Moffitt Revisited: Delinquent and Criminal Career Paths in the 1958 Philadelphia Birth Cohort

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Abstract

Since the emergence of Moffitt's typology of criminal trajectories in 1993, considerable research has focused on whether distinct developmental, criminal paths exist and their value as a theoretical model. Moffitt's typology, however, is based on very limited data, with a small, non-representative sample. Either of these aspects of Moffitt's work and the many replications, could be responsible for the inconsistent results reported in the literature. This study used the data from 1958 Philadelphia Birth Cohort in an effort to replicate Moffitt's work and extend the empirical results from the replications. The 1958 Birth Cohort is extremely large [27,160 cases, with 13,160 males and 14,000 females]. The data cover the entire criminal careers of the cohort, from onset, as early as age seven, up to the 27th birthday. This longitudinal cohort design permits the examination of offense onset, progression, escalation and desistance. Detailed offense data are available thus facilitating the testing of many of Moffitt's assertions. We developed and tested four juvenile and adult career paths: nonoffender, limited, frequent, and chronic. Across the juvenile paths, age of first offense is significantly younger, average severity of the offense increases, as does the share of Sellin-Wolfgang Index Offenses. The juvenile paths were significant predictors of the corresponding adult paths.

Introduction

Criminal Careers

Over the past 42 years, since the publication of *Delinquency in a Birth Cohort* (Wolfgang, et al., 1972), the "criminal career" concept has dominated criminological research. Scholars from across many social science disciplines have attempted to provide theoretical explanations of a so-called "career in crime" and document the empirical reality surrounding a host of significant aspects such as the onset, duration, and trajectories of these careers. The career criminal was also the subject of a two-volume series by the National Academy of Sciences (Blumstein, 1986). There has been significant scholarly interest in studying criminal careers indicating that this clearly delineated area of inquiry has been significant, desirable, worthwhile, etc., Tracy and Kempf-Leonard (1996: 2-3). It is surely the case that an important dimension to longitudinal research on delinquency and crime emerged with *Delinquency in a Birth Cohort* in 1972. Not until the appearance of that study was the topic of criminal careers studied empirically so extensively. In this pioneering research with the 1945 Philadelphia birth cohort, Wolfgang and his associates used a retrospective birth cohort design to investigate the delinquency careers of 9,945 boys who were born in 1945 and who had lived in Philadelphia throughout the course of their juvenile years, for which they were most at risk (ages 10-17). With the benefit of a longitudinal cohort design, Wolfgang et al. (1972) were the first to report population-based data concerning cohort delinquency rates from a data source unlike any other previously investigated in this country. For example, desistance and recidivism probabilities, offense switching, offense severity escalation, offense specialization, age of onset, age at offense, and disposition probabilities, and the effects of these measures on delinquent career progression or cessation can best be estimated from data that are longitudinal in character.

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In addition to the longitudinal character of the data, the 1945 cohort study represented the entire universe of subjects as opposed to a sample (Tracy and Kempf-Leonard, 1996: 6). Among the significant findings of the research was the fact that a very small fraction of the birth cohort, offenders that had accumulated at least five police contacts before becoming adults, had committed a far greater share of the delinquency in the cohort than their proportionate representation in the cohort might have suggested. Specifically, the 627 chronic delinquents constituted just 6 percent of the cohort (n=9,945) and 18 percent of the delinquent subset (n=3,475), yet these chronic offenders were responsible for a total of 5,305 offenses, or 52 percent of all the delinquency in the cohort through age seventeen. With regard to the subset of serious index crimes, it was found that the chronic delinquents had committed 63 percent of the UCR index offenses, including 71 percent of the homicides, 73 percent of the rapes, 82 percent of the robberies, and 69 percent of the aggravated assaults. It is quite likely that the findings of the 1945 birth cohort study concerning the chronic delinquents have become the most important and enduring findings of the research because, even though criminologists had long suspected that rates of offending were skewed--that a small group of habitual offenders were committing crimes at a high rate, the Philadelphia birth cohort study showed just how small the chronic offender group actually was, and just how skewed their rates of offending actually were (Tracy and Kempf-Leonard, 1996: 6). Walker has provided the following assessment of the 1945 birth cohort study, "Their landmark study, *Delinquency in a Birth Cohort*, is the single most important piece of criminal justice research in the last 25 years and has become a major influence on crime control thinking" (1985: 39). With reference to the chronic offender data in the cohort, Walker remarked that, "....since Wolfgang first identified them, those 627 juveniles have inspired the freshest and most important thinking in criminal justice" (1985: 39).

One possible reason for this praise of the 1945 cohort study is that it established a research agenda that bridged the two spheres of academic research and governmental policy. That is, in response to the criminological fact of life represented by the chronic offender, many researchers and government officials recognized that the group of habitual or career criminals represented a special category of offender that held great promise for research. For the academic, the chronic offender or career criminal and the criminal career became delineated foci of both substantive and methodological developments in criminology. For the policy-maker, the criminal career and the career criminal have become the focus of special criminal justice intervention, such as targeted law enforcement and prosecution procedures, special court procedures known as "habitual offender courts," and ultimately by selective incapacitation strategies and stringent sentencing guidelines. These are just a few of the most popular measures that were implemented to combat the career criminal and his excessive and prolonged involvement in criminal behavior.

Developmental Criminology

The life course approach to the study of criminal careers arose in the 1990s as criminologists tried to bring clarity to the debate about the value of longitudinal research. According to Farrington, the developmental and life-course approach to crime is concerned mainly with three topics: (1) the development of offending and antisocial behavior from the womb to the tomb; (2) the influence of risk and protective factors at different ages; and (3) the effects of life events on the course of development (2010:249). The life course approach became prominent, if not preeminent, in the 1990s. In fact, life course, longitudinal research has come to enjoy even greater hegemony than was the case when Gottfredson and Hirschi first raised the issue in the mid to late 1980s. An authority as noteworthy as Farrington has indicated that, "The main reason why developmental and life course criminology became important during the 1990s was because of the enormous volume and significance of longitudinal research on offending that was published during this decade" (2010: 250). Among the studies referenced by Farrington were the following: the three "Causes and Correlates" studies originally mounted by U.S. Office of Juvenile Justice and Delinquency Prevention in Denver, Pittsburgh and Rochester (Huizinga et al., 2003; Loeber et al., 2003; Thornberry et al., 2003). Other important longitudinal projects that came to prominence in the 1990s were the Seattle Social Development Project (Hawkins et al., 2003), the Dunedin study in New Zealand (Moffitt et al., 2001), the Montreal Longitudinal-Experimental study (Tremblay et al., 2003), and the further analyses by Sampson and Laub (2003) of the classic Gluecks' study. Although Farrington (2006) may be right that a variety of life course theories and research helped establish the dominance of the life course approach, it is nonetheless true that the work of Sampson and Laub had a singular role in this process.

Life Course Criminology: Sampson and Laub

In an attempt to explain criminal behavior over the life course, Sampson and Laub (1993) developed the age-graded theory, which looks at the role informal social controls play throughout the various stages of development. To fully encompass the life course perspective, Sampson and Laub (1993) acknowledge the behavior and experiences of individuals at the three major age periods: childhood, adolescence and adulthood. As individuals age, they endure various experiences that shape the pathways or trajectories they are likely to follow. The weaker an individual's bonds are to society and family, the more likely s/he will engage in criminal activity. In 2003, Sampson and Laub added routine activities and human agency to the factors contributing to criminal behavior. The addition of these seeks to adjust for some of the issues missing from their previous theory and to make it more encompassing of human development. The additional factors, according to Sampson, et al., (2006), allow for us to confirm that regardless of various other factors, there will be heterogeneity amongst criminal offending. When following daily routines, individuals are engaging in set behaviors that limit the amount of opportunity for committing crimes or delinquent acts. Following a set schedule requires an individual to arrive at, stay at and leave at particular times, which in turn requires him/her to desist from criminal behavior. Sampson, et al., (2006) have noted that, because life-course persistent offenders are unlikely to follow a structured routine throughout their life, they have fewer constraints on their behavior. Ultimately, the more structured an individual's life is, the less likely s/he will engage in criminal behavior.

Human agency is the concept that individuals choose whether or not to engage in criminal behavior. Sampson, et al., (2006) make note that there are various structural and social factors that play a role in the motivations for engaging in criminal behavior. Individuals have only so much choice in their behaviors based upon the situations they are in, which in turn makes it more difficult to predict criminality. Sampson and Laub (2003) used the Gluecks' data to show that individuals make their behavioral choices based on the circumstances surrounding their lives. Offenders are consciously utilizing free will when committing criminal and delinquent acts. The life course perspective looks at both the experiences of an individual and the ties they have with the social environment to explain the continuity and changes in criminal behavior through looking at process variables and structural factors. Graduating high school and obtaining a job or being accepted in to college can change the behaviors of an adolescent as they are now more able to provide for themselves and need to ensure they behave properly so they do not lose what they have. On the contrary, dropping out of school, losing a job or not being accepted in to college can direct an individual to a more delinquent pathway.

The age-grade theory identifies key components of trajectories, which are long-term patterns of behavior, and transitions, which are short-term events, represent the pathways individuals opt to follow as they age and develops, and along the way they endure turning points, which are significant changes that alter the decisions and choices they make (Sampson and Laub, 1993). Turning points can change an individual's pathway from one of crime and deviant behavior to of that is crime-free and vice versa. With a focus on the informal social controls in an individual's life, Sampson and Laub (1993) point out that familial and school controls play a role in delinquency during childhood and adolescence, antisocial behavior is consistently observed across the lifespan and situations, and informal social controls continue to play a role in criminality during adulthood. As an individual becomes less acquainted with the rules and regulations of society, s/he is more likely to engage in antisocial behavior. Antisocial behavior has been accepted as a contributor to criminal behavior. As children age, the role of parents is extremely important in attempting to deter criminal activity from developing. Sampson and Laub (1993) note consistent discipline, parental monitoring and attachment offer both informal and formal methods of control to reduce the likelihood of delinquency. When there is a lack of parental monitoring and poor discipline, adolescents fail to learn proper behavior and turn to antisocial behavior. Children who feel connected to their parents, are well cared for and are attached to the relationships they have with their parents, are much less likely to engage in deviant behavior, as that would put distress, distrust and disruption in the relationships. Sampson, et al., (2006) also note that attending and succeeding in school is a deterrent to committing crimes. Adolescents who feel no bond or desire to attend school are more likely to engage in deviant behavior such as truancy. When an adolescent is in school, teachers, peers and other adults within the building are monitoring him; upon leaving the building, opportunities for delinquency arise. The structure of going to school, attending classes and doing homework is also a means of deterring youth from engaging in delinquency. Adolescents who do not care about their grades or attending classes exhibit more signs of antisocial behavior than those who regularly attend school.

Adolescents can turn to delinquency due to turning points within the family structure, i.e. when parents get divorced, family is moved from one location to another location, a death in the family, or a change in socioeconomic status (Sampson and Laub, 1993). The turning point is enough to shake up the developmental process of an adolescent and as a means of coping or acting out can lead to antisocial and criminal behaviors. Changing and varying social factors play a role in altering the trajectory of an individual (Moffitt, 1991). Particular social factors can lead a delinquent adolescent away from criminality and towards a life of desistance. Without turning points, a child with low attachment to social controls and family will likely continue down a pathway of criminality; however, turning points such as marriage, military enlistment, parenthood, etc. can be enough to turn an individual from a criminal trajectory to a criminal-free trajectory. There is a clear commonality amongst individuals who continue committing crimes throughout their lives is the existence of antisocial behavior from childhood into and through adulthood (Sampson and Laub, 1993; Moffitt, 1993; Caspi and Moffitt, 1995; Robins, 1978); individuals who exhibit antisocial behaviors as an adult have been doing so since childhood. Aggressive behavior as a child through adolescence is another characteristic that is seen in life-course persistent offenders (Sampson and Laub, 1993). Individuals who demonstrate antisocial and aggressive behavior consistently throughout their lives are more likely to be life-course persistent offenders than adolescence-limited offenders. To further the age-grade theory, Sampson and Laub (1993) argue that having weak social bonds and exhibiting antisocial behaviors as an adolescent leads to the continuance of antisocial behavior and criminality in adulthood. The weak social bonds exist in adolescence and adulthood and are evident in the experiences and behaviors they present. Social factors and social structure play a role in both leading individuals towards or against criminal offending.

