternoster, Piquero and Dean (2000) examine the influence of gender, persistence and onset age on specialization in the 1958 Philadelphia Birth Cohort. The findings suggest that gender does not produce significant differences in the diversity scores across five offence transitions. Moreover, they found that there is a significant difference between early onset and late onset offenders. Although the difference is not substantively large, early onset offenders show more diversity than late onset offenders. In addition, they note that persistent offenders, defined by offending in youth and adulthood, are more diverse on average than non-

persistent offenders. Lastly, the authors assessed the influence of gender, early/late starter status and persistence on the diversity index. They assert that there is a significant relationship between the combination of gender and onset, but that there is little difference in diversity scores between males and females defined as persistent offenders. They conclude, in contrast to Moffit's taxonomy, that gender is not influential, but that age of onset, especially for females, and persistence are related to diversity.

Most of the research using the diversity index focuses on long time periods, generally the life course, for analyses of specialization. The benefit of diversity scores is that research on specialization has included an analysis of correlates across the life course and within shorter time periods. Sullivan, McGloin and Pratt (2006, p. 203) argue that "broad time periods may mask important and informative dimensions of change" in specialization. To address this issue they use data from 658 incarcerated males in Nebraska and examine patterns of monthly and yearly specialization. The monthly intervals yielded an average offender diversity score of 0.097, while the year interval had a score of 0.205 and the three-year study period averaged a score 0.29. The authors conclude that this is indicative of substantial short-term specialization. Sullivan, McGloin and Pratt (2006) found that short-term specialization is related to age of onset, alcohol consumption and community supervision. Moreover, they note that frequent offenders have higher diversity scores than non-frequent offenders in each period, but frequent offenders still exhibit a high degree of short-term specialization.

McGloin, Sullivan and Piquero (2007) extended the Sullivan, McGloin and Pratt (2006) study to assess the effect of local life circumstances on the diversity index over short time intervals. The local life circumstances included employment, co-habitation, substance use and community supervision in each month under observation. The results show that the average diversity score over all months is 0.168, which is indicative of a high degree of specialization. However, after controlling for age of onset, age and race, the panel regression results indicate that the effects of local life circumstances and offence frequency on the monthly diversity scores are significantly related to monthly diversity scores in the sample. The

authors conclude that "with regard to offending specialization LLCs matter" (McGloin et al., 2007, p. 335). This is consistent with Sampson and Laub's (1993) age graded theory of informal social control.

Sullivan, McGloin, Ray and Caudy (2009) compare several techniques for analysing specialization with a sample of repeat offenders from the California Youth Authority for 16 offence types across 14 offence transitions. The mean diversity score in the sample is 0.57, indicating that the sample is more diverse than specialized. In addition, the authors examine the relationship between diversity scores and offending frequency. They found that a relationship exists between diversity scores for offenders with two offences who have a mean diversity score of 0.35, while offenders with eight or more offences have an average diversity score of 0.69. The analysis shows that more frequent offenders are more diverse offenders.

In one of the most extensive longitudinal studies of specialization over the life course, Nieuwbeerta, Blockland, Piquero and Sweeten (2011) analysed specialization in a sample of 4,615 Dutch offenders from the Criminal Careers and Life-Course Study. The sample members are tracked to age 72, and convictions are recorded from the first conviction and include all registered convictions until 2003. The findings are consistent in some regards with past research. First, the authors note that diversity is generally high when the time interval is the entire life course. Second, the analysis of diversity and age show that there is more diversity in offending in adolescence and early adulthood. From early adulthood onwards there is a steady increasing trend towards specialization. Moreover, the research indicates that there are four distinct offender types that exhibit different patterns of specialization over the life course. Each trajectory group has a similar pattern of specialization where diversity scores decrease (i.e., increased specialization) after age 30, but frequent non-desisters have the highest diversity score at any age interval. The authors further their analysis by examining the specialization trajectories of frequent offenders. They found two distinct trajectories for the high rate group that include a low diversity group that have constant and high levels of specialization throughout the life course and a group of offenders who become increasingly specialized after age 30. Nieuwbeerta, Blockland, Piquero and Sweeten

(2011) contend that the highly specialized trajectory groups tend to specialize in property offences.

Most of the research that uses the diversity index as the operational measure of specialization, focuses on general offending samples. Little of this research has analysed the patterns of specialization for specific offender types. Historically, there was an assumption that specific types of offenders (e.g., sex offenders or robbery offenders) are more likely to exhibit specialization. Meithe and Mitchell (2006) used the diversity index to test the assumption of specialization in sex offending on a national American sample of 10,000 male sex offenders released from prison in 1994. Using successive arrests, their results suggest that sex offenders are the least specialized offenders with an average score of 0.54, while drug offenders (0.48) and property offenders (0.51) exhibit the highest degree of specialization over the entire study period. Moreover, the results indicate that sex offenders, violent offenders and drug offenders become less specialized as the number of arrests increases. This trend is most prevalent among sex offenders compared to other offender groups.

Other Methods of Assessing Specialization

The limitations inherent in the dominant approaches to studying specialization have prompted researchers to develop additional modeling techniques to study specialization. In general, these models vary in complexity from logistic regression models to structural equation and latent class models.

Early research on specialization that did not employ transition matrices tends to use correlation techniques. Hindelang (1971) used intercorrelational analysis to study specialization in a study of 763 male and female delinquents in Oakland, California. Using a 24-item self-report survey, he found consistency in the participation of offences among male and female juvenile offenders. Hindelang (1971) notes that the inter-item correlations are not independent. He concludes that the juvenile offenders display an overall pattern of versatility, with females exhibiting a more pronounced pattern of versatility than their male counterparts.

Le Blanc and Frechette (1989) propose a different way of conceptualizing offence specialization that is closely connected to desistence. They argue that,

"specialization, strictly speaking, is the concentration of criminal activity, which has previously been expressed in a variety of forms, into a limited number of crime categories" (Le Blanc & Frechette, 1989, p. 129). Le Blanc and Frechette (1989) analysed the median number of offence categories in both adolescence and adulthood. They found that repeat offenders in Quebec gradually restrict offending versatility as they progress into adulthood.

Francis, Soothill and Fligestone (2004) used latent class analysis to analyse the offending patterns of 11,402 offenders in the Home Office Offenders Index cohort over five-year intervals. The results indicate that there are different cluster solutions for males and females. Males have nine distinct offending clusters, while females have three offending clusters. In aggregate terms, the authors conclude that males display more versatility in each five-year period than females and that females have a "very restricted range of offending" (Francis et al., 2004, p. 80). Moreover, the authors emphasize that females show stability in their cluster in each time period, while males display a trend of increasing specialization in certain clusters over time.

Much of the work that utilizes more complex modeling techniques tends to focus on certain offender types, such as violent or sex offenders. Deane, Armstrong and Felson (2005) used marginal logit models to assess specialization in violent and non-violent offending. Deane and his colleagues (2005) used data on 15,629 juveniles from grades 7 through 12 in the National Longitudinal Study of Adolescent Health. The authors contend that substantial evidence of specialization exists in violent offending but little evidence of specialization occurs in non-violent offending.

Brame, Paternoster and Bushway (2004), using 1945 Philadelphia Birth Cohort data, examine whether offending frequency and offence switching between violent and non-violent offending are related. They found that offending frequency is independent of the probability of switching from a violent and non-violent offence category. They conclude that frequent offenders are not more versatile than their non-frequent counterparts.

Schwaner (1998) analyses the issue of specialization in violence in a sample of 3,353 male parolees in Ohio. He used logistic regression to determine whether specialization in violence, defined as a return to prison with a violent offence contingent on having an initial commitment prior to parole, is present in the sample. Schwaner (1998) found that there is a sub-set of offenders that displays high levels of specialization. One major issue with the specialization model is that it does not control for offence base rates. Schwaner (2000) extended his original study by examining robbery offenders. The results suggest that it is important to focus on sub-types of offenders. He found that robbery offenders are more likely than other offender types to be re-committed to prison for a subsequent robbery offence. Moreover, he notes that a prior robbery, age of onset and number of incarceration periods is related to a robbery offence at re-commitment.

Osgood and Schreck (2007) developed a new method for assessing specialization that is based on item response theory models. Their method attempts to surpass the limitations of other specialization measures. Their modelling technique focuses on specialization at the level of the individual, accounts for offence base rates, and controls for individual offence frequencies. The authors test their technique on the self-reported offending in two waves of a juvenile sample in Montreal at ages 12 and 17. Osgood and Schreck (2007) found that there is substantial individual variation in violent specialization that is greater than expected by chance and that specialization seems to increase with age. They conclude that specialization in violence is not related to offending frequency.

Some research suggests that there is a greater degree of specialization among certain sub-groups of sex offenders (see Soothill et al., 2000). Lussier, Le Blanc and Proulx (2005) test this assertion in a sample of 388 incarcerated sex offenders in Quebec. They compute an annual variety score for each sex offender based on past convictions. They use structural equation modelling to determine whether a latent variable accounts for variety, frequency and onset. The results indicate that sexual offending conforms to a "general construct of deviance," (Lussier et al., 2005, p. 184) but that this finding does not apply to all offender sub-groups. When sexual offending is broken into distinct types of sexual offenders the results show that

offenders who target women exhibit versatility, while child molesters are more specialized.

Farabee, Joshi and Anglin (2001) studied the effects of addiction patterns of severely addicted offenders on specialization. Their sample includes 7,189 male and female offenders who were part of the Drug Abuse Treatment Outcome Study. They note that addictions to cocaine and heroin are related to increased versatility. In addition, their logistic regression model indicates that predatory offenders display more diversity than other offender groups. Moreover, they suggest that the initiation of drug use is related to specialization. The authors suggest that offenders whose onset of offending occurs after their addiction to drugs are more likely to specialize in victimless crimes than offenders whose criminality precedes their addictions.

In a departure from typical offender typologies and specialization, Thompson, Brownfield and Sorenson (1996) examined the notion of gang specialization. The research centres on 171 self-identified gang members in the Seattle Youth Study. Their analysis shows that gangs display little specialization. This contradicts the findings of Warr (1996), which suggest that delinquent groups show a higher degree of specialization in short time periods. Warr (1996) concludes that this is tied to the fluidity of delinquent groups and that these groups organize the behaviour of members towards specific crime types.

Conclusion

The review summarizes certain general trends with regard to specialization. First and foremost is that the degree of specialization or versatility relates, in part, to the technique used to analyse the construct. Regardless of the technique, research shows that different approaches to measuring specialization yield order of scale consistent results (see Sullivan et al., 2009). Second, as Piquero, Farrington and Blumstein assert (2007, p. 3), "offending is more versatile than specialized". This assertion holds for almost every study reviewed in this chapter. Third, the implicit or explicit time frame used to measure specialization has a dramatic impact on the degree of specialization in each study. Research supports the notion that life course

estimates show less specialization than shorter time frames. This is the case with extremely restricted time periods, such as the month or year (McGloin et al., 2007; Sullivan et al., 2006).

When assessed at a more detailed level, there are important findings that temper the global assertion of versatility. Previous research suggests that the offending of juveniles is more versatile than the offending of adults. Klein (1984, p. 191) asserts, in his meta analysis of specialization research, that juveniles exhibit "versatility or a 'cafeteria-style delinquency". However, research supports the idea that as offenders progress into adulthood the degree of specialization tends to increase.

The evidence is somewhat inconclusive regarding gender as an important correlate to the degree of specialization. Few studies examine gender. Moreover, there are conflicting results on whether ethnicity is linked to specialization. This is a result of a limited amount of research on the influence of ethnicity on specialization. However, research indicates that certain dynamic life events, such as drug and alcohol use and age of onset are related to specialization.

In general, specialization research indicates that more frequent offenders, persistent offenders and offenders with lower ages of onset show a lower level of specialization than less frequent offenders. Some research suggests that frequent offenders are more likely to stay within an offence cluster and that there are certain types of crime in which frequent offenders exhibit a higher degree of specialization, including property and drug offences. Moreover, the vast majority of research shows that there is little specialization in violent offences. Violent offending seems to be a randomly occurring part of the histories of frequent offenders.

The findings pertaining to specific offender types (i.e., sex offenders, robbery offenders) indicate that certain sub-groups exhibit a higher degree of specialization, but overall and in the case of sex offenders specifically, "criminal behaviour is characterized by a certain tendency to specialize in sexual crime over time against a backdrop of much versatility" (Lussier, 2005, p. 288).

There are several pivotal issues pertaining to the measurement of specialization. The first is the definition or specialization. Currently, there are

several competing definitions that range from strict offence type consistency across successive offences to those that emphasize a degree of preference in offence types. The second is the aggregation of offence types into meaningful groups. Other than some work with clustering techniques, there is no research that addresses this limitation. Most research uses high-level legally defined categories and maintains that violent offences are characteristically different from property or drug offences, or that serious offences are characteristically different from non-serious offences. Until some of these structural limitations are addressed, it is likely that inconsistent results regarding specialization and versatility continue to exist in criminal career research.

Chapter 5: Method

This study adopts a retrospective longitudinal approach, using official indicators of offending, to study the criminal careers of offenders under the supervision of the Chronic Offender Unit (COP) at the Vancouver Police Department (VPD). Although this study is longitudinal in nature, it is not a cohort or a prospective longitudinal study, which are the standard practices in the bulk of the criminal career research (see Carrington, 2007; Carrington et al., 2005; Glueck & Glueck, 1930; Kyvsgaard, 2003; Le Blanc & Frechette, 1989; Loeber, 1996; Piquero et al., 2007; Shannon, 1991; Tarling, 1993; Thornberry, Lizotte et al., 2003; Tracy & Kempf-Leonard, 1996; Wolfgang et al., 1972). This longitudinal study examines the lifetime convictions of a sample of COP offenders. It is retrospective because the longitudinal data were collected in a single time interval (2007 to 2008).

The focus of this research is to provide an analysis of a sample of high frequency offenders and their offences. Prior research tends to focus on a longitudinal cohort design where partitions between groups take the form of non-offenders, recidivists and chronic offenders born in a certain year. In these studies, group partitioning occurs to maximize differences between the groups, in most cases through offending rates. In these types of research the identification of "chronic" offenders occurs after a specific amount of longitudinal data are collected.

It is important to test the findings from the substantial body of research on general offending samples in the criminal career paradigm against high frequency offending groups. This allows us to determine whether the general set of expectations derived from the literature applies beyond general offending samples.

Definitions of "Chronic"

Past research has yielded the most commonly used definition of a chronic offender as an individual with five or more offences, as measured by self-reports, police contacts, arrests, charges, court dispositions or convictions, over a set period of

time.[19] In some cases research reports findings on a "highly" chronic group with 10 or more offences (see Chaiken & Chaiken, 1982; Ezell & Cohen, 2005; Horney & Marshall, 1991; Peterson et al., 1980; Tracy et al., 1990). From these group divisions, researchers commonly report the finding that a small proportion of offenders are responsible for a disproportionate amount of offences in a cohort. Although the significance of the proportion of offences accounted for by chronic offenders has been challenged (see Tarling, 1993), the literature tends to focus on the entire group of offenders and does not provide an extensive analysis of chronic offenders. This is a direct consequence of the research design where chronic offenders tend to occupy a small proportion of the overall sample.

This approach neglects the possibility that there exists a highly skewed distribution of offending rates within a chronic sample. The highly skewed offence distribution for general offending samples is well documented for juveniles (see Carrington, 2007; Farrington, 1983; Loeber & Stouthamer-Loeber, 1996; Piquero et al., 2003; Thornberry, Lizotte et al., 2003; Tracy et al., 1990; Wolfgang et al., 1972), young adults (Blumstein & Cohen, 1979; Carrington et al., 2005; Ezell & Cohen, 2005; Farrington, 2003b; Shannon, 1988; Tracy & Kempf-Leonard, 1996) and specific adult samples (see Blokland et al., 2005; Chaiken & Chaiken, 1982; Farrington et al., 2006; Horney & Marshall, 1991; Laub & Sampson, 2003; Peterson et al., 1980; Sampson & Laub, 1993; Spelman, 1994) in different types of settings, such as high risk areas and custodial institutions.

While it is well established that a skewed distribution is present in offending rates among general offending samples, little research has focused specifically on the criminal careers of long-term high frequency offenders. This may be the result of the cohort research design, which in most cases precludes the possibility of amassing enough highly chronic offenders to sustain statistical analysis (for some notable exceptions see DeLisi, 2006; Ezell & Cohen, 2005). This has led some researchers to argue that little is known about high frequency offenders.

[19] This definition of a chronic offender was originally created by Wolfgang et al. (1972) and has since been the focal point of an unresolved conceptual debate (Piquero et al., 2003; Piquero et al., 2007; Piquero & Moffitt, 2005).

Cernkovich, Giordano and Pugh (1985), who praise the benefits of general population research, assert that in regard to chronic offenders:

> It is also important to locate the chronic delinquent offender, to compare the behavior of this youth with that of others along the behavioral continuum, and to identify those factors and processes that lead to this extreme level of delinquency involvement. We believe that such a focus will necessitate a return to the study of official delinquents, research subjects virtually abandoned with the advent of the self-report methodology some thirty years ago. *While commentators repeatedly have emphasized the hazards of using institutional or other official and quasi-official samples, we believe that these kinds of samples can locate, in a practical manner, a meaningful number of chronic offenders upon which to base criminological research* (emphasis added). (Cernkovich & Giordano, 1985, p. 731)

This dissertation is a response to the challenge of Cernkovich, Giordano and Pugh (1985). In order to avoid the problem of small samples this research analyses criminal career constructs, including participation, age of onset, the age-crime curve, specialization and offending frequency with officially identified high frequency offenders in the Chronic Offenders Program (COP) at the Vancouver Police Department (VPD).

The first goal of this research is to examine the constructs gleaned from criminal career research to a group of high frequency "property" offenders in a Canadian setting. The second goal of this research is to provide an analysis of the criminal careers of adult high frequency offenders. Tarling (1993) notes that most of the previous research has focused almost exclusively on the criminal careers of juveniles and youth (see Farrington & West, 1990; Glueck & Glueck, 1930; Loeber & Snyder, 1990; Piquero, 2000b; Thornberry et al., 1993; Tracy et al., 1990; Wolfgang et al., 1972). As a result we know less about the criminal careers of adult offenders than the careers of youth. Moreover, he asserts that there is a paucity of research on the criminal careers of highly chronic adult offenders. The first issue has become less prominent as findings from several of the longitudinal studies have been extended (Ezell & Cohen, 2005; Farrington, Lambert, & West, 1998; Laub & Sampson, 2003; Tracy & Kempf-Leonard, 1996). However, little is known about adult chronic offenders because they occupy a small proportion of general offending samples.

The third goal of this research is to provide a detailed examination of the criminal career concept of criminal lambda (λ). Criminal lambda, as conceptualized in research at RAND by Peterson and Braiker (1980) and Chaiken and Chaiken (1982), differs from individual offence rates[20] because it is calculated as the number of offences an active offender commits during his or her free time. In their seminal piece, Blumstein, Cohen, Roth and Visher (1986) assert that:

> The most important criminal career dimension is individual frequency, particularly of serious offences….Research should focus especially on the path of λ over time as offenders age, variation in λ with age for active offenders, the factors associated with intermittent spurts of high-rate and low-rate offending, and differences in λ by crime type. (Blumstein et al., 1986, p. 10)

This sentiment is again echoed in the comprehensive review of the research on the criminal career paradigm undertaken by Piquero, Farrington and Blumstein (2003). Historically, research on λ has taken one of two approaches. The first uses a small time-window and asks offenders to report the offences they have committed. Generally, this method encounters significant issues when dealing with highly chronic offenders due to recall (see Chaiken & Chaiken, 1982; Horney & Marshall, 1991; Visher, 1986). The second method estimates λ through the use of conviction or arrest data. A major issue here is the use of static estimates for the probability of arrest, the probability of conviction and incarceration and the average time of incarceration (see Blumstein & Cohen, 1979, 1987; Blumstein et al., 1986; Canela-Cacho et al., 1997; Cohen, 1986). As a result, many researchers have substituted individual offending rates for active offenders for λ values incorporating street time (Kyvsgaard, 2003; Loeber & Snyder, 1990). Arguably, the lack of distinction in the majority of research on lambda estimates that do not incorporate free time and λs that include free time has led several authors to challenge the utility of the construct (Gottfredson & Hirschi, 1986, 1987, 1988, 1990; Marvell, 2002). This study seeks to

[20] It should be mentioned that individual offence rates for active offenders are often termed lambda and used synonymously with lambda that incorporates free time only. It is the contention of the author that these are in fact distinct constructs.

rectify this issue by incorporating pre-sentence and sentence incapacitation time of convicted offenders over their life course.

The final goal of this research is to add to the Canadian context for criminal career research. Most of the research on criminal careers has emerged from Europe and the United States. As Tarling (1993) notes countries have similar but significantly different social, criminal and justice backdrops that need to be considered. For instance, the United States is understood to have consistently higher rates of violent crime than Canada, which in turn, has notably higher rates for property crime (Gannon, 2001). In addition, all of the Canadian criminal career research has occurred in the two most populated provinces in Canada, namely Quebec and Ontario. It is important to continue this tradition with a Western focus, as research has shown different inter-provincial patterns of crime and sentencing (see Kinney, 2005; Marth, 2008; Thomas, 2002).

Research Questions and Hypotheses

The goals of this research are addressed by the following research questions and hypotheses.

A) Parameters of criminal careers

1. What is the demographic profile of the high frequency offenders in COP at the Vancouver Police Department?

2. What is the prevalence of crime for COP offenders?

3. What is the age of onset and type of 1st conviction for this sample of COP offenders?

4. What is the length of the criminal careers of the COP offenders?

5. What are the age-crime curves for COP offenders, who are at least 30, 35, 40 and 45 years of age?

The first set of research questions address the first and second goals of the dissertation. The analysis presented in this study provides information relating to the descriptive parameters that exist in much of the cohort research on criminal

careers. These include: participation, incidence, criminal career length, age of onset, and the age-crime curve.

Hypothesis 1: High frequency offenders do not desist their offending in accordance with the aggregate age-crime curve and are consistent with Moffitt's LCP group.

Hypothesis 2: The offence counts of high frequency offenders are negatively associated with age of onset.

The first hypothesis is a simple test of Gottfredson and Hirschi's (1990; Hirschi & Gottfredson, 1983) assertion that the age-crime curve is invariant and the decline in the mid to late twenties is dictated by the construct of maturational reform. The second hypothesis tests the commonly reported finding in analyses of chronic offenders that age of onset is predictive of a high number of total offences in the life course (Farrington, 2005b).

B) Criminal lambda

1. What is the profile of "street time" for COP offenders in Vancouver?
2. What are the lambda estimates of different conviction types for COP offenders in Vancouver?
3. Are lambda estimates that incorporate street time significantly different from lambda estimates that do not include street time?
4. Are the lambda estimates stable throughout different periods in the life course?
5. What are the predictors associated with different lambda estimates?

These research questions are important because they are directed at obtaining a more complete understanding of high frequency offending in general. It is the contention of the author that this is neglected in much of the longitudinal research and in research on high frequency offenders that uses a small time interval for data collection.

Hypothesis 1: Lambda estimates that include street time for COP offenders are moderately associated with lambda estimates that do not include street time.

Hypothesis 2: Lambda estimates including street time are stable over the life course.

Hypothesis 3: Age of onset is negatively associated with lambda scores.

Hypothesis 4: Residential instability, the presence of drug addiction and the number of criminal associates are positively associated with lambda scores.

Hypothesis one tests the idea that lambda estimates incorporating street time for high frequency offenders are characteristically different from lambda estimates that do not incorporate street time. Recently, it has been demonstrated that these two different conceptualizations of lambda have important consequences on models of criminal careers (see Piquero, 2008; Piquero et al., 2001). Hypothesis two tests the assumptions of certain researchers (Loeber & Snyder, 1990; Piquero & Moffitt, 2005) that lambda rates for high frequency offenders are stable over time. Hypotheses three and four test the importance of some of the more notable predictors of lambda from past research. The predictors include drug and alcohol addiction (Chaiken & Chaiken, 1982; Elliott et al., 1989; Hussong, Curran, & Moffitt, 2004; Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998; Wish & Johnson, 1986), delinquent peers (Brownfield & Thompson, 2002; Sarnecki, 2001; Thornberry et al., 1994), and residential instability. Moreover, the emergent but neglected finding of a "late-onset" chronic offending group (Gomez-Smith & Piquero, 2005; Piquero, 2008) is examined in this research using age of onset as a predictor.

C) Offence specialization

1. Do COP offenders in Vancouver show patterns of specialization in their offending careers?

2. Do COP offenders display patterns of specialization over different stages of the life course?

3. Are lambda scores associated with the degree of specialization for COP offenders in Vancouver?

This set of research questions examines the commonly reported findings on the link between specialization and offending frequency that asserts more frequent offenders are versatile over their entire offending career. This finding is posited in

certain developmental life course theories (Piquero & Moffitt, 2005) and reported in most of the extant cohort research (Brame et al., 2004; Piquero et al., 2003).

Hypothesis 1: COP offenders become increasingly specialized over the life course.

Hypothesis 2: Lambda estimates and age of onset are negatively associated with specialization.

The first hypothesis addresses, in the context of high frequency offenders, the postulate that offenders tend to restrict the range of their offences as they continue their offending careers over time (Le Blanc & Loeber, 1998; Loeber & Le Blanc, 1990). The second hypothesis assesses the relationship between lambda and specialization for high frequency offenders. Much of the existing literature asserts that offending frequency and lambda have a negative relationship with specialization (Farrington, 2005b).

Data Collection and Design

Initially, a series of meetings was held with the Chronic Offenders Program (COP) members Sergeant John Rennie, and Constables (Det.) Rowan Pitt-Payne, Ruth Picknell and Warren Pomeroy of the VPD to discuss the possibilities for a research relationship. Both parties expressed a strong interest in the collaboration. Background information gathering began in May of 2007. After securing an enhanced reliability screening (see Appendix C for a copy of the letter of support) access to the relevant police information on the 380 chronic offenders in COP and all the relevant background information on the Chronic Offender Program was provided to the researcher. This included access to their Records Management System (RMS) named PRIME, the Canadian Police Information Centre (CPIC) database, and the electronic and hardcopy COP police files pertaining exclusively to COP offenders and their offences.

The RMS-PRIME data contain all police-related events, associated people and objects, beginning from mid-2001. In addition, it contains a set of demographic data on people associated to criminal events in Vancouver. The CPIC database was created in 1966 and is a national repository of information relating to offenders that

are of interest to police agencies. CPIC access is particularly relevant for this study as it contains a national level index of all convictions where an individual is fingerprinted. In certain cases, such as with strict summary offences, fingerprints from accused are not taken. As a result, these types of convictions do not appear in the conviction history of an individual in CPIC. Although the CPIC database is incomplete in terms of less serious offences, it is considered a registry of more serious offences. In the context of this research serious offences include hybrid offences and strictly indictable offences. The electronic and hardcopy COP files contain summary information extracted from the RMS-PRIME and CPIC as well as details on the individual offenders that supplement the summary information contained in the other databases.

After reviewing the sources of information, meetings to discuss the potential research possibilities were held in collaboration with COP members. A small pilot project was undertaken to ensure the validity of the coding procedures for convictions, and to obtain answers to any questions that concerned CPIC records. It involved coding the conviction histories of thirty-five COP offenders. Prior to the pilot project it was assumed that data entry in the CPIC database was consistent. While this is true in general it was discovered that there are certain entry issues that needed resolution. Once these were resolved and the CPIC questions were drafted, the coding procedures were finalized for both the conviction events and the demographic data.

Once the pilot was complete, a formal proposal was drafted that outlined the nature of the research plan, the requisite data required for the project and the data security protocols and safeguards. This proposal was submitted to the VPD for approval in September 2007. After the formal VPD approvals were granted the data coding process began. A detailed review of the coding of indicators is presented in the *Measures* section.

The data coding procedure for this study was complex. First, a list of COP offender names, dates of birth and fingerprint (FPS) numbers was compiled. This list served as the Master Name list from which all the data collection centred. Once this list was prepared, a unique identifier was assigned to each COP offender. To

ensure confidentiality of the COP offenders, the Master Name list remains at the Vancouver Police Department and all demographic and conviction information is linked to an individual through the unique identifier. This study is based on secondary data, but given the sensitive nature of these data (i.e., conviction histories) it is necessary to protect the identities of COP offenders. There is no conflict with keeping this information at the Vancouver Police Department because the information belongs to the VPD.

FPS numbers and dates of birth were used to query individual CPIC criminal history records, termed CPIC level II records. In order to ensure accuracy of the query, the full names and dates of birth were checked against the Master Name List. Subsequently, the criminal histories were verified against the COP files (electronic and paper files) compiled on each offender. Once a valid offender was retrieved in CPIC, all convictions relating to that specific person were coded. The coding process from CPIC yielded a relational dataset where many convictions are associated with one COP offender.

