





**CRIMINAL TRAJECTORIES  
OF TWO SUBSAMPLES  
OF ADJUDICATED ONTARIO YOUTHS**

**Research Report: 2012-1**

**Principal Investigators:**

David M. Day  
Ryerson University  
Toronto, Ontario

Jason D. Nielsen  
Carleton University  
Ottawa, Ontario

Ashley K. Ward  
Ryerson University  
Toronto, Ontario

Jeffrey S. Rosenthal  
University of Toronto  
Toronto, Ontario

Ye Sun  
University Health Network  
Toronto, Ontario

Irene Bevc  
The Hincks-Dellcrest Centre  
Toronto, Ontario

Thierry Duchesne  
Université Laval  
Québec City, Québec

**Research Associates:**

Lianne Rossman  
The Hincks-Dellcrest Centre  
Toronto, Ontario

Samantha Samuels  
The Hincks-Dellcrest Centre  
Toronto, Ontario

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*La présente publication est aussi disponible en français. Elle s'intitule : Trajectoires criminelles de deux sous-échantillons de jeunes de l'Ontario qui ont fait l'objet d'une décision judiciaire.*

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## Executive Summary

This report presents the findings of three studies conducted on two subsamples of adjudicated Ontario youth. The objective of the studies was twofold: (1) to examine the criminal trajectories of the two subsamples over several follow-up periods; and (2) to identify childhood predictors and adolescent correlates of trajectory group membership.

This research is grounded in a number of theoretical, empirical, and statistical advances made over the past 15 years that have contributed to a more fine-grained and comprehensive understanding of the onset, maintenance, and desistance of criminal activity over the life course. These advances include publication of the seminal two-volume work on criminal careers (Blumstein, Cohen, Roth, & Visher 1986); emergence of new theoretical models of antisocial and criminal behaviour framed within a development and life course (DLC) perspective (Farrington, 2003, 2005); accumulation of findings in risk factor research (Farrington, 2007); and the advent of group-based trajectory analysis for examining longitudinal data (Nagin, 2005).

There is now a greater understanding of the role and impact of key risk factors in the lives of individuals on the development of antisocial and criminal behaviour. These risk factors, falling into five life domains (i.e., individual, family, peer, school, and community), include early onset antisocial behaviour, attention problems, and substance use, as well as child maltreatment, broken home and family transitions, parental criminality, poor academic achievement, and delinquent peer association. As well, new theoretical approaches, including cascade models (Masten & Cicchetti, 2010) that are framed within a development and life course perspective have posited testable hypotheses about the complex transactions and interactions among risk factors across multiple levels and systems within and outside the individual. However, more research is needed to further develop and test these models. As well, more research is needed to understand the role and impact of protective and promotive factors on the development of adaptive and maladaptive outcomes (Loeber, Farrington, Stouthamer-Loeber, & White, 2008; Lösel & Bender, 2003).

## Two Subsamples of Adjudicated Youth

The two subsamples together comprise the entire population of 764 male offenders who had served a sentence between January 1, 1986 and December 30, 1997 at one of two Phase 2 (i.e., for youth age 16 - 17 years) open custody facilities (i.e., group homes) in Toronto, Ontario, operated by a children's mental health centre.

**Sample A: Initial follow-up.** In the first study, a randomly selected sample of 378 youth, referred to as "Sample A," was identified for investigation. This sample was, on average, 17.6 years at the time of admission into the facility and the average sentence length was 124.6 days. Their criminal activity was tracked for an average of 12.1 years (range = 5.8 – 22.8 years), from their first recorded court contact to March 17, 2001. The average age of their first court contact was 15.5 years.

**Sample A: Extended follow-up.** For the second study, the length of the follow-up period was extended to 18.7 years, on average (range = 12.3 – 29.3 years), to September 26, 2007. The average age at the end of the 2007 follow-up was 34.1 years. About 88% of the sample was followed for 16 years or more.

**Sample B: Follow-up.** The remaining 386 offenders constituted the second subsample, referred to as “Sample B.” This group was, on average, 17.7 years at the time of admission into the facility and the average sentence length was 122.6 days. Their criminal activity was tracked for an average of 16.4 years (range = 9.8 – 28.7 years), from their first recorded court contact to September 26, 2007. Their average age at first court contact was 15.6 years and the average age at the end of the follow-up period was 32.0 years. A strength of these studies is that the follow-up periods extended from late childhood (for offences committed under the Juvenile Delinquents Act [JDA]) and early adolescence into adulthood. This time span represents a substantial period for which to investigate criminal offence trajectories from a life course perspective.

## The Criminal Data

The criminal data for the initial study of Sample A were derived from four sources: (1) the (Ontario) Ministry of Community and Social Services (MCSS); (2) the (Ontario) Ministry of Community Safety and Correctional Services (MCSCS); (3) the Canadian Police Information Centre (CPIC); and (4) the predisposition reports (PDRs) maintained by the children’s mental health centre. The criminal data for the extended follow-up of Sample A and for Sample B were received from three sources: (1) the (Ontario) Ministry of Community Safety and Correctional Services (MCSCS); (2) the Canadian Police Information Centre (CPIC); and (3) the predisposition reports (PDRs) maintained by the children’s mental health centre. For the present studies, our measure of criminal activity was *counts by age of all unique court contacts arising from a new set of charges* derived from official records. The criminal activity data were adjusted by two factors, time-at-risk and an estimate of the offender’s age at the time of offence not adjudication (which was provided to us in the criminal records, i.e., “rap sheets”).

## Data Analysis

For each study, we conducted two sets of statistical analyses. First, we performed trajectory analysis to derive a small number of clusters of individuals who follow statistically similar criminal trajectories across the follow-up period. Second, we applied multinomial regression analysis to identify the childhood and adolescent risk factors associated with trajectory group membership. A particular aim of these studies was to isolate the factors associated with the high rate and chronic offender groups.

The trajectory analysis of the initial Sample A data was conducted using the Proc Traj macro (Jones, Nagin, & Roeder, 2001) in SAS, a commercially available statistical software program. Trajectory analyses of the extended Sample A data and the Sample B data were performed using *crimCV*, a software program developed by Jason D. Nielsen (2010). We are currently in the process of developing an R package of the *crimCV* software to be made publically available on the Comprehensive R Archive Network (CRAN) at <http://cran.r-project.org/>.



For the regression analyses, a comprehensive and detailed coding scheme was developed to record key variables from childhood (birth to 12 years) and adolescence (13 to 18 years) from the client files maintained by the children's mental health centre that operated the two group homes. Separate coding schemes were developed for the childhood and adolescent factors, though there was considerable overlap between them. The coding schemes were designed to extract as much relevant information from the files as possible, based on a thorough review of the literature. The coding schemes included both risk and protective factors. However, due to a low rate of occurrence among the protective factors, these variables were dropped from the analyses and so are not reported on here. Coding for the risk factors was dichotomous, such that 0 = absent/unknown and 1 = present/suspected. The risk factors were as follows:

### **Individual domain**

- hyperactivity-impulsivity-inattention
- antisocial behaviour
- alcohol and/or drug use
- callousness (adolescent scheme only)
- lacks responsibility or accountability for bad behaviour (adolescent scheme only)
- health problems
- low self-esteem
- extra-familial sexual abuse

### **Family domain**

- criminal family members
- parental psychopathology
- poor child-rearing methods
- familial abuse
- relationship difficulties among family members
- broken home/family transitions
- involvement with alternative care
- biological mother was age 17 or younger at the time of childbirth (child scheme only)

### **Peer domain**

- poor peer relations

### **School domain**

- poor academic achievement
- poor regard for school

The following four variables were added to the coding scheme for the analyses of the extended Sample A and Sample B trajectory results:

- immigration status (child and adolescent scheme)
- death of a caregiver (child and adolescent scheme)
- homelessness (adolescent scheme only)
- suicidality (adolescent scheme only)

### **Study 1: Sample A with Follow-up to March, 2001**

$N = 378$ ; length of follow-up was 12.1 years (range = 5.8 – 22.8 years), from their first recorded court contact, as early as June 1, 1978, to March 17, 2001.

Four trajectory groups were identified (see Figure 1):

- Group 1 – Moderate Rate (MR), comprising 21.7% of the sample
- Group 2 – Low Rate (LR), comprising 65.1% of the sample
- Group 3 – High Rate Adult Peaked (HRADLP), comprising 7.7% of the sample
- Group 4 – High Rate Adolescent Peaked (HRADOLP), comprising 5.6% of the sample.

Significant risk factors in childhood were:

- involvement with alternative care during childhood (HRADLP and HRADOLP versus LR; i.e., the HRADLP and HRADOLP groups were at greater risk than the LR)
- broken home/family transitions (MR versus LR)

Significant risk factors in adolescence were:

- criminal family members (HRADLP, HRADOLP, and MR versus LR)
- involvement with alternative care (HRADLP and HRADOLP versus LR)
- experiencing poor peer relations (LR versus HRADLP, HRADOLP, and MR; i.e., the LR group was at greater risk than the HRADLP, HRADOLP, and MR groups)
- familial abuse (LR versus HRADLP, HRADOLP, and MR)
- broken home/family transitions (LR versus HRADLP, HRADOLP, and MR)

### **Study 2: Sample A with Follow-up to September, 2007**

$N = 378$ ; length of follow-up was 18.7-year (on average) from their first recorded court contact, as early as June 1, 1978, to September 26, 2007.

Eight trajectory groups were identified (see Figure 2):

- Group 1 – Moderate Rate Escalator (MRE), comprising 2.9% of the sample
- Group 2 – Moderate Rate Adult Peaked (MRADLP), comprising 4.5% of the sample
- Group 3 – High Rate Adolescent Peaked (HRADOLP), comprising 4.8% of the sample
- Group 4 – Moderate Rate Chronic I (MRC-I), comprising 5.3% of the sample
- Group 5 – Moderate Rate Chronic II (MRC-II), comprising 11.9% of the sample

- Group 6 – Low Rate Adolescent Peaked (LRADOLP), comprising 16.4% of the sample
- Group 7 – Low Rate Chronic (LRC), comprising 26.2% of the sample
- Group 8 – Low Rate Desister (LRD), comprising 28.0% of the sample

Significant risk factors in childhood were:

- relationship difficulties among family members (HRADOLP and MRADLP versus LRD)
- broken home/family transitions (MRC-II and LRADOLP versus LRD)
- poor child-rearing methods (LRD versus MRC-II and LRADOLP)

Significant risk factors in adolescence were:

- involvement with alternative care (MRADLP, MRC-I, and LRC versus LRD)
- hyperactivity-impulsivity-attention problems (MRE versus LRD)

### **Study 3: Sample B with Follow-up to September, 2007**

*N* = 386; length of follow-up was 16.4-year (on average), from as early as June 29, 1978, to September 26, 2007.

Seven trajectory groups were identified (see Figure 1):

- Group 1 – Moderate Rate Chronic I (MRC I), comprising 3.6% of the sample
- Group 2 – High Rate Adult Peaked (HRADLP), comprising 3.9% of the sample
- Group 3 – High Rate Adolescence Peaked (HRADOLP), comprising 4.4% of the sample
- Group 4 – Moderate Rate Adolescence Peaked (MRADOLP), comprising 11.7% of the sample
- Group 5 – Moderate Rate Chronic II (MRC II), comprising 14.2% of the sample
- Group 6 – Low Rate Desister (LRD), comprising 29.8% of the sample
- Group 7 – Low Rate Chronic (LRC), comprising 32.4% of the sample

Significant risk factors in childhood were:

- an early onset of antisocial behaviour (HRADLP and MRADOLP versus LRD)
- poor academic achievement (LRD versus MRADOLP)

Significant risk factors in adolescence were:

- involvement in alternative care (HRADLP, HRADOLP, and MRC II versus LRD)
- relationship difficulties among family members (HRADLP, MRADOLP, and MRC II versus LRD)
- poor academic achievement (LRD versus HRADLP, MRADOLP, and MRC II)

## Conclusions and Summary

Across the three trajectory analyses, several conclusions may be drawn:

- the number of trajectory groups increased with longer follow-up periods;
- consistent with the extant literature, variations of high, moderate, and low rate offenders were observed across all three analyses;
- examination of offence-related variables (not reported in the Executive Summary) indicated that a small number of offenders accounted for a disproportionate amount of crime.

Across the three multinomial regression analyses, several conclusions may be drawn:

- there was some overlap but also some differences between childhood and adolescent risk factors associated with the high rate and chronic offence trajectory groups;
- risk factors associated with the high rate and chronic offence trajectory groups fell into two domains, individual and family;
- the results were generally consistent with other studies in the literature, though some surprising findings also were observed.

In summary, the results suggested that the criminal offenders in our studies comprise a heterogeneous population. This can be seen in the variability in their rate of criminal activity as it unfolds over time, the shape of their trajectories, and the length of their criminal careers. Criminal justice sanctions should consider this variability to provide a range of appropriate consequences. Second, the majority of individuals who enter into the youth justice system show a low rate of offending (i.e., near-zero), some of whom desist in their criminal activity a few years after their first court contact. Understanding the factors that differentiate the desisters from the persisters is a critical research question that warrants further investigation. Additionally, a large number of offenders in the two subsamples committed crimes at a moderate rate, though in some cases over an extended period of time. It has been suggested (Ward, Day, Bevc, Sun, Rosenthal, & Duchesne, 2010) that moderate rate long-term offenders may be a prime target for treatment interventions and rehabilitation programming by the justice system to address psychosocial factors that may be keeping them entrenched in an active, though at a moderate level, involvement in a criminal lifestyle.