Moffitt's Taxonomy

In addition to the emergence of the life course perspective, the criminal careers literature was further enhanced when Moffitt (1993) proposed two distinctive pathways of juvenile delinquency: (1) adolescence-limited; and (2) life-course persistent. According to Moffitt, both of these career paths stem from various precursors of antisocial behavior. However, the offenders begin their pathway to criminal behavior in differing respects. Adolescence-limited offenders engage in delinquent behavior due to the social influences around them, whereas life-course persistent offenders engage in criminality as a primary result of their neuropsychological makeup. Social factors seem to only play a role in the lives of individuals who are not following the life-course persistent trajectory (Moffitt, 1991). Life-course persistent offenders are not deterred by social factors as they have already committed to a life of criminal behavior. Adolescence-limited offenders are more likely to adapt their behaviors to social factors, especially when their negative behavior is rejected or viewed negatively by their peers.

Adolescence-Limited Offenders

Adolescence-limited offenders are not consistently antisocial across all situations and tend to follow the rules in particular environments, while breaking them in others; they base their behavior on whether or not it is more rewarding to behave in an antisocial or prosocial manner (Moffitt, 1993). The behaviors are not present during childhood and antisocial behavior only exists during the teenage years as a result of a maturity gap, social mimicry and reinforcement. Moffitt (1993) hypothesized that social mimicry, maturity gap and reinforcement are the three main reasons adolescents in this category engage in antisocial behavior. When adolescence-limited offenders see that some of their peers appear to be more independent and free of rules, they aim to mimic the behaviors of the life-course persistent offenders and thus engage in deviant behavior. This mimicry does not follow them throughout the rest of their lives and they age out of the deviant behaviors as they begin to experience independence in their own right. As society changed so did the roles and responsibilities of teenagers; their psychological and physical makeup, however, has not. Moffitt (1993) also says that youth commit delinquent acts as a way to break away from their parents, establish autonomy and engage in behaviors that make them more adult-like. During adolescence, youth endure a number of changes, physical, psychological and social as they enter puberty. They confront school situations and a desire to be independent from their parents. It is at this time that friends and social networks influence behavior more so than parents. Adolescents who want to break free from the controls of parents tend to engage in truancy, drug and alcohol use and shoplifting. These adolescents commit deviant behavior to defy the rules of their parents and to see themselves as independent individuals. As a means of explaining why some youth do not engage in antisocial behavior, Moffitt (1993) offers two concepts.

First, youth are reaching puberty later in age and do not feel the need to express independence, youth are in fewer situations where they are unsupervised, youth have few or no friends, or youth are already fulfilling adult roles without the necessity of breaking free. Second, she also uses the increase in adult roles as reason adolescent-limited offenders discontinue from crime at a particular age.

Life-Course Persistent Offenders

These offenders begin exhibiting antisocial behaviors at an early age and continue to progress into delinquency and then criminality as they age and as new social opportunities arise (Moffitt, 1993). Their antisocial behaviors are evident across all situations, in the home and outside of the home. Moffitt (1993) describes various events of antisocial behavior evident throughout the life of a typical life-course persistent offender stating that these offenders will behave in an antisocial manner at home, in school and at other social settings. Their behavior remains consistent no matter the location or age, but their crimes will vary as the opportunities to commit crime change. Along with neuropsychological deficits, life-course persistent offenders tend to grow up in disadvantaged environments, with little parental monitoring and support, thus increasing the likelihood of antisocial behavior (Moffitt, 1993; Piquero & Brezina, 2001). The combination of a poor social environment and neuropsychological deficits leads an individual down a pathway for persistent criminal behavior. When a child has poor relations with his or her parents, it is also likely that the child will also struggle to gain interpersonal relationships with peers and other adults. These children lack the ability to develop positive communication and relationship building skills, which will impede their overall ability to overcome the hardships of growing up in a disadvantaged environment but also to gain aid for their neuropsychological deficits. Life-course persistent offenders are unlikely to stop committing crime, regardless of interventions.

Additional Trajectories

Over time, as more research has been conducted, a number of new offender pathways have been established. When questions arose about whether or not new pathways should be considered, Moffitt held true to her schema indicating that abstainers and the two original pathways she developed encompass the vast majority of offenders. She did, however, acknowledge two new categories *childhood-limited aggressive* and *low-level chronic offenders* (2006). Along with her two additional pathways, other researchers have redefined or identified other types of trajectories. Some research has found that all offenders eventually desist from crime (Gottfredson and Hirschi, 1990; Sampson and Laub, 2003), which would require the need for a new category. These individuals eventually stop committing crimes all together, but not necessarily around the end of adolescence. There are also abstainers from crime, these individuals do not engage in any delinquent behavior. Blokland et al. (2005) identified four trajectories: sporadic offenders, low-rate desisters, moderate-rate desisters and high-rate persisters. Piquero (2008) reviewed over 80 studies of developmental trajectories and provided an overview of the trajectory methodology, its strengths and weaknesses, and summarized key conclusions of the studies that have used this technique (the Piquero review was updated by Jennings and Reingle, 2012). They found a number of commonalities amongst them (see Figures1a to 1d). Various studies confirmed that there were two trajectories, however, there was evidence of three to five pathways. In addition, a late-onset chronic group was identified. This particular group starts offending in mid to late adolescence and continues to offend as an adult (Piquero, 2008). Three different groups of offenders, low rate, medium rate and high rate, have been identified through group-based research, with varying background factors leading to criminality, different types of offenses being committed and differences amongst the age at the start of criminal behavior. Piquero(2008) suggests more studies be done that look at criminals who have periods of intermittency in their offending patterns. There is variation amongst the offenders, which is lost when researchers do group-based research; there is variety in the types of offenses committed, the turning points that alter an individual's trajectory and dispositions that lead to criminal behavior.

Critique of Prior Research

Moffitt's Original Trajectories

Moffitt's (1993) original paper was an important addition to the criminal careers literature and stimulated many replications. However, there is a glaring limitation of Moffitt's research. Her study neglected to address individuals who are virgin adult offenders—they began committing crime as an adult without any prior juvenile involvement in illegal behavior. In fact, Moffitt (2006) only begins to address the concept about 13 years later, and even then, only reluctantly. Moffitt essentially offers two explanations as to why virgin adult onset may be a measurement artifact.

First, she makes the point that at which antisocial behavior begins is just an estimate because adulthood varies over the generations and that the period of adulthood has now changed, with adulthood really starting sometime after age 18. Specifically, Moffitt noted that, "Whereas the eighteenth birthday may have demarked adulthood for young people born before 1960, the eighteenth birthday falls only midway between puberty and adulthood for contemporary generations (2006: 286). Whatever may be true with regard to maturity and developmental issues, the real point is that New Zealand, like the United States (and most countries) have separate juvenile and adult justice systems with specific age boundaries set by statute. According to Watt (2003: 11), New Zealand established the age jurisdiction for juveniles in The Children and Young Persons Act of 1974 (see also Seymour, 1976), "The 1974 Act followed an example set by the *1969 English Children and Young Persons Act* by legally distinguishing children and young persons. Children were defined as those under the age of 14 and young persons over 14 and under 17. The Act prescribed a different approach to offenders from either category." Further, New Zealand in *The Children, Young Persons and Their Families Act of 1989* also clearly set forth that, for crime measurement purposes, "A young person who commits offences beyond the age of 16 is dealt with in the same manner as an adult, that is, in the District Court or, if the offence is serious, in the High Court."

(http://www.justice.govt.nz/courts/youth/about-the-youth-court/overview-of-principles-and-process).
Moffitt's second explanation for ignoring the virgin adult onset path is simply that they really do not exist–they are an artifact of official crime data. That is, when discussing the results of other studies which identified these offenders, Moffitt suggested that, "most of their adult onset offenders would probably be revealed as adolescent-onset if self-report data were available (2006:287). Unlike the legal age issue above, which has been addressed, this latter issue is an empirical question which can be resolved by studies that use both kinds of data–official and self-reported. The absence of virgin adult offenders, especially chronic criminals, is a serious deficiency—both conceptually and empirically. Tracy and Kempf-Leonard (1996: 80) have reported that 44 percent of adult offenders had no prior record of delinquency. Thus, Moffitt is ignoring a substantial proportion of adult offenders for whom she estimates no career trajectories. Many prior studies suffer this same limitation of focusing solely on juvenile careers (Nagin and Tremblay, 1999; Fergusson, et al., 2000; Maughan, et al., 2000; Colder, et al., 2001; Brame et al., 2001a; Nagin and Tremblay, 2001a; Nagin and Tremblay, 2001b; Brame et al., 2001b; Li, et al., 2001; Cote, et al., 2001; Cote, et al., 2002; Colder, et al., 2002; Lacourse et al., 2002; Chung, et al., 2002a; Guo, et al., 2002; Lacourse, et al., 2003; Broidy, et al., 2003; Mustillo, et al., 2003; Schaeffer, et al., 2003; et al, 2003; Nagin, et al, 2003; Wiesner and Silbereisen, 2003; Oesterle, et al., 2004; Tremblay, et al, 2004; Hix-Small, et al., 2004; Wiesner and Windle, 2004; Bongers, et al., 2004; Brame, et al., 2005; Piquero, et al., 2001. Moreover, Piquero and Brezina (2001) have disputed many of the reasons for adolescence-limited offending and found that, rather than being a specific cause for delinquency, the desire for autonomy is actually rather general, which is inconsistent with Moffitt's premise (1993). They did, however, go on to confirm that peer relationships play a role in the desire and likelihood of engaging in delinquency.

Designs

Many of the replications fail to utilize effective methods to determine the trajectories of offenders over the life-course. Cross-sectional and longitudinal studies are most commonly used when studying criminal activity. Piquero (2008) noted that more studies are using the trajectory technique and future studies should also consider doing so. Studies in the past have not allowed for researchers to distinguish amongst the groups of offenders, but rather assume they develop in pathways of crime in a universal manner. This is a fault of the design and the samples used. Cross-sectional designs have proven to be very useful when researchers have limited time and resources money to conduct a longitudinal study. However, when looking at criminal careers, cross-sectional designs hinder a researcher's ability to investigate fully the pathways of the offenders through the life course. That is, studies that use cross-sectional designs look only at distinct points in time, not continuously. This is a major fault, as it does not let researchers see the actual developmental tracts of the individuals. Cross-sectional designs fail to determine temporal order of development and do not allow researchers to fully see the developmental changes of individuals as they progress over time. Cross-sectional designs would offer no forward progress in the trajectory studies, as they cannot provide information about issues and changes that occur over consecutive developmental time periods. Thus, cross-sectional designs only offer a snapshot in to criminal behavior at a particular point in time, which limits the ability to grasp the behavior filly over a life-course.

Much of the research done with cross-sectional data looks at the age of arrest and conviction rates, which does not allow the tracking of the life course of an offender and neglects to acknowledge individuals who are incarcerated or have passed away. To fully see the pathways of offenders, one must follow the lives of offenders from childhood well in to adulthood. Piquero (2008) notes that cross-sectional techniques also fail to account for individuals who are intermittent in their offending patterns. We acknowledge that cross-sectional research is not incapable of examining important topics surrounding criminal careers, but nonetheless, we maintain that the longitudinal approach, especially the birth cohort method, is the most viable and productive way to study many issues that surround delinquent and adult careers in crime and the transition between the two. Longitudinal studies are important when studying criminal activity over the life-course because this type of design allows the research to examine subjects at various ages and points in their lives, practically continuously. It can also be noted that longitudinal studies are much better for addressing developmental issues, such as the ones that arise during the development of a criminal career. Piquero (2008) also pointed out that many studies have been conducted worldwide and at varying time periods of criminal activities over the life-course of many offenders. The use of longitudinal studies allows us to better see the trajectories of offenders throughout their lives by tracking when and what types of crimes are being committed. As a result of its comparative advantages, a number of researchers have used the longitudinal design to follow trajectories of offenders and non-offenders (Brame, et al., 2005; Bushway, et al., 1999; Bushway, et al., 2003; D'Unger, et al., 1998; D'Unger, et al., 2002; Eggleston et al., 2004; Haviland & Nagin, 2005; Jones, et al., 2001; Land, et al., 1996; Land & Nagin, 1996; Land, et al., 2001, Nagin, 1999, 2005; Nagin & Land, 1993; Nagin & Tremblay, 2005a; Nagin & Tremblay, 2005b; Roeder et al., 1999; Sampson & Laub, 2003). While these studies have used longitudinal data, few followed the subjects for as long or as in-depth as the 1958 cohort study does.