Several rules were followed in the coding of each conviction set. The term conviction set is used here to refer to the fact that an offender may be convicted of several offences in each conviction set on the same day in court. The first coding rule was that all convictions in a conviction set were coded. This is important because convictions, although filtered, are indicators of an offence. The second set of rules revolved around the determination of most serious offence (MSO), or more specifically the most serious conviction (MSC) when an individual had two or more convictions in a conviction set. For a list of the offences included in this study and their offence mapping refer to Appendix A. The rules for determining the MSC were:

1. Violent offences are the most serious in a conviction set.

2. If there is no violent offence (or more than 1 violent crime), the offence with the most serious conviction outcome is considered the MSC.

3. In cases where there is an administrative offence and other substantive offences, the substantive offences are always considered to be more serious than administrative offences. In this study, administrative offences are those that occur as a result of the court process (i.e., failing to appear, breach of

recognizance) and those that stem from a past conviction (i.e., failing to comply with probation). In this research, a substantive offence is an offence that violates the *Criminal Code of Canada* or any Federal Statute (i.e., the *Controlled Drugs and Substances Act*) that is not an administrative offence. By placing less importance on administrative offences, this research is focused on analysing the substantive offending patterns of high frequency offenders.

4. In cases where there are several offences that all receive the same sentence (e.g., one day) in a conviction set, some flexibility was required. In general, the ordering of offences in these cases was Property Offences → Drug Offences (the type of offence) → Other Offences (same consideration as in property and drugs) → Administrative Offences. For example, take a hypothetical conviction set with 1 count of theft over $5000, 1 count of theft under, 1 count of possession of a scheduled substance and 1 count of trafficking a scheduled substance. The MSC in this case is the theft over, followed by the trafficking offence, followed by the theft under offence, and followed by the possession offence. The reasoning behind this decision is that count 1 is a serious theft, and although trafficking is a serious offence it is a victimless crime. This process is similar to the scoring in the legal seriousness scale detailed by Tracy and Kempf-Leonard (1996).

The third set of coding rules centre on the coding of conviction set outcomes and incapacitation time from CPIC. The three most serious conviction outcomes were coded. The most serious sentence in this study is custody, followed in order by conditional sentence orders, probation, suspended sentences, fines, prohibitions, restitution and compensation, conditional discharges and absolute discharges. If a conviction indicated a probation or conditional sentence order as an outcome then the number of days of probation or CSO were coded separately. In instances where a custodial sentence occurred, the following rules governed the coding of incapacitation time. First, time spent in pre-sentence custody, denoted by the term "& 10 days pre-sentence custody" or "& 10 days time-served" was coded separately from a custodial sentence. This is necessary because pre-sentence custody, unlike a custodial disposition, is time that is fully served in an institution. In contrast, custodial time is not necessarily fully served in an institution due to early release. Parole statutes govern the amount of sentenced incapacitation time served by an offender. In cases where an offender serves two or more years in custody, CPIC notes the dates of early release in the form of mandatory supervision, statutory

release and parole. When these events occur they were coded in a separate row with the date of the release so incapacitation time could be calculated. Violations of these early release categories were coded in a similar manner in order to calculate incapacitation time. In cases where a disposition was less than two years, early release is estimated as two-thirds of the sentence for calculations of incapacitation time.

Given the high frequency of convictions for the COP offenders, several additional rules for coding incapacitation time were necessary. First, in cases where there were two or more convictions within a conviction set it was necessary to code total custody time to serve as an indicator for incapacitation time. In the case of multiple offence conviction sets, sentences were assumed to be consecutive if they stated that they were "consec" or "consecutive". In these cases, incapacitation time in days was the most serious custodial sentence plus the total days of the consecutive sentence. When none of these descriptors were noted in the CPIC database in relation to a conviction set, the assumption was that the sentence was concurrent. In these instances, only the longest sentence time was coded in days. The validity of these assumptions was verified through correspondence and discussions with a 20-year CPIC database expert after the pilot project.

A second, but similar process was used to code incapacitation time between conviction sets. This was necessary as a large number of COP offenders received sentences that overlapped between distinct conviction sets. In the instances where custodial sentence overlap occurred, a sentence for a distinct conviction set was deemed to be consecutive if it stated that the sentence was "consec to sentence serving" or "consecutive to sentence serving". In these instances, incapacitation time was coded as the value of the new sentence in days. Conversely, a custodial sentence was determined to be concurrent with a previous conviction set if it did not have any notation in the sentence (i.e., no information) or if the new sentence had the extension of "conc to sentence serving" or "concurrent to sentence serving". In these circumstances determining the length of time that had passed from the first conviction set to second conviction set and subtracting the time overlap from the new custodial sentence defined incapacitation time for second conviction set. The

custody time coded in the second conviction set was the difference in days. Occasionally, this lead to a "0" value for the second conviction set.

CPIC Data Retention Rules

The CPIC database is not without specific limitations including different data retention policies for convictions of adults and juveniles and the completeness of database coverage. According to the CPIC reference manual (2004), the retention policy for adult convictions is until fingerprints provide proof of death, or the individual reaches the age of 80 and meets a series of additional conditions. Discharges are removed one to three years (absolute and conditional, respectively) after the disposition date provided the offender has not committed an additional offence.

The retention policy for young offenders is markedly different from that of adults. For juveniles found guilty of a summary conviction offence, CPIC entries are removed three years following the satisfactory completion of the sentence. For juveniles found guilty of an indictable offence the removal process occurs after five years. This retention time is re-set with the retention time of the new offence when a young offender is convicted of any subsequent offence within the period of the previous offence.

An additional issue is the overall completeness of the CPIC database. In order for a conviction to appear in CPIC, an offender must be linked to the conviction through a unique fingerprint (FPS) number. This is an important issue because all offences that are strictly summary conviction offences do not require the documentation of fingerprints. Therefore, a conviction does not appear in the CPIC database if an individual is not fingerprinted for the offence(s). This does not apply to hybrid or indictable offences because fingerprints are taken in these cases. As a result, the CPIC database is best considered a database that contains more serious offences.[21]

[21] The term "more serious" is used loosely here as many offences in the Criminal Code of Canada and other Federal Statutes have a hybrid classification (i.e., Theft Under $5000).

Sample

Before discussing the sample for this study it is necessary to first describe the nature of the offenders under the supervision of officers within COP. Initially, the VPD considered varying definitions for the inclusion of offenders in the COP drawn from criminal career research (i.e., five or more charges). They found that this definition produced a sample too large for the team of four members to manage effectively. After a period of trial and error they settled on the following operations-based definition of a chronic property offender as:

1. A property criminal with twelve or more charges in the past twelve months and/or,
2. An offender identified by the Operations Division as a significant property offender and/or,
3. A property criminal with a history of non-compliance with court orders (Pitt-Payne, 2007, p. 1).

This definition resulted in a sample of 380 individuals in the summer of 2007.[22] The majority of the offenders meet criterion one of this definition. Although the intent of the COP is to focus on property offenders specifically, each of the offenders in this program is involved with non-property offences. This signifies that these offenders are not solely property offenders.

For the purposes of examining life course offending, a sub-set of the 380 offenders was selected. This sample was collected by taking a random sample of 121 of the 380 male offenders. In addition, all the "Super Chronics"[23] (n=22) and all females (n=19) in the program were appended to the random sample of the 121 chronic offenders in COP. This was done to maximize the number of females in the sample, as most criminal career research focuses exclusively on male offenders. The "Super Chronics" were added at the request of the COP members. The VPD members asserted that these individuals were the most serious of the offenders in COP and requested an analysis of their offending patterns in comparison to the

[22] It is important to note that charges in this case refers to charges in the municipality of Vancouver only and does not consider charges from other municipalities.
[23] The VPD members denote offenders they viewed as the most frequent and serious at any given point in time with the label "super chronic". This list is fluid in that offenders are added or removed from the list based on conditions such as their custodial status, etc.

other COP offenders. In order to examine the research questions developed in this study several sampling parameters were used to select subjects from COP. The requisite parameter of import was that the offenders have a minimum of 12 charges in one year at some point during the 2002 to 2006 time interval. This removed any persons who were nominated by the Operations Division who did not have a reasonable amount of official contacts.[24] These individuals are not appropriate for inclusion in this study because it uses official convictions data as the primary indicator of offending.

Additional sample parameters for the conviction-based analyses were required. First, the individual needed to be at least twenty-four years of age in 2006, so that a minimum of a seven-year time frame as an adult existed for studying adult offending patterns. It was chosen because it is the end point of the commonly reported range of the 15 to 24 year age interval where offending rates are the highest. Second, the offenders must have been born in Canada or have entered Canada prior to the age of twelve to analyse age of onset and career duration. Third, offenders needed to have a minimum of 12 charges within one year at some point during the 2002 to 2006 time interval. Overall, this sample totaled 162 individuals. After a thorough examination of the conviction profiles of the offenders, the sample for this research was narrowed to a final sample size of 152 offenders.[25]

Measures

A) Demographic Data:

Several types of demographic data were extracted from the police files and the RMS to serve as independent variables in the analysis. The indicators are:

1. Age in 2006.
2. Gender: This dichotomous variable was coded as 0 = male, 1 = female.

[24] There were several informal discussions with COP members about this issue. This decision was made because in certain cases an individual police officer would nominate an offender because of intuition.

[25] Only offenders who had at least five convictions by the end of 2006 were included in the analysis. In addition, some offenders were removed because they died, moved to another province or were institutionalized in a psychiatric facility prior to 2006.

3. Alcohol/Drug Addiction: This categorical variable was coded as 0 = no addictions, 1 = drug/alcohol addiction.

4. Mental Instability: This categorical variable was coded as 0 = no mental instability, 1 = mental instability.

5. Employment: This categorical variable was coded as 0 = unemployed, 1 = employed.

6. Birthplace: This categorical variable was used to determine sample eligibility for the conviction-based analyses and was coded as 0 = Canada, 1 = Outside Canada.

7. Ethnicity: This categorical variable was coded as 0 = Caucasian, 1 = Aboriginal, 2 = Middle Eastern, 3 = Asian, 4 = East Indian, 5 = Hispanic, 6 = Black.

8. Risk for Violence: This dichotomous variable was an attempt to provide an indicator for whether an offender had been flagged for violence potential by the VPD. It was coded as 0 = not violent, 1 = violent offender.

9. Super Chronic: The COP members make a differentiation between offenders who they place in the Super Chronic category and those they term Actives. The offenders classified as Super Chronics are deemed to be more serious than those in the Active category. This dichotomous variable is coded as 0 = Active Status, 1 = Super Chronic Status.

10. No Fixed Address: This dichotomous variable was meant to act as an indicator for whether the offender has a fixed address or was homeless. It was coded as 0 = no fixed address, 1 = fixed address.

11. Number of Residential Addresses: This is a count of the number of separate residential addresses contained in PRIME ending December 31st, 2006.

12. Number of NFA: This is a count of the number of separate "No Fixed Address" contained in PRIME ending December 31st, 2006. To be counted there had to be a fixed address separating two separate NFA instances.

13. Number of Criminal Associates: This variable captured the number of distinct individuals who were associated to an offender as a co-offender in their charge history.

14. Province of Conviction: This variable was coded as the specific province of conviction.

B) Criminal Career Variables

Age Groups

Many of the analyses in this research are contingent on one or more categorizations of age. Unfortunately there are no consistent age groupings that exist in the published literature on criminal careers. The age groupings in past research are used to fulfill the analytic purposes of the study at hand. This is the case for this dissertation, which uses five-year age groupings. The grouping is used in specific lambda analyses and specialization analyses that investigate the stability of these constructs over time (see Loeber & Snyder, 1990). Five-year age groups were chosen because the offenders in the sample are frequent offenders with a significant amount of incapacitation time. A five-year interval reduces the possibility of inflated lambda scores for substantial numbers of offenders due to long periods of incapacitation. The five-year age groups are used to investigate the possibility of shorter term specialization which has emerged as focal point for both theory (see Le Blanc & Loeber, 1998; Loeber & Le Blanc, 1990) and research (see Le Blanc & Frechette, 1989; Sullivan et al., 2006).

Age of Onset

This variable was calculated by subtracting the date of birth of the offender from the date at first conviction.

Criminal Career Length

This variable was calculated based on the conviction data by subtracting the age at first conviction from December 31st, 2006. This is the first step in the calculation of time at risk.

Incidence

In general, incidence is calculated as the number of offences per offender for specific crime types over a period of time (Blumstein et al., 1988a; 1988b). In this study incidence of convictions is computed for each offender during their criminal careers.

Incapacitation Time

Incapacitation time is the sum of both pre-sentence custody time and custodial disposition time. However, in the case of custodial sentences that are less than two years (i.e., provincial custody) a weighted incapacitation score is computed. In certain analyses the assumption is that offenders serve two-thirds of their sentence for these dispositions.

Criminal Lambda

Criminal lambda estimates are calculated for each individual for each year of activity in the criminal career (criminal career length). Much of the early research computed lambda scores that included time at risk through the following formula:

> The number of crimes per year of type *i* x [365 days per year / (number of days in the year – number of days inactive through incarceration)].

This method was used to estimate lambda in research using self-report data (Chaiken & Chaiken, 1982; Horney & Marshall, 1991, 1992; Peterson et al., 1980; Rolph et al., 1981; Visher, 1986) where incapacitation time was collected through "event" calendars.

Lambda values for active offenders have been estimated through official data (see Blumstein & Cohen, 1979, 1987; Blumstein et al., 1986; Cohen, 1986). In this study yearly lambda estimates are derived for convictions for active offenders. This formula for conviction type *j* is given in equation 5.1:

$$\lambda_i = O_i t_k / [\frac{Lt_k - I_i t_k}{365.25}]$$

Equation 5.1: The calculation of lambda for conviction data.

Where:

λ_i = Yearly lambda estimate for offender *i* of conviction type *j*.

$O_i t_k$ = Total number of convictions of type *j* for offender *i* in time period *k*.

Lt_k = Total number of days in time period *k.*

$I_i t_k$ = Total number of days of incapacitation for offender *i* in time period *k*.

Lambda scores are calculated in age groups and for the entire criminal career of each offender for specific crime types and seriousness groups.

This dissertation estimates three lambdas based on different groups of convictions. To provide clarity to the results each lambda estimate is defined here. The first lambda estimate only uses the criminal career length of the offender in the denominator. This is the typical lambda estimate that is presented in most research. It is lambda without regard to incapacitation time. In this dissertation it is symbolized as λ_{CL}.

The second lambda estimate incorporates any parole or early release adjustments to custody time in the denominator. In the case of a federal sentence this was coded directly from CPIC. In the case of provincial sentences, which are the majority of incapacitation time sentences, early release dates are not noted in CPIC. As a result, all provincial sentences are adjusted to two-thirds the total sentence length noted in CPIC. This adjustment is only applied to provincial sentences and not the pre-sentence time or federal sentence time. It is lambda that adjusts for two-thirds of provincial custody time and represents the minimum bound of lambda that incorporates custody time. In this dissertation it is symbolized as $\lambda_{2/3}$.

The third lambda estimate incorporates one hundred percent of incapacitation time of provincial custody sentence time into the denominator. The only early release adjustments are when parole for federal sentences was coded from CPIC. This represents a maximum bound for the lambda estimates. This measure is typically reported in studies that use official data and estimate lambdas that include incapacitation time. In this dissertation it is symbolized as λ_{100}.

The lambda estimates in this dissertation are calculated for several groups of crime. The groups are noted in each results section. However, for most of the analyses, and for all the non-descriptive analyses there are three main categorizations that are employed. The first is total convictions, which includes all conviction types. The second is all conviction types excluding administrative offences. Administrative offences include all offences that result from *court*

processes, such as failing to appear in court or from *court sentences*, such as failure to comply with a probation order. This division is important when the analysis is relevant to street offending. The third is serious convictions. This category includes all serious offences as defined below in the "Offence Seriousness" subsection.

Offence Seriousness

Crime seriousness groups are used to combine the specific crime types of each offender. The ordered severity scale used in this study is a modified version of the legal severity scale used by Tracy and Kempf-Leonard (1996, p. 69). The legal severity scale adopted by Tracy and Kempf-Leonard is a seven-point scale that categorizes offences: 1 for "no seriousness; 2 for "minor property"; 3 for "minor violence"; 4 for "drugs"; 5 for "weapons"; 6 for "major property"; and 7 for "major violence". This dissertation, using the scale from Tracy and Kempf-Leonard as a foundation, incorporates a ten-point seriousness scale coded: 1 = administrative offences; 2 = less serious other offences; 3 = less serious drug offences; 4 = less serious property offences; 5 = less serious violent offences; 6 = serious other offences; 7 = serious drug offences; 8 = weapons offences; 9 = serious property offences; and 10 = serious violent offences. For a complete review of the mapping of specific offence types to the ten-point seriousness scale refer to Appendix A.

The decision to use a ten-point scale as opposed to the seven-point scale of Tracy and Kempf-Leonard, was made for several reasons. First, using original offence types from the *Criminal Code of Canada* (CCC) was not feasible given the number of unique legal offence categories for convictions in this sample. In addition, the variability in age of the offenders means that certain categories of offences have been modified in the *Criminal Code of Canada* over time.[26] The ten-point seriousness scale is a method to group specific legal offence types to maintain validity of a time varying legal crime categorization.

[26] For example, prior to 1982 the offence of rape was included in the *CCC*. After 1982 the *CCC* removed the sections pertaining to rape as an offence and substituted it with three levels of sexual assault. An additional example are changes to the theft under and theft over provisions. Over time these laws have been updated from $200, to $1000, to $5000 in an attempt to account for inflation.

Second, this scale allows for the inclusion of severity for "other" offences. It was noted in the pilot data collection process that many of the COP offenders committed property-related offences that were not theft-based but damage focused. A motivation-based distinction was made between offences of theft (i.e., acquisitive) and damage (i.e., excitement/frustration). As a result, both the less serious and serious property categories of the ten-point scale include only theft-based offences of varying severity.

The third distinction is that two categories of drug offences are separated. Again, this is a result of the pilot research where it was discovered that many of the COP offenders were convicted of drug possession offences and drug trafficking offences. The division of the two types of drug offences is a mechanism to capture different motivations of an offender in each crime type.

The last reason for the use of a more detailed seriousness scale relates to the foci of this research, most specifically in relation to specialization. This ten-point and in some analyses nine-point scale (i.e., not including the administrative offence category),[27] differs from the categorization used in past research on specialization. Much of the debate on specialization and whether it is present to a significant degree centres on the optimal number of meaningful crime categories to assess specialization (see Chapter Four for more details). Much of the classic research uses few categories for the analysis of specialization (Kempf, 1987; Lattimore et al., 1994; Paternoster et al., 1998; Rojek & Erickson, 1982; Tracy et al., 1990; Wolfgang et al., 1972). The use of the ten-point severity scale allows for the division of specific crime types (i.e., administrative, other, drug, property weapons, violent) that incorporates severity (i.e., not serious and serious) for an analysis of specialization.

[27] Some researchers might argue that administrative offences are not "real" offences because they either cause no harm and/or that they generally occur as a result of a substantive offence. This is the case, for example, when offenders breach a condition of their probation as part of their sentence for a break and enter conviction.

Specialization

This research assesses specialization at the level of the ten-point severity scale using the diversity index (*D*). The diversity index is reviewed in detail by Agresti and Agresti (1978) and was used extensively as a metric to study population segregation (Reardon & Firebaugh, 2002). Recently, (*D*) has been adopted to study the degree to which individual offenders vary in their offending patterns (Mazerolle et al., 2000; McGloin et al., 2007; Piquero et al., 1999; Sullivan et al., 2006). This novel application of the diversity index has advantages to past research on specialization, which measured specialization by using transition matrices and the Forward Specialization Coefficient (Blumstein, Cohen, Das et al., 1988; Cohen, 1986; Kempf, 1987; Stander et al., 1989; Tracy et al., 1990) or the binominal probability (Lynam et al., 2004; Piquero, 2000a; Piquero et al., 2007). Unlike transition matrices, (*D*) is a proportional measure that is not restricted to offences with distinct date markers. As such it does not focus on the explicit ordering of offences (Sullivan et al., 2006). In addition, and more relevant to this study is that, unlike both the FSC and the binominal probability which provide estimates of specialization within the overall sample, (*D*) "captures the overall amount of offending versatility" at the level of the individual offender (Mazerolle et al., 2000, p. 1154). As a result, it is possible to allow for the analysis of predictors of (*D*) and to make statistical comparisons across other meaningful categories, including age groups.

The diversity index for any individual *i* is computed (see Mazerolle et al., 2000; McGloin et al., 2007; Piquero et al., 1999; Sullivan et al., 2006) according to equation 5.2:

$$d_i = 1 - \sum_{m=1}^{M} p_m^2$$

Equation 5.2: The equation for calculating the diversity index.

Where d_i = the diversity score for offender *i* in period *t*, p_m = the proportion of offences in each of *M* (1, 2, 3…, 10) offence groups. The minimum value of *D* ($d_{(\min)}$)

is always equal to 0 and is interpreted as complete specialization, while the maximum value of D ($d_{(\max)}$) is dependent on *M*. It is given by equation 5.3:

$$d_{(\max)} = (k-1)/k$$

Equation 5.3: The equation for the maximum value of the diversity index given *k* offence groups.

Where *k* = the number of offence groups. For the purposes of this dissertation when *M* = 10, $d_{(\max)}$ = 0.9. When administrative offences are excluded *M* = 9, $d_{(\max)}$ = 0.889. In order to convert d_i into a standardized value *I*, with a minimum bound of 0 and a maximum bound of 1, it must be converted (see Agresti & Agresti, 1978; McGloin et al., 2007) using equation 5.4:

$$I_i = d_i[k/(k-1)]$$

Equation 5.4: The equation for standardized diversity scores.

Sullivan, McGloin and Pratt (2006, p. 211) caution that traditional parametric measures are problematic for the analysis of (*D*), which in general is a skewed dependent variable. They advise the use of Tobit and truncated models for multivariate analyses because diversity scores are a censored variable (see McGloin & Piqero, 2010; McGloin et al., 2007; Sullivan et al., 2006). The use of Tobit models is adopted in this research. Agresti and Agresti (1978) and McGloin, Sullivan and Piquero (2007) caution against using this conversion when the number of nominal categories is large. However, when the *k* is equivalent for the groups the unstandardized and standardized scores are equivalent. As a result, the conversion to a standardized value occurs in the descriptive analyses.

Chapter 6: Sample Characteristics and Criminal Career Parameters

This results chapter presents the background characteristics of the sample of high frequency offenders in the Chronic Offenders Program (COP) at the Vancouver Police Department. It describes findings relating to the major parameters of criminal careers of COP sample. This includes a review of participation in crime, average lifetime convictions, age of onset with a focus on the first recorded conviction type and the age-crime curves for the offenders. The chapter concludes with models that attempt to explain total lifetime conviction counts, where the explanatory variables assessed in each model include stable covariates (i.e., gender and ethnicity), criminal career covariates (i.e., age of onset and criminal career length) and additional frequency related covariates (i.e., drug use, co-offenders, residential instability and the presence of violence). The models assess whether the covariates that are observed in general population cohort samples are related to the conviction counts of a pre-identified high frequency sample.

Sample Characteristics

Tables 6.1 and 6.2 show the background characteristics of the COP sample. Police record these characteristics in their records management system PRIME. The ethnic composition of the sample as recorded by police is predominantly Caucasian (70 percent), followed by Aboriginal at 18 percent and other ethnicities (Black, Hispanic and Asian) at 12 percent. The COP sample is predominately male (88 percent). Table 6.1 shows that 37 percent of the sample was born in British Columbia. It is important to note that the vast majority of the sample is not native to British Columbia and was born in other Western provinces (25 percent), Ontario and Quebec (25 percent) and in other provinces and territories (5 percent). Approximately 9 percent of the sample was born outside of Canada.

Table 6.1: Characteristics of the COP Sample (N=152).

Variable	*N*	*Percent*
Ethnicity		
Caucasian	107	70.4
Aboriginal	27	17.8
Other	18	11.8
Gender		
Male	133	87.5
Female	19	12.5
Place of Birth		
B.C.	56	36.8
Western Provinces (Excluding B.C.)	38	25.0
Ontario/Quebec	38	25.0
Other Provinces/Territories	7	4.7
Outside Canada	13	8.6
No Fixed Address in 2006		
Yes	52	34.2
No	100	65.8
Addiction to Drugs/Alcohol		
Yes	129	84.9
No	23	15.1
History of Violence		
Yes	111	73.1
No	41	26.9
History of Mental Instability		
Yes	46	30.3
No	106	69.7

It is apparent that the sample has high levels of personal instability. The police note that 85 percent of the sample is addicted to drugs, alcohol or both. The data indicate that 30 percent of the sample suffers from some sort of noticeable mental instability. In addition, 73 percent of the sample is reported as violent, indicating that the police consider the offender to be violent, either through past offending or interactions with police. Indices of residential instability yield similar patterns. Thirty-four percent of the sample is recorded as without a fixed address in

2006, while 66 percent have a fixed address.[28] More specific indicators of residential instability, presented in Table 6.2, show that COP offenders have a median of four separate fixed addresses (25th percentile = 3, 75th percentile = 6) and a median of two separate instances of no fixed address (25th percentile = 1, 75th percentile = 3) from 2002 to 2006. The mobility of the COP sample is pronounced when the number of separate provinces in which these offenders are convicted is examined. The sample has a median of two separate convicted. Males have a median of two convicted provinces, while females have a median of one convicted province.

The offenders in this sample are well into adulthood by the end of 2006. The mean and median age of the sample is 36 years and 25 percent of the sample is 41 years old or more. This finding is important, as most research on high rate offenders tends to neglect large samples of adults. The elevated age of the sample is important to consider when assessing the relatively long lengths of their criminal careers. The median criminal career length of the sample is 16.3 years (25th percentile = 10.8, 75th percentile = 22.4). The median number of distinct criminal associates during the four-year period is three with 25 percent of the sample having ten or more.

[28] Often fixed addresses included halfway houses, homeless shelters and single room occupancy (SROs) accommodations. If these temporary housing units are excluded the percentage with no fixed address increases substantially.

Table 6.2: Characteristics of the COP Sample (N=152).

Variable	*Total Sample*			*Males*	*Females*
	Median	*25th Percentile*	*75th Percentile*	*Median*	*Median*
Age (2006)	36.0	30.0	41.0	36.0	33.0
# of Provinces Convicted	2.0	1.0	2.0	2.0	1.0
# of NFA	2.0	1.0	3.0	2.0	2.0
# of Residences	4.0	3.0	6.0	4.0	3.0
# of Criminal Associates	3.0	1.0	10.0	3.0	5.0
Length of Criminal Career	16.3	10.8	22.4	17.0	9.5

Table 6.3 presents the lifetime participation of COP offenders in different offence groups as defined by recorded convictions. Overall, the COP sample shows high rates of participation in each type of offence. All of the offenders are convicted of non-administrative offences (N = 5997 convictions). Moreover, approximately 93 percent of the sample is convicted of a serious offence (N = 1748 convictions) during their lifetime. Approximately 93 percent of the sample is convicted of an administrative offence. For the purposes of this study administrative offences are offences that stem from a previous offence, such as failing to appear in court and violating conditions of a probation order.

An examination of the lifetime participation of COP offenders for non-administrative offences shows that a larger percentage of offenders participated in less serious offence types than serious offence types. For a complete list of the mapping of conviction types to seriousness groups see Table A.1 in Appendix A. For tables that show the lifetime participation of COP offenders for more specific crime types within each seriousness group refer to Appendix B.

Seventy-eight percent of offenders participate in less serious other offences (e.g., property damage under $5,000 and criminal code traffic offences), while

approximately 70 percent participate in less serious drug offences (e.g., drug possession). The lowest level of participation in less serious offences occurs in violent convictions (e.g., assault level I and assault peace officer) with approximately 61 percent of the sample having one or more lifetime convictions. The highest level of participation is found in the less serious property group (e.g., theft under $5,000 and possession of stolen property under $5,000). Approximately 95 percent of the sample have one or more of these convictions in their lifetime.

Table 6.3: Lifetime Conviction Participation of COP Offenders (N=152).

Conviction Type	***Participation Percentage***	***Total Convictions***	***Males***	***Females***
Administrative Offences	93.4	1249	92.5	100.0
Less Serious Other Offences	77.6	560	81.2	52.6
Less Serious Drug Offences	69.7	362	72.2	52.6
Less Serious Property Offences	95.4	3013	96.2	89.5
Theft Under	94.7	2629	96.2	84.2
Less Serious Violent Offences	60.5	314	62.4	47.4
Serious Other Offences	54.6	186	57.1	36.8
Serious Drug Offences	47.4	273	45.9	57.9
Weapons Offences	33.6	74	36.8	10.5
Serious Property Offences	73.0	969	79.7	26.3
Break and Enter	63.8	604	69.9	21.1
Serious Violent Offences	50.0	246	52.6	31.6
Robbery	37.5	151	38.3	31.6
Assault Level II	27.0	77	28.6	15.8
All Convictions	**100.0**	**7246**	**100.0**	**100.0**
All Convictions Not Including Administrative Offences	100.0	5997	100.0	100.0
Serious Convictions Only	92.8	1748	94.0	84.2

Analyses of the serious conviction types show different patterns of lifetime participation. Approximately 55 percent of the COP sample participate in serious other offences (e.g., mischief over $5,000), almost half participate in serious drug offences (e.g., trafficking) and approximately 34 percent of the sample is convicted of a weapons offence.