Third, consistent with the literature, trajectory analyses are able to identify groups of individuals who commit a disproportionate number of crimes. Across the three sets of analyses presented here, these groups included the: (1) high rate adult peaked group (HRADLP); (2) the moderate rate escalator group (MRE); and (3) the moderate rate chronic group (MRC I). Fourth, childhood predictors and adolescent correlates of high rate and chronic offenders can be identified. These factors include variables within the individual domain (e.g., early antisocial behaviour and hyperactivity-impulsivity-inattention) and the family domain (broken home/family transitions, familial criminality, and involvement with alternative care). Knowledge of these risk factors may inform the development of effective targeted early intervention and prevention programs. Fifth, although we were not able to examine it in the present study, there is a need to examine impact of protective and promotive factors, as well as risk factors. All these sets of factors contribute to our understanding of the causes of criminality, thereby supporting targeting them all for prevention and early intervention. Last, the results presented here are limited in their generalizability and need to be replicated with other Canadian samples. As well, the results are best understood within the context of the growing body of literature on criminal trajectories and their correlates as well as the extant theories and models on the development of antisocial and criminal behaviour.



# Criminal Trajectories of Two Subsamples of Adjudicated Ontario Youths

## 1.0 Study Context

Antisocial and criminal behaviour are products of development. That is to say, the onset and maintenance of these behaviours are the result of a complex interplay of multiple developmental processes across various life domains (i.e., individual, family, peer, school, community) that unfold over time. These developmental processes are thought to be either proximal (i.e., in the recent past) or distal (i.e., in the distant past) to the event (i.e., the antisocial act) and can have either direct or indirect effects on the outcome. For example, a history of early childhood maltreatment (a distal risk factor) may place a young person on a developmental pathway towards externalizing problems later in life. Early trauma exposure is thought to disrupt normative developmental processes and neuro-chemical functioning that may set into motion a cascade of negative events leading to mental health problems, involvement in antisocial behaviour, and possibly incarceration (Coleman & Stewart, 2010). In adolescence, association with a deviant peer group (a proximal risk factor), whose activities and values are reinforced through the process of “deviance training” (Dishion, 2000; Dishion & Piehler, 2007), may lead to involvement in property offences, such as shoplifting or break and enters, in drug offences, such as possession or trafficking, in weapons use, violence, gang activity and other delinquent behaviours.

Proximal risk factors may also involve developmental transitions and turning points, such as the transition from grade school to middle school. These transitions create opportunities or vulnerabilities for individuals. Either way, transitions may up-end an individual’s sense of self, self-esteem, and self-confidence and lead to heightened feelings of incompetence and vulnerability (Stewart, 1982). Such negative feelings could persist until the person is able to consolidate the new roles and expectations and demonstrate a renewed sense of resilience. Moreover, until the person is able to regain a stable sense of self, he or she may exhibit poor coping behaviours and be particularly susceptible to negative social influences. Last, relations between distal and proximal variables are thought to involve mediational effects, such that the impact of a distal variable on an outcome is not so much “‘called forth’ from the distant past” (Sampson, 2001, p. vi) as much as mediated by proximal influences.

Recently, a number of theoretical models, framed within a developmental and life course (DLC) perspective (Farrington, 2003, 2005) have been put forth to describe the causal mechanisms by which developmental processes lead to criminal outcomes. These theories include Moffitt’s (1993) developmental taxonomy, Thornberry’s (2005; Thornberry & Krohn, 2005) interactional theory, Catalano and Hawkins’ (1996) social developmental model (SDM), and Farrington’s (2003) Integrated Cognitive Antisocial Potential (ICAP) theory. As well, recent studies exploring the concept of *developmental cascades* (Masten & Cicchetti, 2010) have shown this theoretical framework to be useful in accounting for the emergence and maintenance of antisocial and criminal behaviour (e.g., Dishion, Véronneau, & Myers, 2010). Although each theory has its own emphasis, they all incorporate biological (e.g., neurological and genetic), psychological (e.g., impulsivity and intelligence) and social (e.g., family and peer) factors captured by a bio-psycho-social model, which has become particularly influential in the developmental psychopathology field (Mash & Wolfe, 2010).

The recent emergence of these developmental theories is not coincidental and falls closely on the heels of a number of seminal longitudinal investigations of criminal activity conducted over the past two decades. Two examples of these studies are the Pittsburgh Youth Study (Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998) and the Montreal Longitudinal Experimental Study (Nagin & Tremblay, 1999; Tremblay, 2001). These studies have shed new light on the role of intrapersonal, interpersonal, environmental, and biological factors on the onset, persistence, and desistance of criminality within a developmental context. Moreover, advances in methodological and statistical techniques over the past 15 years, specifically semiparametric mixture models (SPMM), have allowed for a detailed examination of the patterns of change and continuity in offending behaviour across the life course (Nagin, 2005). The objective of these analytical tools is to uncover the hidden or latent heterogeneity among the sample and identify a small number of latent classes of individuals who share a statistically similar trajectory of offending.

Taken together, these new theoretical models coupled with a sophisticated statistical tool for analyzing longitudinal data have given rise to a deeper, more fine-grained understanding of the processes that set an individual onto a developmental pathway towards (or away from) a life of crime. A particular aim of this research is to identify individuals who follow a long-term criminal trajectory characterized by a high rate of offending and who account for a disproportionate amount of crime and, where data are available, to detect early risk factors that are associated with these individuals. Identification of such risk factors may inform the development of early intervention and prevention programs aimed at strengthening protective and promotive factors and reducing the impact of risk factors among high risk children and youth.

The three studies described here make full use of this sophisticated statistical technique. The aim of the studies is to shed light on: (1) the longitudinal course of offending in two subsamples of offenders in Ontario and (2) the childhood and adolescent risk factors associated with their trajectory group membership. In order to place the study findings in context, a brief literature review of criminal trajectories and predictors of trajectory group membership is provided. This is followed by a brief literature review on the prevalence of mental health and psychosocial problems among juvenile offenders, a growing concern among this population.

## 2.0 Literature Review on Criminal Trajectories and Predictors of Trajectory Group Membership

Since its advent about 15 years ago, the criminology field has widely embraced group-based trajectory analysis. In a seminal review of the literature, Piquero (2008) identified over 80 studies that have used these statistical techniques. Three important outcomes have emerged from this literature. First, as Piquero (2008) noted, developments in methodological and statistical techniques have now “caught up” with longitudinal data, providing a “unique window within which to study, document, and understand developmental trajectories of criminal activity” (p. 23). Second, this literature has highlighted the inherent heterogeneity of criminal offender populations in terms of the duration, type, timing, and severity of individual offenders’ criminal careers. Third, the literature has framed the course of offending squarely within a developmental perspective. For example, a number of studies have examined the relationship between offending during adolescence and offending during adulthood (Day, Bevc, Duchesne, Rosenthal, Rossman, & Theodor, 2007; Paternoster, Brame, & Farrington, 2001; Piquero, Brame, & Moffitt, 2005; Piquero & Buka, 2002), providing important insights into the nature and pattern of criminal activity across major developmental life periods. A developmental perspective has broadened the theoretical base to study criminal behaviour, stoking a new generation of research within a more interdisciplinary framework (Thornberry, 2005). However, more work is needed to systematically develop and test predictions about the causes and effects of developmental processes on criminal outcomes based on the emerging theories.

The cumulative effect of this research has been to bring to the forefront important questions about the nature and pattern of criminal behaviour over time and about the dynamic processes that bring about this stability or change. Understanding the developmental pathways and the causal mechanisms underlying the nature and course of different criminal trajectories could facilitate the development of more effective criminal justice policy and programs regarding incarceration, treatment, and rehabilitation.

## **2.1 A review of studies published up to 2005: From Piquero (2008)**

A thorough and comprehensive review of the literature on criminal trajectories and predictors of trajectory group membership for the period between 1993 and 2005 was undertaken by Piquero (2008). The main points of the Piquero review are summarized with a particular emphasis on criminal outcomes among adolescents and adults. A review of studies published between 2006 and 2010 is presented in Section 2.2.

Piquero (2008) divided his review into two sections: (1) studies with known offender samples and (2) studies with general population samples, including both birth cohorts and high risk samples. While, across the two types of studies, the reviewed investigations used samples of individuals from many different countries, including the US, UK, Canada, New Zealand, Germany, and the Netherlands, the results show a remarkable similarity in terms of both the shape and number of trajectory groups reported. This may either be an artifact of the common methodology used or a function of the inherent similarities in the patterns of criminal activity exhibited by individuals around the world.

### **2.1.1 Offender samples**

Nine studies on offender samples, using data from four data sets, were reviewed. The follow-up period for the criminal data generally extended from adolescence into the mid to late 20s or 30s. Two studies followed-up offenders through their 70s (Blokland, Nagin, & Nieuwebeerta, 2005; Sampson & Laub, 2003). Across all studies, the number of trajectory groups ranged from four to six, with more groups yielded from longer follow-ups and larger samples. These groups tended to include both chronic offenders, whose criminal trajectories were quite lengthy and who generally comprised between 3% and 5% of the study sample, and desisters who tended to show an eventual pattern of offending that approached zero. The six trajectory groups of the Sampson and Laub (2003) study are illustrative of the overall findings: (1) High-Rate Chronics (3.2%); (2) Moderate-Rate Desisters (26.1%); (3) Classic Desisters (19.9%); (4) Moderate-Rate Chronics (18.4%); (5) Low-Rate Chronics I (24.4%); and (6) Low-Rate Chronics II (8.0%).

It is not surprising that, across all trajectory groups, the offence trajectories tended to approximate the “age-crime” curve, showing a sharp increase through early adolescence, peaking in mid-adolescence to late adolescence or early adulthood, and declining either gradually or sharply thereafter. Indeed, Piquero noted that it was not uncommon for all groups to show substantial declines in offending by the mid 30s. Interestingly, lower rate offenders tended to peak at an earlier age and higher rate chronic offenders tended to peak at a later age, including the mid 30s. Across the reviewed studies, few predictors of desistance were found, but included good marriages in adulthood (Sampson & Laub, 2003). Last, in the one study that examined childhood and adolescent predictors of trajectory group membership, inconsistent though nonsignificant patterns were observed when predicting trajectories based on either total crimes committed, offence types (i.e., property, violent, alcohol and drug use), or persistence versus frequency of offending. However, a general trend indicated that high-rate chronic offenders showed the highest level of risk on a combined index of risk factors that included early antisocial behaviour, low verbal IQ, and engaging in tantrums (Sampson & Laub, 2003).

## 2.1.2 General population samples

Piquero (2008) noted that a review of all studies conducted with a general population sample was beyond the scope of his review. Therefore, he focused on select findings from the five of the most illustrative studies, including the nature and number of trajectory groups and predictors of trajectory group membership. However, he did provide a list of all studies reviewed with relevant information about each (e.g., age, race, and gender, number of trajectory groups) in an Appendix to the chapter. A casual review of this information suggested that the length of the follow-up periods tended to extend from early to mid adolescence into early adulthood and that the number of trajectory groups yielded from these studies ranged from four to seven, with more groups identified from self-report data and longer follow-ups.

Although similar trajectory groups were found with the general population samples as was found with the offender samples, two differences were observed. First, studies with general population samples tended to identify nonoffender groups, which often comprised a large percentage of the sample. For example, the Cambridge Study in Delinquent Development (CSDD), which followed 411 high risk males to 40 years of age, found that nonoffenders made up about 64% of the sample (see also D'Unger, Land, McCall, & Nagin, 1998; Piquero, Farrington, & Blumstein, 2007). Second, some studies identified a late-onset chronic trajectory group that did not begin offending until mid-adolescence and the offence trajectory which persisted at a high rate into adulthood (e.g., Chung, Hill, Hawkins, Gilchrist, & Nagin, 2002; D'Unger et al., 1998; see also Farrington, Ttofi, & Coid, 2009; Natsuaki, Ge, & Wenk, 2008; Zara & Farrington, 2009).

In terms of predictors of trajectory group membership, trajectory groups were predicted in a number of studies. However, comparing findings across these studies is a challenge because of the wide variation in sample characteristics, length of follow-up, type of data used, and type of predictor variables included in the analyses. The results of five illustrative studies will be summarized.

Fergusson, Horwood, and Nagin (2000) followed a sample of 936 New Zealand male and female youth from ages 12 to 18 years. Trajectory analysis yielded four groups: (1) nonoffenders (61.6%); (2) moderate offenders (26.2%); (3) adolescent onset offenders (6.3%); and (4) chronic offenders (5.9%). They found that the chronic offender group had the least favourable profile of psychosocial factors (e.g., social disadvantage, single parenthood, family dysfunction, parental criminality and substance use, early conduct or attentional problems, low cognitive functioning) and the nonoffenders had the most favourable profile. Wiesner and Silbereisen (2003) tracked offending over a four-year period in a sample of 318 German youth. Results of the trajectory analyses yielded four groups: (1) rare offenders (52.5%); (2) low level offenders (20.1%); (3) medium-level offenders (13.2%); and (4) high-level chronic offenders (14.2%). Given the short follow-up period, a desister group was not found. Medium-level offenders were characterized by low parental empathy. High-level offenders were characterized by an older age at the Time 1 assessment, male gender, deviant peer associates, and a low level of parental empathy and monitoring. Low-level offenders were associated with poor academic achievement and low parental empathy.

