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I, Michelle A. Coyne , hereby submit this original work as part of the requirements for the degree of Doctor of Philosophy in Criminal Justice.

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Predicting Arrest Probability Across Time: A Test of Competing Perspectives

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Predicting Arrest Probability Across Time:
A Test of Competing Perspectives

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ABSTRACT

Criminal involvement is non-randomly distributed across individuals and across groups. Debate regarding the etiology of differences in criminal involvement remains. Using data from the National Longitudinal Survey of Youth 1997, the current study examined latent class membership in the probability of arrest over a 15-year time span starting when participants were 12-16 years-old and ending when they were 28-31 years-old. Latent class regressions were employed to prospectively investigate whether various demographic and criminological risk factors from the base wave could predict class membership. Models were also estimated separately by sex and by race to identify potentially important differences and consistencies in class structure and risk prediction.

Results from the latent class growth analyses resulted in two to three classes characterized by an abstainer group, an adolescent-limited group, and a stable moderate-level chronic group. In general, being male, increased substance use, and increased delinquency were consistent predictors of class membership. Regarding race and sex differences, being a minority was moderately related to class membership in males but was not significant for females. Being male was a very strong predictor of class membership for Black and Hispanic participants but a relatively weak predictor for White participants. Overall, results supported a general risk factor perspective over a gender or race specific risk perspective. Across race, sex, and cohort, self-reported delinquency was the strongest risk predictor of class membership, suggesting that differential arrest probability is predominantly explained by differential involvement in delinquent behavior.

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CHAPTER 1

EXPLAINING CRIMINAL OUTCOMES

Introduction

Turn on the television, pick up a newspaper, read through news and academic articles online, or check your social media account newsfeed. In all likelihood, there is some story about disparity in the United States criminal justice system. The media is chalk full of stories of disproportionate suspension of black youth in schools, of excessive force used by police against impoverished blacks and minorities, of lenient treatment and sentencing of females, and of many other stories painting the decision making of the criminal justice system as arbitrary, racist, sexist, classist, and broken. The disproportionate arrest of young, black, impoverished males is nothing new, yet now, perhaps more than ever before, there is social outcry for an explanation. What can explain why some individuals and some groups get arrested, convicted, and incarcerated more than others?

Criminologists have tried to answer this question for nearly a century. Throughout time there have been a number of competing perspectives regarding the cause of criminal involvement. One paradigm asserts that the larger structural context affects criminal involvement (Merton, 1938; Shaw & McKay, 1942; Sampson et al., 2005; Wilson, 1987). This framework stems from the observation that crime is generally concentrated in impoverished areas just outside major city centers. These neighborhoods are inhabited primarily by socially isolated and economically disadvantaged blacks and minorities (Wilson, 1987; Sampson et al., 2005). Residents in these neighborhoods, the argument goes, lack adequate social and financial

resources and connections to conventional institutions such as schools, employment, government, the police, and to prosocial models. Therefore, poor young black males are disproportionately involved in the criminal justice system in part because their environment pushes them towards criminal lifestyles.

Another group of scholars, however, have focused on the importance of socialization and learning. While connected to the structural context, family factors and socialization in the home, in school, and from peers has been a key focus of a variety of criminological theories including Sutherland's (1947) differential association, Aker's (1977; 1998) social learning theory, and numerous scholars involved in family research (Farrington, 2011; Glueck & Glueck, 1950; Gottfredson & Hirschi, 1990; Harris, 1995; Loeber & Stouthamer-Loeber, 1986; Loeber 1990; McCord, 1991; 2007). According to this perspective, criminal values, techniques, and behaviors are learned in intimate groups, namely the family and close peers. Thus, young black males are disproportionately arrested because they are brought up in a culture which associates with non-conventional values and beliefs, some of which are favorable towards crime. These values and beliefs are learned, observed, and reinforced in the home, in the school, and with peer groups.

In stark contrast to the social learning perspective is the social control paradigm. Social control refutes the assumption that criminal behavior must be learned. Rather, motivation for crime is innate because crime is often the easiest way to obtain desires. Thus, all people see the benefits of crime, and the focus is on how to keep people from committing crime. At the macro-level, prominent scholar such as Kornhauser (1978), Sampson and Groves (1989), Sampson, Raudenbush, and Earls (1997), and Sampson (2006) argued for the need to establish and maintain informal social control in neighborhoods through public, parochial and private ties and collective efficacy. Neighborhoods lacking the ability to come together and solve problems fail

to establish sufficient control over youths, leading to a breakdown of informal social control and fostering the spread of crime. At the micro-level, Hirschi's (1969) social bond theory advocated for the importance of external controls through social bonds to the family, school, work, and conventional law. A lack of social bonds leaves an individual free to deviate from norms and enter a life of crime. Decades later, Gottfredson and Hirschi (1990) came out with self-control theory but this time argued for the importance of internal rather than external control, applying the control perspective to the individual. Overall, control theories claim that motivation for crime is ubiquitous and thus, controls (external or internal) must be in place to inhibit criminal behavior. Along this line of thinking, young black males are disproportionately involved in crime because they lack the external controls through family attachments, commitment to school and work, and a lack of involvement and belief in conventional institutions (Hirschi, 1969) and/or they lack sufficient self-restraint to avoid criminal involvement (Gottfredson & Hirschi, 1990).

Structural forces, social learning, and control are some of the perspectives that make up the backbone of traditional criminological theory. Debates between individual and sociological theories, control and learning theories, and general and topological theories generated decades of empirical research and resulted in a range of intellectual controversies. Now, old debates have again resurfaced as new branches of criminology have developed and as new statistical methods and new data sources have emerged. These debates have challenged the prevailing status of traditional sociological criminology and can potentially shed light on the developmental aspects of criminal behavior over time (Caspi & Moffit, 1995; DeLisi & Vaughn, 2014; Moffitt, 1993; Wright & Cullen, 2012). In turn, new perspectives may also shed light onto the causes of arrest and incarceration disparities between groups and between individuals.

One of the most influential new perspectives in criminology is the life-course and developmental approach. Research from life-course and developmental scholars emerged, in part, due to the identification of a small group of high-level chronic offenders (Shannon, 1978, 1980; Wolfgang, Figlio, & Sellin, 1972) and other findings linking criminal behavior in childhood to criminal outcomes in adulthood (Loeber, 1982; Robinson, 1978; Tracy & Kempf-Leonard, 1996; Tremblay et al., 1999). In tandem with findings regarding criminal careers, life-course approaches also flourished from the paradigm shift from static to dynamic theories and the shift from the narrow focus on adolescent delinquency to a focus on the entire life-course, from childhood through adulthood. The life-course and developmental approach is a broad perspective that employs longitudinal methodology and encompasses sociological, biological, and psychological factors in the explanation of the etiology of offending and the heterogeneity in offending patterns across the life-course (Farrington, 2005; Kirk, 2006; Leblanc & Loeber, 1998; Piquero et al., 2003; Piquero, 2008).

Using insights garnered from the life-course perspective, this dissertation examines some of the most widely tested competing risk factors potentially associated with criminal involvement and behavior. Criminal involvement is captured with arrest probability measured with self-reports of arrest at each wave. Using data from the National Longitudinal Survey of Youth from 1997-2011, this study will track arrest probabilities of youth over a 15-year time span, it will identify distinct trajectories in arrest probabilities, and it will examine which factors best predict group membership in arrest trajectories. Considering the number of empirical studies that find substantial heterogeneity in offending patterns over time (Bosick, Bersani, & Farrington, 2015; Moffitt, 1993; Nagin & Land, 1993; Piquero, 2008), this study will take a developmental approach, employing longitudinal trajectory analyses to identify potentially distinct groups of

offenders. Then, relevant risk factors identified in criminological literature will be used to prospectively identify these distinct arrest patterns. Given the recent debate between general risk perspectives and gender-specific and race/ethnicity-specific risk perspectives, the study will also analyze separate models to examine potential differences across race and sex. The remainder of this chapter will continue with a history of the life-course/developmental perspective and the methodology employed in the discipline. It will follow with a review of the empirical literature in developmental research, and it will conclude with an overview of the theoretical framework and empirical evidence surrounding the criminological perspectives and predictors to be tested.

Before the Life-Course Perspective

The developmental perspective was influenced by four main factors: the Glueck/Sutherland debate, the typological approach to measuring offender behavior, the study of the age-crime curve, and the criminal career paradigm. By the early 1950s, the focus of criminology had moved almost entirely away from examining individual and psychological factors associated with criminal offending (Lombroso, 1910) to an almost exclusive focus on social forces thought to affect crime and crime rates. A key force in this movement away from individual risk factors was the debate between Edwin Sutherland and Sheldon and Eleanor Glueck. Coming from law and psychiatry backgrounds, Sheldon and Eleanor Glueck advocated for a multidisciplinary approach to studying criminal careers. From their view, criminal behavior was caused by a myriad of individual level risk- factors.   The Gluecks' advocated for the identification of these risk factors, for an understanding of how risk factors changed over time, and for scholars to pursue longitudinal studies to understand the development of criminal behavior over the life-course. Sutherland, however, offered a different vision. Working on his

theory of differential association, Sutherland argued that criminal behavior was similar to any other acquired behavior and that all one had to understand was how behavior was learned. Criminal behavior, for Sutherland, was neither pathological nor the product of external risk factors—as the Gluecks' argued. Thus, Sutherland denied the utility of studying individual risk factors and he saw no reason to study the unfolding of criminal behavior over the life-course (Laub & Sampson, 1991).

This was a seductive argument for criminologists at the time, most of whom were sociologically trained. The attraction of viewing criminal behavior not as the product of individual-level risk factors but as the product of social influences—influences outside the individual--gave Sutherland the upper-hand in the debate. In short, Sutherland's purely sociological perspective won the debate (Laub & Sampson, 1991; Sampson & Laub, 2005). The conclusion of the debate would usher in a period of grand theorizing that would define criminology as a field dominated by sociology. Over time, three dominant criminological paradigms would emerge: strain, social learning, and social control. Collectively, these paradigms would guide criminological investigation for the next six decades.

Broadly speaking, these paradigms served as the springboard for the development of a host of theories and for a multitude of tests of these theories. Sponsored by the spread of computer technologies, new statistical programs, and the advent of survey methodology, thousands of tests of criminological theories quickly emerged and filled the criminological cannon. Studies on macro-environmental factors thought to represent sources of strain and anomie competed for theoretical priority against the burgeoning number of studies conducted from the control theory perspective. Theoretical and paradigmatic contests were held, evidence was assessed, and victors announced with each successive review (Laub & Sampson, 1991).

Clearly, there were benefits to the clash of paradigms such as greater clarification and refinement of theoretical perspectives and the wealth of empirical evidence generated. Even so, there were also a number of drawbacks—drawbacks that would eventually reintroduce calls for a Glueck-based approach. For example, each paradigm claimed sets of variables and constructs as its own. Strain perspectives, for instance, claimed measures of anomic social conditions, blocked opportunities, and means-goals disjuncture as indicators of the strain. Social learning claimed peer influence while social control theory claimed parental supervision, punishment, and attachment. Unfortunately, as Armstrong, Lee, and Armstrong (2008) would later show, items from surveys used to measure what were considered orthogonal theoretical constructs were often used indiscriminately and in ways that created substantial overlap between constructs. While each paradigm may have claimed its own block or set of variables, the reality was that individual scholars operationalized these allegedly divergent concepts with indicators that could be used to measure a variety of concepts.

The focus on theory testing and the use of cross-sectional designs encouraged criminologists to view criminal behavior as the product of factors that were static. Moreover, many criminologists began to view criminal behavior as a general proclivity to violate normative behavioral standards. Viewing crime as a general collection of inter-related behaviors diverged from an alternative focus on crime typologies. By the late 1950s, an argument began to surface about the generality of criminal behavior. Opponents of general theories argued that there was too much heterogeneity among offenders and crimes to be explained by a limited set of factors. Rather, opponents argued for a topological approach—an approach that examined varying crime types, such as robbers, burglars, drug dealers, and rapists. These theorists asserted that different factors explained different crimes and thus different types of offenders (Gibbons, 1975; 1982).

An example of the topological approach can be found in the work of Glaser (1972). Glaser put forth a 5- type classification of criminals, including subculture assaulters, adolescent recapitulators, crisis-vacillation predators, vocational predators, and addicted performers. These typologies were defined by two main criteria: crime type, such as personal versus property and predatory versus non-predatory and criminal commitment which referred to onset and continuity in offending. For example, adolescent recapitulators were those individuals who began offending in the adolescent years and who exhibited periodic bouts of lesser crimes. On the other end of the spectrum were the subculture assaulters who were career criminals whose lives centered around violence. However, Glaser (1972) also admitted that many offenders were not highly specialized in their offending, making it challenging to neatly classify them.

While enjoying the limelight for nearly 20 years, the debate between general and topological theorists faded by the late 1970s. Contemporary general theories such as social learning theory (Akers, 1977; 1998), general stain theory (Agnew, 1992) and self-control theory (Gottfredson & Hirschi, 1990) emerged as prominent competing theoretical perspectives on which scholars devoted years of discussion and empirical testing. However, the debate between general and topological theories has recently resurfaced in a different format, now pitting contemporary general theories against developmental/ life-course theories (Paternoster & Brame, 1997).

Most general theories have historically focused on crime and delinquency during the teen years. Part of this focus occurred because surveys of high school students became increasing common but also because a broader debate about the age-crime curve arose (Blumstein & Cohen, 1979; Farrington, 1983; Hirschi, 1983; Hirschi & Gottfredson, 1986). The age-crime curve is an empirical regularity showing that the prevalence of crime emerges in adolescence,

increases rapidly into the late teen and early adulthood years, generally peaking between the ages of 16-24, and then steadily declines with age (Farrington, 1986; Hirschi, 1983). While some scholars have argued that the age-crime curve is invariant across crime type, time period, race, and sex (Hirschi, 1983; Hirschi & Gottfredson, 1986), other scholars have found that females tend to have a later onset, tend to peak earlier, and exhibit much less variance than males (Farrington, 1986; Vishel & Roth, 1986). Other scholars have also shown that Blacks tend to have higher participation rates than other racial groups independent of sex, especially when serious crimes are examined (Kempf-Leonard, Tracy, & Howell, 2001). Regarding crime type at the aggregate level, the age-crime curve is consistent for property crimes, however offenders tend to begin earlier and to peak later for violent crimes, while personal crimes such as drunk driving, disorderly conduct, and gambling tend to continue into late adulthood (Farrington, 1986; Steffensmeier et al., 1989; Sweeten et al., 2013).

The age-crime curve also varies by time period and by cohort, meaning that larger social forces can affect offending patterns for individuals living during unique social and economic transitions (Blusmtein & Cohen, 1979; Elder, 1998; Steffensmerier, et al., 1989). Scholars have been careful to note that the age-crime is largely a reflection of prevalence, meaning the proportion of the population engaging in crime during that time period (Blumstein & Cohen, 1979; Farrington, 1986; Greenberg, 1977) as oppose to a reflection of incidence, or the frequency of individual offending (Steffensmeier et al., 1989; Sweeten et al., 2013). As Farrington (1986) noted, while prevalence peaks in the late teens, the average age for most crimes is between 25-30 years of age, indicating that crime is not exclusive to the juvenile years.

Overall, evidence suggests that the age-crime curve is not invariant. Additionally, scholars identified a small group of offenders who consistently defied the age-crime curve. This

group began offending in late childhood and continued offending well into late adulthood (Blumstein & Cohen, 1987; Moffitt, 1993). These high-level chronic offenders, though less than 10% of the population, were responsible for the majority of crimes and thus, became an important focus in criminology (Shannon, 1978, 1980; Wolfgang, Figlio, & Sellin, 1972). Several other studies linked criminal behavior in childhood and adolescence to criminal outcomes in adulthood (Loeber, 1982; Robinson, 1978; Tracy & Kempf-Leonard, 1996; Tremblay et al., 1999) further shifting attention away from the juvenile years to the criminal career paradigm and longitudinal analyses.

The Criminal Career

The criminal career paradigm focuses on the course or progress of individual offending over time with the goal of explaining the pathway of high-level chronic offenders. Rather than focusing on aggregate patterns of prevalence (the age-crime curve), criminal career research attempted to describe aspects of the criminal career—that is, the age of onset of offending, rates of acceleration and deceleration in offending, changes in offense categories and eventual termination of criminal conduct. Criminal career researchers proposed that different factors, such as family dysfunction, substance use, negative peers influenced different aspects of the criminal career (Blumstein & Cohen, 1987; Farrington, 1986; Piquero et al., 2003). For example, an individual may begin offending due to a combination of poor socialization and influential delinquent peers, but they may increase or decrease in offending for different reasons, such as a lack of employment or substance addiction (Blumstein & Cohen, 1978; DeLisi & Piquero, 2011).

There are four main dimensions of the criminal career: onset, frequency, diversification, and desistance. Onset refers to the point at which criminal behavior began, either officially

(police contact or arrest) or as observed through antisocial behavior. Relative to other criminal career elements, early onset has been studied heavily and is regarded as a strong predictor of serious, chronic offending. A number of studies have shown that an early onset of criminal behavior (pre-adolescence) is associated with increased frequency, diversification, and continuity in offending through adulthood (DeLisi, 2006; Farrington, 1986; Kempf-Leonard, Tracy, & Howell, 2001; Krohn et al., 2001; Mazerolle et al., 2000; Tracy & Kempf-Lenard, 1996). For instance, Krohn et al. (2001) conducted a review of 19 criminal career studies and found that early onset offenders committed 40-700% more crime than later onset offenders. Delisi (2006) found that in a sample of 500 adult offenders, those who had been arrested by age 14 were the most serious, versatile, and chronic offenders. While there is no specific age cut point, Delisi (2006) noted that arrest by 14 years-old was a good time point for differentiating early and late starters and different offending patterns. However, Delisi (2006) also noted that nearly 62 percent of participants with extensive criminal careers were not arrested until age 18 or older. Thus, early onset is a good predictor but not necessarily a required condition of chronic and serious offending.

Research has also indicated that onset is related to both frequency and diversification of offending. Frequency refers to the amount of offending, a primary focus in the criminal career. Wolfang, Figlio, and Sellin (1972) found that boys beginning delinquency at age 13 committed more offenses than any other group, and this negative association between age of onset and frequency of offending has been replicated in several other studies (Elliot, 1994; Kempf-Leonard, Tracy, & Howell, 2001; Nagin, Farrrington, & Moffitt, 1994). Diversification refers to the variety of criminal acts committed. In general, early onset is associated with greater diversification of offending (Mazerolle et al., 2000; Thornberry, Huizinga, & Loeber, 1995). For

example, Thornberry, Huizinga, and Loeber (1995) found that early onset violent offenders in the Rochester Youth Development Study committed a wide variety of offenses. In addition to their violent crimes, 82% had committed property offenses, 82% committed status offenses, and 71% committed public disorder crimes. Contrary to older topological claims that offenders are specialists, most research indicates that offenders commit a wide variety of antisocial and criminal acts (Gottfredson& Hirschi, 1990; Piquero et al., 2003). However, studies have indicated that diversification decreases and individuals become more specialized in their offending as they age (DeLisi & Piquero, 2011; Farrington, 1986; Piquero et al., 2003). The last element, desistance, is perhaps one of the most debated aspects in criminal career and life-course/developmental research.

Desistance can be viewed in two ways-- as the point at which offending literally stops, or as a process of decline in offending behavior over time (Bushway, Thornberry, & Krohn, 2003; Moffitt, 2006). While desistance has been measured in different ways, most contemporary scholars refer to desistance as a process where offending declines and eventually ceases (Bushway, Thornberry, & Krohn, 2003; Laub & Sampson, 2001; Shover & Thompson, 1992). Desistance is a point of contention among discussions of stability and continuity in offending because static theorists such as Gottfredson and Hirschi (1990) and developmental theorists who focus on offending patterns such as Moffitt (1993) claim that chronic offenders continue offending across the life-course. In contrast, dynamic theorists such as Sampson and Laub (1993) claim that eventually all individuals, even highly stable offenders, desist. Much of this debate is rooted in the definitions of desistance and in the concept of heterotypic continuity. Heterotypic continuity refers to the differential manifestation of a common underlying cause or trait. For example, while throwing temper tantrums as a child, getting into fights as an adolescent,

domestic violence as an adult, and being aggressive and difficult as an elderly individual are different behaviors, they reflect the same stable antisocial trait. Life-course theorists like Sampson and Laub argue that all people eventually desist while static theorists like Gottfredson and Hirschi argue that while they may no longer be arrested, stable offenders exhibit heterotypic continuity and show persistent antisocial tendencies (Cicchetti & Rogosch, 1996; Rutter, 1989).