Although it is evident from Table 6.3 that the highest participation levels occur in serious and less serious property crimes, the sample shows high levels of participation in crimes of violence. Fifty percent of the sample is convicted of a serious violent offence, 37.5 percent of the sample is convicted of a robbery offence and 27 percent of the sample is convicted of assault level II. This finding is notable because it is a high level of participation in serious violence in a sample that was originally selected by the police for their high rate of property offences.

Analyses of lifetime participation of males and females in the COP sample yield noticeable differences. In each seriousness group males have higher lifetime participation than females, except administrative offences (93 percent vs. 100 percent) and serious drug offences (46 percent vs. 58 percent). In some seriousness groups the difference is large. Males have a higher lifetime participation in less serious drug offences (72 percent vs. 53 percent), serious other (62 percent vs. 47 percent) and less serious other offences (81 percent vs. 53 percent), weapons offences (39 percent vs. 11 percent), serious property offences (80 percent vs. 26 percent) and serious violent offences (53 percent vs. 32 percent). Consistent with past research on male and female participation, the difference between the participation for males and females is not as large in less serious property offences (96 percent vs. 90 percent). It is important to note that the participation for males and females differs between crime type groups, but female participation in both less serious and serious violence is high at 47 percent and 32 percent, respectively. Moreover, the difference between males and females is reduced further if participation in any type of serious conviction is considered. The data in Table 6.3 show that 94 percent of males and 84 percent of females have one or more serious convictions in their lifetime.

Table 6.4 presents the average number of lifetime convictions for COP offenders separated by levels of seriousness. For tables that show the lifetime average numbers of convictions of COP offenders for more specific crime types within each seriousness group refer to Appendix B. Consistent with past research, the table shows that there is a positive skew in the distribution of lifetime conviction counts. The sample mean for lifetime conviction counts is larger than the median for every seriousness group and for total convictions. At least twenty-five percent of the sample had no recorded convictions for less serious and serious drug offences, serious other offences, weapons offences, serious property offences, less serious and serious violent offences.

Table 6.4 shows the high frequency of COP offenders in their lifetimes. An examination of all conviction types indicates that COP offenders accrue a mean of 47.67 convictions (s = 31.3, median = 41) to 2006. Moreover the top 25th percentile of the sample has 63.5 or more convictions. When administrative convictions are removed from the analysis the sample has a mean of 39.45 convictions (s = 31.30, median = 33.00) and the top 25th percentile of the sample has 52.75 non-administrative convictions or more to 2006. It is apparent that total convictions in the criminal careers of the COP sample are dominated by less serious offences. When only serious offences are considered the mean number of lifetime convictions for the COP sample drops to 11.50 (s = 10.24, median = 8.00). However, the top 25th percentile of the sample has 18.75 serious convictions or more during their lifetime.

Table 6.4: Lifetime Average Number of Convictions for the COP Offenders (N=152).

Conviction Type	*Mean (SD)*	*Median*	*25th Percentile*	*75th Percentile*
Administrative Offences	8.22 (6.76)	6.00	3.00	11.75
Less Serious Other Offences	3.68 (4.22)	2.00	1.00	5.00
Less Serious Drug Offences	2.38 (3.01)	1.00	0	3.00
Less Serious Property Offences	19.82 (20.87)	13.00	6.00	26.75
Theft Under	17.30 (18.40)	11.00	5.00	23.00
Less Serious Violent Offences	2.07 (3.77)	1.00	0	2.75
Serious Other Offences	1.22 (1.64)	1.00	0	2.00
Serious Drug Offences	1.80 (2.92)	0	0	3.00
Weapons Offences	0.49 (0.81)	0	0	1.00
Serious Property Offences	6.38 (7.57)	4.00	0	10.00
Break and Enter	3.97 (6.05)	2.00	0	5.00
Serious Violent Offences	1.62 (2.72)	0.50	0	2.00
Robbery	0.99 (2.23)	0	0	1.00
Assault Level II	0.51 (1.26)	0	0	1.00
All Convictions	47.67 (31.30)	41.00	25.00	63.50
All Convictions Not Including Administrative Offences	39.45 (27.70)	33.00	19.00	52.75
Serious Convictions Only	11.50 (10.24)	8.00	3.00	18.75

As mentioned above, the total conviction counts in the sample are dominated by less serious offences shown in Table 6.4. A more detailed examination of the seriousness groups provides insight into the counts for specific crime types over the lifetime of offenders in the sample. Administrative offences are a large share of the total counts as the sample has a mean of 8.22 convictions (s = 6.76, median = 6). The COP offenders are aptly termed property offenders in that they have a mean of

19.82 less serious (s = 20.87, median = 13) and 6.38 serious (s = 7.57, median = 4) property convictions. Although less frequent in the sample, the COP offenders are involved in drug related crime. The sample mean count for less serious drug convictions is 2.38 (s = 3.01, median = 1) and the mean for serious drug convictions is 1.80 (s = 2.92, median = 0). The sample has means of 3.68 (s = 4.22 median = 2) and 1.22 (s = 1.64, median = 1) for less serious and serious other crimes, respectively. The least voluminous crime type in the sample overall is weapons convictions with a mean of 0.49 (s = 0.81, median = 0). However, the sample exhibits a proclivity for violent offending. The sample mean for less serious violent convictions is 2.07 (s = 3.77, median = 1), while the mean for serious violent offences is 1.62 (s = 2.72, median 0.50).

Table 6.5 presents the sample means of lifetime conviction counts for males and female COP offenders. The table shows the means for males and females for each seriousness group and the ratio of the means between males and females. Inspection of this table shows that males as a group have higher lifetime mean conviction counts than females for most types of convictions. This is the case for less serious other offences (3.9:1), less serious violent offences (2.2:1), serious other offences (2.1:1), weapons offences (4.9:1), serious property offences (7.1:1) and serious violent offences (2.4:1), especially assault level II (2.6:1) offences. In contrast, there are conviction types in which the ratio between males and females is close to 1. Not surprisingly, the ratio for administrative offences (1.3:1) and less serious drug offences (1.5:1) are close to one. In the case of serious drug offences the sample means are the same (1:1), and females marginally surpass males in the case of less serious property offences (0.9:1).

Table 6.5: Lifetime Average Number of Convictions for the Male and Female COP Offenders (N=152).

Conviction Type	*Males (N = 133)*	*Females (N = 19)*	*Ratio*
Administrative Offences	8.46	6.53	1.3:1
Less Serious Other Offences	4.06	1.05	3.9:1
Less Serious Drug Offences	2.48	1.68	1.5:1
Less Serious Property Offences	19.47	22.32	0.9:1
Theft Under	17.30	11.00	1.6:1
Less Serious Violent Offences	2.22	1.00	2.2:1
Serious Other Offences	1.31	0.63	2.1:1
Serious Drug Offences	1.80	1.74	1:1
Weapons Offences	0.54	0.11	4.9:1
Serious Property Offences	7.14	1.00	7.1:1
Break and Enter	4.44	.68	6.5:1
Serious Violent Offences	1.74	0.74	2.4:1
Robbery	1.06	.53	2:1
Assault Level II	.55	.21	2.6:1
All Convictions	49.23	36.79	1.3:1 (n.s.)
All Convictions Not Including Administrative Offences	40.77	30.26	1.3:1 (n.s.)
Serious Convictions Only	12.54	4.21	3:1***

Given that females are a much smaller set of the COP sample than males it is hard to draw statistical conclusions about the impact of that group division on lifetime conviction counts for any of the seriousness groups. However, it is possible to examine the group means for total convictions, total convictions excluding administrative offences and serious convictions. Males in the COP sample have a mean of 49.23 total convictions, while females have a mean of 36.79 total convictions producing a ratio of 1.3:1. For conviction totals that do not include administrative offences, the sample means decrease to 40.77 for males and 30.26 for

females and the ratio between males and females remains 1.3:1. However, the difference in the lifetime counts for males and females is more pronounced in the serious conviction totals. Males in the COP sample have a mean of 12.54 serious convictions as compared to females with a mean of 4.21: a ratio of 3:1.

In order to test whether these differences in group averages are statistically significant the Mann-Whitney U test is performed. This is necessary because the lifetime conviction count data are positively skewed and the large group size disparity between males (N = 133) and females (N = 19). The analysis shows that males and females do not have a statistically significant difference in medians (Z = -1.61, p = n.s.) for total convictions. In addition, males and females do not have a statistically significant difference in medians (Z = -1.69, p = n.s.) for convictions that do not include administrative offences. However, the analysis shows that males and females have a statistically significant difference in medians (Z =-3.80, p < 0.001) for serious convictions.[29] While they do not accrue more total convictions, this suggests that over the lifetime males accrue more serious convictions than females.

Table 6.6 describes the median age of onset[30] for convictions in the COP sample for offenders who participate in each seriousness group in their lifetime and the type of first conviction for sample members. The results indicate that when recorded convictions are used to estimate age of onset the sample is comprised of many late-starters. The median age of onset of the sample for total convictions including and excluding administrative offences is 18 years. The offenders (N = 141) who are convicted of a serious offence have a median age of onset of 19 years. The analysis of specific seriousness groups yields greater age of onset estimates.

[29]The Mann-Whitney U test is used here because of the non-normal distribution of the conviction counts variable. It is limited in that it commonly does not detect true differences between groups. As a result, independent sample t-tests were performed in conjunction with the non-parametric test reported in this dissertation. In each case there was a statistically significant difference between males and females.

[30] This table should be interpreted with caution because of the process by which convictions are reported and the method in which convictions are maintained in CPIC. Research has shown that in general convictions are not ideal offence indicators for age of onset estimates because self reported offending occurs much earlier than does a conviction. Some authors have suggested that this is due to a differential application of discretion in various stages of the justice process applied to youth. In addition, the process of processing people though the justice system often takes a substantial amount of time.

The median age of onset for serious property offences is the lowest at 19, while less serious property offences have a median of 20 years. Less serious and serious other offences have the next highest ages of onset at 21.5 and 22 years, respectively. Less serious and serious violent offences have slightly higher median ages of onset at 22 years. However, the age of onset of robbery is lower at 21 years, while assault level II is higher at 26 years. Both less serious and serious drug offences have high age of onset estimates at 23.5 years and 24 years, respectively. The second highest age of onset estimate of 25 years is found in the weapons category.

Table 6.6: Median Age of Onset and Type of First Conviction for COP Offenders (N=152).

	Age of Onset		*Type of 1st Conviction*	
Conviction Type	***N***	***Median Age of Onset***	***N***	***Percent***
Administrative Offences	142	24	5	3.3
Less Serious Other Offences	118	21.5	10	6.6
Less Serious Drug Offences	106	23.5	13	8.6
Less Serious Property Offences	145	20	54	35.5
Theft Under	145	20	37	24.3
Less Serious Violent Offences	92	22	8	5.3
Serious Other Offences	83	22	6	3.9
Serious Drug Offences	72	24	8	5.3
Weapons Offences	51	25	0	0
Serious Property Offences	111	19	38	25.0
Break and Enter	97	20	21	13.8
Serious Violent Offences	76	22	10	6.6
Robbery	57	21	6	3.9
Assault Level II	41	26	2	1.3
All Convictions	152	18		
All Convictions Not Including Administrative Offences	141	19		
Serious Convictions Only	152	18		

The last two columns in Table 6.6 examine the type of first conviction for each member of the sample. The results indicate that most of the COP sample is initially convicted of a property offence. Approximately 36 percent of the sample is initially convicted of a less serious theft offence. The vast majority of the initial convictions are for theft under $5,000 (24.3 percent). However, one quarter of the sample start their conviction careers with a serious property offence, most of which are for a break and enter (13.8 percent). Approximately 9 percent are first convicted of a less serious drug offence and 5 percent are convicted of a serious drug offence. A small portion of the sample begins their conviction careers with a less serious violent offence (5.3 percent), while a slightly larger portion of the sample begins their careers with a serious violent offence (6.6 percent). Most of the COP sample who begin their careers with serious violence are convicted of a robbery (3.9 percent) or an assault level II (1.3 percent).

A further analysis of age and crime is presented in Figures 6.1 to 6.3. These figures display conviction counts for the sample in each age year. The figures illustrate the results for conviction seriousness (total convictions, convictions not including administrative offences, less serious convictions and serious convictions) and for crime groups (property, violent, drugs and other) for all sample members who reached age 30 (N = 124) and age 40 (N = 51) by 2006. For additional age-crime curve graphs that focus on more age cut points (age 35 and age 45) and different offence groups (serious convictions, other, drug and violent offences) refer to Appendix B.

Figure 6.1 displays age and conviction counts according to seriousness to age 30 for the COP sample. This graph shows that, unlike general population samples, convictions for COP offenders increase to age 30. This finding holds when administrative convictions are removed. This negates the notion that the conviction profile of these offenders is dominated by justice system related offences, such as a failure to observe court rules (i.e., failing to appear) or to adhere to past sentences (i.e., failing to comply with a probation order). It is apparent that age 19 is the first peak in conviction counts for all groups of convictions. Less serious conviction counts and total conviction counts have the highest peak at age 29 and 30. In

contrast, serious conviction counts peak at age 18 and decrease thereafter, but remain relatively stable from age 23 through 30.

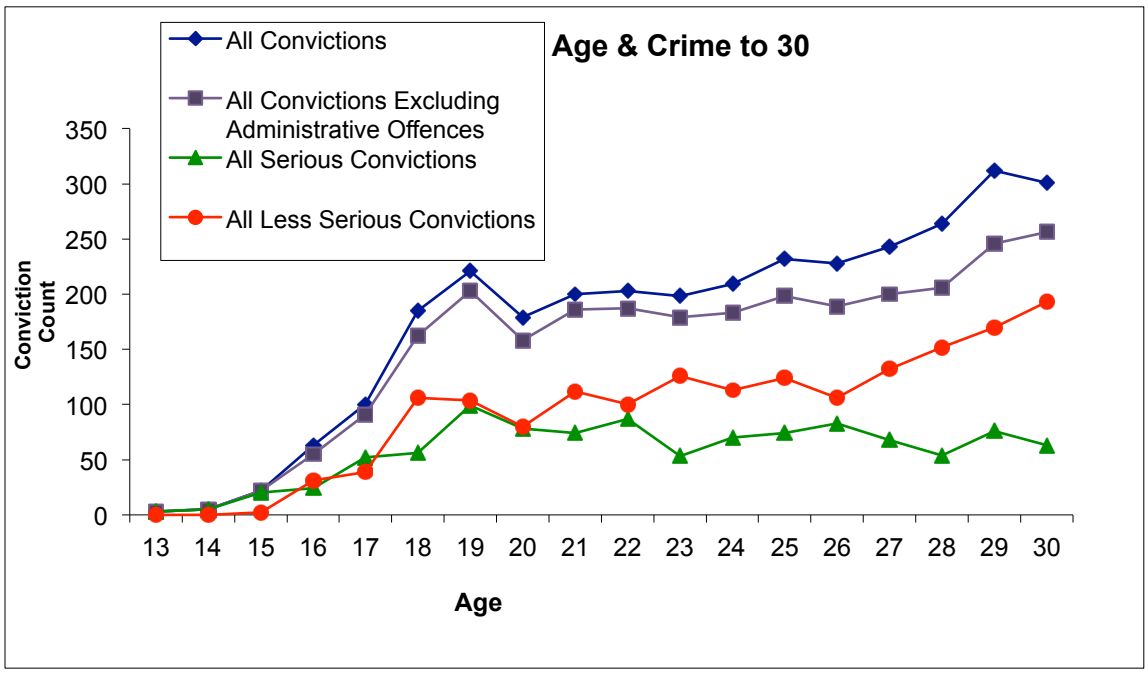


Figure 6.1: Age-crime curves for COP offenders who are 30 years of age or more for all convictions, convictions not including administrative offences, serious convictions and less serious convictions (N =124).

Figure 6.2 displays age and conviction counts to age 30 according to crime types (other, drug, property and violent) for the COP sample. Similar to Figure 6.1, property offences peak at age 19. The counts in each age year remain stable for property offences until they increase to their largest peak at age 30. Other offences peak at age 19 and remain stable to age 30, while violent offences peak at age 21 and remain relatively stable to age 30. Moreover, this pattern of relative stability is observed with drug offences, which have small peaks at ages 19, 22, 24 and 28, but show a pattern of relative stability to age 30.

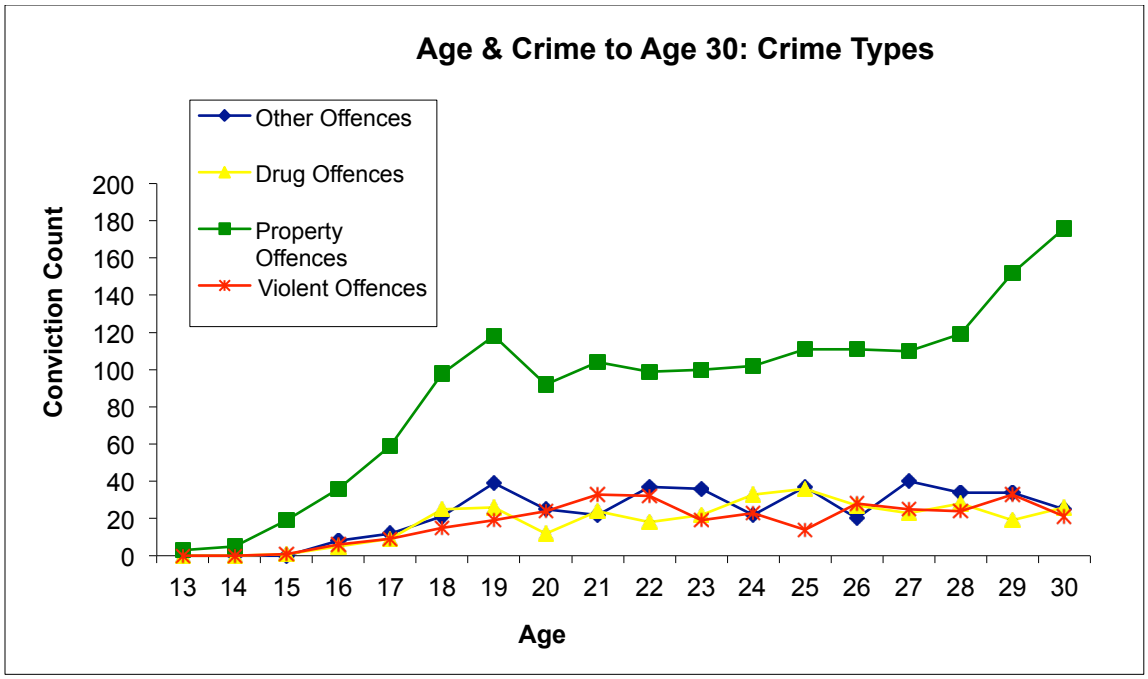
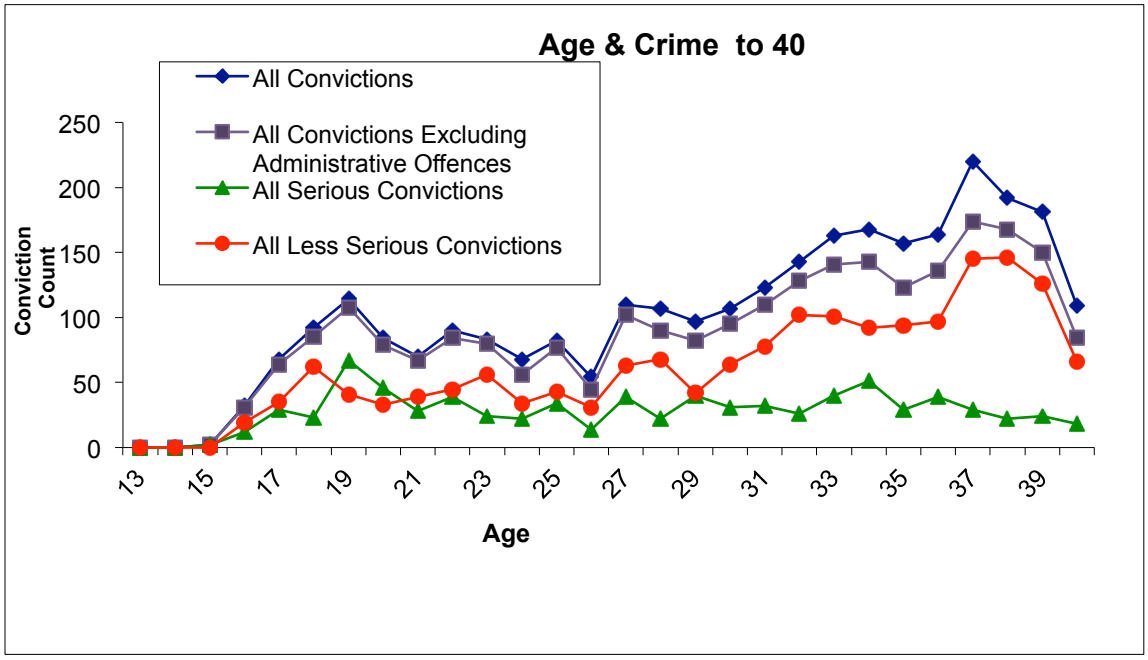


Figure 6.2: Age-crime curves for COP offenders who are 30 years of age or more for all other convictions, drug convictions, property and violent convictions (N=124).

Figures 6.1 and 6.2 are notable because the typical age-crime curve, where offending peaks in the late teen years and young adulthood (early 20s) and declines substantially thereafter, is not observed. Although the late teen peaks are observed in the COP sample to age 30, they are not the highest peak ages of offending in the series. Moreover, certain conviction counts in later years exhibit stability, which is the case for other, drug and violent offences. In contrast to the typical age-crime curve, the series shows that property conviction counts increase into adulthood. When offending is grouped according to seriousness, convictions increase past the peak ages in the late teens reported in general offending samples to age 30, while serious convictions show a slight decreasing trend past age 23 that is relatively stable thereafter. This seems to suggest that the relationship between age and offending asserted by Gottfredson and Hirschi (1990) is not supported in the offending patterns of the COP sample. These findings do offer some partial support for the assertions of Moffitt (1993; Piquero & Moffitt, 2005) on two populations of offenders that comprise the age-crime curve; the life course persistent offenders who offend at a stable rate into adulthood. The offending patterns support the

notion that the COP sample shows relative stability into adulthood for serious offending, drug, other and violent offences. In contrast, property offences and as a result total convictions rise dramatically in the COP sample after early adulthood.

Figures 6.3 and 6.4 take the analysis of age and crime a step further. These figures show the age-crime curves for all members of the sample that reached age 40. Recall that 51 members of the COP sample are 40 years or older in 2006.[31] Overall, these two graphs are similar to Figures 6.1 and 6.2 to age 30. However, Figure 6.3 shows that total convictions, total convictions that exclude administrative offences and less serious convictions continue to increase past age 30 to a peak at 37. The increasing trend does not decline substantially until age 40. Moreover, serious offences in the COP sample remain stable until age 34 and decline slightly from age 35 to 40. Figure 6.4 shows that property offending increases to age 37 and declines to age 40. However, the level of property convictions at age 40 is very close to the total property convictions observed at age 18. Drug offending remains relatively stable from age 30 to 40, while other offences increase past age 30 and only start to decline at age 38. In contrast, violent offending decreases slightly after age 30, but remains stable to age 40.



[31] The data did not allow for a test of offending post age 40 because there were not enough offenders over age 40 in the sample.

Figure 6.3: Age-crime curves for COP offenders who are 40 years of age or more for all convictions, convictions not including administrative offences, serious convictions and less serious convictions (N=51) .

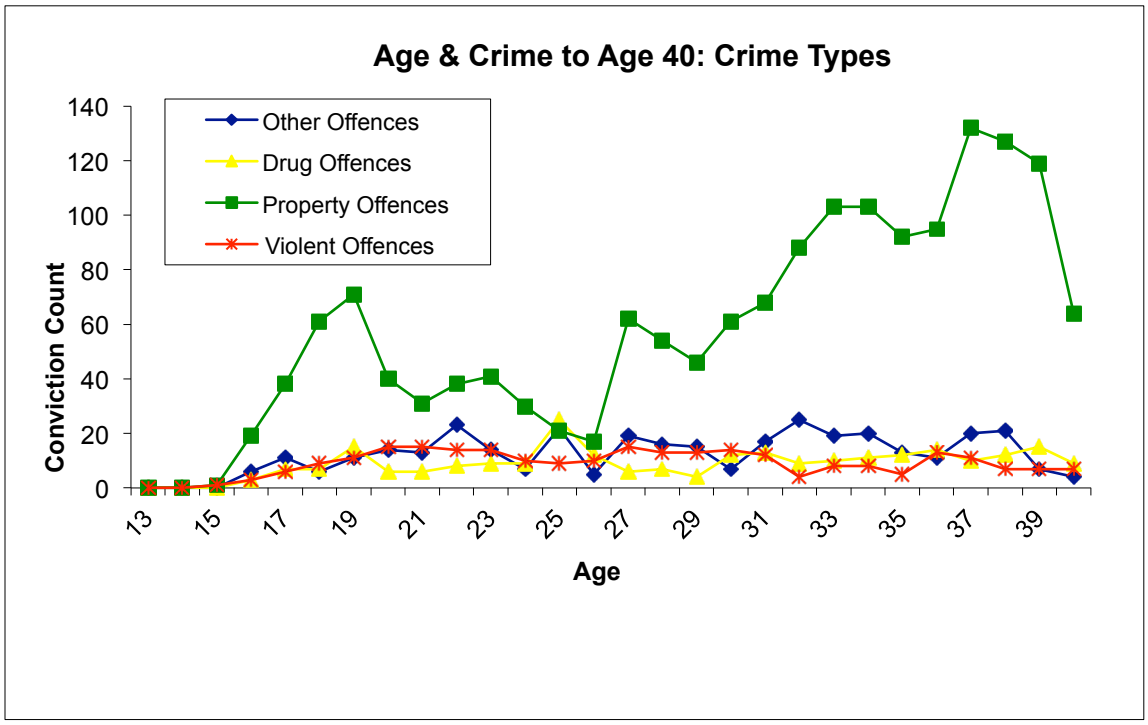


Figure 6.4: Age-crime curves for COP offenders who are 40 years of age or more for all other convictions, drug convictions, property and violent convictions (N=51).

The age-crime curves to age do not support the assertions of Gottfredson and Hirschi (1990) on the invariance of the age-crime curve derived from general population samples. In contrast, the age-crime curves presented here seem to support the findings of Laub and Sampson (2003). Their analysis shows a trend towards desistance after age 30, and that high and moderate rate chronic offenders delay their movement towards desistance until 40 years of age. Figures 6.1 to 6.4 provide limited support for the assertions of Moffitt (1993) because there is some evidence of stability for certain crime types between certain age intervals. However, there is a slight decreasing trend for serious offending as the COP sample nears age 40 and a more substantial drop in the same period for total offending and less serious offending.

The last set of analyses in this chapter test the hypothesis that age of onset is negatively associated with offending frequency. In order to test this hypothesis a series of negative binominal regressions are estimated. The negative binominal regression is used because the predicted variable is a count variable that exhibits overdispersion. The predictors tested in each model are: gender, ethnicity, presence of a mental disorder, age of onset, drug and/or alcohol addiction and the presence of violence. Three models are estimated to predict total convictions, total convictions excluding administrative offences and serious convictions and they include criminal career length as an exposure variable (see Table 6.7).

The results of the negative binominal regressions predicting lifetime counts of convictions (model 1) and counts of convictions excluding administrative offences (model 2) indicate that age of onset and ethnicity are statistically significant predictors for total convictions while age of onset and residential instability are significant predictors of convictions excluding administrative offences. For total convictions the change in expected log count for a one-unit increase in age of onset is 0.023, while the non-Caucasian offenders have an expected log count 0.217 higher than Caucasian offenders. Similarly, the model predicting convictions excluding administrative offences shows that the change in the expected log count for a one-unit increase in age of onset is 0.027, while the change in the expected log count for a one-unit increase in residential instability is 0.046.

In contrast, the results of the negative binominal regression predicting serious conviction counts (model 3) indicate that gender, ethnicity and age of onset are statistically significant. The female status decreases the expected log count serious convictions by -0.660 as compared to males. Non-Caucasian offenders have an expected log count 0.326 more than Caucasian offenders. The expected change in log count of serious convictions for a one-unit increase in age of onset is -0.052.