Chung et al. (2002) followed the offence histories of 808 male and female individuals from ages 12 to 21 years and found five trajectory groups: (1) nonoffender (24.0%); (2) late onset offender (14.4%); (3) desister (35.3%); (4) escalator (19.3%); and (5) chronic offender (7.0%). Regression analysis results indicated that, among youth who were active offenders by age 13, antisocial peers, low bonding to school, and high crime neighbourhoods were associated with the escalator group, compared to the desister group. Among the nonoffenders at age 13, both aggressive behaviour and anxious/depressed characteristics were associated with a later onset of offending. In a two-year follow-up of 1,218 males and females, from ages 15 to 17 years, Wiesner and Windle (2004) found that poor academic achievement, unsupportive family environments, stressful life events, and substance use differentiated the high level chronic offenders from lower level offenders. Last, in a study not reviewed by Piquero (2008), Davis, Banks, Fisher, and Grudzinkas (2004) examined the criminal trajectories for 131 males and females born between 1968 and 1973 who had been involved in the Massachusetts mental health system



as inpatients between 1988 and 1994. Offence data were tracked over a 19-year period, from ages 8 to 25 years. Trajectory analyses yielded three groups: (1) an intermediate offending group (56%); (2) a low offending group (32%); and (3) a high offending group (12%). The latter group accounted for 48% of all the recorded charges. Substance abuse/dependence was more common among the high group and personality disorder diagnoses were more common among the low group, which also had the largest number of females.

It may be concluded from these studies that, in spite of the methodological diversity across these studies, it is evident that, in comparison to the nonoffender and low-rate offender groups, high-rate chronic offenders, who comprise 3% to 10% of the samples, come from the most disadvantaged backgrounds and experience the most risk factors in childhood and adolescence.

## **2.2 A review of studies published between 2005 and 2010**

In the following two sections, findings are examined of relevant studies conducted between 2006 and 2010, where the review by Piquero (2008) left off. Like Piquero's review, studies are divided into those that utilized offender samples ( $N = 9$  studies) and those that used community and high risk samples ( $N = 3$  studies). In all studies, trajectory analysis was employed to prospectively identify clusters of individuals on statistically common pathways of offending for which correlates or predictors of trajectory group membership were examined. Like the articles we reviewed from the Piquero chapter, only studies that examined criminal outcomes with adolescence and adults are described here, rather than studies on antisocial behaviour in younger ages or behaviour that did not lead to criminal charges (e.g., involving aggression, substance use, or general delinquency).

### **2.2.1 Offender samples**

Violent and nonviolent delinquent trajectories and their relationship to adolescent risk factors were studied by MacDonald, Haviland, and Morral (2009) in a sample of about 450 delinquent adolescents from the RAND Adolescent Outcomes Project (AOP). Three similar trajectory groups, each for violent and nonviolent offending, were identified, including low-rate, low-rate desisting, and high-rate chronic. The low-rate offenders comprised 42% and 27% of the violent and nonviolent offenders, respectively. MacDonald and colleagues (2009) found that membership in both the high-rate chronic violent and nonviolent trajectory groups was predicted by delinquent peer exposure, while substance abuse also predicted nonviolent high-rate chronic offending.

Monahan, Cauffman, Steinberg, and Mulvey's (2009) study of criminal careers involved a sample of 1,170 serious juvenile offenders from the Pathways to Desistance Study (Mulvey et al., 2004). Their analysis yielded a five-group model of delinquent trajectories: low antisocial behaviour trajectory (37.3%), moderate antisocial behaviour trajectory (18.7%), mid-adolescence-peak trajectory (14.6%), steadily desisting trajectory (23.7%), and persisting trajectory (5.7%). Youths who continued to engage in antisocial behaviour showed deterioration in anger suppression and stable impulse control over time, while those who desisted showed stability and/or improvement in these variables over time.

Also using individuals enrolled in the Pathways to Desistance Study (Mulvey et al., 2004), Monahan and Piquero (2009) investigated two dimensions of offending, specifically frequency and variety of criminal behaviour, in a sample of 1,345 youthful offenders. A five-group model for variety of offending was found, including: low trajectory (37.3%), moderate trajectory (18.7%), adolescence-peak trajectory (14.6%), desisting trajectory (23.7%), and persistent group (5.7%). A model containing six trajectory groups was identified for offending frequency. These trajectory groups included a low group (54.5%), decreasing group (12.4%), increasing group (7%), moderate trajectory (7.1%), early-peak group (10.3%), and late-peaked group (8.6%). Joint trajectory analysis demonstrated a robust relationship between offending frequency and variety. For example, delinquents within the low variety trajectory had the greatest likelihood of membership in the low offending frequency group. Similar results were found when

examining high frequency and variety offending. The low variety/frequency joint trajectory showed a reduced relationship with antisocial peers and a trend towards parents having greater knowledge of their child's activities, compared to those in the persisting/moderate joint trajectory. As well, individuals with greater resistance to negative peer influence belonged to the desisting/early-peak trajectory over and above the desisting/declining group.

van der Geest, Blokland, and Bijleveld (2009) examined the development of criminal careers in a sample of 270 Dutch males who had received residential treatment for delinquency and behaviour problems. Identified trajectory groups included adolescence-limited serious offenders (35.6%), low-frequency desisters (37.4%), late bloomers (5.9%), high frequency desisters (15.2%), and high-frequency chronic offenders (5.9%). Both the adolescence-limited serious and low-frequency desistance offender groups were correlated with birth complications, attention-deficit/hyperactivity disorder (ADHD; hyperactive/impulsive subtype), parents with psychopathology, good social skills and peer contact, good conscience development, lack of drug use, and absence of problems with authority. Membership in the late bloomers group was related to ADHD (inattentive subtype), combined psychopathology, poor social skills, high daring, and early and excessive alcohol use. The two high rate offending groups were predicted by the presence of a criminal social environment, such as contact with criminal family members and delinquent peers. The high-frequency chronic offending group also was predicted by suicide attempts.

van Domburgh, Vermeiren, Blokland, and Doreleijers (2009) studied the trajectories of 287 boys who were first arrested before age 12 years over a 5-year period. Trajectories were based on the frequency and severity of offending. For both frequency and frequency x severity data, three group models were found. Only results for the frequency data are reported here. The three trajectory groups were labeled low-rate (68.3%), escalating (24.7%), and high rate (7.0%). Group differences indicated that, contrary to expectation, the low frequency youth had an earlier age of onset of offending and were more likely to have a criminal family member than the escalating or high frequency youth. At the same time, the low frequency group was more likely to come from a higher SES family background. Despite these mixed results, compared with the other two groups, the high frequency youth were most likely to have subsequent contact with a child welfare agency as a result of experiencing abuse at home, suggesting that these youth were at risk for additional detrimental outcomes.

In a replication and extension of Sampson and Laub's (2003) study and findings, Bersani, Nieuwebeerta, and Laub (2009) examined the conviction trajectories of a cohort of 4,615 Dutch males and female offenders as part of the Criminal Career and Life-Course Study (CCLS). The trajectory analysis yielded four groups, comprising sporadic offenders (70%), low-rate offenders (15%), classic desisters (11%), and chronic offenders (4%). Analysis determined that classic desisters and chronic offenders were more frequently characterized by early onset criminality. However, individuals who showed factors that placed them at risk for an early onset, chronic offending trajectory (i.e., those characterized by low intelligence and/or psychological instability) were not unique to one particular trajectory group, but rather were dispersed across all the trajectory groups. This finding indicates that there is no consistent pattern of risk factors that distinguishes chronic offenders from the other trajectory groups.

Few studies have been devoted to understanding the offending trajectories of particular ethnic groups. Marshall (2006) studied the criminal conviction rates of a South Australian birth cohort comprised of 3,344 individuals. Six distinct offending groups were identified by the analysis: Very Low Desister (63%), Very Low Persister (21.2%), Moderate Early (6.6%), Moderate Late (6.4%), High (2%), and Very High (.7%). The Very High group was noted to contain the greatest number of Indigenous persons (48%). Livingston, Stewart, Allard, and Oglivie (2008) investigated the trajectories of an Australian male and female offending cohort ( $N = 4,470$ ) over a six-year period. A three group model was yielded by their analysis, including early peaking-moderate offenders (21%), late onset-moderate offenders (68%), and chronic offenders (33%). Livingston et al. (2008) observed that offenders who were Indigenous and/or male were more likely to belong in their chronic offender group than non-Indigenous and female offenders.

Last, Yessine and Bonta (2009) examined the criminal trajectories and predictors of trajectory group membership in a sample of 439 Aboriginal and non-Aboriginal juvenile offenders from Manitoba, Canada. Trajectory analysis yielded two groups, including a stable low (86.6%) and chronic high (13.4%) group. The chronic high trajectory group was distinguished from the stable low group on factors such as negative peer associates, unstable family environment, and substance use. For the non-Aboriginal group, only accommodation differentiated the chronic high trajectory group from the stable low trajectory group. It is important to note that, overall, youth in the Aboriginal group more frequently encountered family dysfunction, lower levels of parental supervision, and substance use than did the non-Aboriginal group.

### 2.2.2 General population samples

Hoever, Blokland, Semon Dubas, Gerris, and van der Laan (2008) investigated the delinquent trajectories of a sample of 503 public school youth, from the youngest cohort of the Pittsburgh Youth Study (PYS) (Loeber et al., 1998). The authors identified five trajectory groups: nondelinquents (27.2%), minor persisting (27.6%), moderate desisting (6.8%), serious persisting (24.2%), and serious desisting (14.3%). In terms of predictors of trajectory group membership, neglectful parenting occurred more frequently for moderate desisters, serious persisters, and serious desisters. As well, serious persisting delinquents more often experienced authoritarian families than did nondelinquents.

Park, Lee, Sun, Vazsonyi, and Bolland (2010) investigated the trajectories of antisocial behaviour (not criminality) in a cohort of 566 inner-city African American youth. Three classes of antisocial behaviour trajectories were identified, including a low steady group (77%), an incremental group (15%), and a high starter group (8%). Membership in both the incremental and high starter groups was predicted by suspension from school, smoking, and using alcohol or drugs at age 11. Poorer parental behavioural control and greater feelings of hopelessness also were noted to predict the high starter group.

In a unique study that considered cultural context, Maldonado-Molina, Piquero, Jennings, Bird, and Canino (2009) examined the delinquent trajectories of two samples of Puerto Rican youth from the Boricua Youth Study (BYS), from the South Bronx, New York ( $N = 1,138$ ) and from San Juan and Caguas, Puerto Rico ( $N = 1,353$ ). The trajectory analysis revealed a five-group model for the Bronx sample and a four-group model for the San Juan sample. The Bronx's trajectory groups were: group 1, or 49.1% of the sample, who did not engage in delinquency; group 2 (37.4%), who had a low offending rate that subsequently dropped to no offending; group 3 (8.1%), representing offenders who initially offended at a low rate but increased their offending; group 4 (4.2%), characterized by delinquents who engaged in a high rate of offending followed by a decline to almost no offending; and group 5 (1.3%), who showed an increased amount of involvement in offending over time. Sensation seeking distinguished the high rate (group 5) from the nonoffending (group 1) trajectory. Group 4 had a greater score of acculturation but less social support compared to the nonoffending group.

The four trajectories of the San Juan sample included: group 1 (59.3% of sample), a nonoffending group; group 2, comprising 34.9% of the sample, who had a very low rate of offending; group 3 (4.2%), who had a stable and slightly greater rate of offending compared to group 2; and group 4 (1.6%), a group that sharply peaked in mid-adolescence followed by a rapid desistance in offending. Interestingly, no high rate, chronic trajectory emerged from the San Juan sample. Similar to the Bronx sample, all offender trajectories were distinguished from the nonoffending trajectory on sensation seeking and greater violence exposure. The offending trajectories in the San Juan sample also were differentiated from the nonoffending trajectory in terms of coercive parental discipline.

### 2.2.3 Conclusions

Three conclusions may be drawn from this literature review. First, the number of trajectory groups yielded from this body of research varied from two groups (Yessine & Bonta, 2009), three groups (Livingston et al., 2008; MacDonald et al., 2009; Park et al., 2010), four groups (Bersani et al., 2009; Maldonado-Molina et al., 2009), five groups (Hoeve et al., 2008; Maldonado-Molina et al., 2009; Monahan et al., 2009; Monahan & Piquero, 2009; van der Geest et al., 2009), to six groups (Marshall, 2006; Monahan & Piquero, 2009). Reasons for differences in the number of trajectory groups could include sample characteristics, methodological design, statistical procedures applied to the data, and outcome variable definition.

Second, in both community samples and offender samples, individuals in the high rate chronic groups tend to begin their criminal careers at an early age and exhibit an early onset of disruptive and aggressive behaviour. Individuals following a moderate rate trajectory experience negative peer association, poor academic achievement and school bonding, problems with substance use, harsh and dysfunctional parenting practices, and criminal family members. Criminal trajectories associated with a low rate of offending appear to be associated with these same factors, but to a lesser extent or amount of exposure (e.g., fewer or less frequent exposure to antisocial peers; dysfunctional yet high-supervision parenting styles, etc.) and exposure to more protective factors. Desistance from criminality was related to resistance to negative peers and greater social skill development, academic achievement, stable impulse and anger control, and family involvement. Last, the body of research supports the notion that male and female chronic offenders experience both common and unique risk factors for offence trajectories. The next section briefly reviews the literature on mental health and psychosocial factors among juvenile offenders.