Sampling Design

In order for empirical research to offer findings which are valuable, either for development of theory or testing hypotheses derived from theory, the samples should at a minimum be: (1) random; (2) large enough to permit statistically valid analyses; and (3) sufficiently heterogeneous in order to capture the characteristics of the general population (i.e., external validity). Unfortunately, these criteria were not well met by prior research. For example, Moffitt's study (1993) used a cohort of 1,037 children (535 boys and 503 girls) born between April 1972 and March 1973 in Dunedin, New Zealand (http://dunedinstudy.otago.ac.nz/studies/assessment-phases/the-study-members). Moffitt's work has focused mostly on the males and has emphasized demonstrated signs of antisocial behavior or conduct disorder. By utilizing a sample with a primary psychological focus on at-risk youth, Moffitt naturally developed career trajectories that could fit the sample at hand. However, these trajectories are only generalizable to juveniles with designated disorders and are not generalizable to the overall juvenile population at risk. Following Moffitt, many replications also utilized samples of at-risk males, which leaves unresolved the problem of generalizing Moffitt's pathways to the general juvenile population. Many trajectory studies have included only males (Nagin and Land, 1993; Nagin et al., 1995; Land, et al., 1996; Land and Nagin, 1996; D'Unger, et al.,1998; Laub, et al., 1998; Nagin, 1999; Roeder, et al., 1999; Nagin and Tremblay, 1999; Bushway, et al., 1999; Land, et al., 2001; Brame, et al., 2001b; Jones, et al., 2001; Piquero, et al., 2001; Paternoster, et al., 2001; Nagin and Tremblay, 2001a; Nagin and Tremblay, 2001b; Brame, et al., 2001b; Piquero, et al., 2002; Lacourse, et al., 2002; Lacourse, et al., 2003; Wiesner and Capaldi, 2003; Brame, et al., 2003; Schaeffer, et al., 2003; Sampson and Laub, 2003; Shaw, et al., 2003; Nagin, et al., 2003; Eggleston, et al., 2004; Piquero, et al., 2001; Brame, et al., 2005; Moffitt, 2006). By not sampling females, prior research has greatly limited the generalizability of the findings.

Along with studying only males, thirty-five studies have looked at only white individuals in their sample (Nagin and Land, 1993; Nagin et al., 1995; Land and Nagin, 1996; Laub, et al., 1998; Nagin, 1999; Roeder, et al., 1999; Nagin and Tremblay, 1999; Fergusson, et al., 2000; Chassin, et al., 2000; Land, et al., 2001; Brame, et al., 2001; Jones, et al., 2001; Paternoster, et al., 2001; Nagin and Tremblay, 2001; Nagin and Tremblay 2001; Cote, et al., 2001; Cote, et al., 2002; Fergusson and Horwood, 2002; Piquero, et al., 2002; Lacourse, et al., 2002; Lacourse, et al., 2003; Mustillo, et al., 2003; Sampson and Laub, 2003; Nagin, et al., 2003; Wiesner and Silbereisen, 2003; Eggleston, et al., 2004; Tremblay, et al., 2004; Francis, et al., 2004; Bongers, et al., 2004; Piquero, et al., 2001; Blokland, et al., 2005; Moffitt, 2006; Blokland and Nieuwbeerta, 2005). Trajectory research which examines only white offenders leaves out the majority of high-rate and more serious offenders, which studies have consistently shown to be racial/ethnic minorities.

A related difficulty concerns that fact that many studies in the past have not been able to examine virgin adult offenders because the majority of studies have only examined juvenile careers (Nagin and Tremblay, 1999; Fergusson, et al., 2000; Maughan, et al., 2000; Colder, et al., 2001; Brame et al., 2001; Nagin and Tremblay, 2001; Nagin and Tremblay, 2001; Brame et al., 2001; Li, et al., 2001; Cote, et al., 2001; Cote, et al., 2002; Li, et al., 2002; Colder, et al., 2002; Lacourse et al., 2002; Chung, et al., 2002b; Guo, et al., 2002; Lacourse, et al., 2003; Broidy, et al., 2003; Mustillo, et al., 2003; Schaeffer, et al., 2003; Shaw, et al, 2003; Nagin, et al, 2003; Wiesner and Silbereisen, 2003; Oesterle, et al., 2004; Tremblay, et al, 2004; Hix-Small, et al., 2004; Wiesner and Windle, 2004; Bongers, et al., 2004; Brame, et al., 2005; Piquero, et al., 2001; Shaw, et al., 2005). According to Piquero, there have been nine trajectory studies undertaken with offender samples using four different data sets, and all subjects were followed through portions of adulthood (2008: 34). There are two significant problems with these studies. First, many of the samples do not follow offenders past the age of 30 (Piquero, 2008). This is an issue as it leaves out individuals who cease to commit crimes or begin to commit crimes after 30. In fact, most studies focused on the 5-15 year old age ranges. By not looking past the teenage years, researchers cannot determine a pathway of criminal careers or desistance upon entering adulthood. Stopping at such a young age also limits the ability to track whether or not individuals have been incarcerated due to criminality later in life and/or have passed away. The use of such young samples limits the ability to fully track an individual's criminal trajectory. Moreover, as Piquero (2008:25) notes studies with "offender-based samples yield higher and more stable rates of offending over longer periods of the life course."

Second, although the issue raised by Piquero would seem to suggest that offender-based samples may seem desirable, the use of offender-based samples precludes the possibility of investigating late starters from among the general population. These late starters may have an entirely different genesis of criminality as well as very different trajectories. As Piquero (2008) points out nine studies have been done with offender samples (Eggleston, et al., 2004; Laub, et al., 1998; Sampson & Laub, 2003; Piquero, et al., 2001; Piquero, et al., 2002; Blokland, et al., 2005; Blokland & Nieuwbeerta, 2005; Francis, et al., 2004) These studies limit both internal and external validity because of the decision to use an at-risk sample that will already have followed the trajectories so researchers cannot truly determine what led the individuals to criminality in the first place. However, these studies do attempt to identify trajectories and have done so in their own right by looking retrospectively at the pathways already taken. In order to determine how many pathways there are and the type of pathways individuals take, whether offending or not offending, it is imperative that a general population be used. The 1958 birth cohort data provides an entire population consisting of both offenders and non-offenders, which will further make the study more generalizable. Thus, over the life-course, offenders can start at any point, stop for a period of time, and then pick up again. This pattern could be misconstrued as desistance as pointed out by Piquero (2008). Further, this pattern can also affect the point at which the career supposedly starts and stops and thus the trajectory category in which such an offender might be classified. If we do not study individuals who have not committed a crime as a youth, but only begins to commit crimes as an adult, researchers are incapable of finding this type of criminal in their juvenile offender samples.

Piquero (2008:40) has indicated that there are over a dozen unique US-based longitudinal studies that have employed the trajectory methodology, most of which have used data from the 1958 Philadelphia birth cohort study. Some of these studies have been based on strictly general population and/or birth cohort samples, while others have made use of more high-risk, urban samples (such as the OJJDP-funded Pittsburgh Youth Study and the Rochester Youth Development Study). With the exception of the 1958 birth cohort study [note: prior research with these data did not use the interview follow-up], the sample size of prior studies has been exceedingly small. The sample sizes of replications play a role in the amount of trajectories seen by the researcher. In theory, as sample size increases so too does the opportunity to identify more trajectories. However, D'Unger, Land, McCall and Nagin (1998) note that once the sample reaches 200, the number of trajectories levels off. By comparison, through the use of the Philadelphia birth cohort study, it is possible to generalize the findings to a population rather than a distorted sample. Moreover, it allows the exploration of additional causes and correlates rather than neuropsychological deficiencies such as the investigation of the types of crime, severity of crime, and timing/spacing of crimes committed by the individuals.

Measurement of Key Indicators

Prior research on career trajectories has used a wide variety of measurement schemes. Some studies have used archival criminal records, but not consistently.

Some use police contacts, some use arrests, while others use convictions. Clearly, these measurements are not equivalent and can lead to highly inconsistent trajectory findings. Similarly, other studies have used self-reported delinquent and criminal behavior rather than official data. Self-reported crime measures are highly unreliable, especially when subjects are asked to recall conduct across distant time intervals of their lives. Regardless of which type of data was used, the significant point here is that prior research has not attended to the qualitative dimension of criminality. That is, trajectory studies have failed to incorporate the severity, gravity, or seriousness of the criminal behavior. Sometimes, the crime code charges are available, other times not. They often even fail to distinguish between felonies vs. misdemeanors. Any substantial effort to develop meaningful career trajectories must account for how serious the criminal conduct actually was. A career of substantial and continued crimes that are trivial and fail to inflict serious harm on victims can hardly be compared to a career that may have been more intermittent but was characterized by serious violent crimes against victims.

Prior Pathways Research With 1958 Birth Cohort

There has been considerable prior research with the 1958 birth cohort data which examined career paths. It is necessary to distinguish here the difference between these studies and the study below. The commentary is not meant to be exhaustive, but rather, only illustrative of the type of studies that have been conducted. Land and colleagues published several papers that examined the career paths in the 1958 birth cohort data. These analyses stemmed from a paper by Land (1992) in which he made several recommendations for possibly resolving certain of the points of contention in the criminal careers debate. In particular, two of these recommendations are of relevance here. First, Land (1992) pointed out that various statistical approaches like the Poisson y-negative binomial model is just one example of a general class of mixed or compound Poisson models and that other specific models from this general class could be used to model criminal careers. This led to a paper by Nagin and Land (1993) in which they developed a new regression approach to micromodels of criminal careers based on mixtures of Poisson distributions and they applied the model to the London longitudinal cohort study of West and Farrington (1973, 1977). These statistical methods were further developed and compared with conventional Poisson and negative binomial regression models (Land, et al., 1996a) and applied to the 1958 cohort data. They found that in contrast to the aggregate criminal careers model of Blumstein and colleagues, the mixed model finds that groupings of the samples into two groups (offenders and nonoffenders) is not sufficient –four groupings are necessary: a nonoffender group, together with three groups ranging in offending levels from low to medium to high (see also, Land et al., 1996b). Further analyses have been reported by D-Unger et al. (1998) which found that five paths fit the data more optimally for males and that among the females in the 1958 birth cohort three paths or offender groups is optimal (D'Unger, et al. 2002).

The statistical improvements achieved by Land and associates are noteworthy and suggested that criminal career research will further advance as more and more rigorous statistical methods are developed. These methods may enhance the effort to identify and model the career transitions that offenders exhibit across their life of crime. However, Land (1992) also made a second pertinent recommendation of great relevance here. That is, Land suggested that researchers must allow key model parameters to be a function of demographic and other characteristics of individuals or their environment in order to take into account measured heterogeneity among individuals. Unfortunately, the work of Land and associates has not moved beyond the basic demographic correlates of age, sex, race/ethnicity, and SES. There is a pressing need for research to use offense characteristics themselves like offense type and offense severity. Perhaps, there is great predictive value to these offense data that can be used to model the specific transitions of specific offenders. This research will attempt to achieve this purpose. Other research with the 1958 cohort data has primarily a statistical rather than a substantive focus. For example, Bushway, et al. (1999) have investigated stability and change in criminal careers by comparing various statistical models: (1) random effects: (2) semiparametric: and (3) fixed effects. Brame, et al. (2001) have reported that there are 3 latent classes in the juvenile careers of both the 1945 and 1958 birth cohorts. Brame, et al. (2003) consider several different analytic frameworks to model desistance from crime. that represent an array of plausible definitions and they found that statistical models and their assumptions matter–each of the models had a number of assumptions about the existence and form of desistance, and they lead to very different inferences about the prevalence of desistance. The use of the 1958 birth cohort data to examine policy-related issues surrounding the career trajectories are exceedingly rare. However, two papers by Cohen, et al. (2010a; 2010b) represent a notable exception. Cohen et al. have argued that despite all the career trajectory studies, one key question remains unexplored: Do trajectory groups differ regarding the costs they impose on victims, the criminal justice system, and the larger society (2010a:281)? Thus, in each paper, Cohen, et al. Attempt to remedy this defect.