Table 6.7: Negative Binomial Regressions for Convictions Counts with Criminal Career Length as an Offset Variable

Explanatory Variables	*Model 1*	*Model 2*	*Model 3*
	Total Convictions	*Total Convictions excluding Administrative*	*Total Serious Convictions*
Intercept	0.319 (0.305)	0.028 (0.303)	-0.049 (0.489)
Gender (Female = 1)	-0.018 (0.148)	-0.078 (0.147)	**-0.660 (0.245)****
Ethnicity (Non-White = 1)	**0.217 (0.109)***	0.200 (0.108)	**0.326 (0.161)***
Mental Disorder (Yes = 1)	0.126 (0.109)	0.139 (0.107)	-0.069 (0.162)
Criminal Career Variables			
Age of Onset	**0.023 (0.011)***	**0.027 (0.011)***	**-0.052 (0.019)****
Other Lambda Covariates			
Drugs/Alcohol (1 = Yes)	-0.065 (0.132)	-0.096 (0.131)	0.201 (0.201)
Violence (1 = Yes)	0.149 (0.112)	0.135 (0.111)	0.196 (0.167)
Residential Instability[32]	0.032 (0.022)	**0.046 (0.022)***	0.051 (0.032)
Provinces Convicted	0.019 (0.048)	0.025 (0.047)	-0.037 (0.072)
Criminal Associates	0.001 (0.003)	-0.002 (0.033)	0.009 (0.005)
Dispersion	0.252 (0.033)	0.247 (0.033)	0.440 (0.076)
Deviance (DF)	154.534 (139)	153.247 (139)	171.454 (139)
Log Likelihood	-666.729	-634.152	-475.930

* P < 0.05
** P < 0.01
*** P < 0.001

The results of these models prompts a rejection of the hypothesis that age of onset is negatively associated with conviction counts for the COP sample in all three models. Moreover, the predictor variables for models of conviction counts that include or exclude administrative offences, and serious convictions are different.

[32]In these analyses the residential instability variable is the number of separate times the police recorded the offender with a new home address.

Summary and Conclusions

This chapter summarizes the background characteristics and criminal career parameters of a sample of offenders under the supervision of the Chronic Offender Program at the Vancouver Police Department. The background characteristics reveal that the offenders are older (median age of 36), they are predominantly male (87.5 percent), they have high levels of residential instability and drug and/or alcohol addiction (84.9 percent). Taken together the results seem to indicate that the offenders experience high levels of instability. A note of caution is warranted with regard to the background variables. The data were coded from the records management system at the VPD. This system stores data for police operations and the data it contains is not always ideal for research purposes. In certain instances this means that the data lacks detail. For example, the variable presence or absence of drug and/or alcohol addiction lacks specificity.

The analysis of the criminal career parameters suggests that the COP offenders are entrenched in a criminal lifestyle. The offenders in this sample have long average criminal careers (median length is 16.3 years) and high levels of participation in each seriousness group. Moreover, the offenders have high average lifetime conviction counts (mean of 47.67) and high average lifetime conviction counts for serious offences (mean of 11.50). The average counts are dominated by property offending. Moreover, there is a significant amount of serious offending, including serious property and violent offences within a larger volume of less serious offending. This is not surprising given that the ratio of serious to non-serious offending in official reported crime statistics indicates that less serious offending is more prevalent than serious offending. The average age of onset in this sample is high with median of 18. This result should be viewed with caution as research has demonstrated that convictions tend to occur long after a first self reported offence (see Piquero et al., 2007), and it is possible, however unlikely, that a conviction that occurred under the age of 18 was purged from CPIC.

The analysis of gender yields results that differ from the sample as a whole. Males and females differ on the levels of participation in various offence types.

Females, as compared to males, are less likely to participate in most offence types, especially in serious property offending. However, females participate in similar levels of serious violence and surpass males in serious drug offences. In addition, males and females have similar average lifetime conviction counts (ratio of 1.3:1), but not serious conviction counts (ratio of 3:1). It is interesting to note that males and females have different average counts in specific crime types. This is most apparent in serious offending. Although, the combined count is similar, the crime types that compose the counts are different.

The analysis in this chapter tests two hypotheses from past life course research. The first is a test of the invariant age and crime thesis of Gottfredson and Hirschi (see Gottfredson & Hirschi, 1990; Hirschi & Gottfredson, 1983) that views the maturation effect as the cause of the precipitous decline in offending in mid-adulthood. The data reveal that the invariance of the age-crime curve does not apply to this sample. These offenders continue a relatively steady conviction count to age 40. The data show that there is some decline in serious offending to age 40. The data seem to provide some support for the assertions of Moffitt (1993) on a two-population model with a relatively stable level of convictions for the life course persister sub-population. In addition, the data provide some support to the research of Laub and Sampson (2003), who found that high and moderate rate chronics offended at a high frequency until 40 and then began to steadily desist. The data does not allow for a test of offending post age 40 because there are not enough offenders over age 40 in the sample.

The second hypothesis tests whether age of onset is negatively associated with lifetime conviction counts. Negative binomial regression models are estimated to test the effect of age of onset and additional covariates, such as drug and/or alcohol addiction and residential instability on all convictions, convictions excluding administrative offences and serious convictions. The null hypothesis is accepted in each model of conviction counts, except for serious convictions because age of onset is significant and positively associated with each conviction type. Moreover, none of the additional covariates are significantly related to counts of total convictions except ethnicity. For convictions excluding administrative offences residential

instability was related to expected counts. The model for serious convictions shows that gender, age of onset and ethnicity are significantly associated with serious conviction counts. These findings do not support either the assertions of Gottfredson and Hirschi (1990) or Moffitt (1993).

Chapter 7: Results for Criminal Lambda

The preceding chapter focused attention on the characteristics of the sample and specific parameters of criminal careers. This chapter focuses on an analysis of the individual level parameter criminal lambda (λ). Lambda is the individual offending frequency of active offenders over defined time periods in one or more offence types. This measure is commonly analysed without regard to time available for offending (i.e., free time). The purpose of this chapter is to describe the profile of free time for COP offenders during their criminal careers (i.e., periods of activity). The next series of analyses focus on a comparison of individual lambda estimates that exclude free time and include free time. Recall from Chapter 5 that there are three estimates of lambda analysed in this chapter. The first is λ_{CL} which is the lambda estimate that incorporates criminal career length in the denominator. The second is $\lambda_{2/3}$ which is the lambda estimate that subtracts incarceration time from criminal career length in the denominator. In addition, it adjusts the provincial custody portion of the incapacitation time to two-thirds the original provincial sentence total. The third is λ_{100} which is the lambda estimate that subtracts total incapacitation time from criminal career length in the denominator. The section continues by assessing the predictive value of criminal career covariates with respect to lambda estimates with and without free time. The last section assesses the stability of lambda estimates of the COP sample over the life course.

Table 7.1 describes lifetime incapacitation time estimates for the COP sample. The study examines both time spent in pre-custody (i.e., remand) and sentenced custody time separately because pre-sentence custody is served in full, while sentenced custody time is in most cases adjusted by early release in both provincial and federal facilities. In the event that COP offenders served federal time, early release (parole) adjustments are calculated.

Table 7.1: Life Course Incapacitation Metrics for COP Offenders (N=152).

Incapacitation Time Metrics	*Mean (S.D.)*	*Median*	*25th Percentile*	*75th Percentile*
Remand Time (in Days)	179.12 (191.83)	120.00	54.00	268.00
Custody Time (in Days)	1920.03 (2242.42)	1018.50	296.25	2869.25
Parole Adjustments (in Days)	-39.52 (164.39)	0	0	0
Total Incapacitation Time (Days)	2059.63 (2192.32)	1169.50	414.75	3190.50
Total Incapacitation Time (YRS)	5.64 (6.00)	3.20	1.14	8.74
Street Time (YRS)	11.63 (6.96)	10.50	6.63	15.15

Table 7.1 shows that on average COP offenders spent a great deal of time in custodial facilities during their lifetimes. The sample has a mean of 179.12 days served in remand (*s* = 191.83, median = 120) and that the top 25th percentile of the sample served 268 days or more. The analysis indicates that the COP sample has a mean of 1920.03 days in custody with the top 25th percentile sentenced to 2869.25 days or more during their criminal careers. The federal parole adjustments for the COP sample are small because the custodial time is reduced by an average of 39.52 days (*s* = 164.39, median = 0), which indicates that most of the COP offenders have few federal sentences in their conviction histories. The combination of the incapacitation metrics creates a mean total incapacitation time for the COP sample of 2059.63 days (*s* = 2192.32, median = 1169.50) with the top 25th percentile having 3190.50 days or more of incapacitation time. Using years as the unit of time, the number reduces to a mean of 5.64 years (*s* = 6, median 3.2) of incapacitation time for COP offenders. Moreover, the bottom 25th percentile of the sample has 1.14 years or less of incapacitation time, while the top 25th percentile of the sample has

8.74 years or more of total incapacitation time. Total incapacitation time must be adjusted against the criminal career lengths of the COP offenders. The street time variable is computed for individuals by subtracting their incapacitation time from the criminal career length. The average amount of street time available for the COP offenders to accrue their convictions is 11.63 years (s = 6.96, median = 10.50) with the top 25th percentile having 15.15 years or more.

Tables 7.2 to 7.4 show descriptive statistics for sample estimates of lambda using different estimates for incapacitation time in the criminal careers of the offenders. This analysis is performed on total convictions, convictions that do not include administrative offences and serious convictions. Recall that lambda, in this study, refers to the yearly individual conviction frequencies of active offenders. Lambda is an individual level estimate, although the descriptive statistics in these tables are shown for the sample as a whole. In order to be included in an estimate for a specific conviction type the offender must have participated in that crime type at some point in their criminal career (i.e., zeros are excluded). For participation rates please refer to Table 6.3 in Chapter 6.

Table 7.2 provides descriptive statistics on lambda estimates that do not adjust for any street time (λ_{CL}) for offenders active in each conviction type. The notable finding in this table is that COP offenders have a high λ_{CL} of 3.07 (s = 1.83, median = 2.74) with the top 25th percentile having 3.78 or more convictions per year. The average λ_{CL} drops noticeably when administrative convictions are removed from the analysis to 2.48 (s = 1.55, median = 2.16) with the top 25th percentile having 3.08 convictions or more per active year. There is a significant drop in λ_{CL} estimates for serious convictions. The average λ_{CL} for serious convictions is 0.72 (s = 0.50, median = 0.62) with the top 25th percentile of the sample having 1.01 or more serious convictions per active year.

Table 7.2: Conviction Frequency per Year of Activity (No Incapacitation Time Adjustment) for COP Offenders (N=152) Active in Each Seriousness Group.

Conviction Type	*Mean (SD)*	*Median*	*25th Percentile*	*75th Percentile*
Administrative Offences	0.63 (0.56)	0.45	0.24	0.80
Less Serious Other Offences	0.28 (0.27)	0.20	0.12	0.36
Less Serious Drug Offences	0.24 (0.41)	0.15	0.09	0.25
Less Serious Property Offences	1.36 (1.40)	0.99	0.48	1.69
Theft Under	1.21 (1.36)	0.77	0.38	1.49
Less Serious Violent Offences	0.21 (0.24)	0.13	0.07	0.27
Serious Other Offences	0.11 (0.09)	0.09	0.06	0.14
Serious Drug Offences	0.28 (0.31)	0.16	0.09	0.38
Weapons Offences	0.09 (0.05)	0.07	0.05	0.11
Serious Property Offences	0.48 (0.42)	0.39	0.18	0.59
Break and Enter	0.32 (0.35)	0.20	0.11	0.44
Serious Violent Offences	0.19 (0.18)	0.12	0.07	0.27
Robbery	0.16 (0.18)	0.10	0.06	0.20
Assault Level II	0.11 (0.10)	0.08	0.05	0.14
All Convictions	3.07 (1.83)	2.74	1.82	3.78
All Convictions Not Including Administrative Offences	2.48 (1.55)	2.16	1.52	3.08
Serious Convictions Only	0.72 (0.50)	0.62	0.30	1.01

Table 7.2 provides details on the λ_{CL} estimates for conviction types grouped by seriousness for the COP sample. For tables that show the lifetime λ_{CL} estimates of COP offenders for more specific crime types within each seriousness group refer to Appendix B. The highest λ_{CL} estimates are found in less serious property convictions. COP offenders are convicted of a yearly mean of 1.36 less serious property offences (s = 1.40, median = 0.99), which is driven by the theft under

$5,000 category with a mean of 1.21 (s = 1.36, median = 0.77). The next highest mean λ_{CL} estimates are found within the administrative conviction category with 0.63 (s = 0.56, median = 0.45) convictions per active year. This result is not surprising given the extensive involvement of the COP offenders in the criminal justice system. The third highest λ_{CL} estimates are found in the serious property convictions category. Serious property offenders are convicted of an average of 0.48 (s = 0.42, median = 0.39) serious property offences per active year, and the top 25th percentile are convicted of 0.59 offences per year. Break and enter offenders are convicted of 0.32 (s = 0.35, median = 0.20) offences per active year.

Offenders active in other offence types have lower average λ_{CL} estimates than in the crime types noted above. Active offenders convicted of less serious other offences (mean = 0.28), less serious drug offences (mean = 0.24), serious drug offences (mean = 0.28), serious other offences (mean = 0.11) and weapons offences (mean = 0.09) have lambdas that range from 0.09 to 0.28 convictions per year of criminal activity. Interestingly, offenders who commit violent crimes do not have the lowest λ_{CL} estimates in either the less serious (mean = 0.21) or serious categories (mean = 0.19) of violence. This seems to indicate that within the COP sample there are sub-groups of offenders who are convicted more frequently of serious crimes, including crimes of violence.

Table 7.3 shows lambda estimates that incorporate adjusted (i.e., two-thirds of sentenced provincial custody time) incapacitation time in the denominator of the equation ($\lambda_{2/3}$). The adjustment is applied only to provincial sentences to account for early release. For tables that show the lifetime $\lambda_{2/3}$ estimates of COP offenders for more specific crime types within each seriousness group refer to Appendix B. In essence, the results in Table 7.3 mirror those of Table 7.2, except that on average the absolute values of the $\lambda_{2/3}$ estimates are greater than the λ_{CL} estimates in Table 7.2. The highest $\lambda_{2/3}$ estimates in Table 7.3 are found in the less serious property conviction type. COP offenders are convicted of a yearly mean of 1.92 (s = 2.77, median = 1.33) less serious property offences, the highest concentration of which

are in the theft under $5,000 category which has a mean of 1.21 (*s* = 1.36, median = 0.77). Similar to Table 7.2, the next highest sample mean $\lambda_{2/3}$ estimates are found in the administrative convictions category with a mean of 0.85 (*s* = 0.83, median = 0.59). However, these are trailed only marginally by the serious property conviction category. Serious property offenders are convicted an average of 0.75 (*s* = 0.86, median = 0.53) offences per active year, with the top 25th percentile convicted of 0.92 offences per year. Break and enter offenders are convicted of 0.51 (*s* = 0.71, median = 0.28) offences per active year.

Table 7.3: Conviction Frequency per Year of Activity with a Two-Thirds Incapacitation Time Adjustment for COP Offenders (N=152) Active in Each Seriousness Group.

Conviction Type	*Mean (SD)*	*Median*	*25th Percentile*	*75th Percentile*
Administrative Offences	0.85 (0.83)	0.59	0.30	1.13
Less Serious Other Offences	0.39 (0.40)	0.26	0.15	0.45
Less Serious Drug Offences	0.32 (0.54)	0.21	0.10	0.34
Less Serious Property Offences	1.92 (2.77)	1.33	0.63	2.78
Theft Under	1.71 (2.73)	1.10	0.51	1.86
Less Serious Violent Offences	0.28 (0.35)	0.18	0.09	0.31
Serious Other Offences	0.18 (0.21)	0.13	0.07	0.17
Serious Drug Offences	0.38 (0.43)	0.21	0.13	0.50
Weapons Offences	0.12 (0.08)	0.09	0.07	0.16
Serious Property Offences	0.75 (0.86)	0.53	0.23	0.92
Break and Enter	0.51 (0.71)	0.28	0.14	0.61
Serious Violent Offences	0.31 (0.39)	0.17	0.08	0.38
Robbery	0.28 (0.41)	0.16	0.08	0.33
Assault Level II	0.15 (0.15)	0.09	0.06	0.19
All Convictions	4.43 (3.59)	3.76	2.06	5.48
All Convictions Not Including Administrative Offences	3.55 (3.13)	2.85	1.72	4.36
Serious Convictions Only	1.10 (1.05)	0.79	0.36	1.54

Offenders active in other offence types have lower average $\lambda_{2/3}$ estimates than in the crime types noted above. All these seriousness group $\lambda_{2/3}$ estimates are within the range of the estimates in Tables 7.2 and 7.4. However, the rank order of the $\lambda_{2/3}$ estimates for the seriousness groups changed. Active offenders in less serious other offences (mean = 0.39), less serious drug offences (mean = 0.32),

serious drug offences (mean = 0.38), serious other offences (mean = 0.18) and weapons offences (mean = 0.12) have average $\lambda_{2/3}$ estimates that are similar to Tables 7.2 and 7.4. Consistent with Table 7.2, mean $\lambda_{2/3}$ estimates for violence are not the lowest sample estimates. The offenders convicted of less serious violent offences have a mean $\lambda_{2/3}$ of 0.35 (s = 0.46, median = 0.22) convictions per year. Furthermore, offenders convicted of serious violence did so more frequently than offenders involved in less serious violence with a mean $\lambda_{2/3}$ of 0.47 (s = 1.19, median = 0.18).

Table 7.4 provides descriptive statistics on the estimates that incorporate one hundred percent of sentenced time for the COP offenders, including noted parole adjustments,[33] in the calculation of available street time (λ_{100}). The resultant λ_{100} estimates are notably higher in all cases. When all conviction types are considered together the average λ_{100} estimate is 5.32 (s = 4.36, median = 4.12) convictions per active year with the top 25th percentile having 6.68 convictions or more. The mean λ_{100} estimates drop when administrative offences are excluded to 4.38 (s = 3.82, median = 3.21) convictions per active year with the top 25th percentile having 5.49 or more. An analysis of average λ_{100} estimates for serious convictions yields a sample mean of 1.54 (s = 2.10, median = 0.83) convictions, with the top 25th percentile having 1.92 or more per year.

[33] The parole adjustments in this estimate of lambda are applied to federal sentences only.

Table 7.4: Conviction Frequency per Year of Activity with 100 Percent of Custody Time Included for COP Offenders (N=149) Active in Each Crime Type[34].

Conviction Type	*Mean (S.D.)*	*Median*	*25th Percentile*	*75th Percentile*
Administrative Offences	1.01 (1.07)	0.70	0.34	1.36
Less Serious Other Offences	0.50 (0.59)	0.29	0.16	0.61
Less Serious Drug Offences	0.40 (0.63)	0.25	0.11	0.49
Less Serious Property Offences	2.16 (2.08)	1.52	0.71	2.67
Theft Under	1.88 (1.89)	1.36	0.54	2.33
Less Serious Violent Offences	0.35 (0.46)	0.22	0.12	0.36
Serious Other Offences	0.28 (0.57)	0.15	0.08	0.24
Serious Drug Offences	0.50 (0.61)	0.29	0.15	0.61
Weapons Offences	0.16 (0.11)	0.12	0.09	0.22
Serious Property Offences	1.03 (1.52)	0.61	0.23	1.20
Break and Enter	0.68 (1.15)	0.33	0.15	0.74
Serious Violent Offences	0.47 (1.19)	0.18	0.09	0.53
Robbery	0.46 (1.37)	0.18	0.10	0.33
Assault Level II	0.19 (0.20)	0.10	0.06	0.24
All Convictions	5.32 (4.36)	4.12	2.12	6.68
All Convictions Not Including Administrative Offences	4.38 (3.82)	3.21	1.77	5.49
Serious Convictions Only	1.54 (2.10)	0.83	0.38	1.92

Table 7.4 provides details on the λ_{100} estimates for conviction types grouped by seriousness for the COP offenders. For tables that show the lifetime λ_{100} estimates of COP offenders for more specific crime types within each seriousness group refer to Appendix B. In essence, Table 7.4 mirrors the findings of Tables 7.2

[34] Three offenders were removed from this analysis. Their lambda estimates were significant outliers.

and 7.3, except that the values of the λ_{100} estimates in seriousness groups are much higher. The highest λ_{100} estimates are in the less serious property conviction type. COP offenders are convicted of a mean λ_{100} of 2.16 (s = 2.08, median = 1.52) less serious property offences, which are predominantly theft under $5,000 offences which have a mean of 1.88 (s = 1.89, median = 1.52). In contrast to Table 7.2, the next highest sample mean λ_{100} estimates are within the serious property conviction category. Serious property offenders are convicted an average of 1.03 (s = 1.52, median = 0.61) offences per active year, with the top 25th percentile convicted of 1.2 offences per year. Break and enter offenders are convicted of 0.68 (s = 1.15, median = 0.33) offences per active year. The third highest λ_{100} estimates are in the administrative convictions category.

Offenders active in other offence types have lower average λ_{100} estimates than in the crime types noted above. Additionally, all the λ_{100} estimates are substantially greater then those for the same seriousness groups in Tables 7.2 and 7.3. However, the order of the λ_{100} estimates in the seriousness groups changes. Active offenders in less serious other offences (mean = 0.50), less serious drug offences (mean = 0.40), serious drug offences (mean = 0.50), serious other offences (mean = 0.28) and weapons offences (mean = 0.16) have average λ_{100} estimates that are consistent with the order in Table 7.2. Similar to Table 7.2 mean λ_{100} estimates for violence are not the lowest in comparison to other crime types. The offenders convicted of less serious violent offences have a mean of 0.35 (s = 0.46, median = 0.22) violent convictions. Furthermore, offenders convicted of serious violence did so more frequently than less serious violence with a mean λ_{100} of 0.47 (s = 1.19, median = 0.18) as compared to a mean of 0.35 (s = 0.46, median = 0.22) for less serious violent convictions. This seems to indicate the portion of the COP sample that commits serious violence tend to have longer incapacitation times than those who do not commit serious violence. The higher the incapacitation time on average leads to higher λ_{100} estimates for violence.

Overall, these three tables indicate that the inclusion and exclusion of incapacitation time in the estimation of lambda for the COP sample and potentially other high frequency offending samples has important consequences for the resultant lambda estimates overall and within specific crime types. This is further explored in Figures 7.1, 7.2 and 7.3 below. In each of the figures the three estimates of lambda–-not including incapacitation time (λ_{CL}), including one hundred percent of incapacitation time (λ_{100}) and including an adjustment to the sentenced portion of incapacitation time ($\lambda_{2/3}$)---are contrasted with each other for total convictions (Figure 7.1), convictions not including administrative offences (Figure 7.2) and serious convictions (Figure 7.3).

The visual analysis shows that not only do these methods of estimating lambda for frequent offenders produce different average results, but they also influence the shapes of the curves. Figure 7.1 shows that the inclusion of incapacitation time, either as total incapacitation (λ_{100}) or a two-thirds adjustment to custodial sentences ($\lambda_{2/3}$), is important for total convictions. The estimates that do not include incapacitation time (λ_{CL}) have a restricted distribution with a maximum of ten convictions per year of activity and a very small positive tail. Conversely, the λ_{100} estimates have a maximum of 22 convictions per year of activity and a long positive tail in the distribution.

Figure 7.2 displays the lambda estimates for total convictions that do not include administrative offences. It is similar to the distributions in Figure 7.1, except the overall lambda values are somewhat smaller due to fact that the number of people with smaller lambdas is larger. The λ_{CL} estimates have a restricted distribution to a maximum of eight convictions per year of activity and a very small positive tail. Conversely, the λ_{100} estimates have a maximum of 19 convictions per year of activity and a long positive tail in the distribution.

Figure 7.3 presents the lambda estimates for serious convictions. It is immediately apparent that the range for individual offenders is much more restricted than for Figures 7.1 and 7.2. The λ_{CL} estimates vary between one and

three convictions per year of activity, while the vast majority of offenders had an estimate of approximately 1 (n = 115) or 2 (n = 32) serious convictions per year. Conversely, the λ_{100} estimates have a maximum of 14 convictions per year of activity and a long positive tail in the distribution.

There are some commonalities among these curves as well. First, there is considerable variability in the average yearly offending frequencies within the COP sample. Second, the estimates approximate the type of curves found in other offending samples, with many offenders committing lower numbers of offences and a smaller number of offenders committing very large numbers of offences. In many ways the results are consistent with the findings in general population samples, except this sample is composed entirely of high frequency offenders.

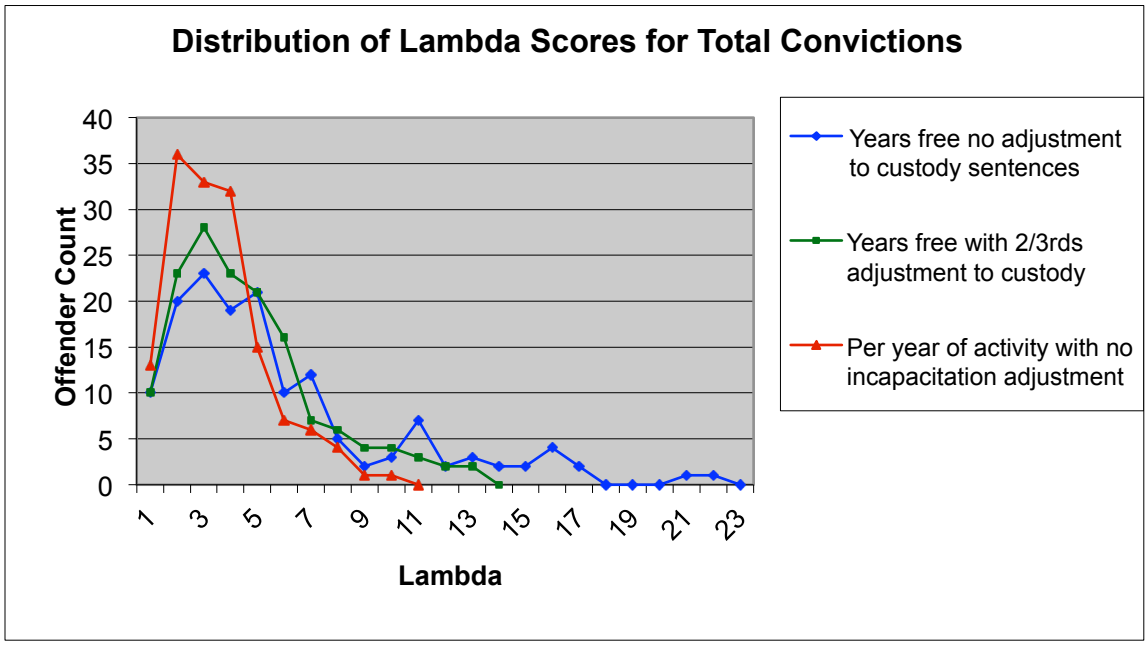


Figure 7.1: The distribution of lambda estimates for total convictions that exclude incapacitation time, include a two-thirds adjustment to custodial sentences and include 100 percent of incapacitation time (N=149).

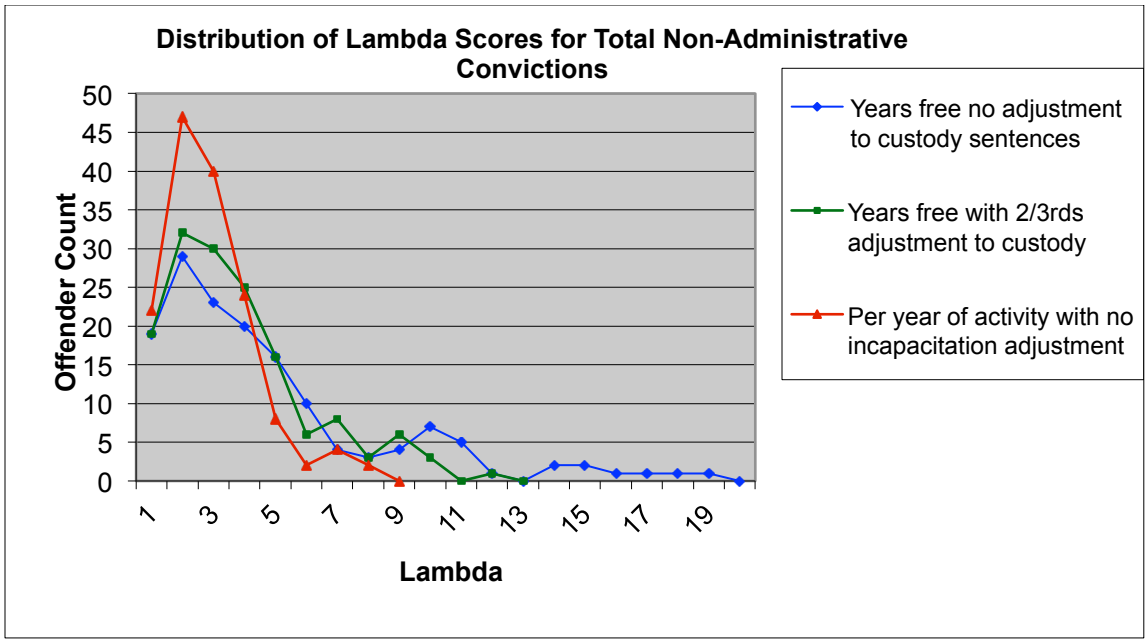


Figure 7.2: The distribution of lambda estimates for convictions excluding administrative offences that exclude incapacitation time, include a two-thirds adjustment to custodial sentences and include 100 percent of incapacitation time (N=149).