## 3.0 Mental Health and Psychosocial Problems among Juvenile Offenders

### 3.1 Prevalence rates of disorders

Studies have shown that between 50% and 85% of juvenile offenders meet criteria for a psychiatric disorder. For example, Wasserman, McReynolds, Schwalbe, Keating, and Jones (2010) reported that 51.1% of a large sample of 9,819 youth in detention and incarceration, across 18 states in the US, met criteria for one or more psychiatric disorder. Common disorders were Substance Abuse Disorder (34.3%), Disruptive Behaviour Disorder (27.1%), and Anxiety Disorder (20.4%). Mitchell and Varley (1990) reported that 76% of incarcerated youth are as severely emotionally disturbed as adolescents in a public psychiatric inpatient facility. Nicol, Stretch, Whitney, Jones, Garfield, Turner, and Stanion (2000) found that 75% of their adolescent sample ( $N = 116$ ), which included both incarcerated and non-incarcerated offenders, had a “clinically significant psychiatric problem of some sort” (p. 251), with Conduct Disorder, Hyperactivity, and Substance Abuse the most common disorders. In a recent study of 245 detained youth in Belgium (Colins, Vermeiren, Schuyten, & Broekaert, 2009), it was found that 83.5% met criteria for at least one psychiatric disorder (past-year prevalence), based on the widely used Diagnostic Interview Schedule for Children-IV (DISC-IV) (Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000).

Using a Canadian sample of 49 incarcerated offenders and 49 nondelinquent youth from the Toronto area, Ulzen, and Hamilton (1998) found that 85.7% of the incarcerated youth and 30.6% of the nondelinquent youth met criteria for at least one psychiatric disorder, based on the Diagnostic Interview for Children and Adolescents (DICA-R). Among the youth in custody, 22.4% had one disorder and 63.3% had two or more disorders, reflecting a high degree of comorbidity. Common disorders among the incarcerated group were Oppositional Defiant Disorder (44.9%), Alcohol Dependence (38.8%), Conduct Disorder (30.6%) and Depression (39.6%). Based on the high prevalence of disorders among this sample, Ulzen and Hamilton concluded that “[a]ccurate psychiatric diagnoses and appropriate interventions for incarcerated adolescents can only improve fiscal and service efficiency in this population” (p. 7) and that “[y]oung offender facilities are underresourced in terms of clinical expertise needed to provide for all the mental health needs of the incarcerated youth in residence” (p. 7).

Colins et al. (2009) reported that 83.5% of their sample of 245 male juvenile offenders qualified as having any disorder, 65.7% any Disruptive Behaviour Disorder, 73.5% any Substance Use Disorder and 72.6% had co-morbid disorders. Similarly, in a study of 378 juvenile offenders in Ontario, Day et al. (2008) reported that the rate of mental health problems in their sample was 81.8%. Common disorders were Substance Abuse Disorder (33.9%), Personality Disorder (22.2%), Conduct Disorder (20.2%), Adjustment Disorder (13.7%), Impulse Control Disorder (12.9%), Sexual Disorder and Gender Identity Disorder (11.7%), and Mood Disorder (10.9%). In a review of 75 studies, Wierson, Forehand, and Frame (1992) found that the most common psychiatric disorders seen among juvenile delinquents were Conduct Disorder, Personality Disorder, Affective Disorder, Attention Deficit Hyperactivity Disorder, Substance Abuse Disorders, and Mental Retardation. Many studies also show that co-morbidity of psychiatric disorders in juvenile offenders is far more common than presenting with one disorder alone (Teplin et al., 2002).

These figures are substantially higher than the 15% to 21% of children and youth in the general population who meet criteria for a psychiatric disorder (Mash & Wolfe, 2010). In a review of 25 published studies of 16,750 youth from seven countries, Fazel, Doll, and Långström (2008) confirmed that “mental disorders are substantially more common in adolescents in detention than among age-equivalent individuals in the general population” (p. 1016), demonstrating further that this phenomenon is observed worldwide; it is not just confined to North America. The greatest risk increases were seen for Conduct Disorder (5 - 20 times higher), Psychosis (10 times higher), ADHD (2 - 4 times higher), and Major Depressive Disorder (2 - 5 times higher). The increase in risk, the authors concluded, may be associated with the greater rate of socioeconomic adversity, child maltreatment, and excessive family conflict among incarcerated youth.

Young people in contact with the law also show high levels of other psychosocial problems, such as anger management and interpersonal problems, poor emotional regulation, and suicidal ideation (Day, 2002). One study (Morris, Harrison, Knox, Harrison, Knox, Tromanhauser, Marquis, & Watts, 1995) found that, although suicide ideation was at the same level for both community samples and incarcerated youth, the latter had significantly more suicide attempts and injury from attempts than the former. In addition, the majority of incarcerated youth use violent means such as stabbing, whereas the majority of the community youth attempt suicide by overdose.

Last, in a study on the relation between psychiatric disorder and risk of recidivism, in a sample of 991 male and female youthful offenders, McReynolds, Schwalbe, and Wasserman (2010) found that the co-occurrence of Disruptive Behaviour Disorder (DBD) and Substance Use Disorder (SUD) approximately doubled the risk of recidivism, after adjusting for demographic (e.g., gender, race) and offence characteristics (e.g., interpersonal, noninterpersonal). Moreover, on its own, anxiety disorders were not associated with recidivism. However, if they were co-morbid with DBD, anxiety disorders increased the risk of recidivism.

## **3.2 Psychiatric disorders and offender types**

### **3.2.1 Versatiles versus specialists**

The literature suggests that different mental health problems appear to be associated with different offender types. In a study of 245 detained male adolescents, Colins et al. (2009) found that property offenders had a higher rate of psychiatric disorders overall than the entire sample. Property offenders also had higher rates of (adolescent onset) Conduct Disorder, Depressive Disorder, and marijuana use compared to versatile offenders (i.e., those who engaged in both property and violent offences). Versatile offenders showed no differences than violent offenders in the types of disorders they exhibit, with the exception of a higher rate of marijuana use.

### 3.2.2 Trajectory group membership

Different mental health profiles also have been found for juvenile offenders showing various criminal trajectories. In a study of 131 male and female youth who had been involved in the mental health care system in Massachusetts whose criminal activity was followed over time, Davis, Banks, Fisher, and Grudzinskas (2004) found that 66.7% of youth in a high rate criminal trajectory group had a Substance Use Disorder and 83.3% had a Disruptive Behaviour Disorder. In contrast, none of the youth in a low rate criminal trajectory group had a Substance Use Disorder and only 23.5% of the low rate group had a Disruptive Behaviour Disorder. Also, 47.1% of the low rate group had a Personality Disorder, in comparison to 16.7% of the high rate group.

### 3.3 Gender

Teplin, Abram, McClelland, Dulcan, and Mericle (2002) reported that, among a sample of 1,829 detainees, nearly 66% of males and nearly 75% of females in a juvenile detention centre met the criteria for at least one psychiatric disorder. In terms of the specific disorders represented, 50% had a Substance Abuse Disorder, 40% had a Disruptive Behaviour Disorder, and 20% of the females had a Major Depressive Disorder. Some studies have shown that females present with more psychiatric problems in addition to having greater severity of psychiatric problems. In a report on a sample of 50 youth at the Syl Apps Secure Custody Centre (SAYC) in Oakville, Ontario (Day, 2002), the results showed that more females than males were elevated on the Conduct Disorder scale (83.3% females versus 44.4% males), Aggression Problem scale (75.0% versus 38.9%), Externalizing Disorder scale (83.3% versus 36.1%), Borderline Personality scale (50% versus 16.7%), and Suicide Psychosocial Problem scale (33.3% versus 5.6%) on the Adolescent Psychopathology Scale (APS; Reynolds, 1998), a self-report measure of mental health and psychosocial problems.

In a second report on another sample of 35 youth at SAYC, Day and Belfon (2009) found that females were significantly more likely to meet criterion for Conduct Disorder than males (63.2% versus 7.1%, respectively). By contrast, Russo and Beidel (1994) found that Conduct Disorder was approximately four times more likely to occur in males than females in the general population. This statistic lends further support to the idea that female offenders' conduct disorder symptoms are more severe than males. Females reported more disturbance in their social relations and personal adjustment than did males. In one study by Lederman, Dakof, Larrea, and Li (2004), it was reported that 84% of girls in detention have experienced significant family trauma and have had an average of three traumatic events in their lives. About half the girls had thought about the trauma in the past year. Last, Wasserman et al. (2010) found that females in detention or incarceration were twice as likely as detained or incarcerated males to meet criteria for an internalizing disorder (i.e., Anxiety Disorder, Depressive Disorder) and reported higher rates than males of Oppositional Defiant Disorder.

### 3.4 Conclusion

It is evident from this literature that: (1) the vast majority of juvenile offenders meet criteria for a psychiatric disorder; (2) most youth offenders have co-morbid disorders; (3) different types of offenders have different patterns of mental health problems which differ in severity; and (4) some studies show that females have more psychiatric problems and greater severity of psychiatric problems than males. In terms of policy and practice implications, these findings highlight the need for a greater level of treatment services for incarcerated youth, as youth with mental health disorders are at greater risk to re-offend. Trupin, Turner, Stewart, and Wood (2004) found that transition planning, including provision of community services, eased the process of youth offenders' reintegration into the community and was associated with lower rates of recidivism during the first year post-discharge. With these results in mind, it would benefit both the youthful offenders and the community at large if the federal and provincial governments would allocate adequate resources into the delivery of counseling services by trained mental health professionals to address the range of psychiatric disorders and psychosocial needs of juvenile offenders. The next sections present the findings of the trajectory and regression analyses on the adjudicated Ontario youths.

## 4.0 Three Trajectory Analyses of Sample A and Sample B

In the next four sections, we present the findings from our program of research. This research concerns an investigation of the criminal trajectories of two subsamples of adjudicated Ontario youths. We present three sets of findings: (1) from our first study of “Sample A” ( $N = 378$ ), followed from as early as June 1, 1978 to March 17, 2001, the end of the first follow-up period (see Day, Bevc, Theodor, Rosenthal, & Duchesne, 2008; Ward, Day, Bevc, Sun, Rosenthal, & Duchesne, 2010); (2) from our extended follow-up of “Sample A,” followed as early as June 1, 1978 to September 26, 2007, the end of the second follow-up period; and (3) from our replication study with “Sample B” ( $N = 386$ ), followed from as early as June 29, 1978 to September 26, 2007, the end of the follow-up period (see Day, Nielsen, Ward, Sun, Rosenthal, Duchesne, Bevc, & Rossman, 2011). For each set of analyses, we aim to identify the high rate and chronic offender groups that account for a disproportionate amount of crime and the child and adolescent risk factors associated with these trajectory groups.

### 4.1 Two subsamples of adjudicated Ontario youths

All the youths in the studies had served a sentence between January 1, 1986 and December 30, 1997 at one of two Phase 2 (i.e., for youth age 16 - 17 years) open custody facilities (i.e., group homes) in Toronto, Ontario, operated by a children’s mental health centre. During this period, a total of 764 male offenders served a sentence at one of the two sites; therefore, our research involves the entire population of youth from these facilities during this period. Information about Sample A and Sample B is presented in Table 1.

**TABLE 1. MEAN (SD) CHARACTERISTICS OF SAMPLE A AND SAMPLE B**

Variable	Sample A ( $N = 378$ )	Sample A ( $N = 378$ )	Sample B ( $N = 386$ )
End of Follow-up Period:	March 17, 2001	Sept. 26, 2007	Sept. 26, 2007
Age at admission into youth home	17.6 years (.85)	n/a	17.7 years (1.0)
Sentence length at youth home	124.6 days (109.8)	n/a	122.6 days (95.6)
Length of follow-up	12.1 years (3.0)	18.7 years (3.0)	16.4 years (4.1)
Age at first court contact	15.5 years (1.8)	n/a	15.6 years (1.6)
Age at last court contact	23.9 years (3.9)	26.1 years (5.5)	24.6 years (5.2)
Age at end of follow-up	27.6 years (2.6)	34.1 years (2.6)	32.0 years (4.0)
Trajectory length	8.4 years (4.5)	10.7 years (5.6)	9.5 years (5.6)

In the first study, a randomly selected sample of 378 youth, referred to as “Sample A,” was identified for investigation. This sample was, on average, 17.6 years at the time of admission into the facility and the average sentence length was 124.6 days (Median = 92 days). Their criminal activity was tracked for an average of 12.1 years (range = 5.8 – 22.8 years), from their first recorded involvement with the justice system to March 17, 2001. The average age of their first court contact was 15.5 years (range = 8.9 - 21.3 years). For the second study, the length of the follow-up period was extended to 18.7 years, on average (range = 12.3 – 29.3 years), to September 26, 2007. The average age at the end of the 2007 follow-up was 34.1 years (range = 28.7 – 40.5 years). About 88% of the sample was followed for 16 years or more.

The remaining 386 offenders from this population constituted the second subsample, referred to as “Sample B.” This group was, on average, 17.7 years at the time of admission into the facility and the average sentence length was 122.6 days (Median = 93 days). Their criminal activity was tracked for an average of 16.4 years (range = 9.8 – 28.7 years), from their first recorded involvement with the justice system to September 26, 2007. Their average age at first court contact was 15.6 years (range = 9.6 – 19.4 years) and the average age at the end of the follow-up was 32.0 years (range = 26.3 – 40.2 years). A strength of these studies is that the follow-up periods extended from late childhood (for offences committed under the Juvenile Delinquents Act [JDA]) and early adolescence into adulthood, well beyond the challenging period of emerging adulthood of the early 20’s (Arnett, 2000, 2007). This time span represents a substantial period for which to investigate criminal offence trajectories from a life course perspective.

## 4.2 The criminal data

The criminal data for the initial study of Sample A were derived from four sources: (1) the (Ontario) Ministry of Community and Social Services (MCSS); (2) the (Ontario) Ministry of Community Safety and Correctional Services (MCSCS); (3) the Canadian Police Information Centre (CPIC); and (4) the predisposition reports (PDRs) maintained by the children’s mental health centre. The criminal data for the extended follow-up of Sample A and for Sample B were received from three sources: (1) the (Ontario) Ministry of Community Safety and Correctional Services (MCSCS); (2) the Canadian Police Information Centre (CPIC); and (3) the predisposition reports (PDRs) maintained by the children’s mental health centre. These data sources were used to ensure a high degree of completeness and accuracy of the information, which is essential for research that requires an accurate temporal sequencing of criminal activity (Smith, Smith, & Norma, 1984).