The first study, Cohen, et al. (2010a) linked offender trajectories to monetary costs associated with criminal offending by members of the 1958 birth cohort. The results indicated that chronic offenders who frequently commit crimes when they are young turn to more serious crimes when they are adults and impose far greater costs than low-frequency chronic offenders and those whose offending peaks during adolescence. The prevention of chronic offenders would save approximately $200 million. In a second, related study, Cohen, et al. (2010b) examined the extent to which the monetary costs of crime across distinct trajectories of crime vary across both gender and ethnicity. The results indicated that male adolescent-peaked and low and high-rate chronic offending impose substantial costs (the average costs imposed on society by one male high-rate chronic offender is greater than $1.5 million. They also estimated costs for females. Even though female chronic offending is rarer, these female offenders still impose greater than $750,000 in costs on average. Results were also available by race/ethnicity. African-American chronic-offending costs the most of any racial/ethnic trajectory group at greater than $1.6 million on average for each chronic offender. Hispanic chronic offending on average costs slightly more than $200,000, and low-rate White offending costs greater than $100,000 on average. Costs also appear to peak at different ages for males and females and for African-Americans, Hispanics, and Whites.

Summary

The foregoing review and critique suggests that it is essential to further the research on criminal careers. However, more than that, further research must be conducted utilizing the best possible data to do so. Studies that utilized cross-sectional or short-term longitudinal methods, just do not capture enough of the life course to determine with sufficient accuracy the onset, progression and desistance of a criminal career. Moreover, researchers that used at-risk samples or small samples constrain the findings because they lack the ability to generalize to the general population.

Methods

Criminal History

Previous studies have used a variety of archival data as the measure of prior criminal behavior (Nagin and Land, 1993; Nagin, et al., 1995; Land, et al., 1996; Land and Nagin, 1996; D'Unger, et al., 1998; Laub, et al., 1998; Nagin, 1999; Roeder, et al., 1999; Bushway, et al., 1999; Land, et al., 2001; Jones, et al., 2001; Piquero, et al., 2001; Paternoster, et al., 2001; Brame, et al., 2001; D'Unger, et al., 2002; Piquero, et al., 2002; Brame, et al., 2003; Sampson and Laub, 2003; Eggleston, et al., 2004; Francis, et al., 2004; Piquero, et al., 2005; Brame, et al., 2005; Blokland, et al., 2005; Blokland and Nieuwbeerta, 2005). These archival documents include criminal records, police contacts, arrests, and convictions. Thus, there is great variation in the basis of the criminal history data which may affect both prevalence and incidence. While it is imperative to look at the history of criminal behavior to get an understanding of the types of offenses an individual, it is not sufficient enough data to determine what the predictors are that lead to criminality or the contextual factors are that deter individuals from crime.

Juvenile Delinquency

Police rap sheets and investigation reports were provided by the Juvenile Aid Division of the Philadelphia Police Department to capture police encounters before age eighteen. In addition to official arrests, the rap sheet data also contain "police contact" information. The police maintain records of these contacts which result in "remedial," or informal, handling of the youth by an officer whereby youth are generally remanded to the custody of their parents. Thus, the juvenile delinquency data contain both official arrests and informal contacts that did not result in an arrest thus representing a total record of official delinquency, and further, representing a much better record of delinquency than data that are based solely on arrest information. The police investigation reports were used to supplement information provided in the rap sheets with detailed descriptions of the criminal event.

Adult Crime

The Municipal and Court of Common Pleas of Philadelphia served as data sources for offenses committed by the cohort after reaching the legislatively imposed adult status of age eighteen. Court files included police reports, so data on adult crime are comparable to that for delinquency. The exception, of course, is that no official "remedial" report exists for adults who encountered police, but who were not arrested.

Adult criminal history data are available through December 31, 1984, or through age 26 for all cohort members. The 1958 Philadelphia birth cohort study is rich in the criminal history and offense data available to assess important criminological issues. Further description of the 1958 Philadelphia birth cohort study data collection procedures and the results of a comparison study of the juvenile delinquency careers for males in the 1958 and 1945 Philadelphia cohorts may be found in Tracy et al. (1985; 1990).

Demographic Variables

The 1958 birth cohort has available the following demographic measures: (1) sex; (2) race/ethnicity (white, African American, Hispanic, and Asian/American Indian). In addition, the data set contains a census tract measure of socioeconomic status that was developed using a composite factor score derived from the following ten measures:

1. Median family income;
2. Percent families below median income;
3. Families below poverty line;
4. percent ages 18-24 with less than high school education;
5. Population on welfare;
6. Percent age 25 and older with less than high school education;
7. Percent age 16 and older out of school & unemployed;
8. percent ages 16-21 out of school & unemployed;
9. percent employed in unskilled labor; and
10. Percent female headed families.

The final socioeconomic status index is the result of a previous effort (Tracy, 1981; 1990) in which the subset of highly correlated variables was factor analyzed in an effort to explain variation in aggregate rates of delinquency across Philadelphia census tracts. The first principle component was ultimately retained as the composite index. This measure includes numerous socioeconomic status components and is better able to measure the multidimensional concept than a single indicator could achieve.

Crime Severity

Previous studies (Chung, et al., 2002a; Chung, et al., 2002b) have utilized self-reports to determine the severity of offenses. The way people perceive severity of offenses can differ greatly amongst individuals so a more uniform method of distinguishing severity it necessary for the information to be valuable. When discussing a crime, there are varying types of crimes (felonies vs. misdemeanors, simple vs. aggravated), which many studies do not distinguish between. Self-report data themselves are highly unreliable, but to use it to determine something as important as severity of offenses when looking at the type of offender trajectories can lead to inconsistency and unreliability. Previous studies lack the ability to develop career trajectories because they fail to account for the severity of crime in an efficient manner. Thus, to determine if the severity of the offense affects the number and type of offense pathways, a method of determining the severity of offenses must be utilized. To do so, each offense is broken down in to various qualitative characteristics. By looking at the qualitative aspect of offenses rather than just counting them, my design allows for distinguishing between the various levels of crimes which studies before did not do. Through the crime code classifications and the Sellin-Wolfgang Crime Severity scale (Sellin and Wolfgang, 1964; Wolfgang, et al., 1985), the severity levels are established and identified within the cohort data. The severity of the crimes committed could play a role in the identification of trajectories, the types of trajectories and the effect the number of offenses committed plays on criminal careers. The uniformity of how each offense is ranked on a severity scale can lead to replication and consistency amongst future studies. This will also eliminate the need to ask individuals how severe they perceived the crime to be, further reducing the likelihood of skewed or varying answers of severity on the same or similar offenses.

Career Pathways

As was noted above, Moffitt's research and the many replications, generated varying accounts of the quality and quantity of offender paths concerning delinquency and crime across the life course. Originally, the Sellin Center researchers used the same offender typology that Wolfgang and associates used in the 1945 birth cohort (Wolfgang, et al., 1972). That is, Wolfgang utilized the following scheme for the delinquent careers: (1) Non-offenders; (2) One-time Offenders; (3) Nonchronic Recidivists (2-4 juvenile contacts); and Chronic (5 or more juvenile contacts). In his work with the 1958 data, Tracy (1990; 1996) used the same classification scheme because he was trying to replicate the 1945 cohort study and compare the two birth cohorts.

It is clear that the original typology was arbitrary and was not guided by any particular theory or any qualitative dimension–and was based simply on the frequency of juvenile crimes. Alternatively, we propose that the 1958 data can be used to develop and test a different set of offender categories as described below. The first, and most obvious category, is **Non-offenders**. This path captures subjects that were never arrested for a delinquent act or an adult crime; and it also represents a **Desistance** path to which a juvenile offender can transition to as an adult. The second category is **Limited**. This path characterizes offenders with only a very limited experience in delinquent or criminal behavior – just one or two delinquent acts or adult crimes. This makes much more sense than the original Wolfgang scheme which treated the offenders with between 2 and 4 offenses the same. Two juvenile acts is merely one more than one-time offenders, while having 4 juvenile delinquencies is just one less than chronic making them significantly different categories of offenders. The third category is **Frequent**. Frequent offenders are those who have greater involvement in delinquency or crime, than the limited, but yet, do not exhibit sufficient offenses to represent chronic or career-like involvement. These offenders commit three or four offenses. Having limited and frequent paths seems to be a more sound approach than lumping together those with two-to-four crimes. The last category is **Chronic**. This category remains faithful to Wolfgang's original path, in that offenders commit five or more offenses, and all research with the 1958 birth cohort data category has consistently shown that these offenders have extensive and serious careers in delinquency, adult crime, or both. It is necessary to point out that, regardless of the offender groups outlined above, the chronic group remains intact as originally conceived by Wolfgang – offenders who accumulate 5 or more arrests. Two issues need to be pointed out.

First, the chronic offender group can mask considerable intra-class variation. That is, a chronic offender can accumulate five offenses in a short period of time (either early in the career or in the late juvenile years), or such an offender can commit one offense per year for five years. Thus, each of these very different types of chronic delinquents is treated alike. Piquero, Sullivan, and Farrington (2010) have addressed this issue and asked whether short-term, high-rate (STHR) offenders are different from long-term, lowrate (LTLR) offenders with respect to risk factors and associated life-course outcomes? They have also noted that this issue raises important theoretical debates about whether offenders can simply be arrayed on a continuum of offense volume, irrespective of the length of their career and/or the time period in which they accumulate their offenses (Piquero, Sullivan, and Farrington 2010: 1313). Perhaps more importantly, they argued the importance of parsing distinct offender groups within this continuum, because it may be that some offenders who are STHR exhibit certain characteristics and risk factors that are not observed among LTLR offenders and that these factors relate to their criminal activity (2010-1313). Second, when we refer to offender paths or categories, we are not suggesting that such groupings are typologies in the sense developed by Nagin and Land (1993). Thus, the empirical question of this paper is whether the offender categories shown above are a better and more valid scheme to capture the qualitative aspects of delinquency and criminal careers than were Wolfgang's original categories. The following are the hypotheses that will guide this investigation:

Hypotheses
• H1: There are no differences across the juvenile paths for the following measures:
• H1a: Age-at-Onset;
• H1b: Age-at-Last offense;
• H1c: Average Offense Severity;
• H1d: Sellin-Wolfgang Index offenses;
• H1f: Juvenile Status Offenses.
• H2: There are no differences across the juvenile career paths and adult paths.
• H2a: There are no differences across the juvenile paths and adult crime status.
• H2b: There are no differences across the juvenile paths and the four adult paths.
• H3: There are no differences across the juvenile career paths and the frequency of adult crime.

Since prime interest in this paper was to validate whether the four-fold classification of juvenile careers functions well empirically to predict the same typology across the adult criminal career, the analyses will consist of the following. First, the H1 hypotheses will be examined using difference of means tests to establish the concurrent validity of the four paths.

Second, H2a will be tested using logistic regression models because the dependent variable is a binary measure which captures whether the offender "was not" or "was" an adult criminal. Third, H2b will be tested using ordered logistic regression models because there are four, ordered categories for the adult paths. Fourth, H3 will be tested using Negative Binomial Regression models because the dependent variable is a count variable with over dispersion. Comparison of Negative Binomial, Poisson Regression, and Zero-Inflated Negative Binomial revealed that Negative Binomial was the best fit to the data.

Results

This paper provides analyses concerning the development and testing of offender pathways across the juvenile and adult criminal careers in the 1958 Philadelphia birth cohort. The goal was to develop a pathway taxonomy as did Moffitt (1993) in order to capture theoretically meaningful career transitions both qualitatively and quantitatively. The subsequent goal was to validate empirically the usefulness of the four-fold scheme to predict the transition from juvenile status to adult criminal career paths. Prior work with the 1958 cohort data (Tracy, et al., 1990; Tracy and Kempf-Leonard, 1996) has conclusively indicated that analyses must be done separately for males and females. The female prevalence and incidence data are highly skewed towards being a nonoffender and limited offenses even if an offender and this was true for both the juvenile and adult time frames.