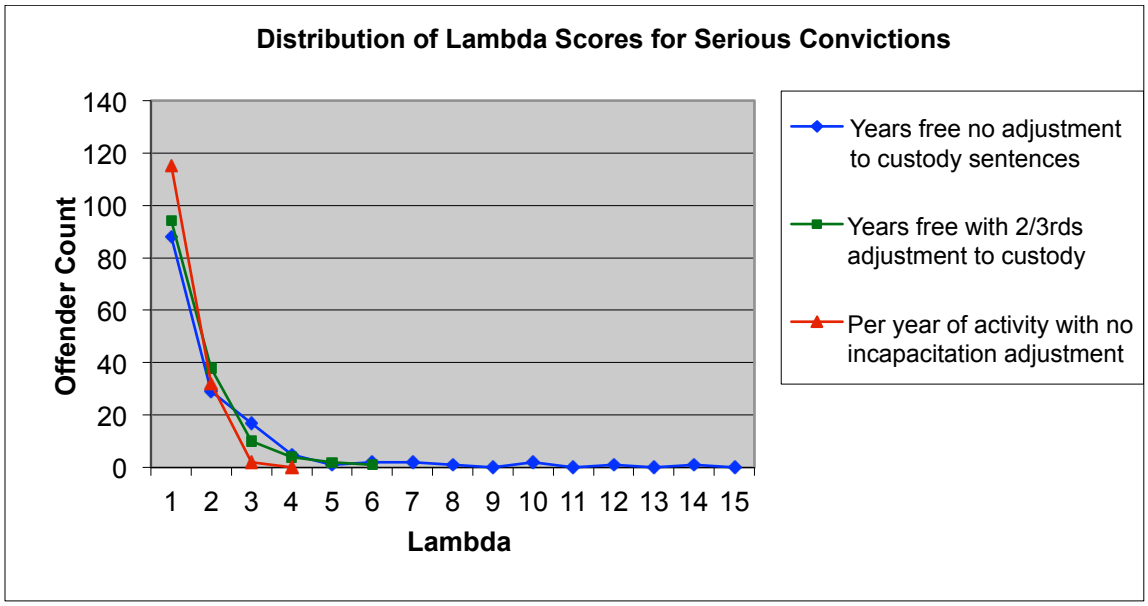


Figure 7.3: The distribution of lambda estimates for serious convictions that exclude incapacitation time, include a two-thirds adjustment to custodial sentences and include 100 percent of incapacitation time (N=149).

The visual analysis provides indications that the lambda estimates for total convictions, total convictions excluding administrative offences and serious

convictions using the three different types of lambda estimates (λ_{CL} , $\lambda_{2/3}$, λ_{100}) are related. Table 7.5 presents the correlations between the different estimates of lambda.

The correlation analysis in Table 7.5 yields some notable findings. First, there are strong and statistically significant *Pearson's r-values* between all lambda estimates using the three offence type divisions. The association between λ_{CL} , $\lambda_{2/3}$, λ_{100} estimates for total convictions and convictions excluding administrative offences are more associated in each conviction grouping. Total convictions and convictions excluding administrative offences λ_{CL} estimates are statistically significant with a strong positive association (r = 0.95). The statistically significant relationship is maintained for total convictions and convictions excluding administrative offences for $\lambda_{2/3}$ estimates (r = 0.96) and λ_{100} estimates (r = 0.98). However, the association between λ_{CL} and $\lambda_{2/3}$ estimates for either total convictions or convictions excluding administrative offences and serious convictions is moderate. They vary between a *Pearson's r* of 0.31 for λ_{CL} estimates, to a *Pearson's r* of between 0.53 and 0.56 for $\lambda_{2/3}$ estimates. Each of the associations is statistically significant.

The relationship between λ_{100} for total convictions or convictions excluding administrative offences and the λ_{100} estimates for serious convictions are strongly related and statistically significant. The relationship between total convictions and serious convictions for λ_{100} has a *Pearson's r* of 0.75, while the *Pearson's r* is 0.79 for convictions excluding administrative offences and serious convictions. This suggests that including different estimates for incapacitation time changes the strength of the relationship between these measures, especially for serious convictions.

Table 7.5: Pearson's Correlations for Different Lambda Estimates for COP Offenders (N = 149).

Lambda Estimate	All Convictions λ_{CL}	Convictions no Admin λ_{CL}	Serious Convictions λ_{CL}	All Convictions $\lambda_{2/3}$	Convictions no Admin $\lambda_{2/3}$	Serious Convictions $\lambda_{2/3}$	All Convictions λ_{100}	Convictions no Admin λ_{100}	Serious Convictions λ_{100}
All Convictions λ_{CL}	1	.952**	.311**	.935**	.881**	.285**	.701**	.625**	.159
Convictions no Admin λ_{CL}		1	.314**	.904**	.934**	.309**	.702**	.689**	.203*
Serious Convictions λ_{CL}			1	.495**	.503**	.949**	.611**	.604**	.770**
Total Convictions $\lambda_{2/3}$				1	.962**	.530**	.890**	.825**	.426**
Convictions no Admin $\lambda_{2/3}$					1	.560**	.889**	.884**	.478**
Serious Convictions $\lambda_{2/3}$						1	.738**	.750**	.917**
All Convictions λ_{100}							1	.975**	.751**
Convictions no Admin λ_{100}								1	.790**
Serious Convictions λ_{100}									1

* P < 0.05
** P < 0.01

The visual analysis of lambda estimates in Figures 7.1 through 7.3 and Table 7.5 seem to indicate that including incapacitation time changes the individual estimates for total convictions, convictions excluding administrative offences and serious convictions. Although these data seem to indicate the importance of including incapacitation time in each estimate, it is not possible to discern whether the estimates are significantly different. Table 7.6 presents the results of paired t-tests of mean difference between λ_{CL}, $\lambda_{2/3}$, λ_{100} estimates for total convictions, convictions excluding administrative offences and serious convictions.

Table 7.6: Paired Sample t-Tests of Three Lambda Estimates for All Convictions, Convictions Excluding Administrative Offences and Serious Convictions.

	All Convictions (Mean)	***Convictions excluding Administrative (Mean)***	***Serious Convictions (Mean)***
N	149	149	149
No Adjustment for incapacitation time (λ_{CL})	3.02 (1.72)	2.43 (1.43)	0.66 (0.52)
Two-Thirds Adjustment to Custodial Sentences ($\lambda_{2/3}$)	4.10 (2.70)	3.33 (2.26)	0.97 (0.96)
100 Percent of Incapacitation Time (λ_{100})	5.32 (4.35)	4.38 (3.82)	1.43 (2.06)
Mean Difference:			
λ_{CL} & $\lambda_{2/3}$	1.08 (1.25)	0.89 (1.05)	0.31 (0.50)
t-value	10.570 ***	10.335***	7.617***
$\lambda_{2/3}$ & λ_{100}	1.22 (2.31)	1.05 (2.11)	0.46 (0.10)
t-value	6.462***	6.101***	4.530***
λ_{CL} & λ_{100}	2.30 (3.38)	1.95 (3.02)	0.77 (1.70)
t-value	8.311***	7.873***	5.544***

P < 0.05
** P < 0.01
*** P < 0.001

Table 7.6 presents the means for each conviction type with the three estimates to incapacitation time. The data below the means in each column tests the mean difference between pairs of λ_{CL}, $\lambda_{2/3}$, λ_{100} estimates within the conviction type in the column. For each conviction type there is a statistically significant mean difference in each of the lambda estimates.

In the total convictions category the mean of the λ_{CL} estimate is 3.02 (s = 1.72), the mean of the $\lambda_{2/3}$ estimate is 4.10 (s = 2.70) and the mean of the λ_{100} estimate is 5.32 (s = 4.35). There is a statistically significant mean difference of 1.08 (s = 1.25, *t-value* = 10.57) between the λ_{CL} and $\lambda_{2/3}$ estimates. In addition, there is a statistically significant mean difference of 1.22 (s = 2.31, *t-value* = 6.462) between the $\lambda_{2/3}$ and λ_{100} estimates. Not surprisingly the largest statistically significant mean difference for total convictions is observed in the contrast of λ_{CL} and λ_{100} estimates with a mean difference of 2.30 (s = 3.38, *t-value* = 8.311).

In the convictions excluding administrative offences category the mean of the λ_{CL} estimate is 2.43 (s = 1.43), the mean of the $\lambda_{2/3}$ estimate is 3.33 (s = 2.26) and the mean of the λ_{100} estimate is 4.38 (s = 3.82). There is a statistically significant mean difference of 0.89 (s = 1.05, *t-value* = 10.335) between the λ_{CL} and $\lambda_{2/3}$ estimates. In addition, there is a statistically significant mean difference of 1.05 (s = 2.11, *t-value* = 6.101) between the $\lambda_{2/3}$ and λ_{100} estimates. The largest statistically significant mean difference for convictions excluding administrative offences is observed in the contrast of λ_{CL} and λ_{100} estimates with a mean difference of 1.95 (s = 3.02, *t-value* = 7.873).

In the serious convictions category the mean of the λ_{CL} estimate is 0.66 (s = 0.52), the mean of the $\lambda_{2/3}$ estimate is 0.97 (s = 0.96) and the mean of the λ_{100} estimate is 1.43 (s = 2.06). There is a statistically significant mean difference of 0.31 (s = 0.50, *t-value* = 7.617) between the λ_{CL} and $\lambda_{2/3}$ estimates. In addition, there is a statistically significant mean difference of 0.46 (s = 0.10, *t-value* = 4.53) between the $\lambda_{2/3}$ and λ_{100} estimates. The largest statistically significant mean difference for serious convictions is observed in the contrast of λ_{CL} and λ_{100} estimates with a mean difference of 0.77 (s = 1.70, *t-value* = 5.544).

Table 7.7 shows the differences between lambda estimates for male (N= 133) and female (N = 19) offenders in the COP sample. This table compares the means for λ_{CL} estimates and λ_{100} estimates. The number of males and females who

participate in each crime type is noted in parentheses. The table does not test for significant differences within each seriousness group because the fraction of females who have participated in each group is too small. Therefore, a test for differences between males and females is performed on total convictions, total convictions excluding administrative offences and serious convictions for both λ_{CL} and λ_{100} metrics.

Table 7.7: Differences Between λ_{CL} (N =152) and λ_{100} (N = 149) Estimates for Male and Female COP Offenders (N=152).

	No Incapacitation Adjustment λ_{CL}			*100 Percent Incapacitation Adjustment* λ_{100}		
Conviction Type	***Males (N)***	***Females (N)***	***Mean Difference***	***Males (N)***	***Females (N)***	***Mean Difference***
Administrative Offences	0.61 (123)	0.76 (19)	-0.15	1.02 (120)	0.96 (19)	0.06
Less Serious Other Offences	0.29 (108)	0.13 (10)	0.16	0.52 (106)	0.25 (10)	0.27
Less Serious Drug Offences	0.23 (96)	0.25 (10)	-0.02	0.39 (96)	0.52 (10)	-0.13
Less Serious Property Offences	1.29 (128)	1.90 (17)	-0.61	2.11 (125)	2.57 (17)	-0.46
Theft Under	1.13 (128)	1.86 (16)	-0.73	2.24 (128)	2.48 (16)	-0.24
Less Serious Violent Offences	0.22 (83)	0.19 (9)	0.03	0.36 (82)	0.23 (9)	0.13
Serious Other Offences	0.12 (76)	0.10 (7)	0.02	0.28 (74)	0.23 (7)	0.05
Serious Drug Offences	0.25 (61)	0.46 (11)	-0.21	0.48 (61)	0.59 (11)	-0.11
Weapons Offences	0.09 (49)	0.06 (2)	0.03	0.16 (48)	0.15 (2)	0.01
Serious Property Offences	0.48 (106)	0.27 (5)	0.21	1.05 (104)	0.64 (5)	0.41
Break and Enter	0.32 (93)	0.21 (4)	0.11			
Serious Violent Offences	0.19 (70)	0.14 (6)	0.05	0.48 (67)	0.32 (6)	0.16
Robbery	0.17 (51)	0.11 (6)	0.06	0.63 (51)	0.22 (6)	0.41
Assault Level II	0.11 (38)	0.07 (3)	0.04	0.15 (38)	0.18 (3)	-0.03
All Convictions	3.05 (133)	3.18 (19)	0.13 (n.s.)	5.44 (130)	4.49 (19)	0.95 (n.s.)
All Convictions Not Including Administrative Offences	2.49 (133)	2.42 (19)	0.07 (n.s.)	4.50 (130)	3.53 (19)	0.97 (n.s.)
Serious Convictions Only	0.75 (125)	0.50 (16)	0.25*	1.63 (122)	0.84 (16)	0.79 (**)

* P < 0.05
** P < 0.01
*** P < 0.001

In almost every seriousness group, the average lambda scores of males exceed the lambda scores of females. For λ_{CL} estimates, this finding is most evident for less serious other offences (0.29 vs. 0.13), serious property offences (0.48 vs. 0.27), weapons offences (0.09 vs. 0.06) and serious violent offences (0.19 vs. 0.14). However, in many offence types the difference in average lambda estimates for males and females is not large. This is the case with less serious violent convictions (0.22 vs. 0.19) and serious other offences (0.12 vs. 0.10). Moreover, in certain conviction categories the average lambda estimates of females exceed those of males. This occurs in administrative offence convictions (0.76 vs. 0.61), less serious drug convictions (0.25 vs. 0.23) and to a much greater degree in less serious property convictions (1.29 vs. 1.90) and serious drug convictions (0.25 vs. 0.46).

When conviction totals are analysed for λ_{CL} estimates the male and female estimates are similar, except for serious offences. The analysis indicates that males have higher λ_{CL} estimates than females, except for total convictions. Males have a lower mean λ_{CL} estimate of 3.05 convictions per year as compared to the female mean estimate of 3.18. When administrative offences are removed from the analysis males have a mean of 2.49 convictions per year of activity as compared to females with a mean of 2.42. When only serious convictions are considered males surpass females with a mean of 0.75 serious λ_{CL} compared to a mean of 0.50 convictions for females.

In order to test whether these differences in-group averages are statistically significant the Mann-Whitney U test is performed. This is necessary because the lifetime λ_{CL} estimates are positively skewed and the large group size disparity between males (N = 133) and females (N = 19). The analysis shows that males and females do not have a statistically significant difference in medians (Z = -0.510, p = n.s.) for total conviction λ_{CL} estimates. In addition, males and females do not have a statistically significant difference in medians (Z = -0.554, p = n.s.) for λ_{CL} estimates that do not include administrative offences. However, the analysis shows that males

and females have a statistically significant difference in medians (Z =-2.416, p < 0.01) for serious conviction λ_{CL} estimates.[35]

The differences between males and females changes for λ_{100} estimates are more pronounced. In general, the absolute differences in mean λ_{100} scores between males and females changes considerably. However, the relative difference between males and females is maintained in most instances. There are some notable differences between the two types of lambda estimates applied to males and females in the COP sample. When incapacitation time is factored into the estimates males have greater mean λ_{100} estimates than females for administrative offences with means of 1.02 and 0.96, respectively. For offences in which the mean λ_{100} estimates of females surpassed those of males the relative differences between the genders decreases. This occurs in the less serious property offence category, which is driven by theft under offences. The mean for males increases to 2.11 while the mean λ_{100} score for females increases to 2.57 as compared to λ_{CL} estimates. In addition, this occurs in the case of serious drug offences where females have an average λ_{100} score of 0.59 as compared to males with an average score of 0.48. However, the relative difference between males and females did increase in the case of less serious drug offences where males have a mean λ_{100} score of 0.39 and females have a mean λ_{100} score of 0.52.

For all other seriousness groups males have considerably larger mean λ_{100} estimates. This finding was most notable in the context of violent offences. For less serious violent offences males have a mean λ_{100} score of 0.36 compared to 0.23 for females, and for serious violent offences males have a mean λ_{100} score of 0.48 as compared to the mean of 0.32 for females. The difference between males and females is large for robbery where males have an average λ_{100} score of 0.63

[35] The Mann-Whitney U test is used here because of the non-normal distribution of the lambda estimate variable. It is limited in that it commonly does not detect true differences between groups. As a result, independent sample t-tests were performed in conjunction with the non-parametric test reported in this dissertation. In each case there was a statistically significant difference between males and females.

compared to the female average of 0.22. It is interesting to note that females have an average λ_{100} score of 0.18 for serious violence that is marginally higher than 0.15 for males.[36] A higher λ_{100} score for males is present in other offences. For less serious other offences males have a much larger mean λ_{100} score of 0.52 as compared to females with an average of 0.25. This finding occurs to a lesser extent in serious other offences where males have an average λ_{100} score of 0.28 and females have an average score of 0.23.

The results for convictions that use the λ_{100} estimates differ, especially for serious offences. In these analyses males have higher λ_{100} estimates than females, including total convictions. Males have a higher mean λ_{100} estimate of 5.44 convictions per year as compared to the female mean estimate of 4.49. When administrative offences are removed from the analysis males have a mean λ_{100} of 4.50 convictions as compared to females with a mean of 3.53. In the case that only serious convictions are considered males surpass females with a mean λ_{100} of 1.63 serious convictions compared to a mean of 0.84 convictions for females.

In order to test whether these differences in group averages are statistically significant the Mann-Whitney U test is performed. This is necessary because the lifetime λ_{100} estimates are positively skewed and the large group size disparity between males (N = 130) and females (N = 19). The analysis shows that males and females do not have a statistically significant difference in medians ($Z = -0.757$, p = n.s.) for total convictions λ_{100} estimates. In addition, males and females do not have a statistically significant difference in medians ($Z = -1.434$, p = n.s.) for λ_{100} estimates that do not include administrative offences. However, the analysis shows that males and females have a statistically significant difference in medians ($Z = -2.784$, $p < 0.01$) for serious conviction λ_{100} estimates.[37] This seems to be consistent

[36] The small group sizes for this comparison of 38 males and 3 females make this result dubious and thus it should be viewed in this regard.

[37] The Mann-Whitney U test is used here because of the non-normal distribution of the lambda estimate variable. It is limited in that it commonly does not detect true differences between groups.

with the literature that notes that once participation rates are accounted for, the rate of offending frequency between males and females is not statistically different in the case of general offending (Blumstein et al., 1986). However, there are significant differences between the genders for serious offending.

The next set of analyses examines λ_{CL} estimates across five-year age groups. The average five-year λ_{CL} scores are displayed in Figure 7.4 for total convictions and Figure 7.5 for convictions excluding administrative offences. For tables that correspond to these figures refer to Appendix B. These figures illustrate the variability in λ_{CL} over time. Both figures indicate that λ_{CL} increases steadily to the late 20s and early 30s for total convictions (mean = 3.09) and convictions excluding administrative offences (mean = 2.54). The λ_{CL} estimates remain high into the late 30s for total convictions (mean = 3.23) and convictions excluding administrative offences (mean = 2.58). It is not until offenders enter their late 30s and early 40s that the λ_{CL} estimates for both conviction types decrease. However, they are still high post age 40. This seems to provide support for Laub and Sampson (2003) who noted that high and medium rate chronics began to show evidence of desistance after peak lambdas were observed at age 40.

As a result, independent sample t-tests were performed in conjunction with the non-parametric test reported in this dissertation. In each case there was a statistically significant difference between males and females.

Figure 7.4: Average λ_{CL} Scores Per Year for All Convictions by Five-Year Age Groups (N = 143).

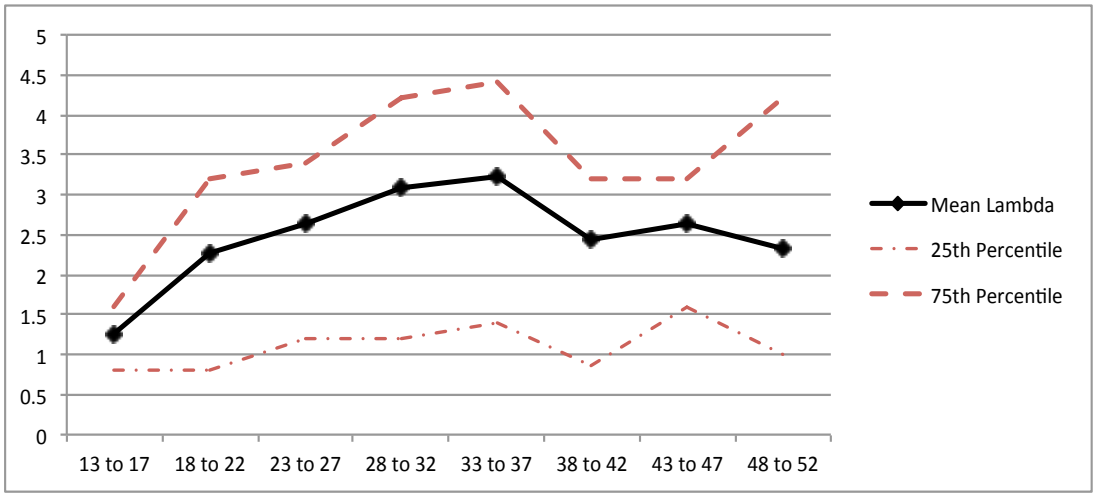
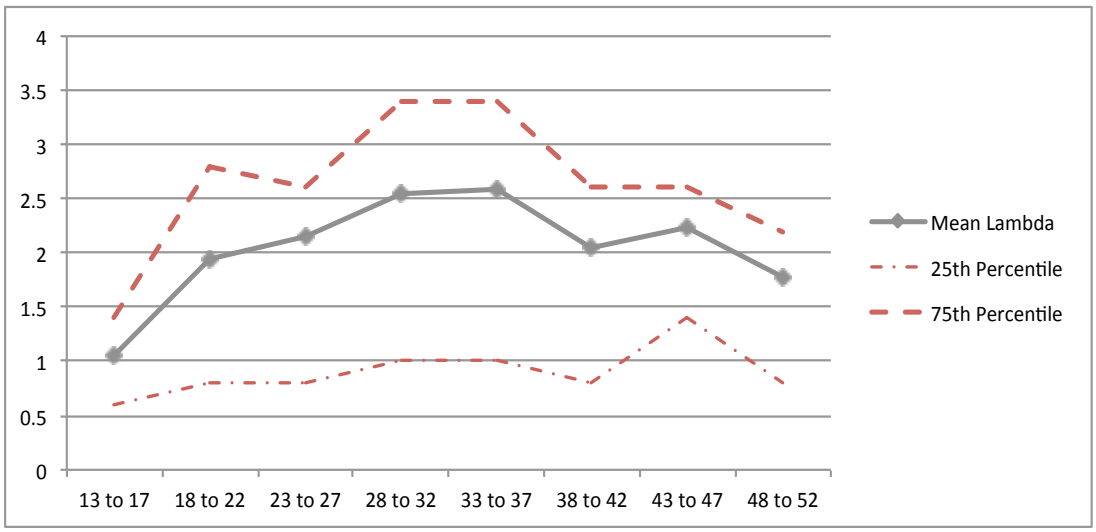


Figure 7.5: Average λ_{CL} Scores Per Year for Convictions Excluding Administrative Offences by Five-Year Age Groups (N = 143).



The analyses presented in Tables 7.8 to 7.10 test predictors associated with different lambda estimates for different conviction types. In each table, three negative binomial regressions are estimated to test the predictive power of several background characteristics including gender, ethnicity and the presence of a mental disorder, age of onset and other lambda covariates, such as drug and/or alcohol addiction, residential instability history of violence and criminal associates on the λ_{CL}, $\lambda_{2/3}$, λ_{100} estimates for total convictions, convictions excluding administrative

offences and serious convictions. The negative binominal regression is used to account for overdispersion.

Table 7.8 reports the results of the regression analysis on lambdas for total convictions. For each of the lambda estimates for total convictions ethnicity is statistically significant. In the model of total convictions λ_{CL} non-Caucasian offenders have an expected log rate 0.23 higher than Caucasian offenders. Additionally, a one-unit change in age of onset produces an expected change of 0.03 in the log rate of λ_{CL}. The models that used the $\lambda_{2/3}$ estimate or the λ_{100} estimate yielded different results. For both of these models, ethnicity remains a significant predictor, but age of onset is not. In the model of $\lambda_{2/3}$ the non-Caucasian status has an expected log rate 0.33 higher than Caucasian offenders, while a one-unit change in residential instability produces a change of 0.05 in the expected log rate. In the model of λ_{100} the non-Caucasian status results in a statistically significant change in the expected log rate of 0.45 compared to Caucasian offenders, while a one-unit change in residential instability produces a change of 0.06 in the expected log rate.

Table 7.9 reports the results of the regression analysis on lambdas for convictions excluding administrative offences. For each of the lambda estimates for convictions excluding administrative offences ethnicity and residential instability are statistically significant. Age of onset is only statistically significant in the model of log rate of λ_{CL}. In the model of convictions not including administrative offences λ_{CL} non-Caucasian offenders change the expected log rate by 0.20 as compared to Caucasian offenders. Additionally, a one-unit change in age of onset produces a change of 0.03 in the expected log rate of λ_{CL}. For both the $\lambda_{2/3}$ and λ_{100} models, ethnicity and residential instability remain significant predictors, but age of onset is not. In the model of $\lambda_{2/3}$ the non-Caucasian status results in a statistically significant change of 0.31 in the expected log rate as compared to Caucasians, while a one-unit change in residential instability produces a change of 0.07 in the expected log rate. In the model of λ_{100} the non-Caucasian status results in a statistically significant

change of 0.44 in the expected log rate, while a one-unit change in residential instability creates a change of 0.07 in the expected log rate.

Table 7.10 displays the results of the negative binomial regressions predicting lambdas for serious convictions. For each of the lambda estimates for serious convictions gender, ethnicity and age of onset are statistically significant. Residential instability is only statistically significant in the models of the λ_{CL} and $\lambda_{2/3}$ estimates. In the model of serious conviction λ_{CL} estimates the female status decreases the expected log rate by -0.50 as compared to male offenders. Additionally, the non-Caucasian status produces a statistically significant change in the expected log rate of 0.34. A one-unit change in age of onset results in a change of -0.04 in the expected log rate of λ_{CL}, while a one-unit change in residential instability produces a change of -0.06 in the expected log rate. For the $\lambda_{2/3}$ model, ethnicity, gender, age of onset and residential instability remain significant predictors. In the model of $\lambda_{2/3}$ the female status results in a change in the expected log rate of -0.64 as compared to male offenders, while the non-Caucasian status produces a statistically significant increase of 0.5 in the expected log rate as compared to Caucasians. Additionally, a one-unit change in residential instability results in a change of 0.07 in the expected log rate, while a one-unit change in age of onset produces a change of -0.05 in the expected log rate of $\lambda_{2/3}$. In the model of λ_{100} the female status decreases the expected log rate by -0.65 as compared to male offenders, while the non-Caucasian status results in a statistically significant increase of 0.62 in the expected log rate. Additionally, a one-unit change in age of onset produces a change of -0.07 in the expected log rate of λ_{100}.

Table 7.8: Negative Binomial Regressions for Total Convictions for Three Estimates (Per Year of Criminal Activity, Adjusted Years Free and Years Free with no Adjustment to Custody Sentences) of Lambda (N=149).

Explanatory Variables	*Model 1*	*Model 2*	*Model 3*
	Total Convictions λ_{CL}	*Total Convictions* $\lambda_{2/3}$	*Total Convictions* λ_{100}
Intercept	0.335 (0.279)	0.693 (0.332)*	1.113 (0.401)**
Gender (Female = 1)	-0.039 (0.133)	-0.165 (0.162)	-0.206 (0.196)
Ethnicity (Non-White = 1)	**0.230 (0.096)***	**0.332 (0.113)****	**0.454 (0.137)****
Mental Disorder (Yes = 1)	0.124 (0.098)	0.094 (0.116)	0.064 (0.143)
Criminal Career Variables			
Age of Onset	**0.025 (0.09)****	0.015 (0.011)	-0.001 (0.015)
Other Lambda Covariates			
Drugs/Alcohol (0 = No)	-0.082 (0.122)	-0.082 (0.142)	-0.039 (0.173)
Violence (0 = No)	0.138 (0.108)	0.163 (0.125)	0.163 (0.149)
Residential Instability	0.033 (0.021)	**0.052 (0.024)***	**0.064 (0.029)***
Provinces Convicted	0.003 (0.045)	0.020 (0.052)	0.053 (0.061)
Criminal Associates	0.0003 (0.003)	-0.0007 (0.004)	-0.004 (0.005)
Dispersion	0.000 (0.000)	0.113 (0.042)	0.324 (0.061)
Deviance (DF)	117.488 (139)	145.493 (139)	147.313 (139)
Log Likelihood	-271.452	-330.243	-384.377

* P < 0.05
** P < 0.01
*** P < 0.001

Table 7.9: Negative Binomial Regressions for Convictions Excluding Administrative Offences for Three Estimates (Per Year of Criminal Activity, Adjusted Years Free and Years Free with no Adjustment to Custody Sentences) of Lambda (N=149).