Numerous studies converge to show considerable continuity in offending from adolescence through adulthood (Caspi et al., 2003; Caspi & Silva, 1995; Farrington & West, 1990; Loeber, 1982; Loeber & Leblanc, 1990; Loeber et al., 2013; Rutter, 1989). Still, some studies highlighted heterogeneity in desistance patterns even among early onset offenders (Sampson & Laub, 1993; 2003), highlighting the importance of studying early childhood as well as life events and circumstances throughout adulthood. Collectively, this body of scholarly efforts further emphasized that crime was not exclusively a juvenile or adolescent issue but rather was a developmental process characterized by both stability and change across time, and thus, paved the way for the life-course perspective (Cullen, 2011).

The Life-Course and Developmental Approach

While important differences would differentiate a criminal career approach from a broader life-course perspective, the two approaches shared a fundamental assumption that criminal behavior follows a developmental process and that events in the life-course could alter the direction of individual lives (Farrington, 1986; Loeber & Leblanc, 1990; Piquero et al., 2003; Rutter, 1992; Sampson& Laub, 1993, 2003). There are also two main differences between the life-course and criminal career paradigms: First, the life-course perspective focuses more on within-individual heterogeneity—that is, it recognizes that criminal behavior can be highly stable

over time and that the age of onset may vary across offenders. In this way, stability is juxtaposed over sometimes small but meaningful individual differences. Second, the life-course perspective seeks to identify varying sequences of life events that distinguish different types of offending careers. As some studies show, entering into a good marriage, a good job, or conversely, experiencing a divorce or similar significant life-change may alter individual criminal trajectories (Sampson & Laub, 1993; 2003; Warr, 1998; 2001).

The life-course perspective provides a broad and interdisciplinary approach to studying crime. The approach easily encompasses biological, psychological, social, and macro-level factors in the study of crime (Lahey, 1999; Leblanc & Loeber, 1998; Dodge, 1990; Masten & Ciccheti, 2010; Nagin & Paternoster, 2000). In addition to stability and change, life-course research examines how individual factors such as personality, temperament, and intelligence interact with social forces such as family dynamics, peers, education, and life events to influence criminal development and future life circumstances. As life-course is such a broad perspective, there are different theoretical explanations of concepts such as onset, continuity, and desistance, largely centered on the debate between static and dynamic theories. There are three main competing perspectives within the life-course paradigm: static, dynamic, and developmental/trajectory-based.

First, static theorists argue that individual traits such as personality, behavior, and criminal propensity emerge early in life and remain relatively stable across time. The static perspective focuses on continuity in criminal propensity. Once personality and behavioral traits have developed, external influences such as parenting, peers, and school are unlikely to substantially alter criminal propensity (Caspi et al., 2003; Caspi & Silva, 1995; Loeber, 1982; Loeber et al., 2013). The static perspective is supported by studies of personality. For instance,

Caspi et al. (2003) found that temperament at age 3 (under-controlled, reserved, confident, well-adjusted) remained remarkably stable and predicted personality and behavioral styles through age 26. One of the most prominent criminological theories reflective of the static perspective is Gottfredson and Hirschi's (1990) self-control theory. Self-control theory asserts that the root cause of all criminal and analogous antisocial behavior can be traced to one factor: low self-control. While other factors such as poverty, family factors, and employment may be related to criminal behavior, they are spurious with low self-control (Gottfredson & Hirschi, 1990). Low self-control is characterized by high levels of sensation-seeking, impulsivity, the inability to delay gratification, a lack of sensitivity toward others, and a preference for physical over mental activities (Gottfredson & Hirschi, 1990). According to the authors, self-control is formed early in life through parental socialization and is essentially fully realized in late childhood (8-10 years-old). Gottfredson and Hirschi (1990) further asserted that once self-control is formed in late childhood, it remains relatively stable across the life-course. Relative stability refers to rank order position in relation to peers. For example, while behavior may change forms and self-control is likely to increase slightly for all, a child who is at the bottom of his 5th grade class in self-control will remain at the bottom in 8h grade, in high school, and throughout adulthood (Gottfredson & Hirschi, 1990).

Self-control theory is a static theory as it argues that at all stages of life, low self-control is the main predictor of behavior. Given their theoretical arguments, Hirschi and Gottfredson (2000) also note that longitudinal analyses and studies focused on heterogeneity of offending patterns and trajectories are not useful. Even so, Gottfredson and Hirschi's self-control theory is one of the most widely tested theories in criminology. While there is ample support for the importance of self-control at various life stages and for its link to a variety of criminal and

negative life outcomes (Baron, 2003; Delisi & Vaughn, 2008; Lamont & Vanhorn, 2013; Pratt & Cullen, 2000; Vaughn et al., 2007), there are mixed findings regarding their claims about parental socialization as the main agent in self-control development (Moffitt, 2005; Wright & Beaver, 2005; Wright et al., 2008) as well as their claim of relative stability (Burt, Simons, & Simons, 2006; Na & Paternsoter, 2012; Turner & Piquero, 2002; Winfree et al., 2006). While the notion of relative stability in self-control and analogous traits has been supported (Beaver & Wright, 2007; Hay & Forrest, 2006; Hopwood et al., 2011; Vazsonyi & Huang, 2010), other studies have indicated substantive heterogeneity in offending patterns (Brame et al., 2001; Bushway, Thornberry, & Krohn, 2003; Francis et al., 2004; Piquero et al., 2001; 2002; Weisner & Capaldi, 2003).

The second perspective, in contrast, is the dynamic approach as presented by Sampson and Laub (1993,2003) that focuses on change across the life-course. Their perspective challenges the predictions made by static theories. For example, Sampson and Laub claim that social bonds and salient life events, such as entering the military, marriage, employment, and having children may lead to changes in criminal pathways in adulthood and at various points in the life-course. Unlike static theorists, Sampson and Laub do not believe childhood traits invariably lead to criminal behavior in adulthood. Rather, they argue that behavioral change occurs as individuals interact with and attach to age-graded institutions that change across the life-course. From their point of view, behavioral change is largely explained by changes in social capital or social bonds where increased quality and involvement in social institutions leads to desistance or less crime.

Turning points are also an important aspect of Sampson and Laub's perspective. Turning points reflect important life events or experiences that have meaningful consequences on the life-

course. As noted, some of the most salient turning points described by Sampson and Laub include marriage, entering the military, and employment. These turning points have the power to redirect pathways regardless of past life experiences/risk factors in childhood and adolescence. Overall, Sampson and Laub called for greater attention to changes in adulthood, not simply adolescence or childhood risk factors (Sampson & Laub, 1993; 2003; 2005).

Sampson and Laub's perspective has received tentative empirical support—primarily from their own reexamination of the Glueck data. In one of their earlier studies, Sampson and Laub (1990) examined two samples of the Glueck boys, a delinquent and non-delinquent sample through 32 years of age. Regressions revealed that adolescent delinquency was associated with educational and employment issues, problem drinking, and crime, thus highlighting heterotypic continuity in behavior. However, marital attachment and job stability were important inhibitors of delinquency in both the delinquent and non-delinquent samples, supporting the importance of adult social bonds. In their 1993 book and article, Sampson and Laub highlighted their qualitative study of the life histories of 1000 Boston delinquents which indicated that marriage, gainful employment, and entering the military had salient effects on changes in criminal behavior. Marriage and family led many to reconsider past ways and to become a "family man." For some, the military provided structure and an appreciation for discipline and hard work, which changed their perspectives on offending. Employment provided structure and purpose, again leading many to phase out of crime. Using the same Glueck data, Laub, Nagin, and Sampson (1998) also found that marriage and employment facilitated the process of desistance through 32 years of age.

In a follow-up study, Sampson and Laub (2003) tracked down a small sample from the Glueck data through age 70, gathering both official and unofficial measures of deviance and

lifestyle changes. Despite similar risk factors and circumstances in childhood, the men exhibited considerable heterogeneity in offending patterns across late adulthood. Specifically, semiparametric analyses identified six distinct offending patterns, which could not be predicted with childhood risk factors. Sampson and Laub (2003) concluded these findings supported the importance of studying life circumstances, especially marriage and employment, in adulthood because change in criminal behavior was evident in their sample. In a more recent study, Sampson et al. (2006) performed a quantitative assessment of the effect of marriage on crime and found that controlling for criminal propensity, being married was associated with less criminal activity, regardless of the type of marriage.

The importance of adult social bonds, especially marriage, has been supported in a few other studies as well. Warr (1998) analyzed data from the National Youth Survey. His analysis found that subjects in the NYS who entered into marriage experienced a substantial decline in the time they spent with friends—including friends who were criminal. The reduction in time spent with friends was associated with a decrease in crime. Warr (1998) therefore supported the concept of informal social control via bonds such as marriage. However, other studies have noted that the impact of social capital may vary by offender type, particularly that marriage and employment may be more impactful for non-violent as oppose to violent offenders (Blokland & Nieuwbeerta, 2005; Piquero et al., 2002). Furthermore, nearly all studies examining offender trajectories find evidence of a high-level chronic offender group which exhibit static tendencies, can be predicted by childhood risk factors (Caspi et al., 2002; Loeber, 1982; Moffitt, Lynum, & Silva, 1994; Moffitt et al., 2002), and in some cases, show few signs of desistance (Blokland et el., 2005). Thus, there are mixed findings regarding the static/dynamic nature of criminal propensity.

The third perspective held by scholars such as Moffitt (1993), Patterson and Yoerger (1993;1997) and Loeber and Leblanc (1990;1998) combines both static and dynamic factors by asserting that individuals may exhibit distinct trajectories in offending across time. Moffitt (1993) undoubtedly provided one of the most widely tested and influential theoretical frameworks for offender classification known as the dual taxonomy. Moffitt contends that there exist two qualitatively different categories of offenders, each with their own theoretical explanations. She notes that many theories do not adequately explain the age-crime curve. Many past theorists defined early onset/antisocial behavior as mid-adolescence, based off of official reports. Moffitt asserts that for a small group of offenders, antisocial behavior begins much earlier. The dual taxonomy notes that there exist two main groups: adolescent-limited (AL) and life-course-persistent (LCP) offenders. The adolescent-limited offenders follow the well-documented age-crime curve (Blumstein & Cohen, 1979; Farrington, 1986; Hirschi & Gottfredson, 1983) and exhibit varying degrees of deviance exclusively during adolescence and early adulthood. Thus, this group is characterized by their somewhat later onset and somewhat early desistence of deviant behavior into adulthood. In contrast, the life-course-persistent offenders exhibit antisocial and deviant behavior early in life and continue exhibiting high levels of deviance through adolescence and adulthood. LCPs represent the small group of high-level chronic offenders.

Moffitt's taxonomy has been tested numerous times, and while receiving some support, many studies indicate the presence of more than just two offender groups. Studies employing mixture modeling have often found evidence for the presence of three or more groups (Blokland, Nagin, & Nieuwbeerta, 2005; Nagin, Farrington, & Moffitt, 1995; Weisner & Capaldi, 2003). For example, Nagin et al. (1995) identified a group of non-delinquents and a group of low

chronic offenders. Moffitt et al. (2002) also found an additional group labeled "recoveries" that exhibited intermittency in offending during adolescent years and then closely resembled Nagin's low chronic offenders in late years. These groups were qualitatively distinct from LCPs and ALs. Many scholars have suggested that inconsistencies in offender classification may be due in part to measurement, particularly the use of official measures such as arrest, versus self-reports which tend to reveal more heterogeneity in deviance patterns (Moffitt et al., 2002; Nagin et al., 1995; Nagin & Tremblay, 2001; Weisner, Capaldi, & Kim, 2007). While it remains unclear how many distinct offender groups exist, as Moffitt (2006) noted, no studies looking for a stable antisocial group have failed to find one (except see Bosick, Bersani, & Farrington, 2015 and Sampson & Laub, 2003).

In addition to contrasting life-course perspectives (static and developmental), these theoretical debates also highlight competing views on the classification of offenders. As alluded to previously, the old debate between general and topological theories has resurfaced in a new format, here as general life-course theories versus developmental trajectory theories. While having very different perspectives on the age-crime relationship, static theorists like Gottfredson and Hirschi and informal social control theorists like Sampson and Laub would agree that there is little utility in group-based frameworks as they are uncertain, difficult to predict, and may infer the existence of groups that do not exist in reality (Sampson & Laub, 2003). Moffitt, Patterson, Nagin, Loeber and other colleagues, on the other hand, would claim that despite methodological limitations, there is meaningful within-offender heterogeneity and that identification and prediction of qualitatively distinct groups of offenders is important.

The question remains if a group of high level chronic offenders exist and if they can be prospectively identified by specific risk factors. This debate has important implications for those

concerned with prediction of criminal patterns (Bosick, Bersani, & Farrington, 2015; Piquero, 2008). If high- level chronic offenders indeed have different etiologies than other offenders, efforts can be concentrated towards early intervention with individuals exhibiting predictive risk factors. Thus, many life-course scholars have refocused their efforts to testing general versus developmental trajectory theories, exploring and improving longitudinal methodology along the way.

Testing Life-Course and Developmental Perspectives

The life-course/developmental perspective acknowledges the importance of both static and dynamic processes as well as the importance of studying how propensity along with life events and experiences shape behavior across the life-course. As a primary goal of the life-course/ developmental approach is to study offending patterns across time, longitudinal analyses are required because they provide a way to study changes in offending and how life outcomes (arrest, incarceration, marriage, employment) may affect those changes. Many early studies employed cross-sectional designs (Agnew & White, 1992; Gottfredson & Hirschi, 1990; Hirschi & Gottfredson, 1969; Warr, 2001). Cross sectional designs fail to capture how early life experiences affect present behaviors, and they fail to capture how present behaviors affect future offending behavior. Furthermore, there is considerable intermittency with offending (Nagin & Land, 1993; Piquero, 2004; Sampson & Laub, 2003) that is lost or often misconstrued as desistance with cross-sectional and static designs.

For example, Bushway, Thornberry, and Krohn (2003) performed two tests of desistance, one using static measures with a cut-off point of 18 years-old and the other test employing semi-parametric analyses across the observation period starting when participants were 13.5 years-old

and ending when participants were 22 years-old. With the static measure, about 27% of the sample desisted. However, semi-parametric analyses revealed four distinct groups with only 8.4% of the sample desisting in the time frame observed. The authors noted that the semiparametric model was better able to capture intermittency in offending patterns and the process of desistance. What may appear to be complete desistance at one point may actually be a temporary period of little to no offending that eventually resurfaces as criminal behavior at later time points. Because core constructs such as onset, offending frequency, and desistance are dynamic processes, it is critical to employ longitudinal analyses that are able to capture repeated observations and heterogeneity in offending patterns (Bushway et al., 2001; Laub & Sampson, 2001; Piquero, 2003).

Semiparametric/ Trajectory Analyses

Fortunately, methodological and statistical advancements have allowed researchers to more closely examine individual and group-based patterns of offending. Of particular relevance is the trajectory method or semiparametric analyses. Semiparametric analysis is a longitudinal method that allows for the observation of differential groups exhibiting distinct offending patterns (Nagin, 1999; 2004; Piquero, 2008). Trajectory analyses group like cases that exhibit similar patterns regarding their onset, frequency, and desistance in offending observations and create distinct curves which highlight changes and/or stability in offending over time. Thus, this method is particularly relevant for life-course/ developmental criminology as a tool to examine heterogeneity in offending patterns.

Nagin and Land (1993) were the first credited with developing and applying semiparametric group-based analysis to the study offender typologies and behavioral trajectories. Their analytical method allowed for the simultaneous estimation of unique offender groups and

unique offender trajectories in offending patterns over time. With trajectory methods, we are able to identify and distinguish high-level offenders from low-level offenders, early starters from late starters, and observe unique patterns of intermittency and desistance. Furthermore, we can then attempt to predict membership in unique offender trajectories, an important focus especially when predicting high-level chronic offending (Nagin & Land, 1993; Piquero, 2008).

While Nagin and Land's models have been used by various researchers (Bosick, Bersani, & Farrington, 2015; Brame et al., 2001; Bushway et al., 2003; Laub et al., 1998; Paternoster, Brame, & Farrington, 2001), their method has not been without controversy. Group-based trajectory analyses have been criticized as atheoretical in that the methods have been employed, in some cases, in an exploratory fashion without theoretically-backed hypotheses (Sampson & Laub, 2003; Sampson, Laub, & Eggleston, 2004). This critique is evidenced in the wide array of findings produced by trajectory analyses with some studies finding just two to three distinct groups (Bushway et al., 1999; Li, Duncan, & Hops, 2001; Land et al., 2001; Land & Nagin 1996; Moffitt, 1993), several finding four groups (Fergusson, Horwood, & Nagin, 2000; Nagin & Land, 1993; Nagin et al., 1995; Laub et al., 1998; Shaeffer et al., 2003) and others finding five to six or more groups (Chung et al., 2002; Eggleston, Laub, & Sampson, 2004; Fergusson & Horwood, 2002; Lacourse et al, 2002; Piquero et al., 2001; Weisner & Capaldi, 2003), for which, little theoretical explanation exists.

There are several important limitations of trajectory analyses. First, it is important to note that the assignment of individuals to distinct groups is approximate and never perfect (Nagin, 2004). The analysis does provide an estimated average probability that group assignment was accurate, but assignment to a particular group does not necessarily indicate that an individual belongs to that group. Rather, it indicates that the individual's patterns on the variable of interest

most closely match that of the group, relative to the others (Nagin, 2004; Piquero, 2008: Roeder, Lynch, & Nagin, 1999). Second, the identification of appropriate groups and parameter estimates can be difficult with short periods of observation and/or when the prevalence of a given observation, for example, incarceration, is low (Muthén, 2006; Piquero, 2008). Finally, the number of groups identified varies based on a variety of conditions including sample size, length of follow-up, mortality, and exposure time. Specifically, larger samples, offender-based samples, and samples with self-reported measures often yield more groups because there tends to be greater variance in offending behaviors (Nagin & Tremblay, 2005). Failure to account for exposure time, length of follow-up and mortality can also result in different group solutions, different trajectory shapes, and can lead to underestimation of offending length and frequency (Eggleston, Laub, & Sampson, 2004). This is most problematic for high-rate chronic offenders as periods of incarceration and mortality can be viewed as desistance, and short follow-ups likely miss continued offending for these individuals. These problems are also true of hierarchical modeling and mixture modeling strategies.

Apart from innate methodological limitations, there is another issue with trajectory analyses: studies report inconsistent findings. The number of groups seems to vary substantively by both data source and by type of sample. In general, official reports, such as arrest and conviction data, tend to yield fewer groups and less heterogeneity. Use of self-report data, on the other hand, tends to be associated with the detection of more groups. Differences in the number of groups detected by semi-parametric models thus appear sensitive not only to modeling assumptions but also to the type of data being analyzed (Blumstein et al., 1988; Farrington, 1986; Farrington et al., 2003; Piquero et al., 2003).

Self-report v. Official Measures.

No data are perfect. However, self-reported data appears to be the preferred data source for use with semi-parametric models, in part because self-reported data yield greater reliability in assessment over time and are less influenced by criminal justice processing (Krohn et al., 2013; Piquero, Schubert, & Brame, 2014). Still, self-report data have problems. It is well known that self-report data can be influenced by under and over-reporting of criminal activity and that reporting differences vary across race and sex. Some research, for example, indicates that blacks tend to under-report their drug use and their criminal involvement more than other races, and that females tend to underreport their drug use and criminal involvement more than males (Hindelang et al., 1981; Huizinga & Elliot, 1986; Maxfield et al., 2000). For instance, Hindelang et al., (1981) found that black youth were less likely to report offenses from their official records, especially for serious offenses. A similar pattern was echoed in Maxfield et al. (2000) where Whites were more likely than Blacks to report known arrests, however, this race difference disappeared among habitual offenders who had very high concordance with official arrest reports. Jolliffe et al. (2003) noted like Huizinga and Elliot (1986) that males had higher concurrent validity than females regarding self-reported offending and court referral. Additionally, the authors noted interaction effects between race and sex where the highest concordance was observed for Black males, followed by White females, White males, and rates were lowest for Black females. However, other studies have reported little to no differences between races on self-reports of offending and official measures of arrest or court records (Brame et al., 2004; Piquero & Brame, 2008; Thornberry & Krohn, 2003).