The reason only three data sources were used for the extended Sample A and Sample B was that the MCSS system was integrated into the MCSCS and thus two sources became one main source. Due to the nature of the data integration process and the importance of continued monitoring of active offenders, historical data for juvenile offenders in Phase 1 (i.e., ages 12- 15 years) were available only for those offenders who were still actively serving youth sentences at the time of our inquiry. Thus, due to the limitations of accessible data at the time, the majority of Phase 1 data for Sample B were retrieved through PDRs.

As well, to aid the accuracy of our time-at-risk adjustments (see Section 4.3), supplemental movement data containing location start and exit dates were provided by the MCSCS. Due to the implementation of a new criminal record monitoring system between the first and second follow-up periods, Sample B data were received in electronic format from the Ministry and contained more information than that received on the paper profiles for the initial follow-up of Sample A. Not only could the charges and dates of convictions be discerned as before, but now the movement data associated with each charge was provided and allowed for a more accurate account of time-served per date of conviction. As a result, we decided not to combine the data for Sample A and Sample B into one large data set for analyses.

## 4.3 Overview of the methodology

The focus of our program of research is twofold: (1) to examine the criminal trajectories of two subsamples of offenders over several follow-up periods and (2) to identify childhood predictors and adolescent correlates of trajectory group membership. Collectively, this research paradigm is referred to as the *classify/analyze* approach (Piquero, 2008; Roeder, Lynch & Nagin, 1999) and involves first classifying individuals into distinct trajectory groups and then identifying the best set of early (i.e., childhood and adolescent) risk and protective factors associated with trajectory group membership. This research is important to identify common and specific factors that distinguish one trajectory group from another (e.g., low-rate limited-term offenders versus high-rate chronic offenders) in an effort to uncover unique causal processes that produce distinct patterns of offending over the life course. In other words, different trajectory groups may have



distinctive etiological pathways that could be precisely identified through the classify/analyze method (Osgood, 2005; van der Geest et al., 2009). This research framework also has important potential implications for the development of policy and programming within the juvenile justice system as well as for early intervention and prevention strategies provided outside the justice system.

As stated above, the two-step methodology underlying the classify/analyze approach first involves the analysis of temporally sequenced, longitudinal criminal data. These criminal data typically include the number of convictions (or arrests, charges, offences, court contacts, etc.) recorded by an individual within a given time period (e.g., annually or semi-annually) based on official criminal records and/or self-report information. For the present study, we used *counts by age of all unique court contacts arising from a new set of charges* derived from official records as the measure of criminal activity. Unique court contacts included those that resulted in a conviction and disposition (e.g., secure or open custody, or fine), including a suspended sentence; those that resulted in a finding of guilt but not a conviction (e.g., absolute or conditional discharge); and those that resulted in either a withdrawal of charges, stay of proceedings, or determination that the person was unfit to stand trial (e.g., due to cognitive competence). For the initial study with Sample A, these latter types of court contacts, which involved neither a finding of guilt nor a conviction, only accounted for 5.7% of the total number of court contacts. As well, for 9.7% of these court contacts, the final status in the official records was “remand,” and so no specific outcomes were available. For Sample B, the latter types of court contacts only accounted for 6.5% of the total number of court contacts and 8.0% of the court contacts involved a “remand” as a final status.

The criminal count data were then adjusted by two correction factors, *time-at-risk* and an estimate of the offender’s age at the time of offence, not adjudication (i.e., when the court renders a final decision about a criminal incident determining, for example, the nature and length of a disposition or sentence, where warranted). The age at offence is important in studying criminal careers<sup>1</sup> (Farrington, Coid, Harnett, Jolliffe, Soteriou, Turner, & West, 2006). Time-at-risk, also referred to as “street-time,” is the amount of time (e.g., in days or months) an individual had spent *not* incarcerated in that period and so was at risk to commit a new offence. This adjustment provides a more precise indicator of an individual’s rate of offending. For example, if an offender had six convictions at the age of 15 and had spent no time incarcerated during that time, his conviction rate would be six. However, if he had six convictions at the age of 15, but had spent six months of that time incarcerated, his conviction rate would be adjusted to twelve.

The age adjustment was based on an average time lag of 157.6 days between the date of an offence and the date of disposition for a randomly selected sample of 479 unique court contacts arising from a new set of charges committed in the Greater Toronto Area (GTA) by 134 individuals in our data set. The offence dates were provided to us by the Metropolitan Toronto Police Service (MTPS) (see Day et al., 2007 for further technical details of these adjustments).

The longitudinal data were then analyzed using a statistical method referred to as *group-based trajectory analysis* (Nagin, 2005). Group-based trajectory analysis is a specialized application of finite mixture modelling that aims to parcel out underlying (unobserved) heterogeneity of within-individual trajectories of behaviour into discrete subgroups or latent classes of common pathways. In this way, trajectory analysis shares similarities with cluster analysis “but in trajectory space” (Maldonado-Molina et al., 2009, p. 177). In other words, group-based trajectory analysis allows the researcher to identify groups or clusters of individuals whose rate of criminal activity is statistically similar as it unfolds over time. The value of this technique is that it is able to describe the inherent heterogeneity in the nature and pattern of criminal offending across *individuals* as the course of their behaviour is charted over time *within individuals*.

<sup>1</sup> Note that the official criminal records (i.e., “rap sheets”) contained the date of adjudication not the date of offence.

On a methodological note, the determination of the number of groups yielded by trajectory analyses is conventionally based on a number of criteria, including the Bayesian Information Criteria (BIC) and the related Akaike Information Criterion (AIC) (D'Unger et al., 1998; Kass & Raftery, 1995; Raftery, 1995). However, these criteria are known to be somewhat problematic on the number of groups issue (Kreuter & Muthen, 2008; Nagin, 2005). For example, Eggleston, Laub, & Sampson (2004, p. 4) noted,

Although the Bayesian Information Criterion has been emphasized as the primary criterion to assess the optimal number of groups, the model selection process is often more complex and thus, group selection remains somewhat subjective.

Although various other methods have been proposed (e.g., comparison of likelihoods, bootstrap, likelihood ratio tests), none is completely satisfactory. As an alternative method, we use cross-validation (Hélie, 2006; Stone, 1974), specifically, *leave-one-out cross-validation*. This method provides a fair, objective, and unambiguous means of assessing the number of groups and avoids the limitations, ambiguities, and subjectivity that may arise with the BIC (Day et al., 2007). The advantage of cross-validation is that it provides a fair measure of how appropriate the chosen group number  $K$  is for the given data, in terms of how accurately a model with that number of groups is able to predict the offender data. A large cross-validation error (CVE) indicates that the model with  $K$  groups is not a good statistical model for these data. A small CVE indicates the model with  $K$  groups is doing a good job of predicting offender data. The cross-validation criterion for number of groups then involves simply choosing the value of  $K$  that minimizes CVE. Whatever criterion is used, once individuals are sorted into discrete trajectory groups, a multinomial regression framework (or other statistical approach) may be applied to identify the best set of developmental predictors (e.g., risk and protective factors) that differentiates the trajectory groups.

The trajectory analysis of the initial Sample A data was conducted using the Proc Traj macro (Jones, Nagin, & Roeder, 2001) in SAS, a commercially available statistical software program. Trajectory analyses of the extended Sample A data and the Sample B data were performed using *crimCV*, a software program developed by Jason D. Nielsen (2010). We are currently in the process of developing an R package of the *crimCV* software to be made publically available on the Comprehensive R Archive Network (CRAN) at <http://cran.r-project.org/>.

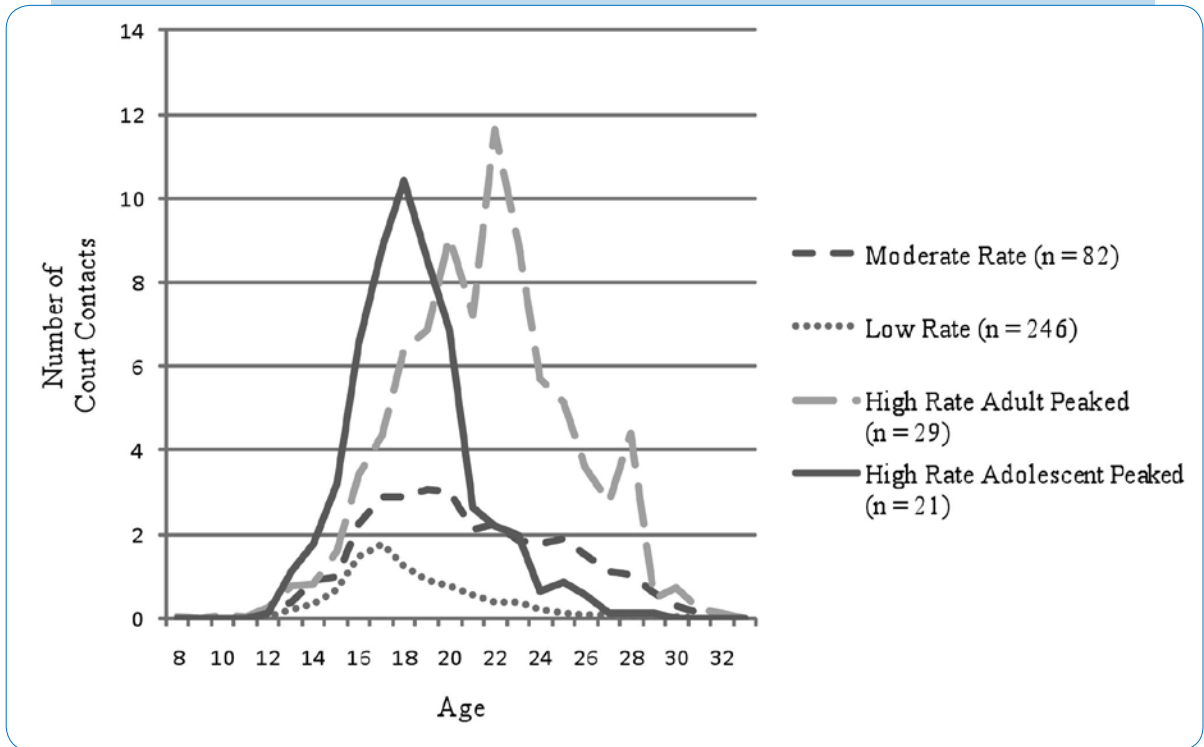
## 5.0 Study 1: Findings for Sample A with Follow-up to March, 2001

### 5.1 Trajectory analysis

The results of a trajectory analysis may be understood in terms of: (1) the proportion of individuals within each trajectory group; (2) the shape of the trajectory; and (3) the duration or length of the trajectory. Labels may be applied to the trajectory groups as a heuristic device to reflect each trajectory's offending rate (e.g., high, medium, low), shape (e.g., linear, bell-shaped, escalating, declining) and length (e.g., desisting, chronic). However, caution is raised in reifying groups generated by a statistical procedure and treating them as if they were real entities.

The initial trajectory analysis for Sample A, with a follow-up period of 12.1 years, on average, yielded four groups, heuristically labeled Moderate-Rate (MR), comprising 21.7% of the sample; Low-Rate (LR), comprising 65.1% of the sample; High-Rate Adult Peaked (HRADLP), comprising 7.7% of the sample; and High-Rate Adolescence Peaked (HRADOLP), comprising 5.6% of the sample. None of the groups had less than 10 individuals in them and the mean posterior probability coefficients were quite high across all four groups, exceeding .94. The trajectory groups are plotted in Figure 1.

FIGURE 1. CRIMINAL TRAJECTORIES FOR FOUR-GROUP MODEL: SAMPLE A



Comparisons on offending-related variables across the four groups indicated that the LR group had the shortest criminal career, lasting, on average, 6.7 years. Their average age at first court contact was 15.9 years and the average age at last court contact was 22.5 years. The MR and HRADLP groups had the longest criminal careers, lasting, on average, 12.0 years and 12.1 years, respectively. Not surprisingly, the small number of individuals following the HRADLP trajectory (7.7%) incurred the most court contacts, adjusted for time-at-risk, with an average of 84.7, accounting for 16.1% of the court contacts. By contrast, the LR group, which comprised 65.1% of the sample, had the fewest adjusted court contacts ( $M = 9.3$ ) and accounted for only 39.0% of the court contacts incurred by the sample.

In terms of the distribution of individuals across the trajectory groups, nearly two-thirds of the sample was classified as low-rate (LR) offenders. These offenders committed offences at a low rate and their criminal careers appeared to desist after about six years, on average, from the onset of their offending. This stands in contrast to the 12 and 12.1 years, on average, for the MR and the HRADLP groups, respectively. What this means is that, even within this known offender sample, the majority of individuals desisted in their offending by their mid 20s. These findings reflect the limited time involvement in criminal activity that can be expected from a majority of individuals involved in the criminal justice system. What accounts for the desistance, however, remains a question for further study. Some research suggests that life course events such as completion of high school (Natsuaki et al., 2009) and marriage to a prosocial partner, finding gainful employment, and involvement in military service (Sampson & Laub, 2005) may be contributing factors. Family involvement, small family size, and positive peer relations also may be associated with offence desistance in juvenile offender populations (van Domburgh et al., 2009).

At the other end of the trajectory group spectrum, the HRADLP group, comprising about 8% of the sample, persisted in their offending into adulthood and committed offences at a very high rate. These individuals represent the chronic offenders, such as those identified in the birth cohort studies of Wolfgang (Wolfgang, Figlio, & Sellin, 1972) and whose developmental pathway, as life-course persisters (LCP), was described by Moffitt's (1993) dual taxonomy theory. The strongest efforts need to be directed toward the early identification and prevention of individuals at risk for a serious and protracted criminal trajectory.