Juvenile Career Paths

Tables 1 to 4 provide data pertaining to a series of delinquency measures that were selected to provide context to, possible explanations of, and empirical distinctions across the four career paths among the cohort subjects during their juvenile status. These measures are: (1) Age-at-Onset; (2) Age-at-Last offense; (3) Average Offense Severity; (4) Sellin-Wolfgang Index offenses; (5) and Status Offenses. Tables 1and 2 indicate that for males, the results are definitive. Across the three juvenile offender paths (1-2; 3-4; & 5+), age-at-onset gets younger, age-at-last offense gets older, average offense severity increases, the percent of S-W index offenses increases (naturally, the percent of S-W non-Index offenses correspondingly decreases), and the percent of status offenses decreases. The analysis of variance results show that there are significant differences across all the delinquency measures except for status offenses. Clearly, the various juvenile paths among males are characterized by distinct differences across all five measures. These differences suggest that the present career paths reflect a differing qualitative context beyond the frequency of juvenile offenses that form the basis for the classification. Simply, the juvenile paths for males comprise a very different juvenile career than just the frequency of police contacts. Tables 3 and 4 indicate that for the cohort females the results are almost equally conclusive as was the case for males. The average age-at-onset and age-at-last offense measures replicate the male findings as one moves across the juvenile paths–chronic females begin juvenile careers significantly sooner and also commit offenses significantly later in their juvenile ages. However, the data concerning crime severity were mixed. That is, the average severity, was significant overall, but it was the frequent category with the highest mean. Moreover, for the S-W index measure, the differences were not significant. Last, for status offenses–as one moves across the paths, the delinquency career becomes less and less serious because the percent of offenses attributable to status events increases unlike the case for males. Tables 1 to 4 thus establish the three categories of delinquent paths have significant concurrent validity for both male and female offenders.

Predicting Adult Paths

Since prime interest in this paper was to validate whether the four-fold classification of juvenile careers functions well empirically to predict the same paths across the adult criminal career, below are presented bivariate data in Tables 5 and 6 and multivariate models in Tables 7, 8, and 9 for males and Tables 10, 11, and 12 for females to address this interest. Tables 5 and 6 provide simple cross-tabulations of the relationship between the four juvenile paths and four adult paths. For males, the association is quite strong. Chronic juvenile males are the most likely to continue their careers at the chronic level as adults. Specifically, 23.3% of these male chronic delinquents were also adult chronics and this percentage is between 3 and 19 times higher than the other three delinquency path categories. Moreover, this group of chronic male delinquents is the only category for which a transition to non-offender adult status was the least likely progression across the two time spans–only 37% of male chronic delinquents desisted as adults as compared to between 51 percent, 68.7 percent, and 85,6 percent of the other juvenile paths. Table 6 indicates that the effect of being a chronic delinquent among females follows the male pattern but shows differences of lower magnitudes. That is, the far and away most likely transition for juvenile females is to a path of desistance, or no adult crimes.

Simply, an overwhelming proportion of females do not commit crimes as adults regardless of juvenile path. The desistance percentages range from 97.5 to 90.8 to 80.7 to 71.4. But like males, the female chronics are the most likely to transition to any level of adult crime and especially chronic adult crime. In order to test the H2a hypothesis, in Tables 7 and 8 provide multivariate logistic regression models predicting adult crime status (no; yes) to determine if the juvenile path variable discriminates between those who committed no adult crime vs. having been arrested at least once. Table 7 shows that for males the results are very clear. The race and SES coefficients are all significant and the odds ratios are very high. However, of prime interest here is the juvenile path variable. Three coefficients were estimated with chronic juveniles being the omitted category. The coefficients are all negative and significant thus indicating that non-offenders, limited delinquents, and even frequent offenders are all significantly less likely than chronic male delinquents to transition to any adult crime at all. Further, the odds ratios are low and all below 1.0 further indicating how substantial the chronic offender effect is. Table 8 provides confirmation that, although female crime is much less frequent in the cohort, the juvenile paths are still important predictors of adult status. While there was no race effects, and a small SES effect, the results for the juvenile paths were as definitive as was the case for males. As one compares the three juvenile paths to the chronic path, the likelihood of adult crime gets less and less likely, the effects get stronger and stronger, and they were all significant. To test the H2b hypothesis, Tables 9 and 10 provide the results of ordered logistic regression analysis. The adult path measure is a four-level variable with ordered categories. As opposed to a multinomial logit model, which ignores the ordering across the levels, ordered regression accounts for prediction across the levels of greater and greater adult crime (Agresti, 1996; 2002; Liao, 1994; Powers and Xie, 2008). These models permit multivariate tests of the predictive validity of juvenile paths for the adult paths.

Table 9 provides the results for males. First, in terms of the demographic factors, the coefficients are all positive and significant which indicates that, compared to the excluded category, White, Black, and Hispanic juveniles are all much more likely than the "other" race/ethnicity category to have increasing scores for the adult paths. Likewise, low SES juveniles are significantly more likely than their high SES counterparts to move across the adult paths towards the chronic level of adult crime. After controlling for these demographic effects, the model indicates definitive results that, when compared to chronic juveniles, non-offenders, limited offenders, and even frequent offenders, all show a significantly lower likelihood of being characterized at the higher and higher levels of the adult crime paths. Moreover, the coefficients all decrease as juvenile delinquency level increases. Clearly, the juvenile paths are significantly predictive of the adult paths–the less delinquency, the less adult crime, while greater and greater juvenile involvement is associated with a higher involvement in adult crime. It is especially important to note that even the frequent juvenile path carries significantly lower odds of increasing adult paths as compared to the chronic juvenile path. Table 10 shows that, despite a much lower representation of cohort females across both the higher juvenile and adult paths, the results mirror those of the males. That is, the race and SES effects show the same exact pattern of significant coefficients. Most importantly, the juvenile paths for females are significantly associated with a higher and higher involvement in adult crime. It is important to note, therefore, that the juvenile paths that were tested do in fact capture both quantitative and qualitative aspects of delinquency and these aspects are important predictors of transitions to adult paths of like extent.

Estimating the Number of Adult Arrests

The last hypothesis, H3, in this paper concerns whether the four juvenile paths are empirically valuable in explaining the number of adult crimes that were committed. This dependent variable is the number of adult arrests, a count variable rather than an interval level variable. Analysis of count variables poses a major problem for multivariate analysis. The problems that arise when using the ordinary least squares (OLS) regression method for analyzing event count data are practically identical to the use of OLS for binary dependent variables. There are four major issues which arise in both contexts. First, the residuals are not normally distributed and are heteroscedastic. Thus, any inferences derived from the analysis about the effects of predictor variables will be biased. Second, OLS predictors can be out-of-range, and even below zero, which is not possible with count data. Third, the regression coefficients will be biased and inconsistent—they do not become more accurate as sample size increases. Last, the standard errors may underestimate the true standard errors which can cause inflated t-tests for the coefficients and in turn the significance of individual coefficients may be inflated (Cameron and Trivedi, 1998; Long, 1997; Gardner, Mulvey, and Shaw, 1995). Thus, the use of ordinary least squares (OLS) regression for count data results in biased, inefficient, and inconsistent estimates (Long 1997). Researchers have had to develop alternative models.

Count data are often characterized by a large proportion of values at zero with the remaining values highly skewed toward the right. Since count measures do not meet the usual normality assumption required of many standard statistical tests, analysts have relied on: (1) a transformation of the variable to induce normality which does not necessarily solve the problem; or (2) categorization of the outcome (e.g., into a binary or three-level measure) which results in loss of information. A preferred alternative is to assume a Poisson distribution which is better suited to a count-based criterion measure. Inspection of a Poisson solution, however, reveals another problem. That is, a necessary condition of the Poisson distribution is that the expected value is equal to the variance. Many count outcomes exhibit more variability than the nominal variance under the Poisson model, a condition called over dispersion. This occurs when the variance exceeds the mean. The consequences can be severe if over dispersion is not addressed. Confidence intervals for regression estimates may be too narrow and tests of association may yield p-values that are too small. Modifications to the Poisson model have been proposed both to account for over dispersion and to understand better the underlying process which leads to such a highly skewed distribution. One such approach is to use the negative binomial model rather than a Poisson, as the variance of the negative binomial distribution exceeds the mean. The negative binomial regression results are shown in Tables 11 and 12 for males and females respectively. For both sexes, the results are definitive – juvenile career paths are significantly associated with a higher count of adult arrests. Table 11 indicates that there are significant race and SES effects for the count of adult crimes among males. White and Black cohort members are significantly more likely than the "other" ethnic group of increasing counts of adult arrests. However, Hispanics are not significantly more criminal than other. Likewise, there is a strong SES effect–high SES subjects are significantly less likely to accumulate adult crimes. Of course, the prime interest in this hypothesis lies with the juvenile career paths. When juvenile non-offenders, limited delinquents, and frequent delinquents are compared to chronic juvenile offenders, each of these pathways is characterized by significantly fewer adult crimes. Further, the effect gets stronger as the juvenile paths move toward non-offenders. Table 12 provides the negative binomial results for females. Unlike males, there are no race/ethnicity or SES effects– these usual correlates were not significant. However, the juvenile path effects matched those of the males. Even though the number of female adult arrests was quite constrained as compared to males, we find that juvenile non-offenders, limited delinquents, and frequent delinquents are significantly less likely than their chronic juvenile female counterparts to have increasing counts of adult arrests. And just like for males, the juvenile path effect gets stronger as the juvenile paths move toward non-offenders.

Summary, Implications, and Conclusions

Summary

This paper sought to replicate and expand upon Moffitt's theory of criminal pathways. Many prior replications suffered from small or nongeneralizable, or used limited measures that either stopped before adulthood or solely used survey data. The goal here, however, was not to test the correlates of Moffitt's pathways, because the present study does not have data on neuro-psychological deficits, maturity gaps, or other measures available to Moffitt. Instead, we sought to replicate and expand upon Moffitt's theory of pathways. First and foremost, it was necessary to develop a new classification of pathways that best represent the similarities of the offenders and distinguishes them from Moffitt's two broad categories. While Moffitt initially found two pathways, adolescent limited and life course persistent, she neglected to identify the individuals who began committing crimes as an adult. The new classification differs from Moffitt's and Wolfgang's and consists of four categories: (1) non-offender; (2) limited; (3) Frequent, and (4) chronic. The results confirmed that there are interesting and empirically valid differences across the juvenile pathways as both juvenile non-offenders and the three categories of juvenile offenders progress to adulthood. The key results were as follows. First, it was found for both males and females, across the three juvenile paths (1-2; 3-4; & 5+), that generally age-at-onset gets younger, age-at-last offense gets older, average offense severity increases, the percent of S-W index offenses increases, and the percent of status offenses decreases. This results served as a first step in validating the present juvenile path classification. Clearly, the V rious career paths were characterized by distinct differences across five important measures of delinquency, thus adding a qualitative context to the frequency of juvenile offenses that originally formed the basis for the classification. Second, in addition to showing that the juvenile paths that we developed could identify notable differences among juveniles and the nature of their careers and delinquent offenses, this research also tested the predictive validity of the juvenile paths to predict adult crime, and the adult paths in particular. To this end, we examined a bivariate cross tabulation of juvenile paths with adult paths. Two multivariate models; (1) a logistic regression model of adult status; and (2) an ordered logistic regression model of the four adult paths were tested.