While there are potential issues with both official and self-reported measures, these issues may not systematically bias estimates of criminal behavior. In a general sample of Seattle youth,

Hindelang et al. (1981) found that the average correlations between self-reported police contacts and official measures of delinquency were high, ranging from .70-.83. Thornberry and Krohn (2003) found considerable concordance between self-report and official data in a sample from the Rochester Youth and Development Study. Comparing official arrests and self-reports of arrest prevalence between ages 14-22, the average concordance was .81 in the overall sample. Interestingly and contrary to previous findings (Huizinga & Elliot, 1986; Maxfield, 2000), females (.84) had a higher concordance rate than males (.74) and no significant race differences were observed. In a follow-up with the same data, Krohn et al. (2013) examined concordance rates between self-reported and official arrest, breaking the same data into two groups, one when participants were 14-18 years-old and one when participants were 21-23 years-old. Findings were similar to their previous study in that there was nearly 80% agreement between self-reported arrest and official reports overall. They found no significant differences between sexes but did find that Blacks were slightly more likely to underreport and Whites slightly more likely to over-report arrests. However, similar to Maxfield et al. (2000), these differences vanished when accounting for prior record. Overall, repeat offenders and older offenders had the highest concordance rates. In a very recent longitudinal comparison of self-reported and official arrests, Piquero, Schubert, and Brame (2014) used the Pathways to Desistance data to examine a group of serious offenders over a seven-year span, starting when participants were ages 14-17 years-old. Results revealed no significant race differences and only slightly higher concordance rates for males. Overall, the authors noted that the congruence between self-reported and official measures of arrests were high (.79-.94) and remarkably stable across seven years. A recent study by Pollock et al. (2015) also found over 80% agreement between self-reported offending and official arrests. In sum, while there are potentially important differences between self-reports and

official arrest measures, the majority of studies report moderate to strong agreement (see Table 1. from Piquero, Schubert, & Brame, 2014).

Findings Using Offender-Based Samples.

Research using offender-based samples has recently entered the criminological mainstream. Some of the main offender samples have included the Boston area delinquents (Glueck's sample), the California Youth Authority parolees (CYA), an offender index from the British Home Office, and a Dutch conviction cohort. Most offender-based samples include follow-up periods well into adulthood and most use official measures, such as arrests and convictions. In general, offender based samples tend to find four to six classes (with the exception of Francis et al., 2004 which found nine classes for males), with longer follow-up periods typically yielding more classes (Nagin & Tremblay, 2005; Piquero, 2008). For example, using one of the oldest and most detailed datasets (Glueck & Glueck, 1950,1956), Laub, Nagin, and Sampson (1998) followed a set of 500 delinquent boys from Boston from ages 7 through age 32. Results revealed four classes of offenders, which included an abstainer group, a very small group of high chronic offenders, and two groups which peaked in offending in their early 20s and declined steadily by age 32. They also found that predictors, such as family factors and prior delinquency had varied effects across classes and that adult social bonds, especially marriage, were most predictive of belonging to the desister groups (Laub, Sampson, & Nagin, 1998).

When Sampson and Laub (2003) extended their analyses by following a subset of offenders from the Glueck data until age 70 (the longest follow-up of individuals to date), they found six distinct groups including a similar low/ abstainer group, a high level chronic group which peaked later in offending, and four groups that followed the familiar age-crime curve pattern. The authors noted that all groups eventually desisted, including the high- level chronic

offenders. Another interesting finding in this study was that childhood and adolescent risk factors, such as personality, temperament, IQ, and family issues, were largely unimportant in predicting who would be classified in the six offense trajectories. The inability of risk factors to predict the six offender classes may be due, in part, to a lack of variation in the sample and a lack of meaningful differences between some of the offender classes. These findings contradicted the theoretical predictions from several developmental scholars like Moffitt who found that neurological deficits, personality, and behavioral issues in childhood differentiate criminal patterns in adulthood (Caspi, 2000; Farrington 2005; Loeber, 1982; Moffitt, 1993, Moffitt et al., 2002; Moffitt & Caspi, 2001).

One of the key questions concerns that has emerged in discussions of desistance and offending trajectories is exposure time (Eggleston, Laub, & Sampson, 2004; Piquero et al., 2001). Exposure time, also known as street time, refers to time where offenders are not deceased, missing, or incarcerated and are thus able to commit offenses. Piquero et al. (2001) used the California Youth Authority (CYA) parolees sample, which followed 500 offenders after parole up through age 33, to examine trajectories associated with arrest with the goal of examining the effects of controlling for exposure time, or time spent outside of incarceration. Without controlling for exposure time, findings yielded six distinct trajectories comprised of a low-level/ abstainer group, a moderate to high chronic group, and four groups (varying in levels from high to low initial offending levels) which followed the age-crime curve. Without controlling for exposure time, 92% of the sample desisted through their late 20s and 30s. The authors then ran models controlling for exposure time by coding the number of months individuals were serving jail or prison time. Once the exposure variable was entered in the model, two of the groups did not appear to desist (a very high level chronic group and a moderate level chronic group),

indicating that 72% of the sample had desisted while the other 28% remained active offenders. In the first model, offenders who were serving jail or prison time were unable to commit new crimes and were likely counted as desisting during that time frame. Thus, Piquero et al. (2001) demonstrated how failing to control for exposure time can misrepresent the proportion of offenders desisting and distort trajectory patterns.

In a slightly different approach, Piquero et al. (2002) examined differences between arrests for violent offending and non-violent offending following the same sample of CYA parolees seven years after they were paroled. Results revealed four trajectories of offending patterns for both violent and non-violent offenses. In contrast to Sampson and Laub (2003), various risk factors predicted assignment to different groups. For example, marriage, employment, and heroin and alcohol dependence predicted membership for some of the non-violent offending trajectories but not for the violent trajectories. Race (being non-white) was related to being classified into the violent offending group but not the non-violent offending group.

Similarly, a study by Blokland and Nieuwbeerta (2005) also found that various life circumstances and predictors such as marriage and employment were associated with inconsistent effects across different types of offenders in their Dutch sample. Blokland and Nieuwbeerta (2005) used both convictions and self-reports, yielding four groups including a very low-level offender group, a small but very high-level group, and two groups that followed the age-crime curve. Marriage was associated with fewer convictions for the lower-level groups, but had no effect on the high-level offending group. Other variables such as employment status, living situation, and parenting status had various effects across different groups. In a previous study published that year using the same sample of over 5000 convicted Dutch offenders from

ages 12-72, Blokland et al. (2005) identified four distinct trajectories including a small (2-2.5%) group of high-level stable offenders. Similar to previous findings (Laub, Nagin, & Sampson, 1998; Piquero et al., 2001; Sampson & Laub, 2003), nearly all desisted by their mid-late 30s, however, in contrast to Sampson and Laub (2003), the high stable offender group maintained a steady level of offending through their 60s and through the end of the study. As in the previous study, life circumstance variables did not consistently predict group membership.

Overall, findings from offender samples indicate considerable heterogeneity in offending patterns across the life-course. All but one study (Francis et al., 2004) has identified four to six classes of a variety of offenders, including variations of an adolescent-limited type, which follows the age-crime curve, a low- level stable offender, and the existence of a small group of high-level chronic offenders. These findings also highlight the inconsistency of group classification based on different samples and slightly different methodologies (exposure time, length of follow-up, and offense types) and more importantly, they show a broad level on inconsistency in the influence of theoretically relevant risk factors allegedly linked to group membership. Table 1.2 presents a summary of the offender-based trajectory findings discussed. For a more comprehensive summary of trajectory analyses, see the Appendix in Piquero, 2008 (p.61-78).

Table 1.1 Offender-Based Findings Summary

Study	Sample	Age	Measure	# classes	Main findings
Laub, Nagin, & Sampson (1998)	Boston area delinquents (500 white males)	7-32	Arrests	4	Low-level, small higher chronic group, and two age-crime curve groups; Marriage had effect on desistance.
Piquero et al. (2001)	CYA parolees (272 males)	18-33	Arrests	6	Demonstrated the importance of controlling for exposure time, here for incarceration. 92% appeared to desist but when controlling for incarceration, 72% desisted.
Piquero et al. (2002)	CYA parolees (524 males)	16-28	Arrests	4	Found that different risk factors predicted group membership for violent v. nonviolent offenses.
Sampson & Laub (2003)	Boston area delinquents (500 white males)	7-70	Arrests	6	Noted that all groups eventually desisted, including high-level offenders; childhood risk factors failed to predict group membership.
Eggleston, Laub, & Sampson (2004)	Boston area delinquents (500 white males)	7-70	Arrests	5-6	Methodological piece illustrating differences when failing to control for exposure time due to follow-up, incarceration, and mortality. When controlling for exposure time, there was one less class and groups exhibited higher mean levels of offending
Francis et al. (2004)	1953 Home Office Offenders Index Birth Cohort (11,402 whites)	birth-40	Conviction	3 (f); 9(m)	Much more heterogeneity and higher levels of offending in males
Blokland & Nieuwbeerta (2005)	Criminal Career and Life-Course Study (5164 whites)	12-72	Conviction / Self-reports	4	Found inconsistent effects of marriage and employment in predicting group membership.
Blokland et al. (2005)	Criminal Career and Life-Course Study (5164 whites)	12-72	Conviction / Self-reports	4	Small group of high-level offenders persisted in offending through elderly years

Findings from General Population-Based Samples.

Numerous US-based longitudinal studies have used trajectory analyses, including data the Philadelphia Birth Cohort Studies, the Pittsburgh Youth Study, the Oregon Youth Study, the Seattle Social Development Project, and the National Longitudinal Survey of Youth. There have also been several international datasets analyzed including the Cambridge Study in Delinquent Development (CSDD), the Montreal Longitudinal Studies, and the Dunedin Health and Human Development Study.

General population samples with children and adolescents (not extending to adulthood) tend to reveal fewer classes, typically ranging from three to four classes largely because the majority of the population consists of non-offenders. Studies involving children generally do not study offending but rather levels of aggression and conduct problems from parent and teacher reports. In one instance, Tremblay et al. (2004) examined maternal reports of physical aggression levels spanning from about 1.5 years-old to 3.5 years-old from nearly 600 Quebec families. They identified three patterns of aggression (high, moderate and low). Furthermore, they found that maternal smoking, young mothers, siblings, family dysfunction, parental coercion, and maternal antisocial behavior predicted class membership in physical aggression levels. In a study of teacher and self-reported physical aggression in older boys, Broidy et al. (2003) identified four trajectories from ages 7.5-10.5 years-old. All four trajectories appeared to show increases in aggression over time. The authors noted that this may have been due, in part, to the fact that their sample came from the Pittsburgh Youth Study, a high-risk sample likely to exhibit aggression. Shaw et al. (2003) and Shaw, Lacourse, and Nagin (2005) also identified four trajectories of maternal reported conduct disorder in low-income Pittsburgh boys from ages 2-8 and 2-10 in the later study. Given the variety of samples and lengths of follow-up, there was

considerable consistency in a four group solution. These four groups generally consisted of an abstainer/ very low group, a small high- level chronic group, and two groups which followed the age-crime curve pattern.

Studies extending into adolescence also show fairly consistent findings despite typically using different measures of behavioral outcomes and different reporting sources (Piquero, 2008). With a few exceptions (Bongers et al., 2004; Nagin & Tremblay, 2001), most studies have reported four trajectories across different outcomes, generally comprised of a high, medium/medium low, and low groups. However, Bongers et al. (2004) found six trajectories for oppositional behavior in data from Holland. Nagin and Tremblay (2001) also found six trajectories but used an atypical outcome measure for adolescent studies, self-reported property crime, in adolescents from 11-17 year-old.

More typical results can be seen in Nagin et al. (2003) who found four trajectories of physical aggression in a sample of over 1000 males from the Montreal Longitudinal Study from ages 10-15 and in Brame, Nagin, and Tremblay (2001) who concluded that four classes was the most parsimonious solution in their study of physical aggression from childhood through adolescence. Initially, Brame, Nagin, and Tremblay (2001) modeled physical aggression trajectories separately for childhood and for adolescence, resulting in three groups in childhood and six groups in adolescence. When modeling childhood and adolescence jointly, a four class solution was the best fit. The study results echoed Robins (1978) in that nearly all adolescents with high physical aggression exhibited high physical aggression in childhood, but most children with physical aggression in childhood decreased to a lower level of aggression into adolescence. Thus, while there was considerable continuity in physical aggression from childhood to

adolescence in the high group, most participants exhibited a decrease in physical aggression with age (Brame, Nagin, & Tremblay, 2001).

As part of the same study as previously mentioned, Broidy et al. (2003) examined six different data sets and generally found four trajectories for males and three trajectories for females. With the exception of the Pittsburgh Youth data (high-risk boys extending only until 10.5 years of age), the trajectories also decreased in negative behaviors across adolescence. This study also identified important sex differences. Males, for example, exhibited a much higher mean level of aggression and delinquency than females. Additionally, boys exhibited greater continuity in negative behavior from childhood through adolescence than females. Females reported so little delinquency/ negative behavior in adolescence that a clear link between childhood and adolescence could not be made. In sum, Broidy et al. (2003) illustrated that regardless of outcome and reporting source, most studies on childhood and adolescence reveal that there exist three to four trajectories that are steadily decreasing/desisting with time. Other important findings from adolescence include that there is considerable continuity from childhood to adolescence, and that males tend to exhibit far more delinquent behaviors than females.

General population samples spanning from childhood through adulthood have produced more heterogeneity in findings. Few studies have found only two classes as suggested by Moffitt's (1993) dual taxonomy. Two exceptions included two studies examining alcohol use (Li, Duncan & Hops, 2001 and Li et al., 2002) which found an abstainer or low group and a moderate to high user group. However, in both studies, participants were not followed past 18 years-old. Land et al. (2001) also identified two classes, however the purpose and analyses differed from traditional trajectory studies. Land et al. (2001) introduced a hazard term controlling for age at first conviction with the goal of compensating for unobserved

heterogeneity. Despite using the same data (London cohort) as Nagin and Land (1993) and Land et al. (1996) who found four classes of conviction patterns, Land et al. (2001) noted that once introducing the hazard term, a two class model was a better fit than others with more classes. The authors concluded that unobserved heterogeneity may inflate the number of classes, and that models with fewer latent classes may provide more accurate estimates and a better fit for hazard regression models. Also employing a hazard term to control for unobserved heterogeneity, Brame et al.'s (2005) study of 727 males from the Rochester Youth Development Study concluded that a 2- class solution was the best fit.   This study looked at both official measures of arrest records as well as self-reports of violent and non-violent crime. Thus, the introduction of hazard terms to control for unobserved heterogeneity may yield fewer classes.

A few studies have identified three classes, often comprised of a very low-level offender group, a moderate, and a high-level chronic offender group (Paternoster, Brame, & Farrington, 2001; Piquero, Brame, & Moffitt, 2005; Weisner, Capaldi, & Kim, 2007). Using the Cambridge Study in Delinquent Development (CSDD) data, Paternoster, Brame, and Farrington (2001) followed the London cohort of just over 400 males from ages 10 up through age 40. Conditioning for unobserved heterogeneity and convictions in adolescence, the authors concluded that a three class solution was the best fit. These included an abstainer/very low rate group of offenders which made up 72% of the sample, a low rate offender group with 0-2 convictions which made up 23% of the sample, and the smallest class (5%) of high chronic offenders with 5-8 convictions. Piquero, Brame, and Moffitt (2005) also found three classes with the same pattern in the Dunedin Multidisciplinary Health and Human Development Study of males from 13-26 years of age. Different from an earlier study (Weisner & Capaldi, 2003) which found six classes in a sample of males from the Oregon Youth study using self-report data,

Weisner, Kim, and Capaldi (2007) found just three classes of offenders in the same sample but with outcomes based on official reports of arrests. While some studies have noted substantive differences in trajectory analyses based on reporting source, others have found similar conclusions regarding the number of classes across measures (Blokland et al., 2005; Blokland & Nieuwbeerta, 2005; Brame et al., 2005; Nagin et al., 1995).

Regardless of the source of data, most studies employing semiparametric analyses have generally revealed four to five classes. For example, in the first study to employ semiparametric group-based analyses, Nagin and Land (1993) found four distinct trajectories of offenders. Using the CSDD sample of 411 white males from ages 10-32, the authors sought to test dual taxonomy theory (Moffitt, 1993) through examining patterns in official convictions. Nagin and Land found four groups: Never convicted/non-offenders, adolescent-limited offenders (convictions peaked 14-18 and none at 32), low-level chronic offenders, and high-level chronic offenders.

Since Nagin and Land (1993), several other studies have also found four classes of offenders. In a follow-up study using the same CSDD sample, Nagin et al (1995) examined trajectories across three reporting sources: official convictions, self-reported deviance, and teacher and parent-reported deviance measures such as drinking, drug use, and getting into fights. While finding the same four groups as Nagin and Land (1993), they also found that the adolescent-limited group continued to report engaging in high levels of deviant behaviors, including heavy drinking, drug use, and fighting, even though their convictions for crime and largely desisted. In a very recent study of the CSDD data, Bosick, Bersani, and Farrington (2015) used trajectory analyses to examine annual offending patterns from ages 19-50. Results indicated four distinct groups, but while all differed in the magnitude of offending, all exhibited similar age-crime curve shapes. Thus, this study failed to find a group with stable high levels of

offending. However, childhood risk factors such as low intelligence, impulsivity, and early

offending were predictive of the high rate offender group.

In a study of three large data sets, D'Unger et al. (1998) examined trajectories of

offending spanning from childhood into adulthood. The Racine, Wisconsin cohort data and

Philadelphia data both used police contacts while the London Cohort/ Cambridge Study in

Delinquent Development(CSDD) used conviction outcomes. Five groups were identified in both

the 1958 Philadelphia Cohort study and in two Racine cohorts (1942 and 1955). Four groups

were identified with the 1949 Racine cohort and in the London Cohort. Samples with the four

groups corresponded with Nagin and Land's (1993) original findings and were generally

comprised of a non-offender group, an adolescent-limited group, a low-level chronic group, and

a high-level chronic group. The Philadelphia cohort with five groups included the same four

groups with the addition of another adolescent-limited group that exhibited a very high offending

peak, even higher than the chronic offender group. Interestingly, the Racine cohorts with five

groups included the four groups and a unique group that exhibited late onset chronic offending, a

group with no theoretical specification (apart from Patterson, 1997). This late-onset chronic

offender group was found in other studies as well (Chung et al., 2002; Piquero et al., 2001;

Weisner & Capaldi, 2003). Moffitt et al. (2002) also identified five classes of conduct disorder

symptoms in the Dunedin data tracing the sample from 7 years of age through 26 years of age.

However, rather than a late onset group, the authors found a unique trajectory which they labeled

the recovery group. This recovery group made up about 21% of the sample and exhibited several

conduct disorder symptoms early, mirroring the high chronic offender group until age 18, and

then they steadily decreased to nearly no symptoms by age 26. Studies that have yielded six

classes have included similar versions of both of these additional late onset and recovery groups (Weisner & Capaldi, 2003).

Clearly, the mixed findings generated from semi-parametric models are troubling. Results may differ by measure (self-report v. official), by sample, by length of follow-up, and even within in the same sample by method (conditioning for unobserved heterogeneity). In general, studies restricted to childhood and adolescence, studies with shorter follow-up periods, and studies controlling for unobserved heterogeneity result in fewer latent classes (Brame et al., 2005; Eggleston, Laub, & Sampson, 2004; Piquero, 2008). Furthermore, sex differences have also been noted in several studies, namely that females generally yield one less class than males (Broidy et al., 2003; D'Unger, Land, & McCall, 2002; Piquero, Brame, & Moffitt, 2005). Some of these differences varied in magnitude from one class to Francis et al. (2004) where the differences were very pronounced with females yielding a three class solution and males a nine class solution. In addition to fewer classes, females also exhibit far less deviance across latent classes than males (Broidy et al., 2003; D'Unger , Land, & McCall, 2002; Francis et al., 2004; Piquero, Brame, & Moffitt, 2005). These differences are fairly consistent and thus warrant further investigation. Another important aspect which has not yet been examined is race differences. As scholars have noted differences in participation and frequency of offending as well as self-reporting across race, this is another potentially important avenue to explore (Kirk, 2006; Piquero, 2008). Table 1.2 presents a summary of the general population trajectory findings discussed. For a more comprehensive overview of trajectory analyses, see the Appendix from Piquero, 2008 (p.61-78).