Third, comprising the second largest trajectory group in the sample, the MR offenders represent an interesting and perhaps challenging subgroup for the justice system, largely because of their persistence in offending. While not committing offences at a high rate, these individuals appear to hold firm to their active involvement in a criminal lifestyle. This may be the result of being "stuck" in a situation from which they cannot easily extricate themselves, perhaps due to the presence of such psychosocial problems as substance use and abuse (this group did have the largest average number of drug offences), low level of social support, maladaptive coping, and so forth, rather than to a hardened commitment to a criminal lifestyle. As such, this group may be a prime target for treatment interventions and rehabilitation programming by the justice system. However, this hypothesis needs further investigation. Last, the HRADLP group represents another interesting and somewhat unique group compared to other trajectory analysis studies. This group showed a very high rate of offending during adolescence, which declined sharply in early adulthood. We expect that our continued follow-up of this subsample will shed further light on the observed pattern of desistence of this group.

## 5.2 Childhood predictors and adolescent correlates of trajectory group membership

The second aim of the classify/analyze approach is to identify early risk factors that predict either uniquely or jointly the various trajectory groups. As stated previously, this objective would be particularly important for the chronic offender groups whose criminal trajectory often begins at an early age and persists into adulthood. These individuals are known to account for a large number of court contacts, commit serious violent offences, and pose the greatest challenge to the criminal justice system (Piquero, Farrington, & Blumstein, 2003, 2007).

A comprehensive and detailed coding scheme was developed to record key variables from childhood (birth to 12 years) and adolescence (13 to 18 years) from the client files maintained by the children's mental health centre that operated the two group homes. Separate coding schemes were developed for the childhood and adolescent factors, though there was considerable overlap between them. The coding schemes were designed to extract as much relevant information from the files as possible. Selection of the variables was based on a comprehensive review of the theoretical and empirical literature and reflected four life domains: individual, family, peer, and school (Borum, 2000; Farrington, 2003; Farrington & Welsh, 2007; Hawkins, Herrenkohl, Farrington, Brewer, Catalano, & Harachi, 1998; Leschied, Chido, Nowicki, & Rodger, 2008; Lipsey & Derzon, 1998; Loeber & Stouthamer-Loeber, 1998; Rutter, Giller, & Hagell, 1998; Thornberry, 2005). The coding schemes included both risk and protective factors. However, due to a low rate of occurrence among the protective factors, these variables were dropped from the analyses and so are not reported on here.

In the individual domain, variables included hyperactivity-impulsivity-inattention, antisocial behaviour, alcohol and/or drug use, callousness, lacks responsibility or accountability for bad behaviour, health problems, low self-esteem, and extra-familial sexual abuse. In the family domain, variables included criminal family members, parental psychopathology, poor child-rearing methods, familial abuse, relationship difficulties among family members, broken home/family transitions (e.g., parental separation or divorce, change in caregivers, frequent moves), involvement with alternative care (e.g., institutional or foster care, child welfare), and biological mother was age 17 or younger at the time of childbirth. The peer domain comprised one variable, poor peer relations (i.e., peer rejection, antisocial peer associates), and the school domain included two variables, poor academic achievement and poor regard for school (i.e., truancy, expulsions, suspensions). Coding for the risk factors was dichotomous, such that 0 = absent/unknown and 1 = present/suspected.

The coding was conducted by a primary coder who was unaware of the trajectory group membership assignments. Inter-rater reliability was conducted by two independent raters on two separate occasions using a 20% random sample of files (11% at Time 1 and 9% at Time 2). Inter-rater reliability was found to be moderate to good (Landis & Koch, 1977) with average Kappas of .79 and .64 for the childhood variables at Time 1 and Time 2, respectively, and .76 and .59 for the adolescent variables at Time 1 and Time 2, respectively.

Because the outcome variable (i.e., trajectory groups) was categorical with more than two groups, multinomial regression analyses were performed to identify the best set of risk factor variables comparing between the MR, HRADLP, HRADOLP groups and the LR group. Multinomial regression analyses yield odds ratios (ORs), which indicate the increase in the odds (i.e., likelihood or risk) of a particular outcome given a one-unit increase in the risk factor variable. ORs allow a researcher to make the statement, for example, that, for an offender with criminal family members, the odds in favour of belonging to a high-rate trajectory group are 7.6 times (i.e., if  $OR = 7.6$ ) as large than for an offender without criminal family members. Note that ORs could be greater than 1, which suggests an increase in the likelihood of a particular outcome for every one-unit increase in the risk factor, or less than 1 (e.g.,  $OR = .36$ ), which suggests a decrease in the likelihood of a particular outcome for every one-unit increase in the risk factor. Because ORs are only estimates, based, for example, on sample size, researchers also will report the 95% Confidence Interval (CI) alongside the OR to indicate the degree of reliability of the estimate; generally speaking, the smaller the CI, the greater reliability of the estimate. For the present study, separate multinomial regression analyses were performed for the childhood and adolescent variables. For this particular analysis, the LR group was used as the reference group, which compares the three other groups against this one. This allowed us to identify risk factors for more serious offending patterns, in terms of offence rates, in relation to the least serious group.

The results indicated that involvement with alternative care during childhood predicted HRADLP and HRADOLP trajectory group membership, in comparison to the LR group. More specifically, the presence of alternative care involvement increased by a factor of 3.14 (95% CI [1.33, 7.39],  $p < .05$ ) and 3.82 (95% CI [1.40, 10.49],  $p < .05$ ) the risk of belonging to the HRADLP and HRADOLP groups, respectively, compared to the LR group. As well, the experience of broken home/family transitions during childhood predicted membership in the MR group, in comparison to the LR group ( $OR = 1.82$ , 95% CI [1.03, 3.22],  $p < .05$ ).

In adolescence, having criminal family members predicted MR, HRADLP, and HRADOLP group membership in comparison to the LR group. More specifically, the presence of criminal family members increased by a factor 2.83 (95% CI [1.37, 5.87],  $p < .01$ ), 3.09 (95% CI [1.08, 8.82],  $p < .05$ ), and 4.51 (95% CI [1.39, 14.62],  $p < .05$ ) the risk of belonging to the MR, HRADLP, and HRADOLP groups, respectively, compared to the LR group. As well, continued involvement with alternative care during adolescence predicted HRADLP and HRADOLP group membership in comparison to the LR group (for simplicity, ORs and CIs are not presented for all results). Last, experiencing poor peer relations, familial abuse, and broken home/family transitions during adolescence predicted membership in the LR group, in comparison to the MR, HRADLP, and HRADOLP groups.

These findings clearly highlight the role of child welfare involvement as a significant risk factor of not only contact with the criminal justice system but also contact that involves a high rate of offending that is maintained over a protracted period of time. This effect is consistent with the notion of *crossover kids*, referring to the disproportionate number of youth who transition from the child welfare system into the juvenile justice system (Finlay, 2003). Problems identified in the child welfare system include the lack of social support services to address the complex needs of these young people and the lack of stability within the system. This lack of stability can lead to the young person experiencing changes in case workers or having multiple out-of-home placements, which may place children and youth at further risk of delinquency. Indeed, as Finlay noted, experiences of displacement, trauma, and loss associated with loss of family, loss of peers, and loss of home, permeate the lives of these young people.

Second, the findings indicated that the presence of criminal family members was associated with chronic offending. Familial criminality, as well as a positive familial attitude toward crime, has been the subject of considerable research recently (e.g., Bijeveld & Farrington, 2009) and has been shown to increase the risk of delinquency among adolescents (Farrington, 1989). This relationship has been shown to be particularly strong for mothers and for fathers who have frequent and ongoing contact with the child but not for fathers who have little contact with the child (Thornberry, Freeman-Gallant, & Lovegrove, 2009). Parental modeling of procriminal behaviour and conveying positive attitudes toward crime may characterize the early family experiences of chronic offenders. As well, criminal parents may have interpersonal and cognitive deficits and experience high levels of stress that can undermine their parenting practices, resulting in indirect negative effects on children's development, leading to a life of high-rate chronic offending (Henggeler, 1989). Moreover, in light of the significance of continued involvement in alternative care in adolescence as a risk factor for the HRADLP and HRADOLP groups, the influence of criminal family members might also be accounted for by the criminal activity of siblings. It is also likely that families with pro-criminal parents would have an increased likelihood of involvement with the child welfare system.

### 5.3 Psychiatric Disorders

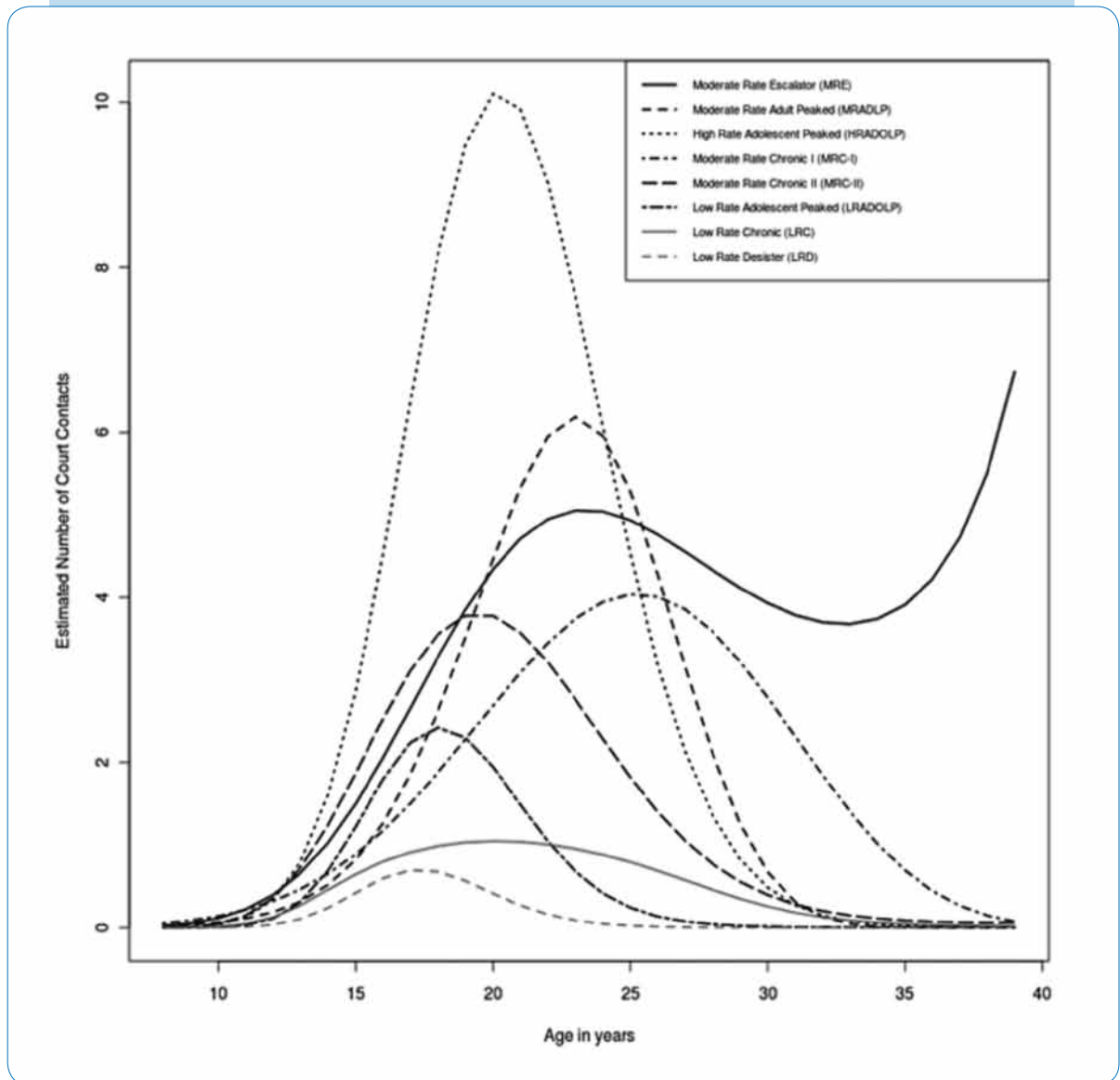
Of the 248 youth who were seen by the staff psychiatrist for assessment of a psychiatric diagnosis while at the youth home, 82% ( $n = 203$ ) met the diagnostic criteria for at least one disorder. The seven most common disorders were Substance Abuse Disorder (33.9%), Personality Disorder (excluding Antisocial Personality Disorder) (22.2%), Antisocial Personality Disorder/Conduct Disorder (20.2%), Adjustment Disorder (13.7%), Impulse Control Disorder (12.9%), Sexual or Gender Identity Disorder (11.7%), and Mood Disorder (10.9%). The large percentage of youth who met criteria for a psychiatric disorder is consistent with the literature on the mental health needs of young people involved in the criminal justice system, as reported earlier. As well, the prevalence of Substance Abuse, Disruptive Behaviour, Conduct, Adjustment Disorder, and Mood Disorder is consistent with many studies with juvenile offenders.