The results across all these analyses indicated that the juvenile path classification does predict adult crime paths with great success. Most important, the results were very similar for both males and females even though sometimes the magnitude of the female effects were slightly lower than for males. The four juvenile paths were very successful in predicting adult crime paths whether the analysis focused on a dichotomous measure or the same ordered, four-fold classification for adults. Third, it was also demonstrated that the four juvenile paths are significantly associated with increasing counts of adult crimes. Any category of the juvenile paths, when compared to the chronic juvenile path, was associated with significantly a lower number of adult arrests. Overall, the results reported above thus validate that the career paths classification that was developed for the juvenile and adult criminal history data capture distinctly different qualities and quantities of delinquency and crime. The findings further indicated a number of anomalies We wondered where did the chronic juvenile delinquents transition to as adults. We found among males that 23 percent continued chronic offending as adults, but, 76 percent did not transition to chronic adult status, including 37 percent who desisted. What happened to the 76 percent, and to the 37 percent in particular who committed no further crimes? For females we found that a small percent (4.8%) continued chronic offending as adults. Yet, 71.4 percent desisted or transitioned to a Limited (19.7%) or Frequent (4.1%) adult pathway. What happened to the 71 percent who committed no further crimes? Why did the female chronic delinquents transition to reduced criminality as adults? We also investigated where did the chronic adult criminals come from? For males, as expected, the highest percentage (47%) came from chronic juvenile delinquents. But, almost one quarter (23%) came from juvenile non-offenders. Similarly, for females, we found that as expected, the highest percentage (33%) came from chronic juvenile delinquents. But, almost in excess of one quarter (28.6%) came from juvenile non-offenders. How did these juveniles who were nonoffenders, and had escaped the numerous opportunities available to youth to commit delinquent acts, progress to a path which sees them classified as chronic adult criminals?

Implications

Theory

Our findings expanded and enhanced theory on life-course trajectories and criminal careers. The results indicated that there are more than two pathways individuals could follow in regards to criminality. Adolescent limited and life course persistent were not the only two possibilities, nor were they truly conclusive. Wolfgang's classification scheme was also negligent in that it combined offenders in groupings that are irrelevant and did not work. Through the analyses, four trajectories were identified: nonoffenders, limited, frequent and chronic. The four-fold classification system was much better suited for criminal pathways, particularly because the original typology was arbitrary and not guided by any particular theory or qualitative dimension. The four-fold scheme captured theoretically meaningful career transitions qualitatively and quantitatively. Moreover, while previous research has predominantly examined only male offenders, this paper adds to the literature by examining female pathways. There were enough females in the sample to distinguish trajectories for female offenders as well.

Research

Future research should utilize the same four-fold classification scheme so literature can become more consistent and reliable. The varying typologies make it difficult for students, and criminologists in general, to state a definitive typology or pathway of an offender. It offers too much leeway for confusion and varying terminology. Findings indicated the importance of following juveniles in to adulthood to determine what transitions affected whether or not an offender will persist or desist, as well as whether a nonoffender will begin to commit. Studies need to be more inclusive of all types of offenders, rather than choosing samples that specifically included chronic offenders or offenders of specific crime types.

Policy

Results demonstrated the importance of stopping a juvenile from committing a crime at a young age. The younger a juvenile begins committing a crime, the more crimes the juvenile will go on to commit. Similarly, the more severe the offenses are at the beginning of the career, the more likely the juvenile will become an adult criminal, which further pushed the need to punish earlier than later. 23.3% of male juvenile chronics continued on to become an adult chronic offender, while 4.1% of female juvenile chronics went on to become an adult chronic, thus it is better to stop the juvenile before committing more crimes by punishing them sooner.

Tracy and Kempf-Leonard (1996) noted that it is imperative that society takes an approach to implement prevention and intervention strategies that address social, psychological and physiological factors that affected the criminality of juveniles. The earlier on the criminal justice system is able to address these issues, the less likely these individuals are to continue forth down a higher adult criminal pathway. The implementation of evidence based intervention programs can drastically reduce the likelihood of a juvenile becoming an offender. Greenwood (2008) found that only 5% of at-risk youth have the ability to participate in the interventions that would benefit them because many programs are utilizing out of date and ineffective options. Evidence based practices should be utilized rather than those that are assumed to work or are employed merely because they are customary or usual.

Conclusion

From a conservative or tempered perspective, this research suggested the following overall conclusions. First, with all due respect to the various statistical models that have been posited to identify and analyze criminal paths, as suggested by the philosopher, William of Occam, in his famous principle, "Occam's Razor," (the principle of parsimony), the simplest solution may be best (http://pespmc1.vub.ac.be/OCCAMRAZ.html). We developed and tested a commonsense classification of juvenile/criminal paths based on an increasing frequency of criminal conduct. This paper showed that a straightforward path classification had concurrent validity by having demonstrated distinct differences across delinquency measures, and also had predictive validity in that the juvenile paths discriminated very well the transition from delinquency to adult crime. Second, this study has provided only qualified support for the life course perspective. Farrington (2010) has described life course criminology as the study of crime from the womb to the tomb. Of course Farrington's description is merely a metaphor. But, the empirical reality of the relationship between age and crime is that the criminal life course is considerably shorter than suggested by Farrington. That is, 64 percent of the criminals in the 1958 Birth Cohort started their adult careers before age 21, 94 percent before age 25, and 98 percent before age 26. Likewise, 92 percent of all the adult crimes were committed before age 26. Of course, there are adult criminals who begin after age 26 and there are criminals who keep committing crimes into their late 20s and 30s, etc. But, these criminals are exceedingly few and it would be thus be more fruitful for criminology to examine the first ten years of adult hood as the criminal life course.

Table 1: Select Delinquency Measures by Juvenile Career Paths for Males

Delinquency Measure	Descriptives		
	N	Mean	Std. Dev.
Age at Onset			
1–2 Juvenile Offenses	2509	15.1558	2.247
3–4 Juvenile Offenses	824	13.9819	2.179
5+ Juvenile Offenses	982	12.6688	2.288
Total	4315	14.3656	2.465
Age at Last Offense			
1–2 Juvenile Offenses	2509	15.6367	2.071
3–4 Juvenile Offenses	824	16.7491	1.010
5+ Juvenile Offenses	982	17.1373	.846
Total	4315	16.1906	1.814
Mean Severity			
1–2 Juvenile Offenses	2509	4.20	5.640
3–4 Juvenile Offenses	824	5.04	4.029
5+ Juvenile Offenses	982	5.92	2.992
Total	4315	4.76	4.912
% SW Index			
1–2 Juvenile Offenses	2509	.36	.450
3–4 Juvenile Offenses	824	.41	.291
5+ Juvenile Offenses	982	.47	.213
Total	4315	.40	.383
% Status Offenses			
1–2 Juvenile Offenses	2509	.22	.385
3–4 Juvenile Offenses	824	.21	.250
5+ Juvenile Offenses	982	.20	.183
Total	4315	.21	.325

*Non-Delinquents excluded; Not Applicable

Table 2: Select Delinquency Measures by Juvenile Career Paths for Males

Analysis of Variance					
Age at Onset	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Between	4515.367	2	2257.684	448.255	.000
Within	21717.862	4312	5.037		
Total	26233.230	4314			
Age at Last Offense	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Between	1907.107	2	953.553	334.234	.000
Within	12301.923	4312	2.853		
Total	14209.029	4314			
Mean Severity	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Between	67747.557	3	22582.519	2914.840	.000
Within	101925.202	4311	7.747		
Total	169672.758	4314			
% SW Index	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Between	8.453	2	4.226	29.185	.000
Within	624.413	4312	.145		
Total	632.866	4314			
% Status Offenses	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Between	.329	2	.164	1.558	.211
Within	455.068	4312	.106		
Total	455.397	4314			

Table 3: Select Delinquency Measures by Juvenile Career Paths for Females

Delinquency Measure	Descriptives		
	N	**Mean**	**Std. Dev.**
Age at Onset			
1-2 Juvenile Offenses	1561	14.8852	2.033
3-4 Juvenile Offenses	264	13.5265	2.178
5+ Juvenile Offenses	147	13.0437	1.817
Total	1972	14.5660	2.133
Age at Last Offense			
1-2 Juvenile Offenses	1561	15.2276	1.972
3-4 Juvenile Offenses	264	15.9999	1.283
5+ Juvenile Offenses	147	16.4980	1.107
Total	1972	15.4257	1.884
Mean Severity			
1-2 Juvenile Offenses	1561	2.68	3.774
3-4 Juvenile Offenses	264	2.8	2.503
5+ Juvenile Offenses	147	2.73	2.343
Total	1972	2.7	3.538
% SW Index			
1-2 Juvenile Offenses	1561	.26	.419
3-4 Juvenile Offenses	264	.23	.270
5+ Juvenile Offenses	147	.21	.234
Total	1972	.25	.392
% Status Offenses			
1-2 Juvenile Offenses	1561	.44	.474
3-4 Juvenile Offenses	264	.49	.337
5+ Juvenile Offenses	147	.59	.291
Total	1972	.46	.448

*Non-Delinquents excluded; Not Applicable

Table 4: Select Delinquency Measures by Juvenile Career Paths for Females

Analysis of Variance					
Age at Onset	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Between	784.978	2	392.489	94.438	.000
Within	8183.291	1969	4.156		
Total	8968.269	1971			
Age at Last Offense	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Between	317.292	2	158.646	46.741	.000
Within	6683.101	1969	3.394		
Total	7000.393	1971			
Mean Severity	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Between	12381.681	3	4127.227	2341.974	.000
Within	24664.948	13996	1.762		
Total	37046.628	13999			
% SW Index	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Between	.606	2	.303	1.973	.139
Within	302.501	1969	.154		
Total	303.107	1971			
% Status Offenses	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Between	3.070	2	1.535	7.696	.000
Within	392.747	1969	.199		
Total	395.817	1971			

Table 5: Juvenile to Adult Paths for Males

	Juvenile Pathways				
Adult Pathways	**Non-offender**	**Limited**	**Persistent**	**Chronic**	**Total**
	None	**1-2**	**3-4**	**5+**	
Non-Offender [0]					
Number	7573	1724	423	363	10083
Percent	85.6	68.7	51.3	37.0	76.6
Limited [1-2]					
Number	1003	565	231	236	2035
Percent	11.3	22.5	28.0	24.0	15.5
Persistent [3-4]					
Number	164	132	107	154	557
Percent	1.9	5.3	13.0	15.7	4.2
Chronic [5+]					
Number	105	88	63	229	485
Percent	1.2	3.5	7.6	23.3	3.7
Total	8845	2509	824	982	13160
Percent	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6: Juvenile to Adult Paths for Females

Adult Pathways	Juvenile Pathways				Total
	Non-offender	Limited	Persistent	Chronic	
	None	1-2	3-4	5+	
Non-Offender [0]					
Number	11724	1418	213	105	13460
Percent	97.5	90.8	80.7	71.4	96.1
Limited [1-2]					
Number	285	126	41	29	481
Percent	2.4	8.1	15.5	19.7	3.4
Persistent [3-4]					
Number	13	11	8	6	38
Percent	0.1	0.7	3.0	4.1	0.3
Chronic [5+]					
Number	6	6	2	7	21
Percent	0.0	0.4	0.8	4.8	0.2
Total	12028	1561	264	147	14000
Percent	100.0%	100.0%	100.0%	100.0%	100.0%

Table 7: Binary Logistic Regression: Adult Status for Males

	B	S.E.	Wald	Sig.	Exp(B)
Race			33.434	.000	
White	2.056	1.032	3.971	.046	7.817
Black	2.336	1.032	5.126	.024	10.337
Hispanic	2.139	1.04	4.23	.040	8.487
Other*					
SES	-.284	0.052	30.055	.000	1.328
Juvenile Paths			1146.32	.000	
Non-Offender	-2.161	0.074	848.442	.000	0.115
Limited	-1.236	0.08	241.174	.000	0.290
Frequent	-0.556	0.097	33.133	.000	0.573
Chronic*					
Constant	-1.939	1.033	3.522	.061	0.144
Chi-square = 1595.716 P= .0001 Nagelkerke R² = .212					

*Reference category

Table 8: Binary Logistic Regression: Adult Status for Females

	B	S.E.	Wald	Sig.	Exp(B)
Race			51.818	.000	
White	.821	.118	48.227	.000	2.271
Black	.361	.330	2.023	.274	.697
Hispanic	.174	1.074	1.098	.998	.066
Other*					
SES	-.260	.109	5.687	.017	1.297
Juvenile Paths			333.735	.000	
Non-Offender	-2.516	.195	166.798	.000	.081
Limited	-1.314	.205	41.033	.000	.269
Frequent	-.478	.243	3.856	.050	.620
Chronic*					
Constant	-19.227	7860.774	.000	.998	.000
Chi-square = 446.817 P= .0001 Nagelkerke R² = .113					