Table 1.2 General Population Findings Summary

Study	Sample	Age	Measure	# classes	Main findings
Childhood					
Broidy et al. (2003)	Pittsburgh Youth Survey (1517 males)	7.5-10.5	Teacher ratings externalizing behaviors; Self-reports misbehavior	4	All four groups increased in aggression and problem behavior over time
Shaw et al. (2003)	Allegheny County Women's, Infants, and Children's Program in Pittsburgh (284 males)	2-8	Parent reports of child adjustment problems	4	High-chronic group, low persistent, and two desister groups; maternal rejection and child fearlessness were predictive low, moderate, and high escalating group
Tremblay et al. (2004)	Quebec families with Five-month old newborn (572 white families)	17-42 months	Maternal rating of physical aggression	3	High aggression predicted by maternal antisocial behavior, coercion, smoking during pregnancy, and family dysfunction
Shaw, LaCourse, & Nagin (2005)	Allegheny County Women's, Infants, and Children's Program in Pittsburgh (284 males)	1.5-10	Parent reports conduct problems & teacher reports hyperactivity	4	Conduct problem trajectories predicted by child and parenting risk factors; hyperactivity predicted by maternal depression; similar class structure for both.
Adolescence					
Nagin & Tremblay (2001)	Montreal Longitudinal Study (1037 white males)	6-15	Teacher ratings of physical aggression, hyperactivity,	4-6	Four classes consistent in teacher reports across measures; Self-reports property offenses yielded six classes

			inattention; Self-reports of property crime		
Brame, Nagin, & Tremblay (2001)	1945 Philadelphia Birth Cohort (9945 males); 1958 Cohort (13,160 males)	10-17	Police contacts	3	Found consistency for violent and nonviolent crimes; high, medium, low groups
Broidy et al. (2003)	Montreal Longitudinal Study (1037 white males)	6-15		4	Found decent consistency in three to four class solutions across samples; Males had more heterogeneity and higher levels of problem behaviors and continuity in problem behaviors
	Quebec Provincial Study (2000 whites)	6-12	Teacher ratings externalizing behaviors; Self-reports misbehavior	4(m) 4(f)	
	Christchurch and Developmental Study (1265 whites)	7-13		3(m) 3(f)	
	Dunedin Multidisciplinary Health and Human Development Study (1037 whites)	7-13		3(m) 2(f)	
	Child Development Project	6-12		3(m) 3(f)	

(585 families)

Bongers et al. (2004)	Zuid-Holland Longitudinal Study (2600 whites)	4-16	Parent reports of Child Behavioral Check List	3-6	Males and females had similar classes and trajectory shapes but males much higher on outcomes

Adulthood

Nagin & Land (1993)	CSDD (411 white males)	10-32	Convictions	4	First to use trajectory method
Land, McCall, & Nagin (1996)	1958 Philadelphia Birth Cohort (1000 males)	8-26	Police contacts	4	Found continued deviance in AL group
	CSDD	10-32	Convictions	4	
D'Unger et al. (1998)	1958 Philadelphia Cohort,	8-26	Police contacts	5	Found fairly consistent results despite different samples
		8-30		5	
	Three Racine, WI Cohorts	8-25	Police contacts	4	
		8-22		4	
Land et al. (2001)	CSDD (411 white males)	10-32	Convictions	2	Controlled for unobserved heterogeneity and found fewer classes
Li, Duncan, & Hops (2001)	Longitudinal study in two urban areas (179)	11-18	Self-reports alcohol use	2	Low/abstainer group and a moderate group

Study	Sample	Age	Measure	Groups	Findings
Paternoster, Brame, & Farrington (2001)	CSDD (411 white males)	10-17; 18-40	Convictions	3	Adolescent groups predicted adult conviction frequency
Chung et al. (2002)	Seattle Public School Students (1053)	13-21	Self-reports offense seriousness	5	Found the high-level escalating group continued offending into adulthood
D'Unger, Land, & McCall (2002)	1958 Philadelphia Birth Cohort (3000 females; 1000 males)	10-26	Police contacts	3(f) 5(m)	Similar patterns across sex but more heterogeneity and higher offending frequency in males
Li et al. (2002)	National Youth Survey (188)	14-18	Self-reports alcohol use	2	Low/abstainer group and a moderate group
Weisner & Capaldi (2003)	Oregon Youth Study (204 mostly white males)	9/10-23/24	Self-reports of offending	6	High-chronic and non-offenders distinguished by individual, family, and peer factors in childhood/adolescence
Brame et al. (2005)	Rochester Youth Development Study (727 males)	11/15-15.5/19.5	Self-reports & Arrests	2	Controlled for unobserved heterogeneity, finding two classes for violent and nonviolent offenses
Weisner, Capaldi, & Kim (2007)	Oregon Youth Study (204 mostly white males)	9/10-23/24	Arrests	3	Found low, moderate, and small group of high-level offenders
Bosick, Bersani, & Farrington (2015)	CSDD (411 white males)	19-50	Convictions	4	All four groups had same age-crime curve pattern; failed to find a chronic group; Childhood factors such as impulsivity and intelligence predicted high rate offending group

In sum, while the number of groups may be inconsistent, findings from trajectory analyses suggest that there are meaningful differences/variation within offenders (Piquero, 2008). Furthermore, there are mixed findings regarding the predictability of distinct offender groups. Some studies have found that childhood and adolescent risk factors predict offender trajectories (Bosick, Bersani, & Farrington, 2015; Moffitt et al., 2002; Piquero et al., 2002; Tremblay et al., 2004; Weisner & Capaldi, 2003) while others have not (Laub & Sampson, 2003). The question remains, if a unique group of high-level chronic offenders exists, do their etiologies differ from other offenders and can they be identified by childhood and adolescent risk factors? The next part of this chapter will discuss the various factors and theories surrounding prediction of offending patterns.

Predicting Offending Patterns

The existence of unique groups of offenders has been a long and arduous debate in criminology. Evidence suggests that despite heterogeneity in frequency of offending, the majority of offenders follow a pattern similar to the age-crime curve, peaking in their late teens through their mid-20s and then steadily declining into their late 20s and 30s (Laub, Nagin, & Sampson, 1998; Sampson & Laub, 2003). However, many studies have identified a small minority of offenders who deviate from the general pattern, continuing offending through late adulthood (Bosick, Bersani, & Farrington, 2015; Moffitt, 1993; 2006). Some suggest that this group represents a serious chronic offender with a different etiology than other offenders (Loeber et al., 2013; Moffitt et al., 2002; Patterson & Yoerger, 1993), while others suggest that this group simply represents the "tail end of a continuous offender distribution" (Bosick, Bersani, & Farrington, 2015; Paternoster et al, 1997; Sampson & Laub, 2005). Beyond the mere existence of

a chronic serious offender group is the question of identification and prediction. Which risk factors differentiate serious chronic offenders from the normative offender population, and can we identify these differences in childhood or adolescence? If so, it would be wise to concentrate early intervention efforts on high-risk youth.

Despite decades of theoretical discussion, paradigm shifts, and empirical research, scholars still do not agree on the most salient predictors of criminal involvement. While a variety of studies support the role of family factors and parenting in criminal development (Cullen et al., 2007; Dekovic, Janssens, & Van As, 2003; Farrington, 2011), just as many find that deviant peers are more influential (Akers, 1998; Harris, 1995; 2000). A large portion of criminological theory has highlighted the negative effects of disadvantaged structural contexts (Krivo & Peterson, 1996; Wilson, 1987; Western & Petitt, 2010), while others have focused on the impact of individual factors such as intelligence, personality, and temperament (Beaver & Wright, 2011; Caspi et al., 2002; Delisi &Vaughn, 2014; Farrington, 2005) as central explanations of crime and delinquency. Many older and modern risk assessment tools like the Level of Service Inventory-Revised (LSI-R) use questions surrounding antisocial personality, antisocial attitudes, antisocial peers, substance use, school achievement, and family factors to assess offender risk (Andrews & Bonta, 2010; Andrews, Bonta, & Wormith, 2006). Families, peers, school achievement, poverty, and behavioral factors are some of the most widely tested and theoretically debated risk perspectives in criminology and will thus be the focus for the current research.

Findings surrounding the causes of criminal involvement have important impacts on policies, interventions, and social perceptions of who gets arrested, convicted, and incarcerated. Media portrayals of the uneven treatment of young, black, impoverished males by police and by the courts begs questions surrounding why these individuals are arrested and convicted at higher

rates than others. Is it because of their race, their social class, their disadvantaged neighborhood conditions, their broken families, their deviant peers, or is it because of differential behavior? These questions have critical implications for our justice system and for our agents of intervention including corrections, school, and families. Given the social outcry regarding disparities in the criminal justice system today, it is imperative to review and reflect on the empirical reality of what influences differential arrest outcomes and patterns.

One of the most consistent findings in criminology is that past criminal behavior predicts future behavior (Farrington, 2003; McCord, 1980; Nagin & Paternoster, 2000). Yet, there is debate about the interpretation of this finding. There are three main positions which explain this phenomenon: state dependence, population heterogeneity, or a mix of these two perspectives. State dependence reflects the notion that committing a crime alters the course of life events in a way that increases the likelihood of subsequent criminal behavior. Criminal involvement can harm or severe a number of conventional ties to family, peers, school, and employment, thus weakening restraints and increasing incentives for criminal behavior. Theories consistent with state dependence include Lemert's (1972) labeling theory, social learning theory (Akers, 1977, 1998; Sutherland, 1947), general strain theory (Agnew, 1992), and Thornberry's (1987) interaction theory. In sum, state dependence attributes onset and continuity in offending to social forces external to the individual such as a dysfunctional family, negative peers, and a disadvantaged neighborhood. These social forces may lead one to criminal behavior early in life. Criminal behavior then limits future opportunities for a conventional lifestyle, increasing the likelihood that one will continue offending.

In contrast, population heterogeneity attributes the connection between past and future behavior to variation in criminal propensity and enduring individual traits. Thus, it is

heterogeneity in time-stable characteristics such as personality, self-control, and temperament that explain variation in criminal behavior. Theories consistent with population heterogeneity include Gottfredson and Hirschi's (1990) self-control theory and biosocial perspectives such as those from Wilson and Hernstein (1987), Caspi et al. (2005), and other biosocial scholars. For example, Gottfredson and Hirschi (1990) attribute offending to low self-control, a time stable trait. Individuals with low self-control self-select into delinquent peer groups, struggle in school, with employment, and in relationships and thus turn to crime as an easy way to obtain desired means. As low self-control remains relatively stable across time, criminal propensity and behavior continues. Similarly, difficult temperament, negative emotionality, antisocial personality, and genetic predispositions may operate in the same way across the life-course. In sum, initial individual differences in criminal propensity lead to self-selected involvement in delinquency and explain onset and continuity in criminal behavior above and beyond social forces.

While often tested against one another, state dependence and population heterogeneity are not necessarily incompatible. For example, Moffitt's (1993) dual taxonomy incorporates both explanations. Adolescent-limited offenders (ALs) are explained by the state dependence perspective where outside forces such as peers and societal pressure influence criminal behavior. While many ALs desist into adulthood, some may get caught in what Moffitt describes as "snares" such as early pregnancy, which then limits opportunities for a conventional future, increasing the likelihood of continued criminal behavior. Life-course-persistent offenders (LCPs), on the other hand, are characterized by neurological and psychological deficits, which emerge early and persist across the life-course. Because of these time-stable deficits, LCPs have high criminal propensity, begin offending at an early age, and exhibit continuity. Sampson and

Laub (1993) while slightly more supportive of state dependence effects, also acknowledge the role of criminal propensity and self-selection. Similarly, biosocial criminologists assert the importance of both social forces and individual propensity in their explanation of gene-environment interactions. Criminal propensity (genes, personality, and intelligence) can be inhibited or exacerbated by interactions with social forces (neighborhood, family, and peers,).

Furthermore, a handful of empirical tests have found simultaneous support for both perspectives (Land et al., 1996; Laub et al., 1998; Nagin & Land, 1993; Nagin & Paternoster, 1994). For example, Nagin and Paternoster (1994) found that a lack of social bonds such as marriage, employment, and education fostered criminal behavior but that variation in traits such as impulsivity and the inability to delay gratification were also related to criminal behavior. Nagin and Land (1993) and Land et al. (1996) found support for population heterogeneity through the existence of distinct offender trajectories but also found support for state dependence—showing that prior arrests and police contacts had strong effects on later criminal outcomes. Thus, the relationship between state dependence factors and population heterogeneity factors is complex. Nagin and Paternoster's (2000) review of empirical tests surrounding state dependence and population heterogeneity concluded that there are largely mixed findings. In general, studies employing representative or conventional samples tend to favor state dependence factors (Nagin & Paternoster, 1991; Paternoster & Brame, 1997) while high risk and offender samples and methods controlling for unobserved heterogeneity tend to favor the population heterogeneity perspective (Nagin & Farrington, 1992; Paternoster & Brame, 1997). Overall, the authors noted that both perspectives are needed to explain the relationship between past and future criminal behavior. Nagin and Paternoster (2000) concluded:

The first is that population heterogeneity matters, and it probably matters more than

criminologists once thought. Part of the unobserved continuity in offending over time, then, is due to the fact that at a very early age individuals do differ with respect to their proneness or propensity to commit crime. While we have little complete knowledge as to the origin of these differences, it should be clear that these differences matter and matter throughout life….The second important conclusion to draw from this literature is that time-varying characteristics of individuals also matter a great deal. That is, in spite of important differences in criminal propensity, an individual's destiny is not foreclosed early in life. (p. 137)

Both dynamic state dependence factors and static individual factors are at play and are critical in examining criminal development and in predicting offending patterns across the life-course. The following sections of this chapter will review empirical evidence related to various widely tested dynamic and static factors identified in the literature.

Sex Differences

Biological sex is generally viewed as a static factor and is a consistent predictor of arrest and other criminal justice outcomes (Hindelang, 1979; Lytle, 2013; Stolzenberg & D'Alessio, 2004). It is clear that females are far less involved in crime than males and that males are over-represented at all levels of the criminal justice system. According to a 2011 report from the Federal Bureau of Investigation, despite making up half of the general population, females made up just about 10% of the incarcerated population, and they only accounted for 26% of arrests. Females are even more underrepresented in federal arrests, accounting for just 12% in 2012 (BJS, 2012). Numerous studies have noted that males are more likely to be arrested than females, controlling for other relevant factors (Stolzenberg & D'Alessio, 2004; Lytle, 2013). However, there is disagreement about why these differences exist. Some argue that it is due to the bias of

police officers—who prefer to not arrest women. This perspective is rooted in the notion of chivalry and patriarchal views, and argue that police officers show leniency toward females because they are seen as the weaker sex and require protection against adverse effects of the criminal justice system (Anderson, 1976; Goethals, Maes, & Klinkhamers, 1997) or because they are not seen as an imminent threat (Pastor, 1978). In one study by Visher (1983), only females who exhibited a hostile demeanor or were involved in violent (as opposed to property) crimes were arrested at similar rates as males. Furthermore, other demographic factors, such as age and race, were better predictors of arrest for females than for males.

In a more recent study, Stolzenberg and D'Alessio (2004) analyzed the impact of sex on the probability of arrest for violent crime using the 2000 National Incident-Based Reporting System (NIBRIS). Controlling for crime seriousness, victim harm, and the use of a weapon, females were less likely to be arrested for all violent crimes except for robbery and forcible rape. The extent of leniency shown varied by crime type, the largest difference being in forcible fondling (48% less likely to be arrested) followed by kidnapping (28%). In a recent unpublished dissertation, Lytle (2013) also found sex effects on arrest even when controlling for offense seriousness, suspect intoxication, demeanor, and other relevant factors. Specifically, results indicated that males were on average, between 1.49-1.63 times more likely to be arrested than females for comparable crimes.

The other main explanation of differential arrest rates between males and females suggests that there are differences in baseline levels of criminal behavior and in the types of crimes typically committed by males. Males are arrested more often, the argument goes, because they commit more crimes and especially more serious crimes. In an early study, Hindelang (1979) compared data from the National Crime Victimization Survey (NCVS) to arrest reports

from the Uniform Crime Reports (UCR). Hindelang reasoned that if police were showing preferential treatment towards females, it would be reflected in a larger proportion of victim reports of female perpetrators from the NCVS relative to the proportion of females arrested according to the UCR. From these comparisons, Hindelang concluded that males were arrested at a rate proportional to their criminal involvement.

Other proponents of the differential behavior perspective would later point to sex differences in crime-related traits such as self-control, aggression, and antisocial behavior. Several studies, for example, have noted that females, on average, tend to have higher levels of self-control than males across the life-course (Elyse-Quest et al., 2006; Kochanska et al. 1997; LiGrinning, 2007; Raffaeli et al., 2005). Females also generally exhibit lower levels of aggression and antisocial behavior than males (Broidy et al., 2003; Buss & Shackelford, 1997; Moffitt et al., 2001). For instance, Broidy et al. (2003) examined four samples of boys and girls with chronic physical aggression patterns and noted that females had lower mean levels of physical aggression than males across all samples. An exception to these findings was Shaeffer et al. (2006) which also examined trajectories in aggressive and disruptive behavior patterns across elementary school. Unlike Broidy et al. (2003), there were similar trajectories of aggressive and disruptive behavior across sex, namely a chronic, highly aggressive group, a stable low aggression group, and a moderate group. Males and females exhibited nearly identical mean levels of aggressive and disruptive behavior in elementary school. Furthermore, males and females had similar rates of arrests in adulthood, although males did have higher rates of incarceration. The authors noted that their results were rare and that the non-representative urban sample and the inclusion of aggression and disruptive behaviors may have inflated similarities between the sexes (Shaeffer et al., 2006).

Reasons for observed behavioral differences between males and females vary. Consistent with Hagan's power-control theory, social control theorists would argue that females should be less involved in crime and analogous behaviors as they are socialized differently. Specifically, females are more closely supervised than males and thus, risky behavior is more likely to be detected and more severely punished than analogous behavior from males (Hagan, Gillis, & Simpson, 1985; Hagan, Simpson, & Gillis, 1987). This notion is consistent with Visher's (1983) findings that females who deviated from traditional gender stereotypes were less likely to receive leniency. Furthermore, females traditionally work more closely to the home attending to child-rearing and domestic responsibilities while males generally spend more time outside of the home. Therefore, males are exposed to greater temptation and opportunity for crime (Hagan, Gillis, & Simpson, 1985; Hagan, Simpson, & Gillis, 1987). Along these lines, females should generally exhibit more self-restraint, less aggression, and be less involved in crime (Gottfredson & Hirschi, 1990).

In contrast, some scholars claim that these differences in behavior are biological in nature. For example, evolutionary psychologists suggest that males are more aggressive than females due to reproductive pressures. Males are biologically programmed to reproduce as much as possible, and males are in constant competition with other males for female mates. Thus, more aggressive males have more chances with females, making aggression an advantageous quality (Buss & Shackelford, 1997; Duntley & Buss, 2011; Wright, Tibbetts, & Daigle, 2014). Other scholars suggest innate dispositional differences between male and female development involving differential brain structure and chemistry, specifically that females exhibit more rapid development of the frontal lobe, a brain region implicated in self-regulatory development

(Lenroot et al., 2007; Lenroot & Giedd, 2010; Raznahan et l., 2010). Clearly, there are multiple explanations for why males are more involved in criminal behavior.

While there are a few studies that have failed to find sex effects (Lundman, 1974; Smith & Visher, 1981), it would be unusual to find that sex did not predict arrest probability to some degree. Despite the variety of explanations for differential arrest probability between males and females, it is unfortunately beyond the scope of the current research to examine why males are more likely to be arrested than females. It is possible, however, to examine the extent to which sex predicts arrest probability over time, and to examine how that varies across another hotly debated factor: race.

Race Differences

The role of race in officer decision making currently occupies the limelight in the United States criminal justice system. Because of the recent media coverage of the disproportionate unarmed killing of Black suspects by White officers, police agencies and police decisions are perhaps more scrutinized now than ever before. While the media has focused on officer use of deadly force, the role of race in the decision to arrest remains a hot button issue. It is clear that minorities are disproportionately represented in arrest data for both juveniles and adults. For example, according to a 2011 FBI report, Blacks account for 28% of arrests, despite making up just around 15% of the population in the United States. Many argue that this disparity is indicative of widespread racial bias in the criminal justice system (Bynum, Wordes, & Corley, 1993; Conley, 1994; Sealock & Simpson, 1998). Meanwhile, others suggest that this disparity is reflective of differential behavior and participation in crime (D'Alessio & Stolzenberg, 2003; Snyder & Sickmund, 1999; Wilbanks, 1987). Some scholars have suggested that officers react not necessarily to a suspect's race but rather to the suspect's demeanor and disrespectful

behavior, which is more prevalent among Black suspects (Skogan & Frydl, 2004). The effect

size of race may vary on a number of legal and extralegal factors. Legal factors in arrest include

offense seriousness, amount of available evidence, suspect intoxication, and victim request for

arrest. Important extralegal factors include suspect demeanor, the presence of

bystanders/witnesses, age and sex. Scholars suggest that if legal factors can account for racial

disparity in arrest, then the disparity is not indicative of discrimination or selection bias of

officers (Pope & Snyder, 2003; Skogan & Frydl, 2004).