Explanatory Variables	***Model 1***	***Model 2***	***Model 3***
	Convictions Excluding Admin λ_{CL}	***Convictions Excluding Admin*** $\lambda_{2/3}$	***Convictions Excluding Admin*** λ_{100}
Intercept	0.012 (0.281)	0.416 (0.335)***	0.894 (0.412)*
Gender (Female = 1)	-0.096 (0.137)	-0.225 (0.168)	-0.255 (0.205)
Ethnicity (Non-White = 1)	**0.201 (0.097)***	**0.311 (0.114)****	**0.436 (0.141)****
Mental Disorder (Yes = 1)	0.136 (0.098)	0.105 (0.124)	0.074 (0.147)
Criminal Career Variables			
Age of Onset	**0.030 (0.09)****	0.019 (0.012)	0.001 (0.015)
Other Lambda Covariates			
Drugs/Alcohol (0 = No)	-0.113 (0.121)	-0.118 (0.142)	-0.075 (0.177)
Violence (0 = No)	0.130 (0.108)	0.142 (0.126)	0.140 (0.153)
Residential Instability	**0.050 (0.021)***	**0.067 (0.024)****	**0.074 (0.030) ****
Provinces Convicted	0.011 (0.045)	0.026 (0.052)	0.061 (0.063)
Criminal Associates	-0.003 (0.003)	-0.004 (0.004)	-0.007 (0.005)
Dispersion	0.00 (0.00)	0.075 (0.042)	0.328 (0.065)
Deviance (DF)	95.819 (139)	142.020 (139)	144.033 (139)
Log Likelihood	-245.592	-302.008	-359.437

* P < 0.05
** P < 0.01
*** P < 0.001

Table 7.10: Negative Binomial Regressions for Serious Convictions for Three Estimates (Per Year of Criminal Activity, Adjusted Years Free and Years Free with no Adjustment to Custody Sentences) of Lambda (N=149).

Explanatory Variables	***Model 1***	***Model 2***	***Model 3***
	Serious Convictions λ_{CL}	***Serious Convictions*** $\lambda_{2/3}$	***Serious Convictions*** λ_{100}
Intercept	-0.249 (0.436)	0.263 (0.510)	1.011 (0.619)
Gender (Female = 1)	**-0.501 (0.236)***	**-0.640 (0.289)***	**-0.648 (0.327)***
Ethnicity (Non-White = 1)	**0.344 (0.135)***	**0.495 (0.153)****	**0.620 (0.188)*****
Mental Disorder (Yes = 1)	-0.074 (0.146)	-0.117 (0.170)	-0.215 (0.209)
Criminal Career Variables			
Age of Onset	**-0.039 (0.017)***	**-0.048 (0.020)***	**-0.073 (0.026)****
Other Lambda Covariates			
Drugs/Alcohol (0 = No)	0.110 (0.188)	0.091 (0.216)	0.175 (0.257)
Violence (0 = No)	0.216 (0.155)	0.194 (0.177)	0.212 (0.213)
Residential Instability	**-0.059 (0.028)***	**0.071 (0.033)***	0.067 (0.040)
Provinces Convicted	-0.027 (0.063)	-0.021 (0.072)	-0.001 (0.088)
Criminal Associates	0.003 (0.004)	0.002 (0.005)	-0.003 (0.007)
Dispersion	0.000 (0.000)	0.000 (0.001)	0.472 (0.119)
Deviance (DF)	51.860 (139)	100.642 (139)	126.077 (139)
Log Likelihood	-133.699	-172.818	-229.166

* P < 0.05
** P < 0.01
*** P < 0.001

Summary and Conclusions

This chapter provides an analysis of different estimates of lambda for three types of convictions: total convictions, convictions excluding administrative offences and serious convictions. The results indicate that the COP sample are high frequency offenders similar to the offenders studied by DeLisi (2006). The estimates for total convictions vary between a mean λ_{CL} of 3.07, to a high of 5.32 for λ_{100} estimates. A similar pattern emerges for convictions excluding administrative offences and serious convictions. These lambda estimates are dominated by property offending, although there are high lambdas for violent offences.

The analysis of gender on lambda estimates suggests that lambdas for males and females differ for specific crime types in the COP sample. However, there is no statistically significant difference between males and females for lambda estimates for total convictions and convictions excluding administrative offences. The only significant difference in lambda estimates between males and females is observed in serious convictions. The results indicate that males have higher average lambda scores for serious convictions.

The analysis shows that there is a moderate relationship between lambdas of total convictions (and convictions excluding administrative offences) and serious convictions that incorporate incapacitation time ($\lambda_{2/3}$ and λ_{100}) and exclude incapacitation time (λ_{CL}). All lambda estimates for total convictions and convictions excluding administrative offences have strong positive correlations. In order to test the hypothesis that the lambda estimates that incorporate incapacitation time and lambdas that do not are different, several paired t-tests are performed. The results show that there is a significant difference between each lambda estimate within each type of conviction. This suggests that the null hypothesis that there is no difference between the lambda estimates can be rejected. These findings are consistent with the findings of Piquero, Blumstein, Brame, Happanen, Mulvey and Nagin (2001) who demonstrate that the failure to incorporate exposure time in trajectories of offending leads to the misidentification of a large proportion of high-rate chronics.

The analysis of λ_{CL} over age shows, in contrast to the assertions of Moffitt (1993) and the findings of Loeber and Synder (1990), that lambda estimates are not stable over the life course. The peak lambda estimates occur in the 28 to 37-age interval and decline thereafter. This suggests that the null hypothesis that lambda estimates are stable through the life course can be rejected.

The last two hypotheses are tested using negative binomial regression. The results show that ethnicity and in some cases age of onset and residential instability are related to lambda estimates for total convictions and convictions excluding administrative offences in the COP sample. Age of onset, when it is significant, is positively related to total convictions and convictions excluding administrative offences lambda estimates. This suggests that the hypothesis that age of onset is negatively related to lambda scores for total convictions and convictions excluding administrative offences is rejected. Moreover, the presence of drug and/or alcohol addiction and the number of criminal associates are not related to lambda scores for these conviction types. Therefore, the null hypothesis that these variables are not predictive of lambda scores for the COP sample can be accepted. The null hypothesis of no association between residential instability and lambda scores can be rejected.

The results of the negative binominal regressions for serious convictions lambda estimates are different. The results indicate that age of onset and gender are negatively associated with serious conviction lambdas. Therefore, the null hypothesis of no association between age of onset and gender and serious conviction lambdas is rejected. However, the models indicated that the presence of drug and/or alcohol addiction, presence of violence and the number of criminal associates are not statistically significant predictors of serious conviction lambdas. Therefore, the null hypothesis of no association can be accepted for these three indicators and lambdas of the COP sample. The inclusion of residential instability shows mixed results. It is negatively associated with λ_{CL}, positively associated with $\lambda_{2/3}$, and shows no association with λ_{100} for serious convictions.

The totality of the results suggests the importance of incorporating incapacitation time into lambda estimates for total convictions, convictions excluding administrative offences and serious convictions. The inclusion of incapacitation time changes the estimates into arguably different quantities, especially for serious convictions. Moreover, in this sample, the only models which yield results consistent with past research are the models of lambdas for serious convictions.

Chapter 8: Results for Specialization

This chapter focuses on an analysis of specialization in the COP sample. In the context of this study, specialization refers to the tendency of COP offenders to have significant proportions of their conviction confined to a specific seriousness group. Specialization is measured in this section in both unstandardized and standardized formats with the diversity index (*D*), originally developed to analyse population segregation (see Agresti & Agresti, 1978). The standardized form of the diversity index is interpreted on a continuum of 0, which indicates complete specialization, to 1, which indicates complete diversity.[38]

The chapter begins by describing the lifetime proportion of total convictions in each seriousness group and the number of seriousness groups accumulated by the sample. The analyses that follow focus solely on the diversity index (*D*). These start with a description of the lifetime diversity scores for COP offenders, a comparison of the lifetime scores of males and females and an assessment of the relationship between specific covariates, including lambda estimates and gender, and diversity scores of the COP sample. The chapter concludes with an analysis of the diversity scores of COP offenders over age periods in the life course.

Table 8.1 presents descriptive statistics on the lifetime proportion of offences in each seriousness group accumulated by the COP sample. For tables that show results for more specific crime types within each seriousness group refer to Appendix B. The proportions are important preliminary indications of specialization using the diversity index, as it is a proportional measure.

Table 8.1 displays some noticeable trends. First, as noted in previous analyses, less serious property offences dominate the lifetime convictions of the COP offenders. A mean of thirty-nine percent of the convictions accrued by the COP sample are for less serious property offences, and the top 25th percentile of the sample has more than 53 percent of their lifetime convictions within this group.

[38] The unstandardized score varies from 0 to 0.9 for ten offence categories and 0 to 0.89 for nine categories.

The next most frequently occurring category is administrative offences. A mean of 18 percent of the convictions accrued by the sample are for administrative offences, and the top 25th percentile of the sample has 27 percent or more of their convictions in this group. The third most prevalent group is serious property offences. The mean proportion of convictions is 18 percent and the top 25th percentile has 21 percent or more of their total convictions in the serious property convictions group. The mean lifetime proportion of less serious other offences is 8 percent. The top 25th percentile of the sample has 12 percent or more of their convictions within this group. The mean proportion for serious other offences is much lower at 3 percent and the top 25th percentile of the sample has 4 percent or more of their lifetime convictions in this group.

Table 8.1: The Proportion of Convictions by Seriousness Group of the Lifetime Offending Profile of COP Offenders (N=152).

Conviction Type	*Mean (S.D.)*	*25th Percentile*	*75th Percentile*
Administrative Offences	0.18 (.13)	0.08	0.27
Less Serious Other Offences	0.08 (.07)	0.01	0.12
Less Serious Drug Offences	0.05 (.06)	0	0.08
Less Serious Property Offences	0.39 (.24)	0.21	0.53
Theft Under	0.34 (.23)	0.16	0.48
Less Serious Violent Offences	0.05 (.08)	0	0.07
Serious Other Offences	0.03 (.04)	0	0.04
Serious Drug Offences	0.05 (.09)	0	0.06
Weapons Offences	0.01 (.02)	0	0.02
Serious Property Offences	0.13 (.14)	0	0.21
Break and Enter	0.08 (.11)	0	0.10
Serious Violent Offences	0.04 (.08)	0	0.05
Robbery	0.03 (.07)	0	0.03
Assault Level II	0.01 (.02)	0	0.01
Serious Convictions Only	0.25 (.18)	0.11	0.37

The lifetime mean proportions for less serious and serious drug offences are approximately equal at 5 percent of total convictions. The top 25th percentile for less serious drug offences is 8 percent or more, as compared to 6 percent for serious drug offences. The mean lifetime proportions of less serious and serious violent offences are close to equivalent. The COP sample has a mean of 5 percent for less serious violent offences as compared to 4 percent for serious violent offences. The top 25th percentile of the sample has 7 percent or more of their offences in the less serious violent offence group as compared to 5 percent in the serious violent group. The sample mean proportion for weapons offences is the lowest at 1 percent with

the top 25th percentile at 2 percent or more. With regard to serious convictions the lifetime mean proportion is 25 percent of convictions with the top 25th percentile having 37 percent or more of their convictions designated as serious.

It is interesting to note that the bottom 25th percentile of the sample has zero or near zero proportions of their offences in several serious groups. These seriousness groups are: less serious other offences, less serious drug offences, less serious violent offences, serious other offences, serious drug offences, weapons offences and serious violent offences. These zero proportions in the different seriousness groups for convictions are an indication that there may be some degree of specialization within the high frequency COP sample.

Table 8.2 provides additional descriptive statistics on the average number of seriousness groups for the sample in conjunction with diversity score estimates for the sample and for males and females. The sample mean number of seriousness groups including administrative offences is 6.55 (s = 2.16, median = 7.0) out of 10. Males have a higher lifetime mean number of seriousness groups at 6.77 compared to the mean of 5.05 for females. When administrative offences are excluded from the analysis the lifetime mean number of offences for the sample drops to 5.61 (s = 2.11, median = 6.0) out of 9. The difference between males and females is more pronounced when administrative offences are excluded. Males have a lifetime mean of 5.84 different seriousness groups while females have a mean of 4.05 different seriousness groups.

Table 8.2: Average Number of Categories of Grouped Offence Types and Diversity Index of the COP Offenders by Gender (N=152).

Measure	*All Offenders Mean (S.D.)*	*All Males Mean*	*All Females Mean*
Number of Seriousness Groups (10)	6.55 (2.17)	6.77 (2.07)	5.05 (2.25)
Number of Seriousness Groups Excluding Administrative Offences (9)	5.61 (2.12)	5.84 (2.01)	4.05 (2.25)
Diversity for All Conviction Types			
unstandardized	0.66 (.16)	0.68 (0.15)	0.51 (0.21)
standardized	0.73 (0.18)	0.76 (0.16)	0.57 (0.23)
Diversity for All Convictions Excluding Administrative Offences			
unstandardized	0.58 (0.22)	0.61 (0.19)	0.37 (0.27)
standardized	0.66 (0.25)	0.69 (0.22)	0.42 (0.31)

The results in Tables 8.1 and 8.2 allow for the estimation of lifetime diversity scores for each sample member. The sample mean unstandardized lifetime diversity score that included ten conviction types is 0.66 (s = 0.16). Only 16.4 percent of the sample has unstandardized diversity scores less than 0.5. Males have higher unstandardized diversity scores on average (mean = 0.68) than females (mean = 0.51). When administrative offences are excluded the sample mean of diversity scores drops to 0.58 (s = 0.22). The mean diversity score for males changes slightly to 0.61, while the mean diversity score for females drops to 0.37.

The analysis of standardized diversity scores exhibits the same order of scale results described in the unstandardized diversity results. The sample mean of standardized lifetime diversity scores that included all ten conviction types is 0.74 (s = 0.18). Only 12.8 percent of the sample has standardized diversity scores less than 0.5. Males have higher standardized diversity scores on average (mean = 0.76) than females (mean = 0.57). When administrative offences are excluded the sample mean standardized diversity score drops to 0.66 (s = 0.25). However, the mean

diversity score for males does not change greatly (mean = 0.69), but the mean diversity score for females falls to 0.42. These analyses suggest that in average terms the sample shows high levels of diversity in their lifetimes, although there are members with diversity scores that suggest some specialization in convictions. Moreover, the analysis suggests that males exhibit higher levels of diversity than females.

In order to test whether these differences in-group averages are statistically significant the Mann-Whitney U test is performed. This is necessary because the lifetime standardized and unstandardized diversity scores are negatively skewed and the large group size disparity between males (N = 133) and females (N = 19). The analysis shows that males and females have a statistically significant difference in medians ($Z = -3.635$, $p < 0.001$) for both standardized and unstandardized diversity scores that include all 10 conviction types.[39] The analysis for the 9 conviction type diversity scores shows that males and females have a statistically significant difference in medians ($Z = -3.722$, $p < 0.001$) for both standardized and unstandardized diversity scores.[40]

Table 8.3 presents the results of the multivariate Tobit regressions for the diversity scores that include administrative offences. Table 8.4 presents the results of the multivariate Tobit regressions for the diversity scores that exclude administrative offences. Tobit regression is used because the lifetime diversity scores represent a censored variable.[41] The maximum diversity score for ten offence categories is 0.9, while the maximum value for nine categories is 0.87. The intent of the two models is to test in a multivariate context the hypothesis that age of onset is negatively associated with specialization, and the hypothesis that lambda

[39] The Mann-Whitney U test is used here because of the non-normal distribution of the diversity variable. It is limited in that it commonly does not detect true differences between groups. As a result, independent sample t-tests were performed in conjunction with the non-parametric test reported in this dissertation. In each case there was a statistically significant difference between males and females.

[40] Consistent transformations in this test mean of the variable of interest do not affect the Mann-Whitney U value or the corresponding Z-value.

[41] The diversity index is censored in this study because not all offenders have equivalent free time to engage in offending behaviour due to varying ages and the amount of incapacitation time in the sample. For more detail on the reasons that the diversity score is considered a censored variable refer to Sullivan et al. (2006), McGloin et al. (2007) and McGloin and Piquero (2010).

estimates are positively associated with diversity scores. The additional variables included in the models are gender, ethnicity and the presence of drug and/or alcohol addiction.

Table 8.3: Tobit Regressions of Diversity Scores Including Administrative Offences (N=149) for Three Estimates of Lambda (Per Year of Criminal Activity, Adjusted Years Free and Years Free with no Adjustment to Custody Sentences).

	Model 1	***Model 2***	***Model 3***
Explanatory Variables	***Diversity Index (10 Categories)***	***Diversity Index (10 Categories)***	***Diversity Index (10 Categories)***
Intercept	0.902 (0.056)***	0.897 (0.057)***	0.889 (0.057)***
Gender (Female = 1)	**-0.144(0.035)*** **	**-0.144 (0.034)*** **	**-0.142 (0.035)*** **
Ethnicity (Non-White = 1)	0.020 (0.026)	0.017 (0.026)	0.014 (0.026)
Addiction Status (Addicted = 1)	0.039 (0.032)	0.039 (0.032)	0.040 (0.032)
Criminal Career Variables			
Age of Onset	**-0.013 (0.003)*** **	**-0.013 (0.003)*** **	**-0.013 (0.003)*** **
Total Convictions λ_{CL}	-0.006 (0.007)	--	--
Total Convictions $\lambda_{2/3}$	--	-0.001 (0.004)	--
Total Conviction λ_{100}	--	--	0.001 (0.003)
Sigma	0.137 (0.007)***	0.138 (0.008)***	0.138 (0.008)***
Log Likelihood	83.878	83.527	83.502
BIC	-132.728	-132.027	-131.976

* P < 0.05
** P < 0.01
*** P < 0.001

Table 8.4: Tobit Regressions of Diversity Scores Excluding Administrative Offences (N=149) for Three Estimates of Lambda (Per Year of Criminal Activity, Adjusted Years Free and Years Free with no Adjustment to Custody Sentences).

	Model 1	***Model 2***	***Model 3***
Explanatory Variables	***Diversity Index (9 Categories)***	***Diversity Index (9 Categories)***	***Diversity Index (9 Categories)***
Intercept	0.915 (0.074)***	0.906 (0.075)***	0.890 (0.076)***
Gender (Female = 1)	**-0.205(0.046)*** **	**-0.203 (0.047)*** **	**-0.198 (0.047)*** **
Ethnicity (Non-White = 1)	0.002 (0.034)	-0.002 (0.035)	-0.009 (0.035)
Addiction Status (Addicted = 1)	0.048 (0.042)	0.051 (0.043)	0.053 (0.042)
Criminal Career Variables			
Age of Onset	**-0.016 (0.003)*** **	**-0.017 (0.003)*** **	**-0.017 (0.003)*** **
Convictions λ_{CL} Excluding	-0.019 (0.011) *x*	--	--
Convictions $\lambda_{2/3}$ Excluding	--	-0.005 (0.007)	--
Conviction λ_{100} Excluding	--	--	0.001 (0.004)
Sigma	0.182 (0.010)***	0.183 (0.011)***	0.184 (0.011)***
Log Likelihood	42.423	41.271	41.018
BIC	-49.819	-47.515	-47.008

x p < 0.1
* P < 0.05
** P < 0.01
*** P < 0.001

Tables 8.3 and 8.4 show that all lambda estimates, when entered into the model separately, are not statistically significant predictors of diversity scores that

include or exclude administrative offences. The predictors that are statistically significant in each of the models in Tables 8.3 and 8.4 are gender and age of onset.

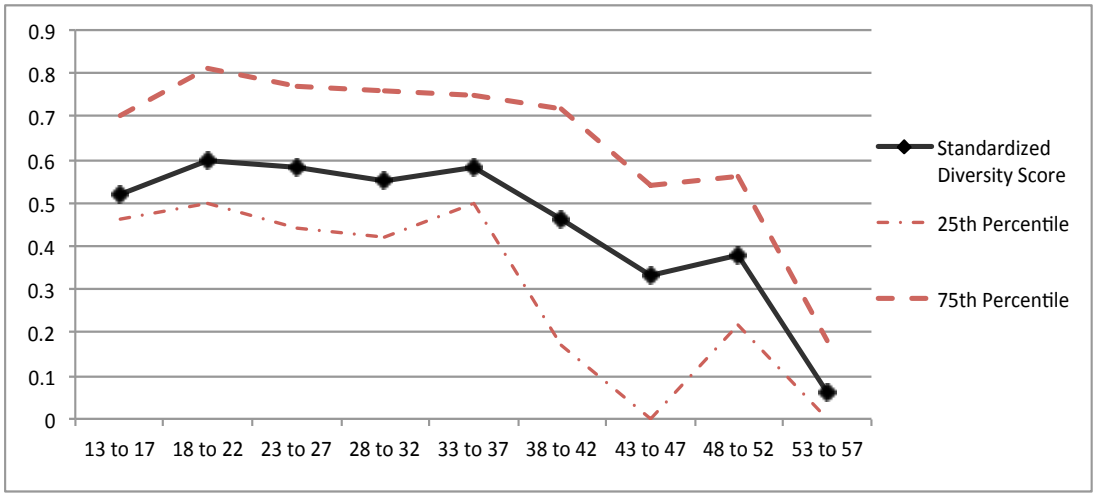
The Tobit regression analysis of diversity scores for the 10 conviction categories in Table 8.3 indicates that the female status produces a change of -0.14 in diversity scores when the model includes λ_{CL}, $\lambda_{2/3}$ or λ_{100} separately. In addition, the Tobit regression in Table 8.3 indicates that a one-unit increase in age of onset produces a -0.013 change to diversity scores when the model includes λ_{CL}, $\lambda_{2/3}$ or λ_{100} separately. In the models of the diversity scores for 10 offence categories, ethnicity and the presence of drug and/or alcohol addiction are not statistically significant predictors.

The Tobit regression model for diversity scores for 9 conviction categories that exclude administrative offences in Table 8.4 produces similar results. The Tobit regression analysis of diversity scores for the 9 conviction categories indicates that the female status produces a change of -0.205 and -0.203 in diversity scores when the model includes λ_{CL} or $\lambda_{2/3}$, respectively. In the model that includes λ_{100} being females produces a -0.198 change in diversity scores. In addition, the Tobit regression in Table 8.4 indicates that a one-unit increase in age of onset produces a -0.16 change to diversity scores when the model includes λ_{CL} estimates. The models indicate that a one-unit change in either $\lambda_{2/3}$ or λ_{100} estimates produces a -0.017 change to diversity scores for 9 offence categories. In the models of the diversity scores for 9 offences, ethnicity and the presence of drug and/or alcohol addiction are not statistically significant predictors.

One of the goals of this research is to assess the stability of diversity score over time by examining specialization in the short term over successive stages of the life course. Figure 8.1 shows the mean standardized diversity scores for the nine conviction categories over five-year age groups. For the corresponding table refer to Appendix B. Figure 8.1 indicates that versatility increases from the juvenile period (mean = 0.52), peaks in the 18 to 22-age interval (mean = 0.60) and declines

slightly until a secondary peak is observed in the 33 to 37-age interval (mean = 0.58). After this age interval diversity scores decrease steadily.

Figure 8.1: Average Standardized Diversity Scores for Convictions Excluding Administrative Offences by Five-Year Age Groups (N = 143).



Summary and Conclusions

This chapter analyses specialization of the COP sample and uses the diversity index as the operational measure of specialization. Overall this chapter indicates that the COP sample exhibits versatility over the entire life course. This is consistent with theories that argue that specialization is rare in offending (Gottfredson & Hirschi, 1990; Hirschi & Gottfredson, 2002c) and theories that propose that frequent offenders tend to have low levels of specialization (Piquero & Moffitt, 2005). Males in the COP sample tend to have higher levels of versatility than females. In addition, there is a small proportion of the sample that exhibits higher levels of specialization.

Several hypotheses are tested in this chapter. The first is that lambda estimates are positively associated with diversity scores. The results of the Tobit regression analyses indicate that all lambda estimates have no statistically significant relationship with diversity scores of the COP sample. This contradicts most of the research on specialization which consistently asserts that offending frequency is negatively associated with specialization (Piquero, 2000a). This result is also inconsistent with Moffitt's theory of life course persistent offenders (see Moffitt, 1993; Piquero & Moffitt, 2005). Moffitt contends that LCP offenders, based

on their high frequency of offending, exhibit a negative relationship between offending frequency and specialization. The null hypothesis of no association is accepted.

The second hypothesis that is tested is that age of onset is negatively associated with specialization. Although the effect size is small, the Tobit regression models indicate that age of onset is positively associated with specialization (negatively associated with the diversity index). This finding is consistent with past research on specialization (see Piquero et al., 1999) and theory (see Piquero & Moffitt, 2005).

The last hypothesis that is tested in this chapter is that COP offenders become increasingly specialized over their life course. This hypothesis is tested by calculating diversity scores over five-year age intervals. The analysis shows that COP offenders are generally versatile in different periods in their lives, although at a lower degree than their lifetime diversity scores. The analysis indicates that there are two peaks in diversity scores at the age interval of 18 to 22 and 33 to 37. After the late 30s the COP offenders have lower diversity scores (i.e., increased specialization). This finding is consistent with past research on specialization in adulthood (Blumstein, Cohen, Das et al., 1988; Cohen, 1986) and the framework of LeBlanc and Loeber (Le Blanc & Frechette, 1989; Le Blanc & Loeber, 1998; Loeber & Le Blanc, 1990) that predicts specialization occurs within the context of desistance. Moreover, it is consistent with research that examines short-term specialization, where specialization increases within shorter intervals of time (McGloin et al., 2007; Sullivan et al., 2006).

Chapter 9: Discussion

This research contributes to the literature on the life course offending of high frequency offenders. The specific focus of the dissertation is on the offending patterns of a high frequency sample retrospectively identified by the Vancouver Police Department. The pre-identified high frequency sample allows for an assessment of the assertions that pertain to high frequency offending that in past research are derived from a small number of frequent offenders who form part of general population samples or intake samples. In addition, this research allows for some tests of the applicability of some of the developmental life course theories and general theories of crime to high frequency offenders.

The results indicate that the COP sample have a high number of lifetime convictions. The lifetime lambda estimates of the COP sample surpass lambda estimates for frequent offenders in past research (see Blumstein et al., 1985). Depending on the estimate of incapacitation time, the frequent offenders in this sample have average lambdas ranging from three convictions per active year to over five convictions per active year. The COP offenders show high levels of personal instability, through high levels of drug and/or alcohol addiction, high levels of residential instability, high numbers of co-offenders and high levels of violence.

The analysis of age and crime indicates that the COP sample does not show evidence of the maturation effect emphasized by Gottfredson and Hirschi (1990). These offenders are convicted frequently until age 40, after which the frequency of offending declines. The age-crime curves shown in this study are more consistent with the offending trajectories of high and medium rate chronics identified by Laub and Sampson (2003).

One of the main foci of this study is the analysis of different lambda estimates through the use of different estimates of incapacitation time. Unlike most research that uses mean sentence length from official data, this study uses actual sentenced times and remand times in the calculation of incapacitation time. This is important because COP offenders have different probabilities of arrest, conviction and

incarceration than the average offender. The analysis of lambda estimates shows that the COP sample lambdas that do not include incapacitation time (λ_{CL}) and those that factor incapacitation time into the estimate ($\lambda_{2/3}$, λ_{100}) are significantly different. This seems to indicate that they are in fact different variables for high frequency offenders. This echoes the assertions of Piquero, Blumstein, Brame, Haapanen, Mulvey and Nagin (2001) who stress the importance of including incapacitation time in the estimation of lambda for frequent offenders. It is the contention of the author that lambda estimates that include incapacitation time are a more valid indicator of offending for high frequency offenders. Moreover, they are an indicator that can be used for comparing the frequency and impact of high rate offenders in a standardized manner.

The multivariate analyses of lambda estimates yield some noteworthy results. The models show that very few traditional predictors of lambda for total convictions are statistically significant. In this study ethnicity, residential instability and, in certain cases, age of onset are related to lambda estimates for total convictions and convictions excluding administrative offences. However, the analyses for serious conviction lambdas indicate that gender, ethnicity and age of onset are significant predictors of serious lifetime lambdas. These results are difficult to interpret, but perhaps they indicate that serious convictions are more useful in understanding the offending of a high frequency sample. For frequent offenders the less serious and more common offence types can obscure relationships.

The analysis of specialization in the COP sample yields some interesting and unexpected results. Over the life course the offenders have high levels of versatility. However, there is a small portion of the COP offenders that are more specialized than versatile. Moreover, the analysis of specialization over shorter-term intervals shows that the COP sample is more specialized than is apparent from their lifetime estimates. The pattern of increased specialization over time is consistent with the framework proposed by Le Blanc and Loeber (1998).