## 6.0 Study 2: Findings for Sample A with Follow-up to September, 2007

### 6.1 Trajectory analysis

Analyses were performed on the extended Sample A data with a follow-up period of 18.7 years, on average. The trajectory analysis yielded eight groups. The larger number of groups was expected and may be attributed to the longer follow-up period (Nagin & Tremblay, 2005; Piquero, 2008). The groups were heuristically labelled Low Rate Desister (LRD), comprising 28.0% of the sample, Low Rate Chronic (LRC), comprising 26.2% of the sample, Low Rate Adolescent Peaked (LRADOLP), comprising 16.4% of the sample, Moderate Rate Chronic II (MRC-II), comprising 11.9% of the sample, Moderate Rate Chronic I (MRC-I), comprising 5.3% of the sample, High Rate Adolescent Peaked (HRADOLP), comprising 4.8% of the sample, Moderate Rate Adult Peaked (MRADLP), comprising 4.5% of the sample, and Moderate Rate Escalator (MRE), comprising 2.9% of the sample. None of the groups had less than 10 individuals in them and the mean posterior probability coefficients were quite high across all four groups, exceeding .88. The trajectory groups are plotted in Figure 2.

**FIGURE 2. ESTIMATED CRIMINAL TRAJECTORIES FOR EIGHT-GROUP MODEL: EXTENDED SAMPLE A**



Comparisons on offending-related variables across the seven groups indicated that the LRD group had the latest age of first court contact ( $M = 15.8$  years), the earliest age of last court contact ( $M = 20.5$  years), and the shortest criminal career, spanning, on average, 4.2 years. The HRADOLP group had the earliest age of first court contact ( $M = 13.7$  years). Not surprisingly, the MRE had the latest age of last court contact ( $M = 34.0$  years) and the longest criminal career at 19.3 years, on average. The MRC I group had the second longest criminal career at 17.8 years, on average, followed by MRC II at 15.9 years, on average, and the LRC group at 13.5 years, on average. Over the duration of their criminal trajectories, the MRE group amassed the largest number of court contacts (adjusted by time-at-risk), with 110.1, on average, followed by the HRADOLP group with 89.5, on average, and the MRADOLP group, 56.4, on average. By contrast, the LRD group had the fewest court contacts, on average, with 4.6.

In terms of the distribution of individuals across the trajectories and the shape and length of the trajectories, comparisons can be made with the initial Sample A results. First, the extended follow-up data has now revealed three low rate trajectory groups, a chronic low rate group (LRC), a desister low rate group (LRD), and an adolescent peaked low rate group (LRADOLP). Together, these three groups comprise the vast majority of the sample, at 70.6%. The emergence of the chronic low rate group (LRC) likely reflects the longer follow-up period, which revealed that some of the low rate offenders from the initial analysis of Sample A persisted in their offending while some desisted after a few years of onset.

Second, the only high rate group that emerged was the adolescent peaked (HRADOLP) group. This group was retained from the initial analysis. Third, we now have four moderate rate groups, including a group of moderate rate escalators (MRE). Individuals following a MRE trajectory showed an upturn in their offending towards the end of the follow-up period. This small group of offenders comprises only 2.9% of the sample, yet accounted for 7.1% of the court contacts.

It is of interest to note that, examination of the initial and the extended trajectory results for Sample A revealed that 62% of the HRADLP group from the initial analysis moved to either the MRE or the MRADLP groups (31% and 31%, respectively) in the extended analysis. In other words, the HRADLP group essentially “became” the MRE and MRADLP groups with the additional follow-up data. Drawing conclusions from such comparisons should be made with caution, however, given: (a) the small sample sizes involved and (b) that the relationship between number of court contacts incurred and periods of incarceration exerts a strong influence in defining both the shape and distribution of the moderate and high rate trajectory groups. In other words, more time spent incarcerated relative to the number of court contacts incurred within a given time period will result in a “peaky” high rate group; less time spent incarcerated relative to the number of court contacts incurred will likely result in more individuals allocated to a moderate rate group. The addition of more criminal data during these time periods may change the shapes and distributions of the initial offence trajectories. In conclusion, while some similarities were observed between the initial and extended trajectory analyses, some differences were observed, as well. Accounting for the differences is difficult for various reasons and remains a matter of speculation.

Last, the MRC I group, which comprises only 5.3% of the sample and had a lengthy criminal career, accounted for 11.2% of the court contacts. By contrast, the LRD groups, which made up 28% of the sample, accounted for only 7.9% of the court contacts. Together, the MRE and MRC I groups may be seen as offenders with lengthy criminal careers who account for a disproportionate amount of crime and could be the target for early intervention.

## 6.2 Childhood predictors and adolescent correlates of trajectory group membership

The regression analyses were repeated with the extended Sample A trajectory results. The results indicated that relationship difficulties among family members in childhood increased the odds of membership in the MRADLP (OR = 4.51, 95% CI [1.30, 15.67],  $p < .02$ ) and HRADOLP groups (OR = 7.42, 95% CI [2.20, 25.05],  $p < .001$ ), in comparison to the LRD group. Second, experiencing a broken home/family transitions in childhood increased the odds of belonging to the MRC-II (OR = 2.22, 95% CI [1.02, 4.84],  $p < .05$ ) and LRADOLP groups (OR = 3.21, 95% CI [1.56, 6.60],  $p < .01$ ), in comparison to the LRD group. Last, poor child-rearing methods placed individuals at greater odds of belonging to the LRD group compared to the MRC-II (OR = .39, 95% CI [.17, .87],  $p < .025$ ) and LRADOLP groups (OR = .35, 95% CI [.17, .74],  $p < .01$ ).

In adolescence, involvement with alternative care, such as child welfare, increased the odds of belonging to the MRADLP (OR = 4.81, 95% CI [1.52, 15.22],  $p < .01$ ), MRC-I (OR = 7.32, 95% CI [2.23, 24.03],  $p = .001$ ), and LRC group (OR = 2.36, 95% CI [1.31, 4.25],  $p < .05$ ), compared to the LRD group. Last, exhibiting hyperactivity-impulsivity-attention problems in adolescence increased the odds of belonging to the MRE group (OR = 5.21, 95% CI [1.29, 21.07],  $p < .05$ ), compared to the LRD group.



These results suggest that the LRD and LRC may be differentiated based on parents' poor child rearing methods in childhood, which was associated with the desister group (LRD), and involvement in alternative care in adolescence, which was associated with the chronic group (LRC). The finding that exposure to poor child-rearing methods in childhood was associated with the LRD group is surprising and unexpected. It may be that, as noted elsewhere (van Domburgh, Loeber et al., 2009; Ward et al., 2010), this low rate offending group was not immune to the presence of risk factors early in life. At the same time, they may also have been exposed to more protective factors, which may account for the desistance in offending. This remains speculative until further research is conducted. Like the initial Sample A results, involvement with child welfare appeared to be associated with a chronic offence trajectory. A total of 80% of individuals in the MRC I group (16/20) had been involved in some form of alternative care (e.g., child welfare or foster home) as an adolescent, compared to 34.3% (34/99) of individuals in the LRD group. Last, problems with hyperactivity, impulsivity, and inattention in adolescence were associated with the MRE group, compared to the LRD group.

## 7.0 Study 3: Findings for Sample B with Follow-up to September, 2007

### 7.1 Trajectory analysis

Analyses were performed on the Sample B data with a follow-up period of 16.4 years, on average. Similar to the extended Sample A data, the analyses yielded seven trajectory groups. These groups were heuristically labeled Moderate Rate Chronic I (MRC I), comprising 3.6% of the sample; High Rate Adult Peaked (HRADLP), comprising 3.9% of the sample; High Rate Adolescence Peaked (HRADOLP), comprising 4.4% of the sample; Moderate Rate Adolescence Peaked (MRADOLP), comprising 11.7% of the sample; Moderate Rate Chronic II (MRC II), comprising 14.2% of the sample; Low Rate Desister (LRD), comprising 29.8% of the sample; and Low Rate Chronic (LRC), comprising 32.4% of the sample. None of the groups had less than 10 individuals in them and the mean posterior probability coefficients were quite high across all four groups, exceeding .89. These trajectories are plotted in Figure 3.

Comparisons on offending-related variables across the seven groups revealed some interesting similarities with the extended Sample A data. The LRD group had the latest age of first court contact ( $M = 16.4$  years), the earliest age of last court contact ( $M = 19.5$  years), and the shortest criminal career, spanning, on average, 3.1 years (see Figure 4). Once again, the HRADOLP group had the earliest age of first court contact ( $M = 14.3$  years). The MRC I group had the latest age of last court contact ( $M = 31.9$  years) and the longest criminal career at 16.6 years, on average. The MRC II group had the second longest criminal career at 14.8 years, on average. Over the duration of their criminal trajectories, the HRADLP group amassed the largest number of court contacts (adjusted by time-at-risk), with 78.1, followed by the HRADOLP group with 62.7, on average, and the HRC group with 52.1, on average. By contrast, the LRD group had the fewest court contacts, on average, with 4.8.

In terms of the shapes of the trajectories, the results share some similarities with the 8-group model yielded by the extended Sample A data, but some differences emerged, as well. First, we still find the two low rate groups, desisters and chronics. Combined, these groups comprise the vast majority of the sample, at 62.2%. Second, like the initial Sample A data, we find both a high rate adolescent peaked group (HRADOLP) and a high rate adult peaked group (HRADLP). These groups, though small in size, accounted for a disproportionate number of court contacts, at 9.9% and 6.8%, respectively. Last, the trajectory analysis revealed three moderate rate groups, MRC I, MRC II, and MRADOLP). Indeed, the MRC I group evinced both the most stable pattern of offending, though at a moderate rate, and the longest criminal trajectory. In this model, the MRC I and the HRADLP groups, which together comprised only 7.5% of the sample, are of particular concern because of either the length of their criminal trajectory or their very high rate of offending.

FIGURE 3. ESTIMATED CRIMINAL TRAJECTORIES FOR SEVEN-GROUP MODEL: SAMPLE B

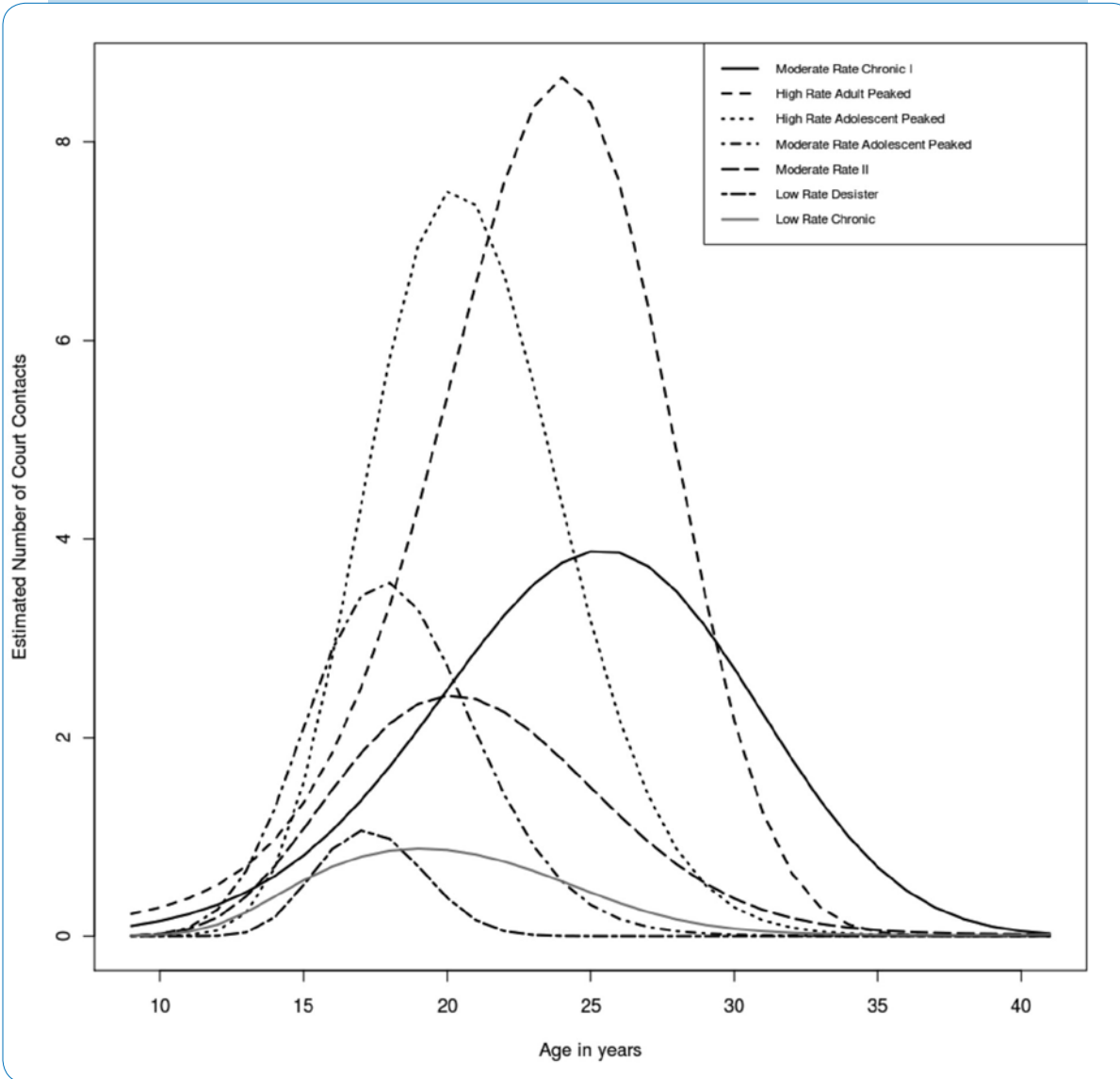
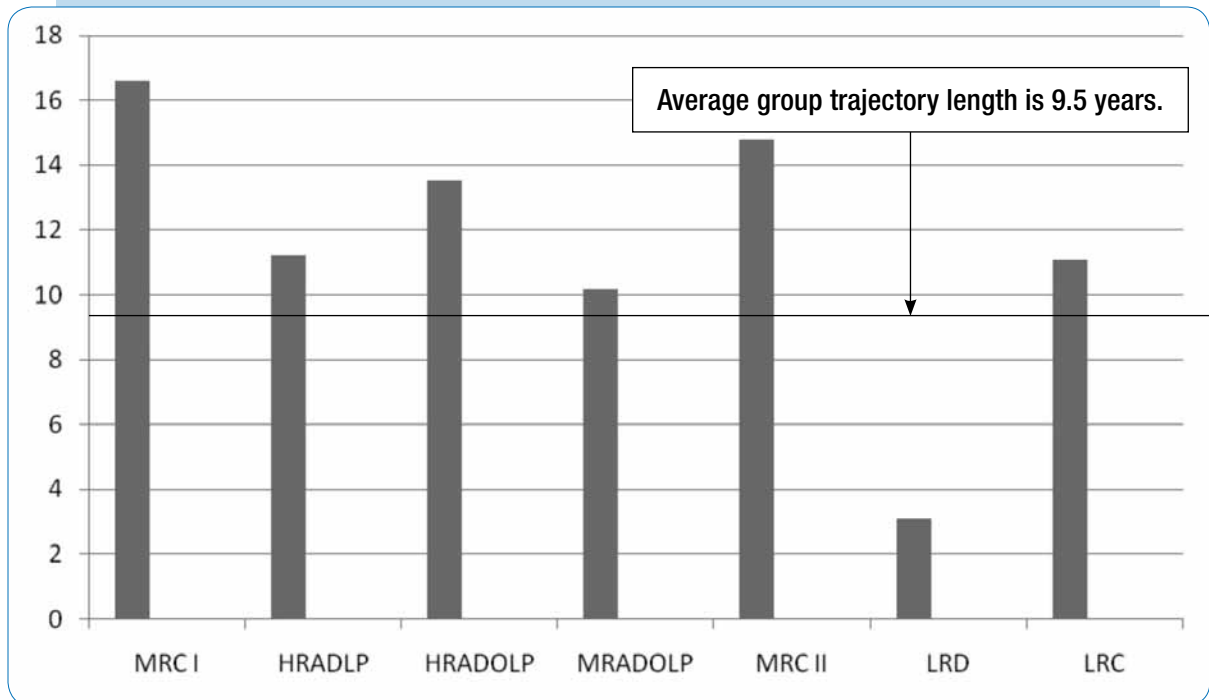