Two studies using data from the National Incident-Based Reporting System (NIBRIS)

from 1997-1998 and 1999 failed to find that race had any effect on arrest, noting that offense

type and seriousness accounted for most of the variation in arrests (D'Alessio & Stozenberg,

2003; Pope & Snyder, 2003). While there are mixed findings across academic research on race

and arrest, nearly 75% of Americans feel that racial profiling is an issue with police, and the vast

majority of minority Americans, especially Blacks, feel that police unfairly target minorities

(Gallagher et al.. 2001). While a few studies have failed to find a race effect on arrest (D'Alessio

& Stolzenberg, 2003; Pope & Snyder, 2003), the majority find that minorities, particularly when

comparing Blacks versus Whites, have a higher probability of arrest, controlling for several legal

and extralegal factors (Kochel, Wilson, & Mastrofski, 2011; Lytle, 2013).

In a recent meta-analysis of race and arrest, Kochel, Wilson, and Mastrofski (2011)

examined 27 separate data sets across 40 different published and unpublished studies. The

authors found statistically significant race effects in 23 of the 27 data sets, indicating that Blacks

were more likely to be arrested than Whites. However, the magnitude of the effect size varied by

data collection, with slightly higher average effect sizes for race when data were reported by

citizens or by victims (OR= 1.79) as oppose to independent researcher observations (OR=1.39)

or official police reports/referrals (OR= 1.36).

Another interesting finding was that the average effect size was notably higher when data were collected between the years of 1986-1995 (OR=1.66) as compared to earlier years 1966-1975 (OR=1.33), 1976-1985 (OR=1.25), as well as more recent years from 1996-2004 (OR=1.38). This may be partially reflective of shifts in criminal justice policy and social perceptions of crime. Regardless, race remained statistically significant. Even when controlling for a myriad of legal factors such as offense seriousness, prior record, availability of evidence, victim request for arrest, suspect influence of drugs or alcohol and relevant extralegal factors such as suspect demeanor and witnesses, Blacks were still on average more likely to be arrest than Whites (OR =1.38). The authors expressed the effect of the odds ratio as if the average probability of arrest for Whites is .20, then the average arrest probability for Blacks was .26. While a difference of .06 may not be particularly meaningful in all contexts, the authors concluded that while the average effect size was not large, it was still of practical concern for policing (Kochel, Wilson, & Mastrofski, 2011).

An unpublished dissertation by Lytle (2013) echoed similar results. Lytle's meta-analysis of 54 studies found that Blacks were 1.39 times more likely to be arrested compared to Whites while controlling for offense seriousness, suspect intoxication, evidence, suspect demeanor, officer characteristics, age, and sex- a nearly identical odds ratio to Kochel, Wilson, and Mastrofki (2011), perhaps due to considerable overlap in studies. While much of the focus in arrest has been on Black and White differences, recent research suggests that Hispanics often receive harsher criminal justice sentences than Whites (Demuth, 2003; Demuth & Steffensmeier, 2004) and in some cases, particularly involving drugs, even harsher sanctions than Blacks (Brennan & Spohn, 2008; Steffensmeier & Demuth, 2001). Thus, Hispanic ethnicity should be

considered in other criminal justice outcomes involving the influence of race. At present, there is relatively little research on Hispanic differences in arrest specifically. However, one study regarding misdemeanor arrests for marijuana possession in New York City between the years of 1980-2003 indicated that Blacks as well as Hispanics were more likely to be arrested for marijuana offenses compared to Whites (Golub, Johnson, & Dunlap, 2007). Lytle (2013) included Hispanics in his race analyses and indeed found that Hispanics, on average, were more likely to be arrested than non-Hispanics (1.25). While parceling out Black, White, and Hispanic differences in arrest is an underdeveloped area, it is an important direction for future research and thus, the current study will include these three groups in all analyses.

The Neighborhood and Socioeconomic Disadvantage

The poverty-crime connection is one of the oldest and most studied relationships in criminology. There is a wealth of evidence that at the macro-level, crime is concentrated in the most impoverished areas (Bursik & Webb, 1982; Krivo & Peterson, 1996; Shaw & McKay, 1942; 1969; Webster & Kingston, 2014; Wilson, 1987). Shaw and McKay's (1942;1969) social disorganization theory and decades of research in Chicago neighborhoods consistently indicated that crime was concentrated in poor, disorganized areas. Numerous criminological theories vouch for the importance of socioeconomic status and neighborhood disadvantage. Merton's (1938) anomie and strain theory capitalizes on economic strain and the gap between desires and legitimate means to obtain them. At the individual level, people feel strained from their lack of resources and respond in different ways, one of which results in criminal behavior. In this case, individuals may "innovate," meaning that they find other ways to obtain what they desire, perhaps by selling drugs, stealing, or writing bad checks. At the community level, crippling poverty and blocked opportunities leads the entire community to cast aside conventional norms

and values. This results in a state of anomie where norms lose the power to control behavior, fostering the spread of crime. While there were relatively few direct tests of the specifics of Merton's theory, a number of studies support the connection between blocked opportunities, poverty, and crime (Burton & Cullen, 1992; Agnew et al., 1996; Western & Pettit, 2010).

Indeed, one of the largest disparities in the criminal justice system is the high proportion of impoverished individuals arrested and incarcerated (Webster & Kingston, 2014; Western & Pettit, 2010). Reiman (1995) attributes this disparity to systematic discrimination against the poor, arguing that sentencing guidelines are lenient to white collar and property offenders and that the poor are unfairly targeted and penalized. Reiman's argument focused mainly on the sentencing and correction phases, highlighting the inability of the poor to provide adequate defense. This was echoed in Western and Pettit's (2010) article on social inequality and incarceration which cited the growing incarceration rate of the poor and uneducated. While it is true that the prison population is dominated by poor, uneducated men, few argue that there is a direct, causal link between poverty and crime. It is obvious that most impoverished people are decent, law-abiding citizens and thus, poverty alone is not enough to cause criminal behavior. Rather, the poverty-crime connection is a complex network of mediating factors such as family processes, negative peers, opportunities, and individual factors (Laub & Sampson, 2003; Webster & Kingston, 2014).

Scholars in community criminology recognize the impact of poverty not as direct but as part of the larger structural context affecting the organization, family structure, culture, cohesion, and ability of the community to create a system of informal social control necessary to deter crime (Bursik & Grasmick, 1993; Kornhauser, 1978; Sampson & Groves, 1989; Sampson, Raudenbush & Earls, 1997). Impoverished communities lack ties to the local police,

government, schools, religious institutions, employment opportunities, conventional role models, and to one another. Under these conditions, people may lack the initiative and/or the resources to effectively control crime (Anderson, 1999; Sampson, Raudenbush, & Earls, 1997; Sampson, 2006). Areas of extreme poverty, as described by Wilson (1987) are often wrought with high unemployment rates, disrupted family structures, overrun with gangs and criminal networks, and are isolated from mainstream society. The combination of isolation, poverty, and domination of criminal networks allows for the spread of criminal values and what many call the "ghetto culture." In these places, even law abiding people adhere to criminal codes (Anderson, 1999). For example, criminal activity like selling drugs may be overlooked as it provides revenue for families.

While many studies support a link between poverty and crime (Braithwaite, 1981; Bjerk, 2007; Krivo & Peterson, 1996; Hay & Forrest, 2009), it is important to note that several studies have also found nonexistent or weak effects between socioeconomic status and crime, especially when measured in terms of parental income (Dunaway et al., 2000; Tittle & Meier, 1990; Wikstrom & Butterworth, 2006; Wright et al., 1999). Admittedly, it is challenging to disentangle the effect that poverty has at both the individual and community level because it is entwined with numerous structural and social processes. Clear evidence of the poverty-crime relationship is difficult to come by because poverty is dynamic and may have reciprocal effects on crime (Sampson & Laub, 1993; Valdez et al., 2007; Webster & Kingston, 2014). Overall, there is evidence that poverty and neighborhood disadvantage plays a role in crime, but it is likely that the effect operates through other prominent factors such as disrupted family processes, school issues, deviant peers, and individual factors (Dunaway et al., 2000; Sampson & Laub, 1993; Valdez et al., 2007; Wright et al., 1999).

The Family

Perhaps no other institution has been as thoroughly studied and scrutinized as the family. Family issues have been linked to a multitude of pathologies including low self-control, substance use, poor school performance, relationship issues, and of course, criminal involvement (Farrington, 2011; Gottfredson & Hirschi, 1990; McCord, 1979; 2007). The family has been implicated in nearly all traditional criminological theories as the primary socialization agent in Sutherland's differential association theory, Akers's social learning theory, and Gottfredson and Hirschi's self-control theory, as an important external control in Hirschi's social bond theory and Sampson and Laub's age-graded theory, and as a potential source of strain in Agnew's general strain theory. Many assert that a good family has the power to counteract negative effects of poverty, neighborhood disadvantage, and negative peers through its ability to provide structure and control and its ability to effectively socialize and instill conventional values. This notion is illustrated in Elijah Anderson's account from *The Code of the Street*: "Although there are often forces in the community that can counteract the negative influences- by far the most powerful is a strong, loving, 'decent' family that is committed to middle class values" (Anderson, 1999). Clearly, there is ample support for the power of the family. The robust studies of the family have resulted in numerous social reforms and policies aimed at crime reduction through family intervention. Examples include family case management, family counseling and therapy, programming for young and new parents, and welfare and other financial forms of assistance to the family. Despite the assertion that family factors matter and the wide variety of social programs available to the family, effectiveness of these interventions is unclear, and some scholars have highlighted the limitations surrounding family research (Farrington & Welsh, 2002; Harris, 1998; Patterson, Crosby, & Vuchinich, 1992; Wright & Beaver, 2005).

The family is a broad network of factors and thus, some aspects of the family may be more influential than others. In general, there are four main categories of family factors: global, contextual, dispositional, and proximal (Dekovic, Janssens, & Van As, 2003). Global factors include family size, composition, and socioeconomic status. Family social disadvantage, a larger family size, and growing up in a single-parent versus a two-parent family have been liked to aggression, antisocial behavior, and early onset of delinquency (Doggett, 2010; Hetherington & Clingempeel, 1992; Gorman-Smith et al., 1996; Patterson, Crosby, & Vuchinich, 1992). Neighborhood disadvantage and poverty often have weaker, indirect effects, largely through their effects on parenting practices and other family dynamics (Farrington, 2011; Loeber et al., 1998; Pachter et al., 2006). For instance, Dodge, Pettit, and Bates (1994) found that the 50% of the effect of socioeconomic status on externalizing problem behaviors and aggression was accounted for by parental socialization. A low- income, single-parent household with several children likely provides less monitoring and supervision for the youth, and thus the socioeconomic status and family composition are related to delinquent behavior through their effect on the parent's ability to properly monitor and socialize his or her children. In a more recent study, Boutwell and Beaver (2010) analyzed the role of broken homes in the development of self-control among the Fragile Families data. The study asked parents questions regarding their health, mental status, behavior, personality tendencies, employment, home environment, and parenting practices. Prior to being matched on parental measures, results indicated that broken homes had a significant effect on the development of self- control and delinquency. However, after matching the data on maternal and paternal covariates, the association between a broken home and levels of self-control was no longer statistically significant, illustrating that parental characteristics and parenting practices were more influential than the structure of the

family itself.

Another important component of the family is contextual dynamics. Contextual dynamics capture the family as a system of relationships and refer to family processes such as marital discord, family cohesion, mutual support, family routines and activities. Studies have shown that poor marital relationships and marital conflict are related to increased antisocial behavior (Fincham, 1994; Fincham & Osborne, 1993). A meta-analysis by Buehler et al. (1997) concluded that parental conflict and violence was related to externalizing problem behavior and delinquency across parent and child reporting sources. A lack of family cohesion and a lack of emotional support and nurturance have also been associated with antisocial behavior (Delisi, 2003; McCord, 1979; Olsen, 1994). These contextual factors are also generally related indirectly, via their effects on other variables such parenting practices (Erel & Burman, 1995; Loeber et al., 1998). Another family dimension that operates similarly to contextual factors is dispositional factors. Dispositional factors refer to characteristics of parents such as criminal background, personality and temperament, depression, intelligence, and confidence. Parents with a criminal background and antisocial tendencies are more likely to produce criminal and antisocial children (Farrington, 2005; McCord, 2007; West & Farrington, 1973). There is evidence that maternal depression and anxiety is related to aggression and antisocial behavior (Koblinsky et al., 2006; Pachter et al., 2006; Shaw et al., 2009). For instance, Pachter et al. (2006) used the National Longitudinal Survey of Youth to examine how parenting, neighborhood effects, maternal depression and poverty affect child behavioral problems. Findings indicated that maternal depression had a significant effect on behavior, however it was largely indirect, through its effect on parenting practices. Thus, similar to the other family factors mentioned, parental characteristics often have important but indirect effects on behavioral outcomes (Dekovic,

Janssens, & Van As, 2003; Pachter et al., 2006; Shaw et al., 2009).

Of the family factors, proximal factors have arguably received the most attention and have the strongest effects on the development of behavior (Dekovic, Janssens, & Van As, 2003; Farrington, 2005; Glueck & Glueck, 1950; McCord, 2007). Proximal factors deal with parent-child relations and involve parental attachment and warmth, parental supervision and monitoring, parental disciplinary practices, parental involvement, and general parenting styles. Many scholars have noted the importance of secure attachment, finding that children who are not effectively attached to their parent(s) are more likely to exhibit violent and antisocial behaviors (Farrington, 2011; Kinnear, 1995; Rankin & Wells, 1990). Conversely, children who are securely attached and have a positive relationship with parents are more likely to be effectively socialized and are less likely to be involved with delinquent peers, substance abuse, and delinquency (Hirschi & Gottfredson, 2002; Kinnear, 1995; McCord, 1991; 2007; Rankin & Wells, 1990). The benefits of a positive parent-child relationship can carry into adulthood as Shroeder, Giordano, and Cernkovich (2010) found that adults with positive relationships with at least one parent were more likely to exhibit healthy, pro-social lifestyles. In contrast, those lacking a healthy relationship with parents were more likely to be depressed, involved with substance abuse, and have anger issues.

In addition to attachment, the other major parent-child dynamic is socialization. Effective parental socialization includes sufficient supervision and monitoring, recognition of problem behavior, and fair and consistent discipline (Gottfredson & Hirschi, 1990; Patterson, 1982). There have been several studies which support the importance of parental socialization. Overall, the two strongest socialization aspects that predict problem behavior are a lack of supervision and harsh and inconsistent punishment (Farrington, 2005, 2011; Loeber et al., 1998; Smith &

Stern, 1997; West & Farrington, 1973). A meta-analysis by Rothbaum and Weisz (1994) concluded that parental responsiveness, reasoning, reinforcement, and punishment were significantly related to externalizing problem behaviors in children. In a more recent study, Pratt, Turner, and Piquero (2004) tested the effects of parental socialization and adverse neighborhood effects on low self-control. Using data from the National Longitudinal Survey of Youth, questionnaires of caretakers and their parental styles, and the Behavioral Problem Index, their results confirmed that parental socialization, specifically parental supervision and discipline, had a stronger effect on self-control compared to adverse neighborhood conditions. A number of other studies have supported the link between effective parental socialization and self-control (Cullen et al., 2007; Gibbs, Giever, & Martin, 1998; Feldeman & Weinberger, 1994; Polakowski, 1994; Unnever, Cullen, & Pratt, 2003; White, Johnson, & Byeske, 2000). However, recent scholars have called attention to the limits of parenting and family factors (DeLisi & Vaughn, 2014; Harris,1998; Rowe, 2002; Wright & Beaver, 2005).

While family factors, especially parenting, are widely considered impactful in behavioral and personal development, some studies have noted weak and inconsistent effects across parenting dimensions. For example, Rankin and Wells (1990) found that parental punishment but not parental supervision were predictive of delinquent behavior. In contrast, Hay (2001) found that parental supervision was related to self-control but that parental discipline was not statistically significant. Wright and Beaver (2005) demonstrated methodological problems with parenting measures on self-control across models and across reporting sources. The authors used parent and teacher reports with two models, one standard linear regression and one mixed regression with a twin sample to control for cluster effects resulting from similarity between relatives. Overall, parent reports yielded more significant parenting effects than teacher reports.

Parent reports indicated that parental affection, withdrawal, and family rules were statistically significant (yet weak) predictors of self-control while teacher reports yielded significant effects only for parental withdrawal. Additionally, the linear regression models yielded more significant parenting effects than did the mixed models. Overall, effects were weak and inconsistent. Furthermore, studies employing genetic analyses often find little to no common environmental effect, indicating that genetic effects and non-shared environmental effects such as school, peers, and work environment exert stronger effects than family and parenting (Barnes & Boutwell, 2012; Beaver et al., 2008; Dunn& Plomin, 1990; Hopwood et al., 2011). Harris (1995, 1998, 2000) echoed this in her group socialization theory noting that parental influence is likely limited to the home environment. She asserted that children learn behavior specific to certain contexts and in certain relationships. As most people's lives are lived outside the home, behaviors learned in other contexts have more long-lasting effects, especially behaviors learned from peer groups (Harris, 1995, 1998).

Peer Influence

Another critical source of socialization comes from peer networks. In addition to Harris's (1995, 1998, 2000) group socialization theory, several criminological theories argue the importance of peers, namely differential association and social learning theory. The foundation of these theories is that behavior is learned in intimate groups through the processes of imitation and differential reinforcement (Akers, 1977, 1998; Sutherland, 1947). While parental socialization is important early in life, peers become increasingly important as children age and spend more time out of the home. It has been well established both theoretically and empirically that having delinquent friends is a predictor of delinquency (Akers & Sellers, 2004; Lipsey & Derzon, 1998; Hwang & Akers, 2006; Warr, 2001). Delinquent/ criminal peers are influential not

just in childhood and adolescence, but in adulthood as well. For example, Alarid et al. (2000) found that the number of criminal friends predicted violent, property, and drug crimes among a sample of adult men and women in a community corrections center. Similarly, Akers and LaGreca (1991) found that deviant peers predicted drinking patterns in elderly adults. A very recent study by Thomas (2015) indicated that the influence of peers extends to offense specialization. Specifically, participant reports of peer involvement with theft, violence, and substance use was related to self-reports of increased specialization in the same acts of deviance.

While the association between deviant peers and delinquency is well accepted and established, there are different explanations for this relationship. Differential association and social learning theory would argue that individuals learn values, motives, and behaviors from delinquent peers. Thus, a person becomes delinquent because antisocial behavior is learned from and reinforced by friends. In contrast, other perspectives such as self-control theory and biosocial perspectives would argue for homophily or self-selection, meaning that "birds of a feather flock together." Individuals with low self-control, high sensation-seeking, and impulsivity seek out others like themselves and self-select into deviant peer groups. The potential for delinquent behavior existed before the peer association, and therefore, the relationship between negative peers and delinquency is spurious with low self-control and other traits. The battle between social learning and social control theorists (Akers, 1996; Costello 1997; Hirschi, 1996; Kornhauser, 1978; Matsueda 1988, 1997) waged on for decades and produced multiple empirical tests of both perspectives. Overall, a meta-analysis by Pratt and Cullen (2000) and a more recent meta-analysis by Pratt et al. (2010) concluded that social learning theory and the importance of deviant peers stacks up well against other competing theories.

Many studies that have examined peer influence have used participant reports of

perceived peer deviance. While perceptions of peer deviance are relevant and meaningful (Akers, 2009), they are not always accurate depictions of actual peer deviance. Research has indicated that perceptions of peer deviance are often subject to projection bias where respondents inaccurately project their own levels of deviance on their peers (Rebellion & Modecki, 2014; Young et al., 2011). This was illustrated in a recent study by Young et al. (2014), which used a sample of students from the Netherlands ranging between 11-18 years-old to examine the relationship between participant deviance, perceptions of peer deviance, and actual peer deviance. Findings echoed previous studies, providing evidence that perceived perceptions of peer deviance are strongly tied to personal deviance but do not match up well with actual peer deviance. Thus, while it is clear that having deviant peers is tied to criminal involvement, the direction of the relationship and the specific mechanism by which deviant peers influence individual behavior is less clear. However, many modern scholars have abandoned the blank slate assumption and acknowledge that there is likely an element of self-selection into deviant peer groups, and these deviant peer groups then continue reinforcing delinquent behavior (Harris, 2000; Young et al., 2014).