*Reference category

Table 9: Ordered Logistic Regression: Adult Paths for Males

Adult Path	Estimate	S.E.	Wald	P-value
Non-offender	1.718	1.041	2.722	0.099
Limited	3.164	1.042	9.229	0.002
Persistent	4.059	1.042	15.169	0.000
Chronic*				
White	2.10	1.04	4.076	0.043
Black	2.38	1.04	5.254	0.022
Hispanic	2.21	1.048	4.448	0.035
Other*				
Low SES	0.296	0.051	34.021	0.000
High SES*				
Non-offender	-2.444	0.068	1274.147	0.000
Limited	-1.525	0.073	431.527	0.000
Persistent	-0.807	0.088	83.602	0.000
Chronic*				.
Chi-square = 207.7, P= .0001 Nagelkerke R² = .272				

*Reference category

Table 10: Ordered Logistic Regression: Adult Paths for Females

Adult Path	Estimate	S.E.	Wald	P-value
Non-Offender	1.761	.383	2.115	.000
Limited	1.992	.400	2.474	.000
Persistent	2.096	.437	2.304	.000
Chronic*				
White	1.593	.342	2.164	.000
Black	1.675	.329	2.589	.000
Hispanic	1.597	.000	2.373	.000
Other	0[a]			
Low SES	.262	.109	5.801	.016
High SES*				
Non-Offender	-2.599	.190	18.623	.000
Limited	-1.396	.201	48.283	.000
Persistent	-.540	.239	5.113	.024
Chronic*		.	.	.
Chi-square = 79.80, P= .410 Nagelkerke R² = .106				

*Reference category

Table 11: Negative Binomial Regression: Adult Crime Counts for Males

	Beta	S.E.	Wald	D.F.	P-value
Intercept	-1.190	.7453	2.550	1	.110
White	1.887	.7449	6.416	1	.011
Black	2.125	.7447	8.146	1	.004
Hispanic	1.920	.7502	6.549	1	.010
Other*		.	.	.	.
Low SES*					
High SES	-.220	.0192	131.213	1	.000
Non-offender	-2.050	.0445	2118.347	1	.000
Limited	-1.247	.0491	644.780	1	.000
Persistent	-.614	.0594	106.853	1	.000
Chronic*		.	.	.	.

*Reference category

Table 12: Negative Binomial Regression: Adult Crime Counts for Females

	Beta	S.E.	Wald	D.F.	P-Value
Intercept	1.301	.2156	36.413	1	.000
White	.074	.1961	.141	1	.707
Black	.152	.1877	.659	1	.417
Hispanic	.110	0.1923	0.232	1	0.523
Other*					
Low SES*					
High SES	-.065	.0596	1.178	1	.278
Non-offender	-1.053	.0963	119.426	1	.000
Limited	-.958	.1026	87.302	1	.000
Persistent	-.775	.1216	40.613	1	.000
Chronic*					

*Reference category

References

Agresti, A. (1996). An Introduction to Categorical Data Analysis. New York: John Wiley & Sons, Inc

Agresti, A. (2002).Categorical Data Analysis, Second Edition. Hoboken, New Jersey: John Wiley & Sons, Inc.

Blokland, A. A. J., Nagin, D. S., & Nieuwbeerta, P. (2005). Life span offending trajectories of a Dutch conviction cohort. Criminology 43: 919–954.

Blokland, A. A. J., & Paul Nieuwbeerta, P. (2005). The effects of life circumstances on longitudinal trajectories of offending. Criminology, 43, 1203–1240.

Blumstein, A., Cohen, J., Roth, J. A., & Visher, C. A. (Eds.) (1986). Criminal careers and career criminals, Vol. I, II. Washington, DC: National Academy Press.

Bongers, I. L., Koot, H. M., van der Ende, J., & Verhulst, F. C. (2004). Developmental trajectories of externalizing behaviors in childhood and adolescence. Child Development, 75, 1523–1537.

Brame, R., Mulvey, E. P., & Piquero, A. R. (2001a). On the development of different kinds of criminal activity. Sociological Methods and Research, 29, 319–341.

Brame, R., Nagin, D. S., & Tremblay, R. E. (2001b). Developmental trajectories of physical aggression from school entry to late adolescence. Journal of Child Psychology and Psychiatry, 42, 503–512.

Brame, R., Bushway, S., & Paternoster, R. (2003). Examining the prevalence of criminal desistance. Criminology, 41, 423–448.

Brame, R., Bushway, S. D., Paternoster, R., & Thornberry, T. (2005). Temporal linkages in violent and nonviolent criminal activity. Journal of Quantitative Criminology, 21, 149–174.

Broidy, L. M., Nagin, D. S., Tremblay, R. E., Bates, J. E., Brame, R., Dodge, K. A., et al. (2003). Developmental trajectories of childhood disruptive behaviors and adolescent delinquency: A six-site, cross-national study. Developmental Psychology, 39, 222–245.

Bushway, S. D., Thornberry, T. P., & Krohn, M. D. (2003). Desistance as a developmental process: A comparison of static and dynamic approaches. Journal of Quantitative Criminology, 19, 129–153.

Bushway, S. D., Brame, R., & Paternoster, R. (1999). Assessing stability and change in criminal offending: A comparison of random effects, semiparametric, and fixed effects modeling strategies. Journal of Quantitative Criminology, 15, 23–61.

Cameron, A. C. and P.K. Trivedi (1998) Regression Analysis of Count Data. Cambridge: Cambridge University Press. Caspi, A. & Moffitt, T.E. (1995).

The continuity of maladaptive behavior: From description to understanding in the study of antisocial behavior. In Dante Cicchettie and Donald Cohen. (eds.). Developmental Psychopathology, Vol. 2, Risk, Disorder and Adaptation. New York: Wiley.

Chassin, L., Presson, C. C., Pints, S.C., & Sherman, S. J. (2000). The natural history of cigarette smoking from adolescence to adulthood in a midwestern community sample: Multiple trajectories and their psychosocial correlates. Health Psychology, 19, 223–231.

Chung, I-J., Hawkins, J. D., Gilchrist, L. D., Hill, K. G., & Nagin, D. S. (2002a). Identifying and predicting offending trajectories among poor children. Social Service Review, 76, 663–685.

Chung, I-J., Hill, K. G., Hawkins, J. D., & Gilchrist, L. D. (2002b). Childhood predictors of offense trajectories. Journal of Research in Crime and Delinquency, 39, 60–90.

Cohen, M. A., Piquero, A. R., & Jennings, W. G. (2010a). Studying the costs of crime across offender trajectories. Criminology & Public Policy, 9(2), 279-305.

Cohen, M. A., Piquero, A. R., & Jennings, W. G. (2010b). Monetary costs of gender and ethnicity disaggregated group-based offending. American Journal of Criminal Justice, 35, 159-179.

Colder, C. R., Balanda, K., Mayhew, K. P., Pentz, M. A., Mehta, P., Campbell, R. T. (2001). Identifying trajectories of adolescent smoking: An application of latent growth mixture modeling. Health Psychology, 20, 127–135.

Colder, C. R., Campbell, R. T., Ruel, E., Richardson, J. L., & Flay, B. R. (2002). A finite mixture model of growth trajectories of adolescent alcohol use: Predictors and consequences. Journal of Consulting and Clinical Psychology, 70, 976–985.

Cote, S., Tremblay, R. E., Nagin, D. S., Zoccolillo, M., & Vitaro, F. (2002a). Childhood behavioral profiles leading to adolescent conduct disorder: Risk trajectories for boys and girls. Journal of the American Academy of Child and Adolescent Psychiatry, 41, 1086–1094.

Cote, S., Zoccolillo, M., Tremblay, R. E., Nagin, D. S., & Vitaro, F. (2001). Predicting girls' conduct disorder in adolescence from childhood trajectories of disruptive behaviors. Journal of the American Academy of Child and Adolescent Psychiatry, 40, 678–684.

Dunedin Multidisciplinary Health and Development Study, http://dunedinstudy.otago.ac.nz/

D'Unger, A. V., Land, K. C., & McCall, P. L. (2002).Sex differences in age patterns of delinquent/criminal careers: Results from poisson latentclass analyses of the Philadelphia Birth Cohort. Journal of Quantitative Criminology, 18, 349–375.

D'Unger, A.V., Land, K.C., McCall, P.L., & Nagin, D.S. (1998). How many latent classes of delinquent/criminal careers? Results from mixed poissonregression analyses of the London, Philadelphia, and Racine cohort studies. American Journal of Sociology, 103, 1593-1630.

Eggleston, E. P., Laub, J. H., & Sampson, R. J. (2004). Methodological sensitivities to latent class analysis of long-term criminal trajectories. Journal of Quantitative Criminology, 20, 1–26.

Farrington, D. P. (2006). Building developmental and life-course theories of offending. In F. T. Cullen, J. P. Wight, & K. R. Blevins (Eds.), Advances in criminological theory, vol. 15: Taking stock: The status of criminological theory (pp. 335-364). New Brunswick, NJ: Transaction Publisher.

Farrington, D. (2010). Life-course and developmental theories in criminology. In E. McLaughlin & T. Newburn (Eds.), The SAGE handbook of criminological theory. (pp. 248-271). London: SAGE Publications Ltd.

Fergusson, D. M., Horwood, L. J., & Nagin, D. S. (2000). Offending trajectories in a New Zealand cohort. Criminology, 38, 525–552.

Francis, B., Soothill, K., & Fligelstone, R. (2004). Identifying patterns and pathways of offending behavior: A new approach to typologies of crime. European Journal of Criminology, 1, 47–88.

Gardner W.P, E.P. Mulvey and E.C. Shaw (1995) "Regression analyses of counts and rates: Poisson, overdispersed Poisson, and negative binomial models." Psychological Bulletin 118:392-404

Gottfredson, M.R., & Hirschi, T. (1990). A general theory of crime. Stanford, CA: Stanford University Press.

Greenwood, P. (2008). Prevention and intervention programs for juvenile offenders. Future Of Children, 18(2), 185-210.

Guo, J., Chung, I-J., Hill, K. G., Hawkins, J. D., Catalano, R. F., & Abbott, R. D. (2002). Developmental relationships between adolescent substance use and risky sexual behavior in young adulthood. Journal of Adolescent Health, 31, 354–362.

Haviland, A. M., & Nagin, D. S. (2005). Causal inferences with group based trajectory models. Psychometrika, 70, 557–578.

Hawkins, J. D., Smith, B.H., Hill, K. G., Kosterman, R., Catalano, R. F. & Abbott, R. D. (2003). Understanding and preventing crime and violence: Findings from the Seattle Social Development Project. In T. P. Thornberry & M. D. Krohn (Eds.), Taking Stock of Delinquency: An Overview of Findings from Contemporary Longitudinal Studies (pp. 255-312). New York: Kluwer/Plenum.

Hix-Small, H., Duncan, T. E., Duncan, S. C., & Okut, H. (2004). A multivariate associative finite growth mixture modeling approach examining adolescent alcohol and marijuana use. Journal of Psychopathology and Behavioral Assessment, 26, 255–270.

Huizinga, D., Weiher, A. W., Espiritu, R. & Esbense, F. (2003). Delinquency and crime: Some highlights from the Denver Youth Study. In T. P. Thornberry & M. D. Krohn (Eds.), Taking Stock of Delinquency: An Overview of Findings from Contemporary Longitudinal Studies (pp. 47-91). New York: Kluwer/Plenum. Jennings, W. G., & Reingle, J. M. (2012).

On the number and shape of developmental/life-course violence, aggression, and delinquency trajectories: A state-of-the-art review. Journal of Criminal Justice, 40, 472-489.

Jones, B. L., Nagin, D. S., & Roeder, K. (2001). A SAS procedure based on mixture models for estimating developmental trajectories. Sociological Methods and Research, 29, 374–393.

Lacourse, E., Cote, S., Nagin, D. S., Vitaro, F., Brendgen, M., & Tremblay, R. E. (2002). A longitudinal-experimental approach to testing theories of antisocial behavior. Development and Psychopathology, 14, 909–924.