FIGURE 4. AVERAGE CRIMINAL TRAJECTORY LENGTH BY TRAJECTORY GROUP FOR SAMPLE B



## 7.2 Childhood predictors and adolescent correlates of trajectory group membership

As a goal of this study was to replicate the findings from Sample A, the same set of childhood predictors and adolescent correlates was applied to Sample B with the addition of four new risk factors: immigration status (child and adolescent), death of a caregiver (child and adolescent), homelessness (adolescent), and suicidality (adolescent).

A total of 350 of the 386 files (90.6%) from Sample B were coded. The remaining files could not be located. The primary coder was unaware of the trajectory group membership assignments. Inter-rater reliability with a second coder was found to be moderate to good (Landis & Koch, 1977). Separate multinomial regressions were performed for the childhood variables and the adolescent variables. The LRD group was used as the reference group for these analyses, which compares the other six groups against this one. Once again, this allowed us to identify risk factors of more serious offending patterns, in relation to the least serious group.

The results indicated that an early onset of antisocial behaviour predicted the HRADLP and MRADOLP trajectory groups, in comparison to the LRD group. More specifically, the presence of early antisocial behaviour increased by a factor of 4.2 ( $p < .05$ , 95% CI [1.16, 15.01]) and 3.3 ( $p < .05$ , 95% CI [1.49, 7.51]) the risk of belonging to the HRADLP and MRADOLP groups, respectively, compared to the LRD group. As well, poor academic achievement predicted membership in the LRD group, in comparison to the MRADOLP group (OR = .36,  $p < .05$ , 95% CI [.13, .97]).

In adolescence, experiencing relationship difficulties among family members predicted membership in the HRADLP, MRADOLP, and MRC II groups, compared to the LRD group. More specifically, experiencing relationship difficulties among family members as an adolescent increased the risk of belonging to the HRADLP, MRADOLP and MRC II groups by a factor of 4.0 ( $p < .01$ , 95% CI = 1.08, 14.69), 5.2 ( $p < .01$ , 95% CI = 2.26, 12.14), and 2.1 ( $p < .01$ , 95% CI = 1.02, 4.21), respectively. As well, involvement in alternative care during adolescence predicted HRADLP, HRADOLP, and MRC II group membership, in comparison to the LRD group. Last, poor academic achievement in adolescence predicted the LRD group, compared to the HRADLP, MRADOLP, and MRC II groups.

These findings highlight the role of two individual factors in childhood as predictive of trajectory group membership. An early onset of antisocial behaviour was associated with both a high rate and a moderate rate trajectory group, compared to the LRD group. Poor academic achievement was associated with the LRD group, compared to the MRADOLP group. Poor academic achievement in adolescence was further associated with the LRD, compared to the two moderate groups. Also in adolescence, two family factors were associated with serious offending, compared to the LRD group; involvement in alternative care was associated with two high rate groups and the MRC II group, and experiencing relationship difficulties among family members was associated with the HRADLP, MRADOLP, and MRC II groups.

With regard to the finding that individuals in the LRD group were overrepresented on poor academic achievement, compared to the MRADOLP group, Wiesner and Silbereisen (2003) also found that poor academic achievement was associated with a low-level offence trajectory. Perhaps poor academic achievement is not as serious a risk factor for later criminality as other factors (e.g., early conduct problems) or that the absence of other severe risk factors may reduce the extent of criminal involvement. Moreover, although we were not able to test it directly in the present study, the LRD group may also have experienced more protective factors than the other groups.

A surprising finding concerned the MRADOLP trajectory group. This group showed an offence profile that was parallel to the HARDOLP group, though at a much lower rate. Moreover, this group experienced as many childhood (early conduct problems) and adolescent (poor family relations and involvement with alternative care) risk factors as the HRADLP group, yet their rate of offending was considerably lower. Given the presence of these risk factors, one would expect the rate of offending for the MRADOLP group to be as high as the HRADLP group. In other words, one could ask what other factors might have been acting on this group to suppress their rate of offending. One possibility is that the MRADOLP group experienced more protective factors in childhood and adolescence than the HRADLP group, which were not detected in the present study. This speculation requires further study but also underscores the importance of examining protective factors alongside risk factors, an area of investigation that has received far less attention in the literature (Löesel & Bender, 2003). Protective factors are often studied in the context of abstaining or desisting from crime. However, they may also play a role in either suppressing the overall rate of offending or delaying the onset of offending.

### 7.3 Psychiatric Disorders

As with the Sample A data, we recorded the psychiatric disorders for all individuals seen by the staff psychiatrist at the two youth homes and for whom a diagnosis (or psychosocial problem) was reported in the client files. Of the 386 individuals in the subsample, 182 were known to have been seen by the staff psychiatrist (47.2%). Of these, all but two (98.9%) received a diagnosis of one or more disorders (two were assigned a psychosocial problem rather than a disorder). The average number of disorders was 2.2; 13.2% were given one disorder, 48.4% were given two disorders, and 37.4% were given three disorders. The most common disorders were a Personality Disorder (60.4%), Substance Abuse Disorder (54.9%), Impulse Control Disorder (40.1%), Adjustment Disorder (22.0%), Sexual Disorder or Gender Identity Disorder (18.1%), and Mood Disorder (11.0%). A limitation of these results (and the results for Sample A) is that they are based on the diagnosis of a single staff psychiatrist. However, they do reflect the high prevalence of mental health problems seen among juvenile justice youth. These results are consistent with the findings of the Sample A data (Day et al., 2008).

## 8.0 Conclusions

Findings from three sets of analyses with two subsamples of juvenile offenders in Ontario were described. The objective of the analyses was twofold: (1) identify the inherent heterogeneity of offending rates over time with particular interest in the high rate and chronic offence trajectories; and (2) identify the childhood predictors and adolescent correlates associated with the trajectory groups, particularly the high rate and chronic groups. The practical mission of this research is to advance knowledge of developmental crime prevention and to inform the development of effective early intervention and prevention programs particularly for high risk groups of children and youth to prevent or forestall a developmental pathway towards a life of crime.

Six conclusions may be drawn from this program of research. First, the extant theory and research that underpin the present investigation clearly suggest that antisocial and criminal behaviour is a product of developmental processes. That is, a confluence of biological, psychological, and social factors come together to set an individual onto a developmental pathway towards antisocial and delinquent behaviour. For example, even before birth, factors may conspire against the developing fetus, predisposing it towards impulsive, hyperactive, and aggressive behaviour. A lack of proper nutrients during critical periods of development or pre- or postnatal exposure to toxic agents (e.g., fetal alcohol or drugs) may result in mild or severe deficits in cognition and behaviour. These deficits may contribute to a wide range of conditions such as poor motor coordination, low intelligence, hyperactivity, language impairment, impulsivity, self-control problems, poor frustration tolerance, social information-processing deficits, and learning disabilities. Such features are known to be markers of aggressive behaviour in children.

Second, the results of the trajectories analyses reported here indicate that the criminal offenders in our studies comprise a heterogeneous population. This can be seen in the variability in their rate of criminal activity as it unfolds over time, the shape of their trajectories, and the length of their criminal careers. Criminal justice sanctions should consider this variability to provide a range of appropriate consequences. Third, the majority of individuals who enter into the youth justice system evince a low rate of offending (i.e., near-zero), some of whom desist in their criminal activity a few years after their first court contact. Understanding the factors that differentiate the desisters from the persisters is a critical research question that warrants further investigation (Piquero, Sullivan, & Farrington, 2010). Additionally, a large number of offenders in the two subsamples committed crimes at a moderate rate, in some cases over an extended period of time. It has been suggested (Ward et al., 2010) that moderate rate long-term offenders may be a prime target for treatment interventions and rehabilitation programming by the justice system to address psychosocial factors that may be keeping them entrenched in an active, though at a moderate level, involvement in a criminal lifestyle.

For the purpose of criminal sanction decisions, it would seem advantageous to attend to the various dimensions comprising an individual's criminal career, including the rate of offending and length of the offending trajectory as well as the severity, type and timing of offences. Moreover, consideration of the results of the risk assessment instruments in combination with trajectory analysis results might further contribute to better decisions by the justice system about risk management for offenders on specific offence trajectories (Piquero et al., 2010; Ward et al., 2010). In other words, attention should be paid to addressing the needs of offenders in different trajectory groups and across a range of risk levels. It is also suggested that early intervention and prevention programs could be directed toward those at greatest risk for a longer-term criminal trajectory, though not to the exclusion of children and youth who present with fewer risk factors and more protective factors. Resources could be allocated and efforts focused on all types of persistent offenders, not just the high rate offence trajectory groups. This point also was made by Piquero et al. (2010) in a study of short-term high rate offenders (STHR) and long-term low rate (LTLR) offenders from the CSDD. Piquero et al. noted that more consideration should be given to understanding the nature of short-term "spurts" in a criminal career and what the appropriate response by the criminal justice system would be.

Fourth, consistent with other studies in the literature, trajectory analyses are able to identify groups of individuals who commit a disproportionate number of crimes. Across the three sets of analyses presented here, these groups included the high rate adult peaked group (HRADLP), moderate rate escalator group (MRE), and the moderate rate chronic (MRC I) group. Fifth, childhood predictors and adolescent correlates of high rate and chronic offenders also can be identified. These included variables within the individual (e.g., early antisocial behaviour and hyperactivity-impulsivity-inattention) and family (broken home/family transitions, familial criminality, and involvement with alternative care). Knowledge of these risk factors may be useful to inform the development of effective targeted early intervention and prevention programs. Last, although we were not able to examine it in the present study, there is a need to examine protective and promotive factors as well as risk factors. All these sets of factors contribute to our understanding of the causes of criminality thereby supporting the targeting for prevention and early intervention.

## 9.0 Limitations

The present studies have a number of limitations. First, the studies were limited by problems inherent in any archival file review study. Their findings reflect the amount and quality of information that was accessible in the client files. Much of the childhood data, for example, came from retrospective accounts by key informants contained in the PDRs, documents that are prepared for the courts. Only the most salient factors may have received attention in the PDRs, with less salient, but nonetheless equally important (i.e., in terms of explanatory power), factors given less attention. Second, the risk factor variables were coded as either “absent/unknown” or “present/suspected.” Whether a factor was absent because the youth had not experienced it or because the factor was not mentioned in the documents on file could not be confirmed.

Third, although our coding scheme included both risk and protective factors, the low base rate of occurrence of the protective factors precluded an examination in the analyses. Fourth, our criminal data were based on official records and may have underestimated the full extent of the participants’ criminal activity by not including less serious offences and/or offences that may not have come to the attention of the authorities. Fifth, the results presented here are limited in their generalizability and need to be replicated with other Canadian samples.

As a final word, the results of the studies presented in this Report are best understood within the context of the growing body of literature on criminal trajectories and their correlates as well as the extant theories on the development of antisocial and criminal behaviour. As well, caution is suggested about moving too quickly to do “something to people *predicted to be* high-rate offenders” (italics in the original) (Piquero, 2008, p. 52). Risk factors are meant to be understood as probabilistic not deterministic. Risk-focused interventions and prevention strategies that are based on sound theoretical models, framed within a developmental and life course perspective (Farrington, 2005b), offer both the greatest likelihood of effectiveness as well as the ability to test causal models of development, thereby contributing to the advancement of the growing field of prevention science (Lochman, 2006).

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