Low IQ and Low school achievement

Along with deviant peer associations, low IQ and low school achievement have consistently been linked to negative behavioral and criminal outcomes (Beaver & Wright, 2011; Farrington, 2005; Gottfredson, 1985; Moffitt, 1993; Tremblay et al., 1992). Control and social bond theories would argue that commitment to and high achievement in school represents a stake in conformity and acts as a deterrent against criminal activity. People who do well in school and are invested in their education have future plans and thus, something to lose by engaging in deviance (Hirschi, 1969). In the many tests of social bond theory, commitment to school has

been one of the more consistent predictors of delinquent involvement (Cernkovich & Giordano, 1992; Gottfredson, 1985; Krohn & Massey, 1980). The link between low school achievement in terms of poor grades and conduct disorder has been found in a number of large longitudinal data sets such as the Pittsburgh Youth Study, Ontario Child Health Study, Cambridge Study, and New York State Study, and the Developmental Trends Study (Loeber et al., 1998; Velez, Johnson, & Cohen, 1989; Frick et al., 1991). Johnson, McGue, & Iacono (2005) used the Minnesota Twin studies to examine disruptive behavior in 11 year-old children and noted that poor academic achievement (low grades) was associated with disruptive behavior along with attention issues and low IQ.

Low IQ, especially low verbal IQ, has also been associated with delinquency among juveniles (Bartels et al., 2010; Farrington, 1992; 2005; Lynam, Moffitt, & Stouthamer-Loeber, 1993). Delinquents and children with behavioral disorders tend to perform better on nonverbal tests as they often struggle with abstract concepts and prefer physical, concrete tasks (Guay & Ouimet, 2005; Moffitt, 1993; Rogeness, 1994). Low IQ is also predictive of arrests and criminal involvement in adulthood (Bartels et al., 2010; Moffit et al., 1981; Stattin & Klackenberg-Larsson, 1993; West & Farrington, 1973). Stattin and Klackenberg-Larsson (1993) found that low IQ measured as early as 3 years of age predicted official records of offending through age 30. Furthermore, offenders with four or more offenses had an average IQ of 88, compared to the non-offender average of 101.   This link between low IQ and crime is also found at the aggregate levels. For example, using the National Longitudinal Study of Adolescent Health, Beaver and Wright (2011) noted statistically significant negative associations between county level IQ scores and county level property and violent crime rates regardless of race distribution and poverty rates. Similarly, Diamond, Morris, and Barnes (2012) revealed that both individual IQ

and prison pod level IQ was predictive of violent inmate incidents in state prison.

While some scholars have suggested that IQ is spuriously related to behavior through socioeconomic status, many studies have found that IQ remains a predictor of deviance above and beyond SES and measures of structural disadvantage (Beaver & Wright, 2011; Farrington, 1990; Moffitt et al., 1981; Moffitt& Silva, 1988). As noted in Wright and Beaver (2011), the negative county-level association between IQ and crime rates remained regardless of poverty rates. A recent study by Hanscombe et al. (2012) examined if genetic influences in intelligence varied by SES in a sample of 8716 twin pairs from the Twins Early Development Study. Measuring genetic effects in intelligence at various points from ages 2-14, findings revealed that while there was greater variation in intelligence in lower SES families, genetic influences were similar across SES levels.

Others have suggested that low IQ is related to offending through low school achievement. Students with low IQ struggle with abstract concepts, struggle to keep up with assignments, and perform poorly on tests. Some students may drop out, cutting off opportunities for legitimate and meaningful employment and potentially increasing time with delinquent peers, thereby creating greater incentives for criminal involvement (Farrington, 2005; Lynam, Moffitt, & Stouthamer-Loeber, 1993). Studies have noted that low IQ and low school achievement (poor grades, dropping out, repeating grades) are highly correlated and both predictive of criminal behavior (Farrington, 1992, 2005; Lynam, Moffitt, & Stouthamer-Loeber, 1993). However, disentangling the individual of IQ and school achievement effects remains a challenge.

Individual Factors

Another prominent set of risk factors involves individual characteristics such as personality, temperament, self-control, and genetic predispositions. While the study of individual

risk factors was shunned in criminology for decades following the Sutherland/Glueck debate,

scholars like E.O. Wilson, R.J. Herrnstein, Avshalom Caspi, Terrie Moffitt, Adriane Raine, Tony

Walsh, David Farrington, and several others have helped bring individual risk factors back to

criminological research. One of the most prominently studied individual traits is self-control.

Self-control refers to one's ability to regulate his or her emotions and actions. People with low

self-control are generally characterized as being impulsive, risk-seeking, insensitive to others,

unable to delay gratification, and they prefer physical over mental activities (Gottfredson &

Hirschi, 1990; Grasmick et al., 1993). Numerous studies have linked self-control to a host of

problem behaviors, substance use, delinquency, criminal involvement, and other negative life

outcomes (Pratt & Cullen, 2000). Another important risk factor is personality. Personality

aspects such as callousness, a lack of empathy and conscientiousness, and negative emotionality

can be identified very early in life and can predict criminal outcomes in adulthood (Caspi, 2000;

Johnson et al., 2014). Using a sample of very young children, Caspi (2000) found that

temperament measured at age 3, especially the under-controlled/impulsive type, predicted self-

reported aggression, delinquency, and convictions at 18-21 years of age in the Dunedin

Longitudinal Study. In a follow-up study with the same data, Caspi et al. (2003) found that

temperament and personality remained remarkably stable from 3 through 26 years of age. In a

recent study, Johnson et al. (2014) investigated the association between a personality diagnosis

in adolescence and involvement in crime during early adulthood. Findings indicated that

individuals with a diagnosed personality disorder, especially those with narcissistic, paranoid,

and passive-aggressive symptoms, were much more likely to commit violent crimes in early

adulthood. While some studies report change (Burt, Simons, & Simons, 2014; Na & Paternoster,

2012; Winfree et al., 2006), many other studies find relative stability in traits like self-control,

aggression, antisocial behavior, personality and temperament across time (Caspi & Silva, 1995; Hay & Forrest, 2006; Loeber, 1982; Vazsonyi & Huang, 2010).

Neurological deficits, neurotransmitter imbalances such as serotonin levels, dopamine receptors (DRD2, DAT1, DAT2), and certain genetic variants and polymorphisms (MAOA, 5HTTLPR, COMT) have also been linked to aggressive and antisocial personalities, conduct disorder, and criminal behavior (Beaver, 2009; Beaver & Wright, 2011; Caspi et al, 2003; Caspi et al., 2005). One of the most consistent findings is that the gene interaction between a low variant of the MAOA gene and maltreatment in childhood is associated with antisocial behavior (Caspi et al., 2002; Foley et al., 2004; Kim-Cohen et al., 2006). In sum, low self-control aggression, impulsivity, negative emotionality, antisocial personality, neurological deficits, chemical imbalances, and genetic variants are all potential risk factors for antisocial and criminal behavior, especially when combined with environmental stressors (Beaver, 2009; Wright, Tibbetts, & Daigle, 2014). While this body of research has gained attention and support, unfortunately measures of personality, temperament, aggression, and genetic markers are scarce and are not available in many large, longitudinal data sets. This is true of the 1997 base wave of the *NLSY97*, and thus, no measures of self-control, personality, or any genetic contributions will be investigated in the current study.

While genetic and direct personality measures were not available in the base wave of the *NLSY97*, there were questions from Achenbach's (1981) Behavioral Checklist measuring problem behavior for the younger cohort, and there were questions measuring negative life expectations for the older cohort. The measure from the Behavioral Checklist was intended to act as a proxy for emotional and dispositional characteristics, tapping into depression, anxiety, getting along with peers, and lying and cheating. Achenbach and Edelbrock's (1981) Behavioral

Problem Checklist has been used by numerous studies capturing dispositional and behavioral issues in individuals across different ages (Achenbach, McConaughy, & Howell, 1987; Broidy et al., 2003; Stoolmiller, 1994) and was used as a measure of personality. For the older cohort, the negative expectations scale asks questions regarding the probability of becoming pregnant, being arrested, going to jail, and death. While not a direct measure of personality, beliefs and expectations can often affect and are often products of innate disposition, attitudes, and self-esteem (Greenberg, 1981; Tomaka & Blascovich, 1994; Swann Jr. et al., 2007) which are important aspects of personality.

Problem Behavior

Substance Abuse.

Substance use is a major health concern in the United States, and its connection to crime has been studied for decades (D'Amico et al., 2008; Mukku et al., 2012; Slade et al., 2008; Sussman, Skara,& Ames, 2008). In the criminological literature, substance use has been theoretically connected to crime in three main ways. One theoretical connection is that substance use is indirectly related to crime, meaning that both drug use and crime are caused by another common variable(s) such as poverty, deviant peers, or individual traits. For example, social learning scholars may claim that substance abuse is related to crime through exposure to delinquent peers, which is responsible for both substance use and criminal behavior. Another explanation is that substance abuse is associated with crime but is not causal. Rather, it is spurious and is intertwined with numerous problem behaviors. This has most commonly been discussed in terms of the criminal subculture with differential norms geared towards violence, drugs/partying, and respect or as part of the larger "criminal lifestyle," similarly focused on partying, materials, and power, which drugs help obtain (Anderson, 1999; Bennett, Holloway, &

Farrington, 2008; White & Gorman, 2000). However, some argue that the relationship between substance use and crime/delinquency is indeed causal, either that drugs directly cause crime, or involvement in crime directly causes drug use (Ford, 2005; Goldstein, 1985; Goode, 1997; Slade et al., 2008). While there are numerous studies examining the substance use-crime connection, most have not been direct tests of these theoretical perspectives but rather have focused on the strength and direction of the relationship between either the onset of substance use or the type and degree of substance use and criminal outcomes.

One of the most prominent perspectives is that substance use directly causes crime because people become dependent and "enslaved" by their substance use and need money to support their habit (Bennett, Holloway, & Farrington, 2008; Goldstein, 1985). People are desperate and will engage in shoplifting, burglary, or robbery to obtain money to purchase their drug(s) of choice. Thus, crime is an economic necessity for drug users. Another causal perspective is that substance use causes psychological and cognitive problems where individuals suffer from judgement impairment and lose their ability to think rationally, thus increasing the likelihood of criminal involvement (Goode, 1997; Sussman, Skara, & Ames, 2008). A number of studies have supported the link between substance use and subsequent delinquency and criminal behavior (Bennett, Holloway, & Farrington, 2008; Ford, 2005; Ellickson & McGuigan, 2000; Loeber & Farrington, 2000). For instance, Ford (2005) found that prior marijuana use predicted delinquency but that prior delinquency did not predict subsequent marijuana use in a high school sample. Ford (2005) proposed that this link operated through the weakening of social bonds, leading to delinquency. Ellickson and McGuigan (2000) found a similar unidirectional relationship but attributed the link to contextual effects via increased exposure to deviant peers.

The association between substance use and deviance has also been supported in the

reverse temporal order, meaning that studies have found that delinquency causes substance use (Bui et al., 2000; Mason et al., 2007; Menard, Mihalic, & Huizinga, 2001). For example, in a study of high school-aged adolescents, Bui et al. (2000) found that delinquency in 10th grade was associated with increased drug use in 12th grade, but that drug use in 10th grade was not associated with increased problem behavior in 12th grade. Mason et al. (2007) found an association between delinquency at age 11 and alcohol use at age 16, and similarly, van den Bree and Pickworth (2005) found that delinquency in middle school predicted both the initiation and progression of marijuana use.

Given the bidirectional nature of substance use and deviance, many studies acknowledge that the relationship between substance use and delinquency/crime is reciprocal (D'Amico et al., 2008; Dembo et al., 2002; Huang et al., 2001). Research on reciprocal effects has been sparse and has yielded mixed results. Huang et al. (2001) examined the association between alcohol and aggression in a group of fifth graders followed through age 18 and only found reciprocal effects between ages 16-18 years-old. Mason and Windle (2002) found reciprocal effects between substance abuse and delinquency over a 2-year time period but only for males. The best support for reciprocal effects comes from D'Amico et al. (2008) which used path modeling to examine a sample of 13-17 year-old at-risk youth from the Los Angeles juvenile probation system. Substance abuse, including alcohol, marijuana, and hard drug use, was examined along with a delinquency scale and interpersonal, property, and drug-related crimes. Substance abuse and delinquency had consistent positive effects across all three crime types at the 3-month, 6-month, and 12-month follow-ups. In a fourth model which included a latent delinquency model, results indicated that there were stable reciprocal effects between substance abuse and delinquency across time. Overall, the direction between the relationship of substance use and crime remains

unclear and requires further investigation.

Another set of studies from substance use literature has focused on types of drugs and their unique effects of crime. Bennett, Holloway, and Farrington (2008) conducted one of the only meta-analyses of substance use and crime. The authors focused on studies which examined at least one drug and one crime outcome and which used either offender-based, drug user-based, or general population samples. The final analysis included 30 studies spanning from 1980s through 2000s, most of which examined crack, cocaine, and heroine, and a few which examined marijuana and methamphetamine use. Overall, 19 of the 30 studies had a significant effect sizes for the relationship between drug use and crime indicating that on average, drug users were 2.8 to 3.8 times more likely than non-drug users to be involved with crime. Effect sizes were greatest for crack users who were on average six times more likely to have committed a crime and lowest for marijuana users who were on average 1.5 times more likely to have committed a crime. Drug use as a whole was related to all types of crimes ranging from theft and other property crimes to robbery, prostitution, as well as arrest and incarceration outcomes. Effect sizes were highest for property crimes and shoplifting, and in nine studies were higher for males than females. The authors concluded that drug use is positively related to involvement in a variety of crimes, however more research is needed to make conclusive statements regarding differential effects across, age, sex, and drug type (Bennett, Holloway, & Farrington, 2008).

The last major aspect of substance use and crime is onset. The age of onset of substance use is one of the most commonly cited factors negatively associated with criminal involvement (Gordon, Kinlock, & Batjess, 2004; Slade et al., 2008; Thornberry, Huizinga, & Loeber, 1995). Early onset of substance abuse is related to a variety of negative life outcomes including chemical dependence, use of illegal hard drugs, issues with employment, relationships, and

criminal involvement (Elliot, 1994; Mukku et al., 2012). Some research has observed a pattern of substance use progression where adolescents may begin substance use with drugs like caffeine (Collins et al., 1997) or more commonly, they begin experimenting with alcohol and tobacco and then move to marijuana (Gordon, Kinlock, & Battjess, 2004; Kandel, Yamaguchi, & Chen 1992; Sussman, Skara, & Ames, 2008). Alcohol, tobacco, and especially marijuana are often seen as "gateway drugs," leading to more serious drug use. Interestingly, Graham, Marks, and Hansen. (1991) noted that early use of both alcohol and tobacco but not alcohol alone was associated with progression to harder drugs and that tobacco use alone in seventh grade accelerated substance use progression more than any other combination. It is unclear what accounts for these patterns, but accessibility, cost, and perception of safety/low-risk may partially explain initial use of alcohol and tobacco (Grant & Dawson, 1998; Sussman, Skara, & Ames, 2008).

Early onset of substance abuse seems to operate similarly to early onset of problem behavior, and many studies have found that those who begin substance use early also engage in delinquency at younger ages (Chaiken & Chaiken, 1990; Thornberry, Huizinga, & Loeber, 1995). These offenders are most likely to continue offending even during periods of non-addiction (Inciardi et al., 1993; Kinlock, O'Grady, & Hanlon, 2003). Research indicates that the comorbidity of early substance use and delinquency are particularly predictive of chronic, serious offending. For instance, using a sample of high risk predominantly African American males, Slade et al. (2008) found that a substance use disorder at any time point was related to increased arrests and convictions. However, those males with a diagnosed substance abuse disorder by the age of 16 were nearly four times as likely to be incarcerated than those with later onset.   Griffin, Bang, and Botvin (2010) examined marijuana and alcohol use onset in a sample of over 600 7th-12th grade students and their life outcomes at age 24. Findings revealed that both

onset of alcohol and onset of marijuana use before high school was associated with increased habitual substance use as well as occupational, relationship, and legal problems. The severe consequences of early substance use may be due, in part, to the fact that child and adolescent brains are still developing. Therefore, substance use may interfere with the development of critical brain structures in the prefrontal cortex which can impair executive functioning and impulse control, leading to poor decision making and criminal involvement (Chambers et al., 2003; Cunningham, 2004; Hyman, 2005).

Among studies of high risk and incarcerated populations, the combination of early onset of substance use and crime is strongly predictive of chronic violent offending (Chalub & Telles, 2006; Elliot, 1994; Gordon, Kinlock, & Battjess, 2004; Mukku et al., 2012). Using a sample of 194 youth between 14-18 years-old from five Baltimore County outpatient substance abuse clinics, Gordon, Kinlock, and Battjess (2004) found that 80% of their sample had reported at least one arrest and nearly all had reported aggressive behavior in terms of threatening to hurt someone and using physical force. Their regression analyses also indicated that earlier onset of substance use was related to the use of harder drugs, more aggressive behavior, more delinquency, greater crime severity (violent), and more lifetime arrests. However, effects of early use may vary by drug type as Green et al. (2010) found that marijuana use was related to drug and property offenses but not violent crime. While the direction of substance abuse and delinquency may not be clear and the effects of different drugs may vary across persons, it is evident that early onset of substance use is predictive of early onset of delinquency, a combination which often results in numerous arrest, conviction, and incarceration outcomes (Gordon, Kinlock, & Battjess, 2004; Mukku et al., 2012; Slade et al., 2008).

Delinquency.

As previously noted, one of the strongest predictors of criminal behavior is prior deviance, and the earlier the onset of delinquency, the more likely it is to continue and progress in frequency and severity (Nagin & Paternoster, 2000; Piquero, Farrington, & Blumstein, 2007). In most criminological research, delinquency is treated almost exclusively as the dependent variable. As such, relatively little attention has been paid to the potential negative effects of delinquency on later life outcomes (Makarios, 2009; Makarios, Cullen, & Piquero, 2015). The life-course/developmental perspective acknowledges the role of early problem behaviors and the negative effects it can have on several social domains across multiple life stages (Sampson & Laub, 2003; Moffitt et al., 1993; Loeber et al., 2013). A dissertation by Makarios (2009) and a recent publication by Makarios, Cullen, and Piquero (2015) addressed this gap in the literature using the *NLSY97* to examine effects of delinquency on educational, occupational, and social outcomes. Findings revealed that delinquency during adolescence consistently predicted problems with school, employment, welfare and personal behavior such as risky sexual activity, net of other factors such as parenting and deviant peers. Thus, it is important to understand the complex reciprocal effects of delinquency across the life-course (Krohn & Thornberry, 2005; Makarios, Cullen, & Piquero, 2015).

Evidence suggests that problem behavior emerges early in life and can be observed as early as three years-old (Caspi, 2000; Caspi et al., 2003; Johnson et al., 2014). Early behavioral issues often follow a pattern, manifesting first as oppositional defiant disorder in young children, progressing to conduct disorder in childhood and adolescence, and then exhibiting antisocial personality disorder in adulthood (Farrington, 2005; Fergusson. Horwood, & Lynskey, 1995). While some children with conduct disorders and behavioral issues do not become antisocial adults, antisocial behavior in adulthood nearly requires antisocial behavior in childhood (Loeber,

1982; Loeber et al., 2013; Robins, 1978). Antisocial behavior and analogous traits such as low self-control, impulsivity, risk-taking, and aggression often remain relatively stable, meaning that while behavior may fluctuate, one's rank order among peers remains the same (Kokko & Pulkkinnen, 2000; Hay & Forrest, 2006; Hopwood et al., 2011; Vaske et al., 2012; Vazsonyi & Huang, 2010; Wright, Beaver, & Gibson, 2010). Many times, these behaviors exhibit heterotypic continuity, meaning that different age-graded behaviors may manifest over time but are reflective of the same underlying stable trait. For instance, Kokko and Pulkkinnen (2000) found that aggression and deviant behavior at 8 years-old predicted unemployment, drinking, and other social problems at 27 years of age. Thus, what may be biting and crying as a toddler may become fighting, theft, and substance use in childhood and adolescence, and evolve into serious criminal behavior in adulthood.

There is also evidence for homotypic continuity, or stability in the same trait or behavior. Many studies indicate relative stability in self-control in childhood and adolescence. For instance, Vazsonyi and Huang (2010) examined self-control from children 4-5 years-old through ages 10-11 years-old, and found that stability coefficients for self-control ranged from 0.63 to 0.83, indicating moderate to strong relative stability. In a sample of older children from ages 7-15 years-old, Hay and Forrest (2006) also examined the stability of self-control and found high levels of relative stability in 84% of the sample with only a small group of respondents experiencing significant change. Similarly, Higgins et. al. (2009) found relative stability across a six year period (r=.48-.71) in a sample of adolescents 12-16 years of age. Relative stability has also been observed in behaviors analogous to self-control. Vaske et al. (2012) examined trajectories of risk-seeking behavior in a representative sample of individuals aged 14-23 years old across three 2-year time intervals. Results indicated three separate trajectories of risk-taking

behavior, all exhibiting strong relative stability. Additionally, the high and moderate risk-taking classes exhibited absolute stability, with no statistically significant change over time. While some studies suggest that behavior is more dynamic and exhibits significant change across time (Burt, Sweeten, & Simons, 2014; Na & Paternoster, 2012; Winfree et al., 2006), there is overall good support that problem behaviors exhibit considerable continuity across the life-course.