Lacourse, E., Nagin, D. S., Tremblay, R. E., Vitaro, F., & Claes, M. (2003). Developmental trajectories of boys' delinquent group membership and facilitation of violent behaviors during adolescence. Development and Psychopathology, 15, 183–197.

Land, K. C. (1992). Models of criminal careers: Some suggestions for moving beyond the current debate.Criminology 30: 149-155.

Land, K. C., McCall, P. L., & Nagin, D. S. (1996). A comparison of poisson, negative binomial, and semiparametric mixed poisson regression models, with empirical applications to criminal careers data. Sociological Methods and Research, 24, 387–442.

Land, K. C., & Nagin, D. S. (1996).Micro-models of criminal careers: A synthesis of the criminal careers and life courseapproaches via semiparametric mixed poisson regression models with empirical applications. Journal of Quantitative Criminology, 12, 163–191.

Land, K. C., Nagin, D. S., & McCall, P. L. (2001).Discrete-time hazard regression models with hidden heterogeneity. Sociological Methods and Research, 29, 342–373.

Laub, J.H., Nagin, D.D., & Sampson, R.J. (1998).Trajectories of change in criminal offending: Good marriages and the desistance process.American Sociological Review, 63, 25-238.

Laub, J. H., & Sampson, R. J. (2001). Shared Beginnings, Divergent Lives: Delinquent Boys to Age 70. Cambridge, MA: Harvard University Press.

Li, F., Duncan, T. E., & Hops, H. (2001). Examining developmental trajectories in adolescent alcohol use using piecewise growth mixture modeling analysis. Journal of Studies on Alcohol, 62, 199–210.

Liao, T. F. (1994). Interpreting Probability Models: Logit, Probit, and Other Generalized Linear Models.

Thousand Oaks, CA: Sage Publications, Inc. Loeber, R., Farrington, D.P., Stouthamer-Loeber, M., Moffitt, T. E., Caspi, A., White, H. R., Wei,E. H. & Beyeres, J. M. (2003). The development of male offending: Key findings from fourteen years of the PittsburghYouth Study. In T. P. Thornberry & M. D. Krohn (Eds.), Taking Stock of Delinquency: AnOverview of Findings from Contemporary Longitudinal Studies (pp. 93-136).

New York: Kluwer/Plenum. Long, J. S. (1997). Regression Models for Categorical and Limited Dependent Variables. Thousand Oaks, CA: Sage.

Powers, D. and Xie, Yu. (2008). Statistical Methods for Categorical Data Analysis. Bingley, UK: Emerald Group Publishing Limited.

Maughan, B., Pickles, A., Rowe, R., Costello, E. J., & Angold, A. (2000). Developmental trajectories of aggressive and non-aggressive conduct problems. Journal of Quantitative Criminology,16, 199–221.

Moffitt, T. E. (1991). Juvenile delinquency: Seed of a career in violent crime just sowing wild oats—or both?

Paper presented at the Science and Public Policy Seminars of the Federation of Behavioral, Psychological, and Cognitive Sciences, Washington, DC.

Moffitt, T. E. (1993). 'Life-course-persistent' and 'adolescence-limited' antisocial behavior: A developmental

taxonomy. Psychological Review, 100, 674–701.

Moffitt, T.E. (2006). A review of research on the taxonomy of life-course persistent versus adolescence-limited antisocial behavior. In F. Cullen, J. Wright and K. Blevins (Ed) Taking Stock: The Status of

Criminological Theory. New Jersey: Transaction Publishers.

Moffitt, T. E., Caspi, A., Rutter, M., & Silva, P. A. (2001). Sex Differences in Antisocial Behaviour: Conduct Disorder, Delinquency and Violence in the Dunedin Longitudinal Study. Cambridge: Cambridge University Press.

Mustillo, S., Worthman, C., Erkanli, A., Keeler, G., Angold, A., & Costello, E. J. (2003). Obesity and psychiatric disorder: Developmental trajectories. Pediatrics, 111, 851–859.

Nagin, D. S. (1999). Analyzing developmental trajectories: A semi-parametric, group-based approach.

Psychological Methods, 4, 139–177.?Nagin, D. S. (2004a). Response to methodological sensitivities to latent class analysis of long-term criminal trajectories. Journal of Quantitative Criminology, 20, 27–36.

Nagin, D. S. (2005). Group-based modeling of development over the life course. Cambridge, MA: Harvard University Press.

Nagin, D. S., Farrington, D. P., & Moffitt, T. E. (1995). Life-course trajectories of different types of offenders. Criminology, 33, 111–140.

Nagin, D. S., & Land, K. C. (1993). Age, criminal careers, and population heterogeneity: Specification and estimation of a nonparametric, mixed poisson model. Criminology, 31, 327–362.

Nagin, D. S, Pagani, L., Tremblay, R. E., & Vitaro, F. (2003). Life course turning points: A case study of the effect of school failure on interpersonal violence. Development and Psychopathology, 15, 343–361.

Nagin, D. S., & Tremblay, R. E. (1999). Trajectories of boys' physical aggression, opposition, and hyperactivity on the path to physically violent and non-violent juvenile delinquency. Child Development, 70, 1181–1196.

Nagin, D. S., & Tremblay, R. E. (2001a). Parental and early childhood predictors of persistent physical aggression in boys from kindergarten to high school. Archives of General Psychiatry, 58, 389–394.

Nagin, D. S., & Tremblay, R. E. (2001b). Analyzing developmental trajectories of distinct but related behaviors: A group-based method. Psychological Methods, 6, 18–34.

Nagin, D. S., & Tremblay, R. E. (2005a). Developmental trajectory groups: Fact of fiction? Criminology, 43, 873–904.

Nagin, D. S., & Tremblay, R. E. (2005b). From seduction to passion: A response to Sampson and Laub. Criminology, 43, 915–918. Occam's Razor. http://pespmc1.vub.ac.be/OCCAMRAZ.html

Oesterle, S., Hill, K. G., Hawkins, J. D., Guo, J., Catalano, R. F., & Abbott, R. D. (2004). Adolescent heavy episodic drinking trajectories and health in young adulthood. Journal o Studies on Alcohol, 65, 204–212.

Paternoster, R., Brame, R., & Farrington, D. P. (2001). On the relationship between adolescent and adult conviction frequencies. Journal of Quantitative Criminology, 17, 201–226.

Piquero, A.R., Sullivan, C.J., and Farrington, D.P. (2010). Assessing Differences Between Short-Term, High-Rate Offenders and Long-Term, Low-Rate Offenders. Criminal Justice and Behavior ,37: 1309-1329.

Piquero, A.R. (2008). Taking stock of developmental trajectories of criminal activity over the lifecourse. In A.M. Liberman (Ed.), The long view of crime: A synthesis of longitudinal Research (pp. 23-78).

New York: Springer. Piquero, A. R., Brame, R., Mazerolle, P., & Haapanen, R. (2002). Crime in emerging adulthood. Criminology, 40, 137–169.

Piquero, A.R. & Brezina, T. (2001). Testing Moffitt's account of adolescent-limited delinquency. Criminology 39: 353-370.

Piquero, A. R., Blumstein, A., Brame, R., Haapenen, R., Mulvey, E. P., & Nagin, D. S. (2001). Assessing the impact of exposure time and incapacitation on longitudinal trajectories of criminal offending. Journal of Adolescent Research, 16, 54–74.

Piquero, A. R., Brame, R., & Moffitt, T. E. (2005). Extending the study of continuity and change: Gender differences in the linkage between adolescent and adult offending. Journal of Quantitative Criminology, 21(2), 219–243.

Robins, L. (1978). Sturdy childhood predictors of adult antisocial behavior: Replications from longitudinal studies. Psychological Medicine 8: 611-622

Roeder, K., Lynch, K., & Nagin, D. S. (1999). Modeling uncertainty in latent class membership: A case study in criminology. Journal of the American Statistical Association, 94, 766–776.

Sampson, R.J., & Laub, J.H. (1993). Crime in the making. Cambridge, MA: Harvard University Press.

Sampson, R.J., & Laub, J.H. (2003). Life-course desisters? Trajectories of crime among delinquent boys followed to age 70. Criminology, 41, 555-592.

Sampson, R.J., Laub, J.H. & Sweeten, G.A. (2006). Assessing Sampson and Laub's Life-Course Theory of Crime. In F. Cullen, J. Wright and K. Blevins (Ed) Taking Stock: The Status of Criminological Theory. New Jersey: Transaction Publishers.

Schaeffer, C. M., Petras, H., Ialongo, N., Poduska, J., & Kellam, S. (2003). Modeling growth in boys' aggressive behavior across elementary school: Links to later criminal involvement, conduct disorder, and antisocial personality disorder. Developmental Psychology, 39, 1020– 1035.

Sellin, T., & Wolfgang, M. E. (1964). The measurement of delinquency. New York: John Wiley and Sons.

Seymour, J.A. (1976). Dealing with Young Offenders in New Zealand – the System in Evolution. Occasional Pamphlet Number Eleven. Legal Research Foundation, Auckland.

Shaw, D. S., Gilliom, M., Ingoldsby, E. M., & Nagin, D. S. (2003). Trajectories leading to school- age conduct problems. Developmental Psychology, 39, 189–200.

Thornberry, T. P., Lizotte, A. J., Krohn, M. D., Smith, C. A. & Porter, P. K. (2003). Causes and consequences of delinquency: Findings from the Rochester Youth Development Study. In T. P. Thornberry & M. D. Krohn (Eds.), Taking Stock of Delinquency: An Overview of Findings from Contemporary Longitudinal Studies (pp. 11-46). New York: Kluwer/Plenum.

Tracy, P.E. (1981). Ecology and delinquency: Developing a composite measure of social class. Philadelphia: Center for Studies in Criminology and Criminal Law, Wharton School, University of Pennsylvania.

Tracy, P.E., Wolfgang, M.E., & Figlio, R.M. (1985). Delinquency in two birth cohorts, executive summary. Washington, D.C.: U.S. Government Printing Office.

Tracy, P.E., Wolfgang, M.E., & Figlio, R.M. (1990). Delinquency careers in two birth cohorts. New York: Plenum Press.

Tracy, P.E. & Kempf-Leonard (1996). Continuity and Discontinuity in Criminal Careers. New York: Plenum Press.

Tremblay, R. R, Nagin, D. S., Séguin, J., Zoccolillo, M., Zelazo, P., Boivin, M., Pérusse, D., & Japel, C. (2004). Physical aggression during early childhood: Trajectories and predictors. Pediatrics, 114, 43–50.

Tremblay, R. E., Vitaro, F., Nagin, D., Pagani, L., & Seguin, J. R. (2003). The Montreal Longitudinal and Experimental Study: Rediscovering the power of descriptions. In T. P. Thornberry & M. D. Krohn (Eds.), Taking Stock of Delinquency: An Overview of Findings from Contemporary Longitudinal Studies (pp. 205-254). New York: Kluwer/Plenum. Walker, S. (1985).

Sense and nonsense about crime. Pacific Grove, CA: Brooks Cole.Watt, E. (2003). A History of Youth Justice in New Zealand.http://www.justice.govt.nz/courts/youth/documents/about-the-youth-court/History-of-the-Youth-Court-Watt.pdf

West, D. L, and Farrington, D. P. (1973).Who Becomes Delinquent? Heinemann, London.

West, D. J., and Farrington, D. P. (1977).The Delinquent Way of Life, Heinemann, London.

Wiesner, M., & Capaldi, D. (2003).Relations of childhood and adolescent factors to offending trajectories of young men. Journal of Research in Crime and Delinquency, 40, 231–262.

Wiesner, M., & Silbereisen, R. K. (2003).Trajectories of delinquent behavior in adolescence and their covariates: Relations with initialand time-averaged factors. Journal of Adolescence, 26, 753–771.

Wiesner, M., & Windle, M. (2004). Assessing covariates of adolescent delinquency trajectories: A latent growth mixture modeling approach. Journal of Youth and Adolescence, 33, 431–442.

Wolfgang, M.E., Figlio, R.M. & Sellin, T. (1972). Delinquency in a birth cohort. Chicago: University of Chicago Press.

Wolfgang, M.E., Figlio, R.M., Tracy, P.E., & Singer, S.I. (1985). The national survey of crime severity. Washington, DC: U.S. Government Printing Office.