The multivariate analyses of the diversity index show that age of onset is positively related to specialization. This finding is consistent with most research on specialization. In addition, the findings indicate that females tend to be more specialized than their male counterparts. The most interesting result from the analysis is that each lambda estimate has no association with specialization. This finding contradicts most of the research to date, which shows that offending frequency is inversely related to specialization. The analyses in this study provide some additional answers to the contentious issues identified by Farrington (2005a) as applied to a sample of high frequency offenders. Notably, these findings are different than many of the reported findings from general population and intake samples.

Policy Implications of the Research

Much of the discussion of the recommendations with regards to the COP offenders centers on whether the starting point for policy is the protection of society or whether it is to address the underlying causes of offending through rehabilitative interventions. In addition to these types of policy ramifications, the utility of a shift toward interventions similar to the Chronic Offender Program is discussed.

The introduction of *Bill C-25: The Truth in Sentencing Act* in Canada, which went into effect in February 2010, is an intervention relevant to COP offenders. The Bill presumes a one-for-one credit for remand length to sentence length outcomes (Casavant & Valiquet, 2010). Anecdotal evidence from COP members indicates that the COP offenders, with their high volume of convictions and experience with the court process, engaged in risk calculations of remand stay length and probable sentence length. Although it is not necessitated in common-law, there was an assumption prior to *Bill C-25* (see Roberts, 2005; Webster, Doob, & Myers, 2009; Weinrath, 2009) that one day of remand was credited at two to three days of sentence time. *Bill C-25*, as applied to COP offenders effects a change in the calculation of the benefit of remand credit against a sentence outcome. This is noted as one of the objectives of the Bill (see Casavant & Valiquet, 2010).

More recently, the Government of Canada has been debating *Bill C-2: Tackling Violent Crime Act*. The Bill is broadly intended to protect Canadians from violent crime and amends the age of protection from exploitation, minimum sentences for offences where firearms are used, impaired driving, dangerous offender provisions and bail legislation. Although it has been criticized (Canadian Bar Association, 2007; Canadian Criminal Justice Association, 2007), of particular importance to COP offenders are the amendments to the dangerous offender provisions. The most significant modification is the inclusion of offences that are "subject to a sentence of only two years or more" (Canadian Criminal Justice Association, 2007, p. 3). The wide range of sentences in the *Criminal Code of Canada* for a variety of offence types make the ramifications of this component of the legislation serious. Moreover, the Bill provides a list of designated offences that is overly inclusive, such as breaking and entering and assaulting a peace officer (Canadian Bar Association, 2007; Canadian Criminal Justice Association, 2007).

The overreaching nature of the Bill is evident in that it creates a presumption that an offender can be considered a dangerous offender after the offender is convicted of three designated offences. Once this occurs the onus is placed on the accused to prove that he or she is not a dangerous offender (Canadian Bar Association, 2007; Canadian Criminal Justice Association, 2007). Although the intent of the Bill is to target the most serious offenders it creates a situation where, if enacted, all of the COP offenders in this dissertation could be subject to a dangerous offender designation. This designation could collectively incapacitate all of the COP offenders for extremely long periods of time because they all have several convictions for these broad offence categories and a high frequency of convictions. This is, in effect, counter to the idea of selection incapacitation, as discussed in pervious chapters. It could create a context similar to the Three Strikes policies that exist in the United States, the latent consequences of which have included increased prison crowding, exponential increases in prison costs and serious limitations on due process (see Auerhahn, 2002; Merritt, Fain, & Turner, 2006). For these reasons, the proposed legislation is not advocated as a response to COP offenders in Vancouver.

Although *Bill C-2* seems to be an over inclusive response to perceived dangerousness, this does not preclude the use of short-term relatively fixed incapacitation sentences in response to COP offenders. Without specifying the meaning of short-term fixed sentences, there are potential benefits to the idea of applying short-term incapacitation sentences to offenders who are well beyond the traditional definition of chronic (e.g., thirty convictions or more). First, they provide all parties with a known outcome upon conviction. Second, and as a negative commentary on the state of our social support system, the COP members often commented that the offenders were in a superior state after some time in an institutional setting. The results of this study indicate that the COP offenders experience high levels of drug addiction, homelessness and other forms of instability. The COP members indicated that while in custody the offenders were healthier, had gone through the outcomes their drug addictions and were more amenable to potential interventions, such as various treatment regimes. It was often the case that, in these settings, COP members were able to start the process of connecting the offenders to services that addressed their individual needs.

As the recognition of the uniqueness of high frequency offending has increased in Western nations, other promising governmental responses have emerged that are founded on rehabilitative goals. The data in this research, and anecdotal evidence from the COP members indicate that COP offenders as a group have many co-occurring problems and behaviours that are linked directly or indirectly to their offending intensity. In British Columbia there has been a shift to a rehabilitative court model with the implementation of Downtown Community Court (DCC), which opened in September of 2008. In general, community courts have an underlying philosophy that differs from the traditional court system. Community courts diverge from the due process and crime control philosophies and instead focus on "helping defendants with underlying problems" through rehabilitation (Karafin, 2008, p. vi). The DCC in Vancouver is structured to achieve this goal through integration with other criminal justice agencies and social service agencies. The DCC is structured to:

> Facilitate early and expedited responses to harmful behaviour by ensuring that the health and social circumstances of accused are assessed and addressed in order to develop a framework for potential resolution of a proceeding at the initial stages. A collaborative approach (is) adopted to develop case management recommendations that accord with the community interests and the interests and risk-related needs of the offender. (Government of British Columbia, 2008, p. 11)

At present, the DCC is restricted to a specific set of offence types and offenders within a circumscribed portion of the City of Vancouver, British Columbia.[42] After a guilty plea the DCC may hear:

> *Criminal Code of Canada* summary offences, absolute jurisdiction offences, optional indictable (hybrid) offences where the Crown elects to proceed summarily, and proceedings where the accused elects to dispose of a charge by guilty plea.
> Simple drug possession cases under the *Controlled Drugs and Substances Act*; and
> Provincial offences that are heard by Provincial Court Judges.
> (Government of British Columbia, 2008, pp. 7-8)

The DCC is a specialized court with a dedicated prosecutor and defence counsel. The prosecutor is responsible for reviewing Reports to Crown Counsel (RCCs) and determining the applicability of the offence and offender for participation in the DCC. After an accused consents to the process, a triage team provides an initial screening. The purpose of this assessment is to review the social, health and additional risk factors and assist the Crown and the DCC team with the sentencing and intervention submissions in the court process. In the event of a court disposition based on the triage screening process, a case management team is responsible for developing a case management plan. The individualized case management plan is aimed at connecting offenders with the requisite services to address their needs and risk factors, and at monitoring compliance.

It is important to note that the DCC is not mandated to deal exclusively with chronic offenders but any proscribed offence types within the catchment area that pose harm to the community. However, the nature of the DCC process with triage

[42] The area contains all of District 1 and District 2 west of Clarke Drive of the Vancouver Police Department.

assessments and caseworkers is well suited to offenders who have varying degrees of co-morbidity and a high offending frequency. This focus on chronic offenders seems to be reflected in the intensive case management stream, which is limited to a maximum of 100 offenders at any given time (Government of British Columbia, 2008). One of the important limiting factors of this court model is the availability of space in the services required to meet the multitude of needs of COP offenders.

The results of this dissertation suggest that the advent of chronic offender programs in the police, courts and other parts of the criminal justice system is a progressive shift in perspective and resources. Evidence from other nations indicates that an integrated response to chronic offenders has positive effects on the future offending, the maladaptive behaviours and the conditions of offenders (see Dawson, 2005, 2007). However, given the mobility of the chronic offending population, the effects of these strategies seem to be dependent on the local context and whether they are adopted across jurisdictions (Ministry of Justice, 2009). The province of British Columbia is trending in this direction. Currently, there is a debate around the creation of community courts in other jurisdictions. Moreover, the integration of chronic offender monitoring programs in police agencies is occurring in other jurisdictions. At present, the Prolific Offender Management (POM) pilot project is being evaluated in six cities in British Columbia. This project integrates stakeholders from the Royal Canadian Mounted Police and municipal police forces, related criminal justice agencies, and various other authorities, such as health and housing to address chronic offending. In terms of improved collaboration and decreases in offending, the initial results seem promising (Government of British Columbia, 2009).

The challenge is to identify the most frequent and serious offenders to include in the programs. This is important when resources are constrained, as is often the case with new approaches to address frequent offending. This is where the results of this dissertation can assist with these types of decisions. The use of lambda allows researchers and practitioners to calculate standardized estimates of offending frequency over different units of time. This allows for more accurate comparisons between individual offenders as a metric for inclusion or as an

outcome after an intervention. Moreover, if seriousness is relevant, weighted lambda estimates can be calculated from the combination of lambda scores and offence seriousness scales that are present in past research (see for example Statistics Canada, 2009; Wolfgang, Figlio Robert, Tracy, & Singer, 1985).

Limitations of the Research

There are several notable limitations to the research design in this study that are important to acknowledge. These pertain primarily to the database, the sample and the indicators of offending. Specifically, the sample includes pre-identified frequent offenders who vary in age. Moreover, the COP unit is a practical intervention that consequently has an impact on the offenders. In addition, the use of convictions as the indicator of offending is a topic of substantial debate. It is recommended that the results of this research be understood in light of these considerations.

The database limitations pose two potential challenges to this research that relate to the establishment of the criminal career concepts of age of onset, criminal lambda and specialization. The retention policy of CPIC and conviction rules impact these constructs in the following ways. First, the requirement of an FPS number means that no strict summary offences are recorded in CPIC. For lambda, specialization and age of onset estimates this means that the content of CPIC is biased towards more serious offences (i.e., those with at least a hybrid status irrespective of the prosecutorial decision to proceed by way of summary conviction or indictment) because police do not collect fingerprints for strict summary offences.

In addition to the finding that convictions may occur many years after a first self-reported offence, the retention policy of CPIC has the potential to impact age of onset estimates. This is an outcome of the retention policy for convictions of young offenders. In Canada, the minimum age of criminal responsibility is 12 years of age. It is possible that the COP offenders were convicted of one offence at the age of 12 and not convicted of any further offences for a period of three to five years, in which case the record is expunged. In the case of summary offences, this requires that the COP offenders not receive a conviction for an offence until after their 15th birthday,

while for indictable offences they needed to be conviction-free until after their 17th birthday. Although, this scenario is possible, it is unlikely as most of the COP offenders had at least one conviction as young offenders. For the purge scenario to be possible it requires that they avoided additional convictions as a youth. Recall that the retention time is re-set to the duration of the new convictions. This combined with the overall frequency of these offenders makes this scenario unlikely.

Another issue is that the COP unit members provided the sample in this dissertation. The sample in this research is a purposive sample of known high frequency offenders. As a result, the representativeness or generalizability of the sample to chronic offender populations outside of the COP offender population is unknown. It is important to note that the sample in this research was collected specifically from a group of known high frequency property offenders under the supervision of the Vancouver Police Department. The random sample from the original COP population of 380 was an attempt to ensure that the offenders selected for this research were representative of the population of COP offenders under the supervision of the COP unit at the time of the research. This was necessary to accurately analyse the characteristics of the COP offender population.

Early in the research process a decision was made to combine the offenders with the label of "super chronic" with the random sample of COP offenders. This was because the analysis of the twenty-two offenders labeled "super chronic" indicated that they did not differ on the key variables of interest for the research. First, lambda estimates for the "super chronic" offenders were not statistically different from the rest of the COP sample. Second, a dummy variable for "super chronic" was not predictive of any of the lambda estimates for any of the types of convictions in the regression models. A split sample approach was used to compare models with and without the "super chronic" variable. No differences between models were observed.

It is apparent that the COP members thought that the "super chronic" offenders were the most frequent and serious offenders in their population, but a note of caution is warranted when interpreting the meaning of this label. First, the

COP members use this label for operational purposes. This means that the list is fluid and when some offenders are incarcerated they are removed from the list and replaced by other offenders who are free and deemed worthy of closer supervision. Second, this list is used as a basis for information dissemination to Target Teams and the General Investigation Unit at the Vancouver Police Department. Given limited resources, the COP unit needed a smaller subset of offenders to monitor and disseminate information to these two police functions. Last, the use of the label "super chronic" was a time specific label in the sense that COP members had a reason to believe that the offender warranted the label and the increased attention. This occurred partly as a result of the interactions of the police with COP offenders. For example, COP members conducted lifestyle interviews with offenders while they are incarcerated or at other locations. This information is used for a variety of purposes, but one of the uses is to gauge the likelihood that the offender is amenable to lifestyle changes, such as treatment or re-establishing connections to family. Additions to the "super chronic" list occurred in instances when offenders indicated that they had no intention of desisting or accepting assistance from outside sources. It is possible that the "super chronic" offenders were potentially more serious offenders at the time of their inclusion on the list. This is not possible to discern because the list was accessed in May of 2007 and the data collection for the research ended on December 31, 2006. Additional data collection is required to test this assumption.

The issues of sampling mean that the results of this dissertation may not be generalizable to other chronic offending samples and the results are limited in their replicability outside of the COP population of 380 offenders. As a result, it is unknown if these offenders differ from other samples of high frequency offenders. However, the potential critique that the COP offenders are simply frequent less serious offenders is inaccurate. It is worth noting that the COP offenders are not solely minor offenders or property offenders. They have extensive criminal backgrounds that contained numerous non-property and serious offences.

The sample was selected in this fashion because research indicates that cohort research designs under-represent chronic or high frequency offenders

(Bartusch et al., 1997; Cernkovich & Giordano, 1985; Spelman, 1994). High frequency offenders, of the magnitude examined in this research, are such a small subset of the offending population that it is difficult to locate reasonable sample sizes for analysis. Some research on frequent offenders focuses on samples from sites that are more likely to contain these offenders, such as prisons (Chaiken & Chaiken, 1982; Ezell & Cohen, 2005; Haapanen, 1990; Peterson et al., 1980) or probation (DeLisi, 2006). The author of this research is fortunate that the VPD had dedicated a substantial amount of resources toward the identification of high frequency offenders. Given that the intent of this research is to assess the dimensions of criminal careers for a frequent sample, the issue of the purposive sample selection strategy is not a major impediment to the research.

A related issue with the sample selection is that the offenders are of varying ages. This is less of a problem overall for this study but does have an impact on specific analyses that examine offending patterns over time. The sample size decreases significantly when the results focus on offenders age 40 and beyond. This is important when examining the analyses of offending that report post-age 40 findings.

Another potential concern with the results of this research is the possibility of intervention effects from the COP unit. The COP unit is a police initiated intervention and the interaction of COP members with the COP offenders likely had an effect on the risk of apprehension and possibly, given the increased targeting of resources to these offenders, on the probability of remand time and conviction for any given offender. These outcomes impact the count of convictions and incapacitation time which, if significant, impact the lifetime estimates of lambda.

There are several reasons to indicate that this concern is not a significant limitation to the results of the dissertation. First, the time overlap between the data collection of lifetime convictions and the initiation of the COP unit was less than two years. The COP unit was implemented in 2004 and the data collection ended on December 31, 2006. Initially, not unlike novel programs in other organizations, COP members began with several attempts to identify a manageable population and to determine the mandates of the program. This start-up process continued with

consultations and information dissemination on the COP unit with other groups and stakeholders (i.e., probation officers, Crown Counsel and treatment organizations). Accounting for the time investment of these initial start-up activities suggests that the time overlap between the COP unit intervention and the data collection approximates one year.

Second, anecdotal evidence from the lifestyle interviews suggested that the offenders were not initially influenced by the deterrent effect of the COP unit. This means that the underlying offending frequency of the offenders probably did not change substantively during the overlap period of the COP intervention and data collection. Anecdotally, the interviewed offenders often indicated that they needed a certain amount of money to support their negative lifestyles (i.e., drugs, gambling, etc.) and could not offer a reliable estimate of self-reported offending. Last, although there were 380 offenders in their COP population at the time of data collection, not all 380 were subjected to increased targeting and monitoring. As mentioned previously, the subset of "super chronic" offenders were subjected to more intense supervision and targeting. Four officers staffed the COP unit and it was not possible for them to monitor all 380 COP offenders, prepare, organize and disseminate this information, appear in court and conduct lifestyle interviews. The intensity and diversity of their responsibilities make it unlikely that the offending frequency or specialization estimates of the COP offender sample in this research are biased during the time frame of data collection.

However, the data did indicate that remand became more prevalent later in the conviction histories of the COP offenders. This is important to consider because it is part of the mandate of the COP unit to increase pre-trial detention of COP offenders who have a history of violating court orders. Recall that COP offenders had a median of 120 days in remand over their entire life course of offending. This is probably not a major concern for biased estimates of incapacitation time as the median criminal career length of the COP offenders is 16.3 years. Moreover, it is not possible to discern whether the increase in the prevalence of remand stays is the direct result of the COP offender histories of non-compliance, the COP intervention,

the shift towards increased remand admissions in Canada (see Roberts, 2005; Webster et al., 2009; Weinrath, 2009) or a combination.

A pivotal concern for this study is directed at the offending indicator of official convictions. There is an on-going debate on the validity of offending indicators that contrasts the benefits of self-reported offending measures against official agency measures. Most of the researchers within the field are strong advocates of self-report indicators of offending, although much of the research in the field has traditionally used official indicators of offending. One of the most vocal advocates of the advantages of self-report indicators of offending, especially for age of onset and offending sequences, is David Farrington (see Farrington, 2003b; Farrington et al., 2003; Kazemian & Farrington, 2005; Piquero et al., 2003; Piquero et al., 2007). The essential critique of official records is that they are a filtered source of data on offending, and as such they underestimate total offending and are not accurate indicators of important processes connected to offending, such age of onset and offence sequencing. Most authors are in favor of self-report methods used in conjunction with official data sources. Nevertheless, a large body of longitudinal research notes the strong relationship between official and self-reported offending (Curry, 2000; Farrington, 2003b; Kazemian & Farrington, 2005; Piquero et al., 2003).

There are some researchers that challenge the assertion that self-report methods are superior to official indicators. First, there are specific limitations in self-report methods. As applied to general populations of offenders, some of the critiques include: under-reporting, especially with regard to serious offending, a limited number of crime types are assessed, a large number of trivial offences may be reported and many respondents forget or do not interpret behaviour as criminal (see Jackson, 1990; Mosher, Miethe, & Phillips, 2002).

Some research has challenged the validity of self-reports with regard to age and crime. Lauritsen (1998, 1999) analysed the self-reported data from the National Youth Survey to examine whether self-reported offending conformed to the widely accepted shape of the age-crime curve. She found that for all of the five waves examined, self-reported offending "declined significantly over the subsequent

four-year period," which is incongruent with the widely cited age-crime curve (Lauritsen, 1999, p. 148). She suggested that the reliability and validity issues in self-report measures of offending in longitudinal designs is a result of "repeated testing" and changing "content validity" of the offending indicators in the NYS (Lauritsen, 1999, p. 144).

The issues of reliability and validity of self-reports tend to be more acute with regard to frequent offenders. The difficulties involved in gathering reliable offending data in the RAND Inmate Surveys is evident in the methodological changes from the First to Second Surveys. The second RAND Inmate Survey used a shorter-time window and life event calendars to estimate monthly self-reported offending for all prisoners. However, in the case of frequent offenders (i.e., 10 or more offences of a specific type) they estimated daily offending counts, which were used to calculate yearly ranges for the frequent subsample. Much attention has been devoted to the accuracy of these estimates (Spelman, 1994; Visher, 1986). Certain authors have asserted that the maximum range of the estimates are significant over-estimates (Visher, 1986), and others have refined the life calendar method for deriving lambda estimates from offenders in custodial settings (Horney & Marshall, 1991, 1992).

More recent research, as a result of studies like the RAND Inmate Surveys, directly examines the validity and reliability of self-reports for frequent offenders. Simon (1999, p. 221), in her study of 273 incarcerated violent male offenders, found that with regard to validity and reliability of self-reports "offenders with more extensive criminal histories are likely to be poor historians of their own crime commission rates….High-rate chronic offenders cannot be relied upon to accurately report their crime commission rates".

At one point during the dissertation research, information pertaining to self-reported offending of the COP sample was requested. The COP members at the VPD conduct lifestyle interviews with offenders when they are incarcerated either in pre-sentence custody or during a custodial sentence. The officers indicated that they had tried to gather estimates of street offending in the past, and that the offenders were unable to recollect anything other than gross approximations for daily

offending. These included statements about a daily dollar value needed to maintain their current lifestyle, and that they were caught by the police approximately 1 time for every 100 crimes committed. Therefore, it seems that using anything but official indicators to examine the offending of the COP sample is not possible.

Directions for Future Research

The limitations of this research provide a basis for future research. The use of police operations data means that many of the covariates of the lambda estimates and the diversity index are less precise than typically desired. It would be informative to interview the COP offenders to collect more detailed information on age of onset for self-reported offences, arrests and convictions. More detailed indicators on education, relationships, experience with the justice system, drug use, alcohol use, group offending and self-reported crime type preferences, are required for formal tests of the theories reviewed in this dissertation. Moreover, in-depth interviews with COP offenders allow for the analysis of additional past and present trauma variables. This affords a test of competing development life course theories, such as Sampson and Laub's age graded theory of informal social control.

This study uses conviction data to estimate conviction-based lambdas. A different but related line of research is to derive estimates for street offending for the COP sample. The production of convictions is a filtered process, where actors in the criminal justice system influence the categorization of crime. In certain instances the original charges may be modified. This happens, for instance, when an accused disposes his or her case via a plea to a lesser included offence, or when the Crown relays charges. The filtering process also restricts the volume of offences that eventually lead to a disposition and sentence. The crime filter shows how a small proportion of reported offences are cleared, a smaller proportion are proceeded with by the Crown, and a smaller proportion result in a guilty verdict. Typically, the values for each of these stages are estimated for a general population sample using mean values from official statistics (see Blumstein & Cohen, 1979, 1987; Canela-Cacho et al., 1997), which are not available for high frequency offenders as a subgroup. The use of general population mean values for each of the

probabilities applied to high frequency offender samples biases the resultant lambda estimates and any estimates for their street offending. Probabilities related to high frequency offenders need to be used instead. These are, however, are still static in time. The fundamental understanding that a high frequency offender passes through the system multiple times may be captured by using more elaborate statistical information on the offenders at each stage in the criminal process. This includes distributional information based on the history of the offender or shifts towards specific types of convictions. Capturing the continuous frequent offender trajectories in the justice system can be explored by using mathematical models. In particular, they can be used to estimate street offending for COP sample.

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Appendices

Appendix A: Map of Criminal Code of Canada Offence Types to Specific Crime Types and Seriousness Groups

This table presents the mapping of Criminal Code of Canada offence types to specific crime types and seriousness groups used in this dissertation. It is important to note that all "attempted" and "conspire" offences are being counted as an actual offence.

Table A.1: Table of Concordance for CCC Offence Types, Grouped Crime Types and Seriousness Groups.

Specific Crime Type (1 to 26)	Criminal Code of Canada Offence Type	Seriousness Group (1 to 10)
Administrative Offences	Fail to Comply with Recognizance, Probation Order, Undertaking, Disposition Breach of Conditional Sentence Order	Administrative Offences
Minor Other Offences	Acknowledging Instrument in a False Name, Bypass Electricity, Causing a Disturbance, Contributing to Juvenile Delinquency, Flight, Harassment, Impersonation, Mislead Police Officer, Obstruct Police Officer, Prostitution, Trespass	Minor Other Offences
CCC Minor Traffic Offences	Driving While Disqualified, Fail to Remain at Scene of Accident, Refuse to Provide Sample	Minor Other Offences
Minor Property Damage Offences	Mischief, Mischief Under, Willful Damage	Minor Other Offences
Other Drug Offences	Fail to Disclose Prescriptions	Minor Drug Offences

Drug Possession Offences	Possession of a Scheduled Substance, Restricted Drug, Narcotic, Controlled Substance	Minor Drug Offences
Minor Fraud Offences	False Pretences, False Pretences Under, Forgery, Fraud, Fraudulently Obtain Transport or Food, Fraud Under, Possession of Counterfeit Money, Possession of Credit Card, Uttering Forged Documents	Minor Property Offences
Minor Theft Offences	Mail Theft, Possession of Stolen Property, Possession of Stolen Property Under, Theft, Theft Under	Minor Property Offences
Minor Other Theft Offences	Possession of, Break and Enter, Coin Device, Motor Vehicle Instruments	Minor Property Offences
Minor Assault Offences	Assault, Assault Police Officer, Unlawfully Causing Bodily Harm, Uttering Threats	Minor Violent Offences
Serious Other Offences	Causing Suffering to an Animal, Committing an Indictable Offence, Disguise	Major Other Offences
Serious CCC Traffic Offences	Criminal Negligence in the Operation of a Motor Vehicle, Dangerous Driving, Dangerous Driving Causing Bodily Harm, Driving While Impaired, Driving While Impaired Causing Bodily Harm, Impaired Care and Control,	Major Other Offences
Serious Property Damage Offences	Arson, Forced Entry, Mischief Over	Major Other Offences

Escape Offences	Breaking Out, Escape Lawful Custody, Prison Break, Unlawfully at Large	Major Other Offences
Drug Trafficking Offences	Cultivation of a Narcotic, Produce a Scheduled Substance, Trafficking in Narcotics, Scheduled Substance, Controlled Substance, Restricted Substance, Unlawfully Selling Drugs	Major Drug Offences
Weapons Offences	Carrying a Concealed Weapon, Possession of a Prohibited Weapon, Possession of a Weapon	Weapons Offences
Firearms Offences	Dangerous Use of a Firearm, Use of an Imitation Firearm, Point a Firearm, Possession of a Firearm, Use of a Firearm During an Offence	Weapons Offences
Serious Fraud Offences	Deal in Forged Documents, False Pretences Over, Fraud Over, Production of Counterfeit Money	Major Property Offences
Serious Theft Offences	Possession of Stolen Property Over, Theft Over	Major Property Offences
Break and Enter Offences	Break and Enter, Unlawfully in a Dwelling	Major Property Offences
MVT Offences	Theft of Motor Vehicle	Major Property Offences
Serious Assault Offences	Assault Causing Bodily Harm, with a Weapon, Forcible Confinement	Major Violent Offences
Other Sexual Offences	Indecent Act, Sexual Interference	Major Violent Offences

Sexual Assault Offences	Indecent Assault on a Female or Male, Rape, Sexual Assault, Sexual Assault Causing Bodily Harm	Major Violent Offences
Robbery Offences	Armed Robbery, Robbery, Robbery with a Firearm, Robbery with Violence	Major Violent Offences
Aggravated Assault/Manslaughter Offences	Aggravated Assault, Manslaughter	Major Violent Offences

Appendix B: Additional Tables and Figures not Included in Results

Table B.1: Lifetime Conviction Participation of COP Offenders in Each Crime Type (N=152).

Conviction Type	*Participation Percentage*	*Total Convictions*	*Males*	*Females*
Other Offences				
Other Offences	50.0	181	51.1	42.1
Less Serious Traffic Offences	15.8	42	17.3	5.3
Mischief/Property Damage Offences Under	59.9	337	66.2	15.8
Serious Other Offences	4.0	6	3.8	5.3
Serious Traffic Offences	34.2	99	34.6	31.6
Mischief/Property Damage Offences Over	8.6	21	9.8	0.0
Escape Offences	25.0	58	27.1	10.5
Drug Offences				
Less Serious Drug Offences Other	0.7	12	0.0	5.3
Drug Possession Offences	69.7	350	72.2	52.6
Drug Trafficking & Production Offences	47.4	273	45.9	57.9
Theft Offences				
Less Serious Other Theft Offences	35.5	145	39.8	5.3
Theft Under Offences	94.7	2629	96.2	84.2
Fraud/False Pretences Under Offences	36.8	239	35.3	47.4
Theft Over Offences	56.6	336	61.7	21.1
Fraud/False Pretences Over Offences	3.3	6	3.8	0.0
MVT Offences	10.5	23	12.0	0.0
Break and Enter Offences	63.8	604	69.9	21.1
Weapons Offences				
Weapon Possession Offences	29.0	58	31.6	10.5
Firearms Offences	9.2	16	10.5	0.0
Violent Offences				
Robbery Offences	37.5	151	38.3	31.6
Other Sexual Offences	1.3	2	1.5	0.0
Sexual Assault Offences	3.3	12	3.8	0.0
Assault Level 1 Offences	60.5	314	62.4	47.4
Assault Level II Offences	27.0	77	28.6	15.8
Assault Level III & Manslaughter Offences	3.3	6	3.8	0.0

Table B.2: Lifetime Average Number of Convictions for the COP Offenders in Each Crime Type (N=152).