Given the common stability in deviant behavior, it should not be surprising that delinquency at any age predicts arrest outcomes. Even for those individuals arrested who have no history of problem behavior in childhood or adolescence, it is likely his or her deviant behavior which generated the arrest. Many criminological perspectives advocate for risk factors discussed such as poverty, family factors, and deviant peers without recognition that despite the presence of these risk factors, it is deviant behavior which causes arrest. This is evidenced in a wealth of literature on police officers' decisions to arrest which on the whole indicate that while race, sex, and a handful of other extralegal factors may retain statistical significance, it is the current offense which most consistently and strongly predicts arrest (D'Alessio & Stozenberg, 2003; Kochel, Wilson, & Mastrofski, 2011; Lundman, 1974; Lytle, 2013; Pope & Snyder, 2003; Smith & Visher, 1981) often followed by other legal and behavioral factors.

Net of other predictors, problem behavior is what elicits negative outcomes like arrest, conviction, and incarceration. It is important to consider that the family, deviant peers, poverty, or substance abuse may be spurious with or even products of bad behavior (Makarios, Cullen & Piquero, 2015; Piquero, Farrington, & Blumstein, 2007; Loeber et al., 2013). Failure to acknowledge the importance of delinquency and problem behavior at any stage of the life-course can lead to theoretical misspecification, inaccurate portrayal of the criminal justice system, and ill-conceived policies. Thus, it is the goal of the current research to assess the empirical reality of

prominent criminological risk factors.

The Current Study

While criminological paradigms have changed over time, studies of the age-crime curve, the criminal career, and continuity/change in crime have highlighted the need to study behavior longitudinally, examining childhood through adulthood. Given the acknowledgment of the importance of both static and dynamic factors, there have been a host of empirical studies employing trajectory analyses on a variety of samples and across a variety of outcomes. Still, results are inconclusive. While most research indicates that there is meaningful heterogeneity in offending, it remains unclear whether distinct offending patterns can be predicted from childhood and adolescent risk factors. These questions remain critical issues in criminology because of the importance of identification and prediction of high-level, chronic offenders.

Overall, findings regarding predictors of criminal involvement are inconsistent. Decades of criminological theorizing and tests of competing perspectives have provided greater theoretical specification, large bodies of empirical research, and methodological advancements, yet the question still remains: What explains differences in criminal involvement? Traditional criminological perspectives place the blame largely on factors external to the individual such as the structural environment, family processes, and negative peer groups. In contrast, more modern perspectives have focused on enduring individual traits such as self-control, temperament, intelligence. Because frequent, stable offenders are responsible for a large proportion of crime, they are an important target for intervention. Thus, understanding if the etiology of chronic offenders indeed differs from general offenders is a vital point for criminological theory, for criminal justice policy, and for identification and intervention in the home, in the school, and in

correctional facilities.

This research intends to use the *NLSY97* to test competing bodies of criminological risk factors including poverty, family, peers, school achievement, substance use, and prior delinquency and their ability to predict criminal involvement from adolescence through adulthood across race and sex. Taking a life-course/developmental approach, latent class growth analyses will be used to identify distinct trajectories in arrest probability. Latent class regressions will then examine the extent to which the various risk factors predict class membership in arrest probability. While general risk predictive instruments proponents suggest that risk variables and demographics operate uniformly across race and sex, other scholars argue the need for gender-specific and race/ethnicity-specific risk assessment (Belknap & Holsinger, 2006; Daly, 1992; Van Voorhis, 2005). In order to examine potential differences in arrest probability patterns and risk prediction, these analyses will be estimated separately across race (Whites, Hispanics, and Blacks) and across sex. This research will attempt to address the following questions:

1. To what extent is there heterogeneity in arrest probability patterns over time?

2. How many unique trajectories of arrest probability exist in the full sample? In males? In females? In Whites? In Hispanics? In Blacks?

3. What kinds of groups of arrest probability patterns exist? Is there an abstainer group? An adolescent-limited group? A late-onset group? A chronic offender group?

4. To what extent do race and sex predict group membership?

5. To what extent do measures of poverty, family factors, negative peers, poor school achievement, negative expectations and problem behaviors, substance use, and prior delinquency predict group membership?

6. Which risk variables are the best predictors, and are these risk variables the same across

race and sex? What are the differences in arrest probability patterns and predictors of

group membership across race and sex?

CHAPTER 2

METHODS

The current study examines competing bodies of risk factors to see which best predict criminal involvement, measured in terms of arrest probability, across time. The criminological literature is chalk full of theories and perspectives advocating for the importance of various risk factors, such as dysfunctional families, negative peers, problems in school, substance use, and delinquent behavior. The broad definition of what constitutes a risk factor necessarily means that potentially thousands of variables can be classified as risk factors. All that is required is that the presence of the factor is associated with a probabilistic increase in arrest.

Risk factors should not be thought of as "causal" since temporal ordering cannot always be established. Risk factors may occur after the onset of arrest and they likely have reciprocal and interactive effects (Krohn & Thornberry, 2005; Thornberry, 1987). For example, substance use may lead to an arrest or, conversely, substance abuse may be the product of an arrest. Alcohol and/or drug addiction may lead a person to commit property crime to obtain his or her drug of choice, leading to an arrest, or a person may turn to drugs and/or alcohol after an arrest due to exposure to negative peers of a need to cope with negative life circumstances. Nonetheless, it is important to note that this research project is not focused on establishing causal connections but is designed to test the predictive power of bodies of risk factors identified in the literature as associated with arrest profiles over time.

Taking a life-course and developmental approach, trajectory analyses will be used on data from the National Longitudinal Study of Youth 97 to identify latent class membership in arrest

probabilities across a 15-year time span, beginning when participants were between the ages of 12-17 years-old in 1997 and ending when they were between 27-32 years-old in 2011. Once the latent classes have been detected and empirically assessed, the analysis will move to testing the predictive capacity of risk variables on membership in the latent classes. Self-reported sex, race, household poverty, school achievement, family factors, negative peers, negative attitudes, substance use, delinquency, and a composite risk scale combining all of these factors from 1997 will be regressed on latent class membership. The results of the analysis will shed light into which body of risk factors are more, or less, strongly associated with group membership and arrest probability over time.

Based on the previous literature review, I identified ten hypotheses related to the latent class structure expected in these data and the association of several independent variables with arrest profiles. These hypotheses are enumerated below:

1. Consistent with the findings of Piquero's (2008) review of trajectory studies, longitudinal arrest profiles will be heterogeneous, resulting in three to five distinct latent classes in arrest probability. Specifically, it is expected that

    a. At minimum, there will be a very low probability /non- arrested class and a stable mid-high level arrest probability class.

    b. There will fewer latent classes identified for females than males.

    c. There will be the same number of latent classes across race.

2. While there are some mixed findings (Pratt, 1998; Visher, 1981), it is expected that there will be a statistically significant relationship between race, sex, and latent class membership, consistent with Daly and Bordt (1995), and the meta-analyses from Kochel, Wilson, and Mastrofski (2011), and Lytle (2013). Specifically, it is expected that

a. Males more likely to be placed in the higher arrest probability class than females (Daly & Bordt, 1995; Visher, 1981).

b. Minorities will be more likely to be placed in the higher arrest probability class than Whites (Kochel, Wilson, & Mastrofski, 2011; Lytle, 2013).

3. Consistent with Agnew (1992), Bjerk (2007), and a review by Webster and Pettit (2014), there will be a statistically significant yet weak relationship between poverty and arrest probability. Specifically, participants from more impoverished households will be more likely to be placed in the higher arrest probability class. However, the strength of this relationship is likely to diminish once other variables, such as family factors, are added to the model (Dunaway et al., 2000; Wright et al., 1999).

4. Consistent with Farrington's (2005, 2011) reviews of family factors, there will be a statistically significant relationship between family factors and arrest probability. Specifically, fewer family routines and activities and more family risk/dysfunction are expected to be related to placement in the class with higher arrest probability. This relationship should hold across sex and race.

5. Consistent with Akers (1977), Pratt et al. (2010), Sutherland (1947), and Thomas (2015) there will be a statistically significant relationship between negative peers and arrest probability. Specifically, participants reporting higher proportions of negative peers will more likely be placed in the class with a higher arrest probability. This relationship should hold across sex and race.

6. Consistent with Hirschi (1969), Johnson, McGue, and Iacono (2005), Moffitt (1993), there will be statistically significant relationships between school achievement and arrest probability. Specifically, lower achievement in school is expected to be related to

placement in the class with highest arrest probability. This relationship should hold across sex and race.

7. Consistent with Caspi (2000), Caspi et al., (2003), and Johnson et al. (2014), there a will be a statistically significant relationship between problem behavior and negative attitudes (Greenberg, 1981; Tomaka & Blascovich, 1994; Swann Jr. et al., 2007) and arrest probability. Specifically, a higher degree of problem behavior and a higher degree of negative attitudes is expected to be related to placement in the class with higher arrest probability. This relationship should hold across sex and race.

8. Consistent with Griffin, Bang, and Botvin (2010) Slade et al. (2008), Sussman, Skara, and Ames (2008), and Mukku et al. (2012), there will be a statistically significant relationship between substance use and arrest probability. Specifically, a higher degree of substance use is expected to be related to placement in the class with higher arrest probability. This relationship should hold across sex and race.

9. Consistent with reviews by Piquero, Farrington, and Blumstein (2007) and Loeber et al. (2013), there will be statistically significant relationship between delinquency and arrest probability. Specifically, a higher degree of delinquency is expected to be related to placement in the class with higher arrest probability. This relationship should hold across sex and race.

10. Consistent with Andrews and Bonta (2010) and Farrington (2005), the aforementioned risk factors are inter-related, and there will be a statistically significant relationship between the combined risk scale and arrest probability. Specifically, a higher combined risk score is expected to be related to placement in the class with higher arrest probability. The

combined risk scale should have the strongest relationship, with arrest probability. This relationship should hold across sex and race.

The Sample

Data for this study were collected as part of the "National Longitudinal Surveys," a set of longitudinal data sets sponsored by the United States Department of Labor and the Bureau of Labor Statistics. Data were collected for the purpose of investigating the labor market and life experiences of various groups of men and women in the United States. The National Longitudinal Surveys have been used by a wide variety of economists, health researchers, sociologists, and criminologists over time to examine a myriad of social processes and experiences. The first surveys began in 1966 with the National Longitudinal Survey of Young Men and Older Men (discontinued in 1981) and in 1967 with the National Longitudinal Survey of Young Women and Mature Women (discontinued in 1983). One of the largest and most well-known surveys of the set was the National longitudinal Survey of Youth 1979 (*NLSY79)*, a large national sample of participants who were 14-22 years-old at the start of the survey in 1979. There was also a follow-up of the biological children of the 1979 cohort in 1986 called the *NLSY79* Children and Young Adults.

The current study used the most recent dataset collected separately in 1997. The National Longitudinal Survey of Youth 1997 (*NLSY97*) followed nearly 9000 children born between the years of 1980-1984 who were between 12-17 years-old at the first wave of data collection (Moore et al, 2000). All youth between the ages of 12-16 by December 31, 1996 and residing in a non-institutional housing unit within the 50 states were eligible for selection. Homeless youths and youths residing in institutions that could not be linked to a parent or caregiver's household

were excluded. However, youths that were in boarding schools, college dormitories, jails, prisons, or other detention facilities were included in the sample if a parent or guardian was identifiable and was linked to an eligible housing unit. Thus, all non-institutional housing units in the United States and all youth between the ages of 12-16 years-old by December 31, 1996 were eligible and had a known nonzero probability of selection.

Two probability samples were drawn for the *NLSY97*. The first sample was a cross-sectional sample representative of the population. The second sample was a supplemental sample excluding non-Blacks and non-Hispanics drawn in order to reach target proportions for Blacks and Hispanics. The samples were selected in two phases. The first stage of the probability sampling included approximately 90,000 housing units drawn randomly across all 50 United States. There were three phases within this stage. First, 100 primary sampling units (PSUs) which included metropolitan areas or counties with at least 2000 housing units (based on 1990 Census data) were systematically sampled from across the United States. The next phase was the selection of segments, defined as one or more neighboring blocks within each PSU that consisted of at least 75 housing units, based on 1990 Census data. In total, 1151 segments within the 100 PSUs were systematically sampled, with 9-10 in the smaller PSUs and up to 80 in the largest. Map software was produced to examine the selected segments and identify eligible housing units for field researchers to investigate. Housing units were then selected using systematic sampling.

Next, field researchers determined if the housing units were occupied using the 1993 Current Population Survey and direct observation. Once occupied units were identified, field researchers attempted to gain cooperation from an adult in the home, and a brief paper screening interview was administered to determine if there were any eligible youths in the housing unit. If a youth between 12-16 years-old lived in the housing unit, a second brief screening interview

was given to gather demographic information including age, race, sex, and grade of the youth (s). For the cross-sectional, representative sample, all eligible youths were included. In the supplemental sample, all non-Black and non-Hispanic youths were excluded. The cross sectional and supplemental sampling processed were nearly identical, differing only in the selection of PSUs. For the supplemental sample, PSUs included single counties only (at least 2000 housing units) with higher minority populations rather than including county clusters of metropolitan areas. The rest of the sampling process was the same as that previously described for the cross-sectional sample.

Sample weights were used in order to compensate for selection probabilities, participation rates, and to reduce potential nonresponse bias. Sample weights were constructed in six main steps including the calculation of household selection probability, adjustment for screener nonresponse, adjustment for subsampling of youths within screened households, construction of a combination weight for the cross sectional and supplemental sample, adjustment for interview nonresponse, and finally, post-stratification of the non-response adjusted weights (Moore et al., 2000). The data collection efforts resulted in 9808 eligible youths selected across all 50 United States from both the cross-sectional and supplemental samples, of which, 8984 completed the initial interview (Moore et al., 2000). While the sample is large, it was smaller than originally expected in that the investigators estimated that there were 4000 fewer eligible youths identified than expected. Field researchers attributed this to the non-reporting of eligible youths in housing units. However, the nonresponse did not appear to result in any specific bias regarding age, race, or sex of the participants (Moore et al., 2000).

The initial 1997 baseline interview involved a one hour-long interview from a trained field researcher of the youth and a separate interview of one parent conducted at the participant's

residence. Youths also completed a self-administered computer guided survey focused on more sensitive subject matter such as their parent's behavior, their peers, and their delinquent behavior. Research indicates that computer-assisted interviewing techniques often elicit more honesty and reporting than face-to-face interviews, especially when reporting stigmatized behaviors such as using drugs, risky sexual behavior, and criminality (Ghanem et al., 2005; Kurth et al., 2004; Metzger et al., 2000). At the end of each interview, participants were asked to provide the name and phone numbers of contacts should they relocate before the next interview. After the first wave, mail requests and phone calls were made to locate participants. Follow-up interviews of youths were conducted annually until 2011. Regarding follow-up, the most common reasons for non-interviews were refusals followed by the inability to locate a participant. The only slight bias noted was that it was harder to collect information from higher socio-economic status PSUs. The researchers note that this is not necessarily indicative of bias at the individual household level but rather at the larger PSU level only. Overall, there did not appear to be any evidence of substantive bias in the *NLSY97* (Moore et al., 2000).

The goal of this particular data collection effort was to document the transition from school to work and from adolescence into adulthood with particular focus on labor market activity, educational experiences, and family. Data were collected on a wide range of demographic, economic, neighborhood, educational, family, behavioral, and individual factors, including criminal justice outcomes. The majority of information, however, comes from youth self-reports, and some comes from parental reports and interviewer observations. All variables of interest for this study came from youth self-reports with the exception of one variable which involved observation from trained interviewers.

The analytic sample contains all youth 12-16 years-old at the base wave in 1997.

However, in any longitudinal study it is important to recognize that human development is highly age-graded. Measuring drug use of 8 year olds therefore makes little sense, but measuring drug use of 16 year olds does. Even in this sample there are important developmental differences between 12 year-olds and 16 year-olds. Recognizing these developmental differences, methodologists employed measures that were age-graded.   Given the age-graded nature of human development (Farrington, 2005; Laub & Sampson, 1993, 2001; Piquero, Farrington, & Blumstein, 2003; Sampson & Laub, 2005), I elected to split the sample in two by dividing the sample by birth cohort. Participants who were born in 1980-1981 and were thus 15-17 at the initial wave were treated as one older sample while participants born between 1982-1984 and were 12-14 at the initial wave were treated as a separate younger sample. The split generally reflects one younger set of participants in junior high school and one older set of participants who are in high school-- two distinct developmental and social time periods. Another important reason for this split involved the availability of independent measures by age, which will be addressed in the measures section. Among the age-graded measures, most used 14 years of age as the cut-off point. While there may be some overlap with those participants who are 14 years-old, this appeared to be the most logical way to split the birth cohorts.

While the younger cohort had a slightly lower poverty ratio (276.15 v. 294.09) the samples were statistically similar on key demographic variables with a nearly even split between males and females (48.4-49.5% female, 50.5-52.5% male) and a majority of White participants (52.1-52.5%), followed by Black (25.9-26.8%) and Hispanic participants (21.1-21.7%). The samples were also similar on arrest outcomes with 33-34% having been arrested at least once. However, the older cohort scored higher on incarceration with 9% having been incarcerated at least once (versus 7% for the younger cohort) as well as key risk factors including delinquency

(1.15= younger, 1.61= older), substance use (.75= younger, 1.43= older), and especially negative

peers (9.58= younger, 13.35=older). As these measures were taken at the base wave in 1997,

this is not surprising given the age differences between the older (mean= 15.5 years) and younger

cohorts (mean= 13 years) and further illustrates why the samples were analyzed separately.

Table 2.1 shows the descriptive statistics for the younger sample and Table 2.2 shows the

descriptive statistics for the older sample. Table 2.3 provides difference of means tests for the ten

variables that the samples had in common. As noted, there are no statistically significant

differences on race, sex, or arrest outcomes, but the older cohort was slightly less impoverished

and reported higher involvement with incarceration, negative peers, substance use, and

delinquency on average.

Table 2.1 Demographic and Risk Variable Descriptives for Younger Sample N= 5378

	Mean	S.D.	Proportions
Age in years (1997)	13.00	.82	
Race (0= White, 1=Hispanic, 2= Black)	1.73	.85	52.5% (W) 21.7%(H) 25.9% (B)
Sex (0=Female)	.52	.50	48.4% (F) 51.6% (M)
Poverty Ratio	276.15	261.53	
PIAT score	98.17	19.16	
Family Routine index (0-28)	15.04	5.52	
Family Risk index (0-21)	2.81	2.33	
Negative Peers (5-25)	9.58	4.39	
Behavior Problems (standardized)	.00	1.00	
Substance Use (0-3)	0.75	1.01	
Delinquency (0-10)	1.15	1.67	
Risk Scale (standardized)	.04	3.12	
Ever Arrested (0=no)	.33	.47	67.5% (no)
Ever Incarcerated (0=no)	.07	.25	93.4% (no)
Arrest Total (1997-2011)	1.10	2.90	
Incarceration Total (1997-2010)	.11	.51	

Table 2.2 Demographic and Risk Variable Descriptives for Older Sample N= 3565

	Mean	S.D.	Proportions
Age in years (1997)	15.50	.50	
Race (0= White, 1=Hispanic, 2= Black)	1.75	.85	52.1% (W) 21.1% (H) 26.8% (B)
Sex (0=Female)	.51	.50	49.5% (F) 50.5% (M)
Poverty Ratio	294.09	283.58	
8th Grade grades (1-8)	5.71	1.75	
Negative Peers (5-25)	13.35	4.42	
Negative Expectations	107.42	99.44	
Substance Use (0-3)	1.43	1.18	
Delinquency (0-10)	1.61	2.04	
Risk Scale (standardized)	.07	2.75	
Ever Arrested (0=no)	.34	.47	66.6% (no)
Ever Incarcerated (0=no)	.09	.28	91.5%(no)
Arrest Total (1997-2011)	.94	2.55	
Incarceration Total (1997-2010)	.15	.61	

Table 2.3 T-Test for Independent Samples Difference of Means by Cohort

	Mean difference	S.D. difference	t value
Race	.02	.03	-.54
Sex	.01	.01	-1.04
Poverty	17.94	6.86	2.62*
Ever Arrested	.01	.01	.87
Total Arrests	.10	.07	1.45
Ever Incarcerated	.02	.01	3.31**
Total Incarcerations	.04	.01	3.42**
Negative Peers	3.78	.10	38.80***
Substance Use	.68	.02	28.01***
Delinquency	.46	.04	11.12***

*$p<.05$ ** $p<.01$ *** $p<.001$

Additional analyses examining potential sex and race differences in latent class structure and risk prediction were calculated separately. Each cohort was split by males and females for analysis of sex differences and by Black participants, Hispanic participants, and White participants for analysis of race differences. While much prior research has focused only on Black-White differences in criminal justice outcomes, more recent research argues that there are key differences between the three groups and that Hispanics must be considered in addition to Blacks and Whites (Brennan & Spohn, 2008; Demuth, 2003; Demuth & Steffensmeier, 2004; Steffensmeier & Demuth, 2001). These analyses involved identical measures and analyses as the full samples. Descriptive statistics by race and sex differences and results for these supplemental analyses will be presented in separate sections following the results from the full sample analyses.