Conviction Type	*Mean (SD)*	*Median*	*25th Percentile*	*75th Percentile*
Other Offences				
Other Offences	1.1 (1.8)	0.5	0.0	2.0
Less Serious Traffic Offences	0.3 (0.8)	0.0	0.0	0.0
Mischief/Property Damage Offences Under	2.2 (3.3)	1.0	0.0	3.0
Serious Other Offences	0.0	0.0	0.0	0.0
Serious Traffic Offences	0.7 (1.2)	0.0	0.0	1.0
Mischief/Property Damage Offences Over	0.1 (0.7)	0.0	0.0	0.0
Escape Offences	0.4 (0.8)	0.0	0.0	0.8
Drug Offences				
Less Serious Drug Offences Other	0.1 (1.0)	0.0	0.0	0.0
Drug Possession Offences	2.3 (2.9)	1.0	0.0	3.0
Drug Trafficking & Production Offences	1.8 (2.9)	0.0	0.0	3.0
Theft Offences				
Less Serious Other Theft Offences	1.0 (1.8)	0.0	0.0	1.0
Theft Under Offences	17.3 (18.4)	11.0	5.0	23.0
Fraud/False Pretences Under Offences	1.6 (6.3)	0.0	0.0	1.6
Theft Over Offences	2.2 (3.2)	1.0	0.0	3.0
Fraud/False Pretences Over Offences	0.0 (0.2)	0.0	0.0	0.0
MVT Offences	0.2 (0.5)	0.0	0.0	0.0
Break and Enter Offences	4.0	2.0	0.0	5.0
Weapons Offences				
Weapon Possession Offences	0.4 (0.7)	0.0	0.0	1.0
Firearms Offences	0.1 (0.3)	0.0	0.0	0.0
Violent Offences				
Robbery Offences	1.0 (2.2)	0.0	0.0	1.0
Other Sexual Offences	0.0 (0.1)	0.0	0.0	0.0
Sexual Assault Offences	0.1 (0.5)	0.0	0.0	0.0
Assault Level 1 Offences	2.1 (3.8)	1.0	0.0	2.8
Assault Level II Offences	0.5 (1.3)	0.0	0.0	1.0
Assault Level III & Manslaughter Offences	0.0 (0.2)	0.0	0.0	0.0

Table B.3: Age of Onset and Type of First Conviction for COP Offenders in Each Crime Type (N=152).

	Age of Onset		*Type of 1st Conviction*	
Conviction Type	***N***	***Median Age of Onset***	***N***	***Percent***
Administrative Offences	142	24	5	3.3
Other Offences				
Other Offences	77	24	4	2.6
Less Serious Traffic Offences	24	23	--	--
Mischief/Property Damage Offences Under	91	22	6	3.9
Serious Other Offences	6	26	--	--
Serious Traffic Offences	52	23	6	3.9
Mischief/Property Damage Offences Over	13	23	--	--
Escape Offences	38	24	--	--
Drug Offences				
Drug Possession Offences	106	23.5	13	8.6
Drug Trafficking & Production Offences	72	24	8	5.3
Theft Offences				
Less Serious Other Theft Offences	54	28	2	1.3
Theft Under Offences	145	20	37	24.3
Fraud/False Pretences Under Offences	56	24	15	9.9
Theft Over Offences	86	20	17	11.2
Fraud/False Pretences Over Offences	5	29	--	--
MVT Offences	16	23.5	--	--
Break and Enter Offences	97	20	21	13.8
Weapons Offences				
Weapon Possession Offences	44	26.5	--	--
Firearms Offences	14	25	--	--
Violent Offences				
Robbery Offences	57	21	6	3.9
Other Sexual Offences	2	20	--	--
Sexual Assault Offences	5	19	1	0.7
Assault Level 1 Offences	92	22	8	5.3
Assault Level II Offences	41	26	2	1.3
Assault Level III & Manslaughter Offences	5	22	1	0.7

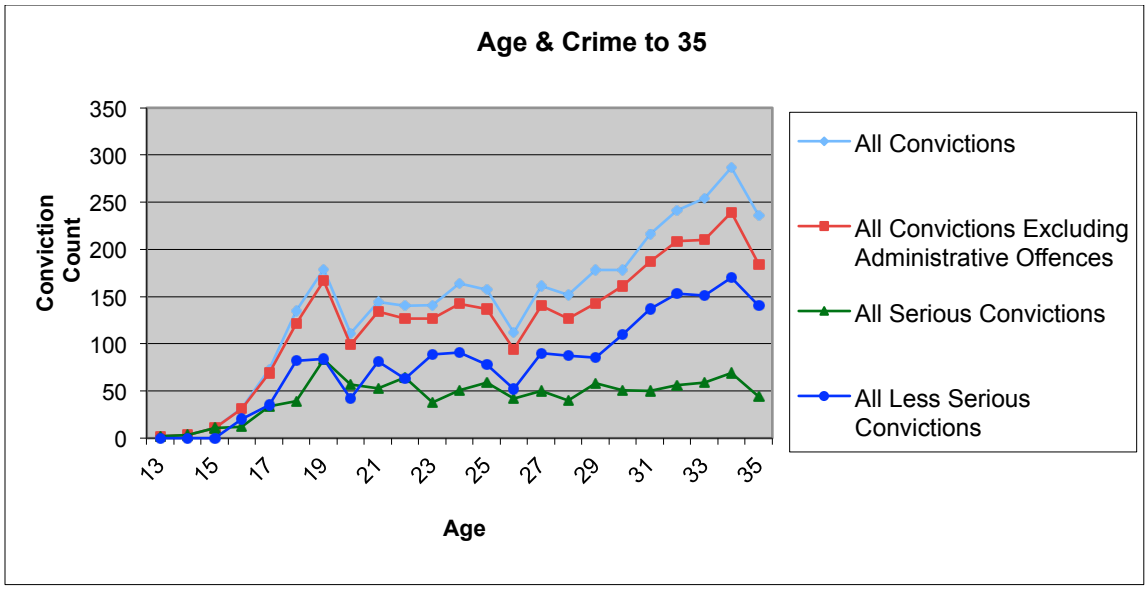

Figure B.1: Age-crime curves for COP offenders who are 35 years of age or more for all convictions, convictions not including administrative offences, serious convictions and less serious convictions (N=88).

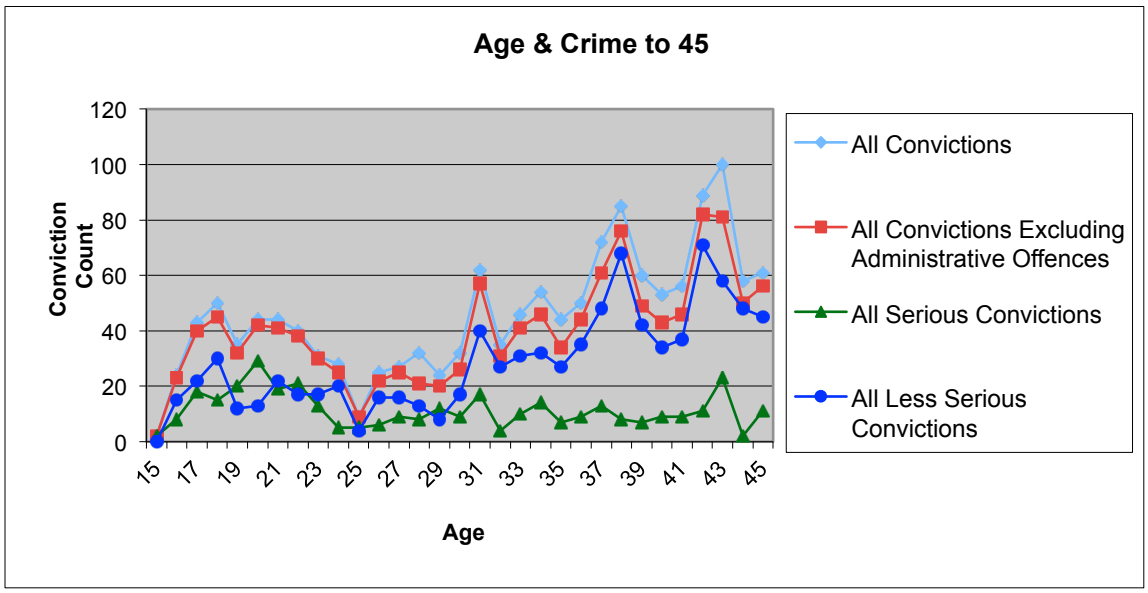

Figure B.2: Age-crime curves for COP offenders who are 45 years of age or more for all convictions, convictions not including administrative offences, serious convictions and less serious convictions (N=23).

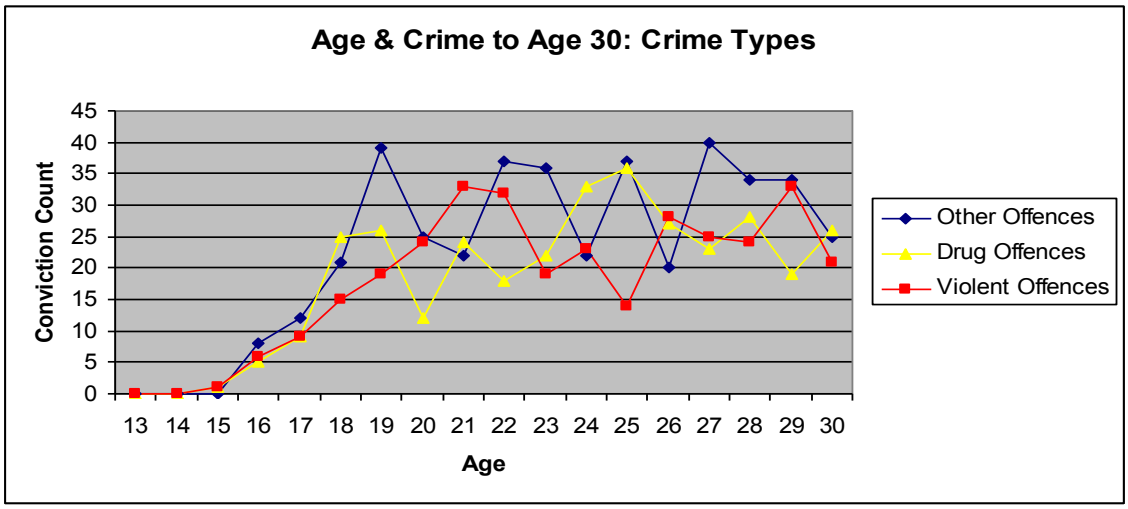

Figure B.3: Age-crime curves for COP offenders who are 30 years of age or more for all other convictions, drug convictions and violent convictions (N=124).

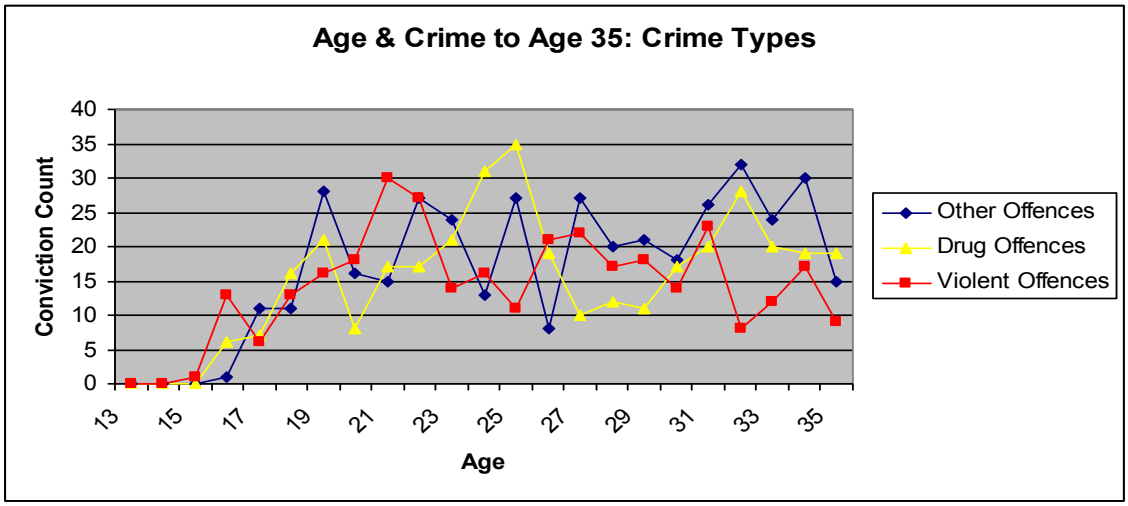

Figure B.4: Age-crime curves for COP offenders who are 35 years of age or more for all other convictions, drug convictions and violent convictions (N=88).

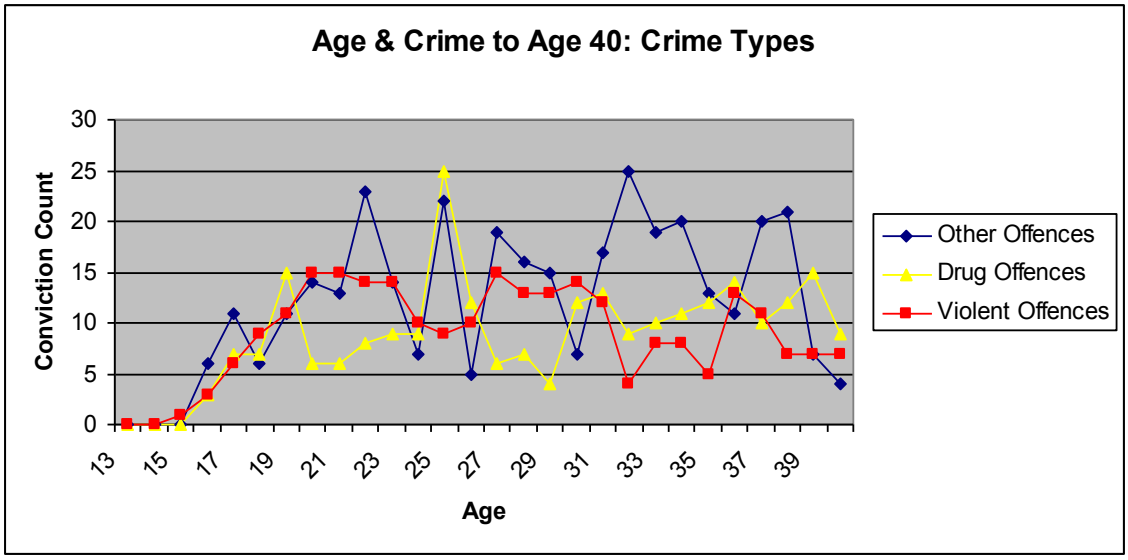

Figure B.5: Age-crime curves for COP offenders who are 40 years of age or more for all other convictions, drug convictions and violent convictions (N=51).

Table B.4: Conviction Frequency per Year of Activity (No Incapacitation Time Adjustment) for COP Offenders (N=152) Active in Each Crime Type.

Conviction Type	*Mean (SD)*	*Median*	*25th Percentile*	*75th Percentile*
Other Offences				
Other Offences	0.16 (0.17)	0.11	0.07	0.17
Less Serious Traffic Offences	0.08 (0.04)	0.07	0.05	0.13
Mischief/Property Damage Offences Under	0.21 (0.19)	0.15	0.09	0.28
Serious Other Offences	0.06 (0.02)	0.05	0.04	0.07
Serious Traffic Offences	0.1 (0.07)	0.08	0.05	0.13
Mischief/Property Damage Offences Over	0.09 (0.1)	0.07	0.04	0.08
Escape Offences	0.07 (0.05)	0.06	0.04	0.09
Drug Offences				
Drug Possession Offences	0.23 (0.41)	0.15	0.09	0.25
Drug Trafficking & Production Offences	0.28 (0.31)	0.16	0.09	0.38
Theft Offences				
Less Serious Other Theft Offences	0.19 (0.2)	0.11	0.06	0.2
Theft Under Offences	1.21 (1.36)	0.77	0.38	1.49
Fraud/False Pretences Under Offences	0.24 (0.36)	0.13	0.08	0.21
Theft Over Offences	0.24 (0.28)	0.15	0.08	0.32
Fraud/False Pretences Over Offences	0.04 (0.01)	0.04	0.04	0.05
MVT Offences	0.07 (0.03)	0.07	0.05	0.1
Break and Enter Offences	0.32 (0.35)	0.20	0.11	0.44
Weapons Offences				
Weapon Possession Offences	0.08 (0.05)	0.07	0.05	0.1
Firearms Offences	0.07 (0.03)	0.07	0.04	0.1
Violent Offences				
Robbery Offences	0.16 (0.18)	0.10	0.10	0.20
Other Sexual Offences	0.07 (0.05)	0.07	0.04	0.11
Sexual Assault Offences	0.08 (0.02)	0.08	0.06	0.1
Assault Level 1 Offences	0.21 (0.24)	0.13	0.07	0.27
Assault Level II Offences	0.11 (0.10)	0.08	0.05	0.14
Assault Level III & Manslaughter Offences	0.06 (0.03)	0.05	0.04	0.08

Table B.5: Conviction Frequency per Year of Activity (One-Third Incapacitation Time Adjustment) for COP Offenders (N=152) Active in Each Crime Type.

Conviction Type	*Mean (SD)*	*Median*	*25th Percentile*	*75th Percentile*
Other Offences				
Other Offences	0.19 (0.2)	0.12	0.08	0.19
Less Serious Traffic Offences	0.1 (0.06)	0.08	0.05	0.15
Mischief/Property Damage Offences Under	0.24 (0.23)	0.17	0.09	0.30
Serious Other Offences	0.08 (0.05)	0.06	0.05	0.1
Serious Traffic Offences	0.12 (0.12)	0.09	0.06	0.14
Mischief/Property Damage Offences Over	0.11 (0.12)	0.08	0.05	0.1
Escape Offences	0.09 (0.06)	0.07	0.05	0.11
Drug Offences				
Drug Possession Offences	0.27 (0.50)	0.18	0.10	0.28
Drug Trafficking & Production Offences	0.33 (0.37)	0.18	0.11	0.44
Theft Offences				
Less Serious Other Theft Offences	0.23 (0.26)	0.13	0.07	0.26
Theft Under Offences	1.45 (2.00)	0.89	0.45	1.66
Fraud/False Pretences Under Offences	0.29 (0.45)	0.15	0.08	0.26
Theft Over Offences	0.29 (0.38)	0.17	0.09	0.37
Fraud/False Pretences Over Offences	0.05 (0.01)	0.05	0.04	0.05
MVT Offences	0.09 (0.04)	0.07	0.05	0.13
Break and Enter Offences	0.39 (0.46)	0.24	0.13	0.50
Weapons Offences				
Weapon Possession Offences	0.09 (0.05)	0.07	0.06	0.12
Firearms Offences	0.09 (0.04)	0.08	0.05	0.11
Violent Offences				
Robbery Offences	0.21 (0.25)	0.13	0.07	0.29
Other Sexual Offences	0.12 (0.09)	0.12	0.06	0.18
Sexual Assault Offences	0.1 (0.05)	0.11	0.06	0.15
Assault Level 1 Offences	0.25 (0.29)	0.15	0.08	0.29
Assault Level II Offences	0.13 (0.12)	0.09	0.05	0.16
Assault Level III & Manslaughter Offences	0.07 (0.03)	0.05	0.04	0.1

Table B.6: Conviction Frequency per Year of Activity (Two-Thirds Incapacitation Time Adjustment) for COP Offenders (N=152) Active in Each Crime Type.

Conviction Type	*Mean (SD)*	*Median*	*25th Percentile*	*75th Percentile*
Other Offences				
Other Offences	0.22 (0.24)	0.14	0.09	0.26
Less Serious Traffic Offences	0.12 (0.16)	0.12	0.06	0.21
Mischief/Property Damage Offences Under	0.28 (0.27)	0.19	0.11	0.33
Serious Other Offences	0.11 (0.1)	0.08	0.06	0.14
Serious Traffic Offences	0.15 (0.19)	0.1	0.7	0.16
Mischief/Property Damage Offences Over	0.13 (0.16)	0.08	0.06	0.11
Escape Offences	0.11 (0.08)	0.08	0.06	0.15
Drug Offences				
Drug Possession Offences	0.31 (0.53)	0.20	0.10	0.33
Drug Trafficking & Production Offences	0.38 (0.43)	0.21	0.13	0.50
Theft Offences				
Less Serious Other Theft Offences	0.27 (0.31)	0.16	0.08	0.32
Theft Under Offences	1.71 (2.73)	1.10	0.51	1.86
Fraud/False Pretences Under Offences	0.34 (0.54)	0.17	0.09	0.34
Theft Over Offences	0.37 (0.49)	0.19	0.10	0.48
Fraud/False Pretences Over Offences	0.05 (0.01)	0.06	0.04	0.07
MVT Offences	0.08 (0.07)	0.08	0.07	0.16
Break and Enter Offences	0.51 (0.71)	0.28	0.14	0.61
Weapons Offences				
Weapon Possession Offences	0.11 (0.06)	0.09	0.07	0.15
Firearms Offences	0.12 (0.07)	0.1	0.08	0.16
Violent Offences				
Robbery Offences	0.28 (0.41)	0.16	0.08	0.33
Other Sexual Offences	0.21 (0.11)	0.21	0.13	0.29
Sexual Assault Offences	0.18 (0.13)	0.16	0.07	0.29
Assault Level 1 Offences	0.28 (0.35)	0.18	0.09	0.31
Assault Level II Offences	0.15 (0.15)	0.09	0.06	0.19
Assault Level III & Manslaughter Offences	0.08 (0.05)	0.06	0.05	0.12

Table B.7: Conviction Frequency per Year of Activity (100 Percent of Custody Time Included) for COP Offenders (N=149) Active in Each Crime Type.[43]

Conviction Type	*Mean (SD)*	*Median*	*25th Percentile*	*75th Percentile*
Other Offences				
Other Offences	0.31 (0.47)	0.16	0.1	0.33
Less Serious Traffic Offences	0.16 (0.16)	0.12	0.06	0.21
Mischief/Property Damage Offences Under	0.35 (0.35)	0.25	0.14	0.44
Serious Other Offences	0.11 (0.06)	0.1	0.07	0.15
Serious Traffic Offences	0.24 (0.55)	0.12	0.07	0.18
Mischief/Property Damage Offences Over	0.16 (0.22)	0.09	0.07	0.13
Escape Offences	0.17 (0.19)	0.11	0.08	0.19
Drug Offences				
Drug Possession Offences	0.38 (0.59)	0.25	0.11	0.47
Drug Trafficking & Production Offences	0.50 (0.61)	0.29	0.15	0.61
Theft Offences				
Less Serious Other Theft Offences	0.35 (0.42)	0.2	0.1	0.42
Theft Under Offences	1.88 (1.89)	1.36	0.54	2.33
Fraud/False Pretences Under Offences	0.42 (0.68)	0.21	0.09	0.46
Theft Over Offences	0.53 (0.87)	0.23	0.11	0.56
Fraud/False Pretences Over Offences	0.07 (0.03)	0.06	0.05	0.09
MVT Offences	0.16 (0.18)	0.1	0.8	0.19
Break and Enter Offences	0.68 (1.15)	0.33	0.15	0.74
Weapons Offences				
Weapon Possession Offences	0.14 (0.08)	0.11	0.08	0.2
Firearms Offences	0.17 (0.14)	0.15	0.1	0.18
Violent Offences				
Robbery Offences	0.46 (1.37)	0.18	0.10	0.33
Sexual Assault Offences	0.24 (0.21)	0.2	0.07	0.46
Assault Level 1 Offences	0.35 (0.46)	0.22	0.12	0.36
Assault Level II Offences	0.19 (0.20)	0.10	0.06	0.24
Assault Level III & Manslaughter Offences	0.1 (0.07)	0.08	0.06	0.16

[43] Three offenders were removed from this analysis. Their lambda estimates were significant outliers.

Table B.8: Proportion of Convictions for the COP Sample (N =152) in Each Crime Type.

Conviction Type	*Mean (SD)*	*Median*	*75th Percentile*
Other Offences			
Other Offences	0.03 (0.04)	0.003	0.04
Less Serious Traffic Offences	0.005 (0.01)	0.0	0.0
Mischief/Property Damage Offences Under	0.04 (0.5)	0.03	0.07
Serious Other Offences	0.001 (0.004)	0.0	0.0
Serious Traffic Offences	0.02 (0.03)	0.0	0.02
Mischief/Property Damage Offences Over	0.002 (0.008)	0.0	0.0
Escape Offences	0.007 (0.02)	0.0	0.005
Drug Offences			
Drug Possession Offences	0.05 (0.06)	0.04	0.07
Drug Trafficking & Production Offences	0.05 (0.09)	0.0	0.06
Theft Offences			
Less Serious Other Theft Offences	0.02 (0.04)	0.0	0.03
Theft Under Offences	0.34 (0.23)	0.29	0.07
Fraud/False Pretences Under Offences	0.03 (0.08)	0.0	0.03
Theft Over Offences	0.04 (0.06)	0.02	0.07
Fraud/False Pretences Over Offences	0.0005 (0.003)	0.0	0.0
MVT Offences	0.0032 (0.01)	0.0	0.0
Break and Enter Offences	0.08 (0.11)	0.04	0.10
Weapons Offences			
Weapon Possession Offences	0.009 (0.02)	0.0	0.01
Firearms Offences	0.002 (0.007)	0.0	0.0
Violent Offences			
Robbery Offences	0.03 (0.07)	0.0	0.03
Other Sexual Offences	0.0004 (0.004)	0.0	0.0
Sexual Assault Offences	0.002 (0.008)	0.0	0.0
Assault Level 1 Offences	0.05 (0.07)	0.2	0.07
Assault Level II Offences	0.01 (0.02)	0.0	0.01
Assault Level III & Manslaughter Offences	0.001 (0.006)	0.0	0.0

Table B.9: Average λ_{CL} Scores Per Year for All Convictions by Five-Year Age Groups (N = 143).

Age Group	*N*	*Mean*	*25th Percentile*	*75th Percentile*
13 to 17	47	1.26	0.80	1.60
18 to 22	121	2.27	0.80	3.20
23 to 27	111	2.63	1.20	3.40
28 to 32	95	3.09	1.20	4.20
33 to 37	79	3.23	1.40	4.40
38 to 42	56	2.43	0.85	3.20
43 to 47	23	2.63	1.60	3.20
48 to 52	11	2.33	1.00	4.20
53 to 57	4	3.15	1.00	5.05
58 to 62	2	1.50	1.00	2.00
63 or greater	2	1.00	0.80	1.20

Table B.10: Average λ_{CL} Scores Per Year for Convictions Excluding Administrative Offences by Five-Year Age Groups (N = 143).

Age Group	*N*	*Mean*	*25th Percentile*	*75th Percentile*
13 to 17	47	1.05	0.60	1.40
18 to 22	121	1.95	0.80	2.80
23 to 27	111	2.15	0.80	2.60
28 to 32	95	2.54	1.00	3.40
33 to 37	79	2.58	1.00	3.40
38 to 42	56	2.05	0.80	2.60
43 to 47	23	2.23	1.40	2.60
48 to 52	11	1.78	0.80	2.20
53 to 57	4	2.45	0.75	4.10
58 to 62	2	1.30	0.80	1.80
63 or greater	2	0.90	0.60	1.20

Table B.11: Average Standardized Diversity Scores for Convictions Excluding Administrative Offences by Five-Year Age Groups (N = 143).

Age Group	*N*	*Mean*	*25th Percentile*	*75th Percentile*
13 to 17	47	0.52	0.46	0.70
18 to 22	121	0.60	0.50	0.81
23 to 27	111	0.58	0.44	0.77
28 to 32	95	0.55	0.42	0.76
33 to 37	79	0.58	0.50	0.75
38 to 42	56	0.46	0.17	0.72
43 to 47	23	0.33	0.00	0.54
48 to 52	11	0.38	0.22	0.56
53 to 57	4	0.06	0.00	0.18
58 to 62	2	0.00	0.00	0.00
63 or greater	2	0.25	0.00	0.50

Appendix C: VPD Letter of Support

Chronic Offenders Program
Vancouver Police Department
312 Main Street
Vancouver, BC
V6A 2T2

Telephone: (604) 717-3478

October 31, 2007

Office of Research Services
Simon Fraser University

Dear Sir or Madam:

The Chronic Offenders Program (COP) at the Vancouver Police Department was initiated in 2004. We have asked Chris Giles (student number 973011333), a doctoral student under the supervision of Professor Paul Brantingham in the School of Criminology at SFU, to assist us with an analysis of several aspects of COP and the chronic offender population under the supervision of the program. We believe that this collaboration would be extremely useful because Mr. Giles possesses the research and analytical skills necessary to undertake a study that promises both operationally and scientifically valuable information. We recognize that one of the products from this collaborative research effort will be a doctoral dissertation on the topic of the *Criminal Careers of Chronic Offenders in Vancouver, British Columbia*, described in the research ethics application. Additionally, we view this as a unique opportunity to have an independent analysis on these topics. To achieve the goals of the proposed research analysis, Chris Giles has passed an enhanced reliability security clearance with the Vancouver Police Department and will be granted access to relevant police file information on the people involved in the Chronic Offender Program and their associated offences. We fully support this research programme. If you have any additional questions or concerns do not hesitate to contact the Chronic Offenders Program directly.

Sincerely,

Sgt. J. Rennie

John Rennie (Sergeant)
Sergeant in Charge – Chronic Offenders Program & Anti-Fencing Unit
Vancouver Police Department
(604) 717-2852