Measures

As previously noted, nearly all measures come from youth self-reports. While self-reports are advantageous for studying individual perceptions of a variety of risk factors, there is concern with the accuracy of self-reports. Individuals may fabricate or misremember information, and some studies have noted race and sex differences regarding reporting delinquent and criminal behavior such as blacks tending to under-report more than other races, and females tending to under-report more than males (Hindelang et al., 1981; Huizinga & Elliot, 1986; Maxfield et al., 2000). While there are potential issues with youth self-reports, these issues may be minor, and in fact, some research suggests that self-reports may not always differ markedly from parent or teacher reports (Hindelang, Hirschi, & Weis, 1979; Thornberry & Krohn, 2003). Studies with self-reported measures consistently find higher prevalence rates of offending across nearly all but violent crimes, especially those commonly missed by official measures such as theft, vandalism, and drug use (Piquero, Farrington, & Blumstein, 2007). Thus, official measures capture serious crime with higher clearance rates well, while self-reports better capture less serious and victimless crimes, but even so, findings from studies with self-report measures are similar to findings from official measures (Krohn et al., 2013; Maxfield et al., 2000; Piquero, Schubert, & Brame, 2014). Furthermore, the *NLSY97* and its self-reported data have been used by numerous other researchers to investigate a variety of health, employment, and criminal justice outcomes (McDonald, Manlove, & Ikramullah, 2009; Makarios, 2009; Makarious, Cullen, & Piquero, 2015).

Dependent Measure: Arrest

There are two outcome measures: arrest and latent class membership in the probability of arrest. Data were collected annually from 1997-2011. At the initial wave, participants were asked

if they had ever been arrested (0=no, 1=yes). After the first year, participants were asked annually if they had been arrested since their last interview (0=no, 1=yes). The analytical method, latent class growth analysis, used these binary arrest measures to calculate a probability of arrest across the 15 waves and placed individuals exhibiting similar arrest probability patterns in the same class. Once the latent growth class analyses were conducted and a class solution chosen, the latent class probabilities for arrest were saved and added to the data set. Participants were then matched with their class number. The assigned class number reflected the individual's latent class membership in the probability of arrest from 1997-2011 and was used as the outcome for the latent class regression analyses. Latent class regressions would then predict the likelihood of belonging to one class versus another. The questionnaire also asked how many times individuals had been arrested in the preceding year. However, as the goal of this study was to examine the probability of arrest rather than the number of arrests over time, only the binary arrest measures (yes/no on arrest at each wave) were used.

It is important to clarify that self-reported arrests are intended as a proxy measure for criminal involvement/behavior. Another possible perspective on arrests is that they may be used as a measure of social control, and thus, may interact with police decisions to make arrests. Local policing department procedure as well as location may be important factors when examining which individuals are arrested at higher rates relative to others (National Research Council, 2004). However, much of the policing literature suggests that police-citizen encounters are highly reactive, and most often the result of a call from a witness or victim (Black, 1971; Cordner, 1979; National Research Council, 2004; Reiss, 1971). Therefore, the potential overlap between police behavior and arrests may not be problematic, and arrest can still serve as an appropriate measure of criminal behavior. Furthermore, a number of studies have indicated that

there is much more self-reported offending that official arrests, and that it takes numerous offenses to generate a single arrest (Pollock et al., 2015). Thus, self-reports of arrest are likely to capture actual criminal behavior.

As previously noted, there are methodological concerns with self-reports of arrests, namely that participants may misremember being arrested or that they may under or over-report being arrested. Some studies have noted that patterns in self-reporting of arrests may vary across race, sex, and crime type. For instance, a few studies have indicated that blacks tend to under-report arrests more than other races, and that females tend to under-report arrests more than males (Elliot, 1994; Hindelang et al., 1981; Huizinga & Elliot, 1986; Maxfield et al., 2000). Babinski, Hartsough, and Lambert (2001) examined official records and self-reports of arrest from male and female participants of the Hyperactivity Follow-Up Study of Young Adults at the University of California Berkeley and found that participants were more likely to report less serious crimes such as public disorder and theft for which they were not caught but were less likely to report arrests for more serious, personal crimes. Interestingly, participants with a high number of convictions were more likely to accurately report arrests compared to others. Thus, self-reports of arrest may under count arrests for more serious crimes, particularly from less frequent offenders. While research suggests that self-reports may vary by race and sex, and that self-reports generally yield higher counts of arrest than official reports, overall there is good statistical agreement between self-reported and official measures of arrest (Babinski, Hartsough, & Lambert, 2001; Maxfield et al., 2000; Thornberry & Krohn, 2003). Furthermore, the current research is not investigating arrests for specific crime types nor asking for counts of arrests over time. Rather, the arrest measure is a simple yes/no on arrest for each year. Therefore, the

weaknesses of self-reports such as participants forgetting information and over/under reporting certain crimes may not be as problematic.

Independent Measures

Demographics.

Three main demographic variables were available across samples: race, sex, and household income to poverty ratio. All variables used in the analyses were self-reports from the initial 1997 wave. Race was split into three groups, White=1, Hispanic=2, and 3=Black. A trivial number of other racial groups were available but were excluded in order to focus on the three main racial groups. Sex was dummy-coded as 0=female and 1=male. The household income to poverty ratio was a calculation of the participant's annual household income to their poverty level. Higher numbers reflect higher income households while lower numbers reflect more impoverished households. While it is ideal to have multiple indicators of socioeconomic status (Farrington, 2005; Webster & Kingston, 2014) there were serious limitations in the measures included in the data. Measures of parental income and other economic data included a substantial number of missing cases.

Risk Factors.

Risk factors were gathered from participant self-administered surveys at the initial 1997 wave. As mentioned previously, computer-aided interviews provide additional anonymity compared to face-to-face interviews and therefore often yield more reports of consequential behavior and personal items (Ghanem et al., 2005; Kurth et al., 2004; Metzger et al., 2000). This strategy is particularly useful given the topics in the survey such as family behavior, substance use, and delinquency. While a variety of variables, such as employment, receipt of high school diplomas, marriage, and a limited number of personality measures were available at different

waves, the inclusion of these measures would have altered the prospective design of this study.

Similar to other data collection efforts, not all variables of interest were collected across all

waves. For example, delinquency questions were only collected in the first four waves, and this

was true for a number of other variables such as family factors, which were only available in the

first two waves. Therefore, in order to partially control for temporal order and for sake of

parsimony only measures available in the base wave were made eligible for inclusion. As the

researchers included age-graded measures, some items were only available for participants 14

years-old and younger (younger cohort) and some only available for participants 15 years of age

or older (older cohort). As such, some measures differ between models with the younger and the

older samples. Table 2.4 provides a list of the variables used in the latent class regression

analyses for each cohort.

Table 2.4 Independent Risk Variables Used in Latent Class Regressions

Younger Cohort	Older Cohort
Race	Race
Sex	Sex
Household poverty ratio	Household poverty ratio
Negative Peers	Negative Peers
Substance Use	Substance Use
Delinquency	Delinquency
PIAT Math standard score	Grades in 8th grade
Problem Behavior scale	Negative Expectations scale
Family Routines index	
Family Risk index	

The following variables were available across samples: negative peers, substance use, and delinquency.

- Deviant Peers Scale: a one factor 5-item scale (alpha = .84) ranging from 5-25. Each of the five items asked about the percent of one's peers that engaged in a given activity. A 5-point Likert response set was used.

"About what % of your peers…" (1= Almost none/ less than 10%, 2= About 25%, 3= About 50%, 4=About 75%, 5= Almost all/ more than 90%)

- Get drunk monthly
- Smoke cigarettes
- Use marijuana, inhalants, or other drugs
- Cut classes
- Belong to a gang

Higher values indicate a greater presence of deviant peers. While this measure does not neatly separate definitions, differential association, and the processes of imitation and operant conditioning, it does capture the amount or saturation of negative peers in the participant's life as well as the type and degree of delinquency that peers are engaged in, both important aspects of negative peer associations (Akers, 1998; Matsueda, 1982).

- Substance Use Index: a 3-item index ranging from 0-3 which asked,

"Have you ever…" (0=no/ 1=yes):
- Smoked a cigarette
- Had a drink (alcoholic- not just a sip)
- Used marijuana

Higher values indicate the use of more drugs. This substance use measure is limited as it does not tap into harder drug use, such as cocaine, hallucinogens, or opiates, nor does it ask about the frequency of use. There was a question about hard drug use in the data, however there was very little variation in the measure as only a very small proportion of youth had engaged in hard drug use at that time. Moreover, there were numerous missing responses. There were

also variables regarding age at first use and monthly use of various substances but unfortunately, there was far too much missing data.

While the substance use index is limited, it does capture relatively early use (participants are as young as 12 years-old). Early onset of substance use, including alcohol and cigarettes, has been a consistent predictor of a variety of social and behavioral problems and has been found to be a substantive predictor of criminal involvement (Gordon, Kinlock, & Battjess, 2004; Griffin, Bang & Botvin, 2010; Slade et al., 2008; Mukku et al., 2012). Furthermore, research indicates that hard drug usage often begins later in adolescence and early adulthood, which is older than most participants in the initial 1997 wave (Kandel, Yamaguchi, & Chen, 1995; Sussman, Skara, & Ames, 2008).

- Delinquency Index: The *NLSY97* research staff created a 10-item index ranging from 0-10 which asked,

    "In the past 12 months have you…" (0=no/ 1= yes):
    - Run away from home
    - Stayed away at least overnight
    - Ever carried a hand gun
    - Ever been in a gang
    - Damaged/destroyed property
    - Stole something worth < $50
    - Stole something worth > $50
    - Other property crimes
    - Sold/ help sell marijuana or other hard drugs
    - Been arrested or taken into custody for illegal/ delinquent activity

Higher values indicate higher levels of delinquency. Delinquency involves a broader range of behaviors than official measures of adult crime, and thus should include a diversity of minor and serious offenses including status offenses and other risky activities. Fortunately, the *NLSY97* provides a variety of deviant behaviors including relatively benign acts such as the status offense of running away up through officially sanctioned crimes such as theft and

selling drugs as well as dangerous behaviors like carrying a gun and gang involvement. These items are distinct from substance abuse, from attitudinal measures, and from official measures of crime, and the items closely resemble items used in several other studies capturing delinquent behavior (Krohn & Massey, 1980; Makarios, 2009; Makarios, Cullen, & Piquero, 2015).

 The following risk factor variables were available for the younger cohort only: family risk index, family routine index, behavioral problems index.

- Family Risk Index: The *NLSY97* research staff created a composite scale of family risk factors which reflects a broad contextual approach of the family, tapping not only parental supervision and parent-child dynamics but also the larger home and neighborhood context in which the family exists. A 21-item index ranging from 0-21 encompasses a wide variety of items involving the physical home environment, the neighborhood, and the parent-child dynamics. Unlike all of the other measures which were self-reports only, this index includes child reports of parental behavior and characteristics and family dynamics as well as the interviewer's perceptions of neighborhood and physical environmental risk. Higher values indicate higher family risk. A full list of the items is available in Appendix A. While some research has separated parenting variables from home and neighborhood environment variables, these items are often highly interrelated (Dekovic, Janssens, & Van As, 2003; Farrington, 2005; 2011; McCord, 2007) as negative neighborhood and home environments often translate to ineffective parenting and thus problems with parent-child relations. Furthermore, the current research was most interested in examining bodies of risk factors rather than very

specific aspects. Therefore, I elected to use this comprehensive composite measure to tap

a wide range of family dysfunction and risks.

- Family Routine Index: The *NLSY97* research staff created a 4-item index ranging from 0-

  28 which asked,

"How many days per week does your family…"(0-7)
- Eat together
- Do housework together
- Do something fun together
- Do something religious together

Higher scores indicate more time spent in family routines. Contextual factors and family

dynamics are important. In contrast to the adverse effects that poor parenting and family

dysfunction can have, family cohesion, involvement, and time spent together doing

conventional activities has been linked to healthier behavioral development (Dekovic,

Janssens, & Van As, 2003; Farrington, 2011; Shroeder, Giordano, & Cernkovich, 2010).

This measure was therefore used to examine the potential benefits of this family

dimension.

- PIAT Math Standard Score: a continuous standard score of what the individual earned on

  the PIAT Math assessment. Higher values indicate better scores. Ideally, other tests,

  particularly those involving verbal intelligence would be used as verbal intelligence has

  been linked to criminal behavior (Ayduk et al., 2007; Guay & Ouimet, 2005; Stattin &

  Klackenberg-Larsson, 1993). However, there were substantial missing patterns in the

  available verbal test, and the measure could not be employed. Furthermore, there were no

  questions regarding school grades (as there are in the older cohort) for this group as many

  of the sample had not yet been through the eighth grade. While limited, the PIAT Math

  assessment is a standardized test that has been used in many other studies examining

school achievement and intelligence (Bracey, 2001; Carlson & Corcoran, 2001; Heckman, Krueger, & Friedman, 2004).

- Behavioral Problems index: The *NLSY97* research staff created a four item index taken from Achenbach and Edelbrock's (1981) Behavioral Problem Checklist ranging from 0-8. Half of the items were different for males and females, yielding separate measures. In order to combine the measures, each index was standardized and added together. Participants were asked to assess the degree to which each item was true of them in the past six months and values were coded 0=not true, 1= somewhat true, 2= often true. Male participants were asked, "In the past six months have you…"

  - Lied/cheated
  - Been unhappy/sad/depressed
  - Had trouble paying attention
  - Not gotten along with others

Female participants were asked, "In the past six months, you…"

  - Lied/cheated
  - Been unhappy/sad/depressed
  - Done poorly in school
  - Had trouble sleeping

Higher values indicated more behavioral problems. While limited in capturing the full scope of behavioral issues, the measure was intended to act as a proxy for emotional/dispositional problems as there were no personality or other attitudinal measures available for this group, and the substance use and delinquency scales capture more specific, criminogenic behaviors. Furthermore, Achenbach and Edelbrock's (1981) Behavioral Problem Checklist has been used by numerous studies capturing dispositional and behavioral issues in individuals across different ages (Achenbach, McCnaughy, & Howell, 1987; Broidy et al., 2003; Stoolmiller, 1994).

The following risk factor variables were available for the older cohort only: grades in 8th grade and a negative expectations scale.

- Grades in 8th grade: Participants were asked what kind of grades they generally received in the 8th grade with scores ranging from 1-8 where:

    - 1= Below Ds
    - 2= Mostly Ds
    - 3= Cs and Ds
    - 4= Mostly Cs
    - 5= Bs and Cs
    - 6= Mostly Bs
    - 7= As and Bs
    - 8= Mostly As

    Higher values indicated higher grades. Unfortunately, participants in this age group did not have any PIAT or other standardized test scores available in the data. Therefore, this study must rely on reports of grades from the eighth grade. While an incomplete picture of school achievement and intelligence, grades are a standard way to assess progress in school, and poor grades have been linked to several social and behavioral problems (Gottfredson, 1985; Johnson, McGue, & Iacono, 2005; Wilson, Gottfredson, & Najaka, 2001).

- Negative expectations scale: A one factor 7-item scale (alpha=.87) asking participants about their expectations for the future. Each item asked the participant to provide a percent chance that something would occur in a given time frame. The measure is continuous. The index asked, "What is the % chance that you will…"

    - Be arrested, rightly or wrongly, by next year
    - Get seriously drunk by next year
    - Be a victim of violent crime next year
    - Die from any cause by next year
    - Become a parent by 20 years-old
    - Be in jail by 20 years-old

Higher values indicated more negative expectations. As previously noted, there was an absence of personality and other dispositional measures in this data. While this older group lacked measures from the Behavioral Checklist, they did have these measures of negative life outcomes. While not a direct measure of disposition, beliefs and expectations can often affect and are often products of innate disposition and attitudes (Greenberg, 1981; Tomaka & Blascovich, 1994; Swann Jr. et al., 2007) and thus, negative expectations are used to tap risky attitudes on poor life outcomes.

Combined Risk Scale.

There were two risk scales, one for each cohort. Each risk scale was made up of the added standardized values from the individual risk variables available in each cohort. The younger cohort risk scale (alpha= .65) included the added standardized values from the following seven risk variables: negative peers, substance use, delinquency, PIAT Math standard score, family risk, family routines, and behavioral problems. The older cohort risk scale (alpha= .65) included the added standardized values from the following five risk variables: negative peers, substance use, delinquency, grades in 8th grade, and negative expectations. Higher values indicated the presence of more risk factors. All risk factors presented and examined in this research have come from the existing literature, are often used in standard risk prediction tools, have received some degree of support, and are interrelated (Andrews & Bonta, 2010; Farrington, 2005; Farrington, Loeber, & Ttofi, 2012; Loeber & Farrington, 1998). Therefore, this research examined whether the robust combined measure of all risk factor dimensions could predict arrest probability better than any individual risk factor.

Correlation matrices were produced and all variables of interest were examined for multicollinearity. The strongest correlation was between substance use and delinquency (0.56)

but this was not indicative of multicollinearity as the tolerance value was .70 (VIF= 1.43), and

there were no issues with inflated standard errors in the regression analyses. Table 2.5 presents

the correlation matrix for the variables of interest for the younger cohort, and Table 2.6 presents

the correlation matrix for the variables of interest for the older cohort.

Table 2.5 Younger Cohort N=5378 Arrest, Demographic, and Risk Variable Correlations

	1	2	3	4	5	6	7	8	9	10	11
1. Ever Arrested	1.00	.08*	.26*	-.12*	.21*	-.08*	.15*	-.13*	.17*	.28*	.38*
2. Race		1.00	-.01	-.31*	.28*	.00	.14*	-.34*	.04*	-.09*	.01
3. Sex			1.00	.02	-.01	.02	-.11*	.01	.00	.04*	.20*
4. Poverty Ratio				1.00	-.31*	-.02	-.13*	.30*	-.07*	-.02	-.05*
5. Family Risk					1.00	-.37*	.29*	-.34*	.33*	.20*	.28*
6. Family Routines						1.00	-.14*	.02	-.21*	-.22*	-.16*
7. Negative Peers							1.00	-.17*	.26*	.37*	.32*
8. PIAT Score								1.00	-.16*	-.05*	-.11*
9. Problem Behavior									1.00	.32*	.37*
10. Substance Use										1.00	.56*
11. Delinquency											1.00

Control variable: Incarceration.

Binary variables of monthly incarceration were also available from 1997-2009 and then

for the first four months of 2010. Participants were asked annually if they had been incarcerated

in each month of the preceding year (0=no, 1=yes). An index was then created totaling the

number of months in each year that the participant was incarcerated (0-12) for 1997-2009, and

for the first four months of 2010 (0-4). Incarceration was not used directly as an outcome

variable, but rather in an attempt to control for "street or exposure time," an important issue

highlighted by Piquero et al. (2001). The rational and method for controlling for street time will

be discussed with the additional analyses under the analytical plan section.

Table 2.6 Older Cohort N=3565 Arrest, Demographic, and Risk Variable Correlations

	1	2	3	4	5	6	7	8	9
1. Ever Arrested	1.00	.07*	.25*	-.11*	.16*	-.26*	.23*	.29*	.45*
2. Race		1.00	-.02	-.29*	.12*	-.16*	.06*	-.16*	-.03
3. Sex			1.00	.00	-.11*	-.18*	.08*	.03	.23*
4. Poverty Ratio				1.00	-.11*	.23*	-.10*	.03	-.07*
5. Negative Peers					1.00	-.18*	.31*	.31*	.31*
6. 8th Grade grades						1.00	-.19*	-.18*	-.25*
7. Negative Expectations							1.00	.34*	.36*
8. Substance Use								1.00	.52*
9. Delinquency									1.00

Analytical Plan

The statistics software packages SPSS and Mplus were used in order to explore

differential trajectories in arrest probabilities over time and relevant predictors of those latent

class trajectories. SPSS was used for data management, creation of variables, and descriptive

statistics. Mplus was used for examining trajectories in arrest probability with latent class

growth analyses and for the latent class regression analyses involving predictors of class

membership in arrest probability. All models in Mplus were performed using full information maximum likelihood for randomly missing data in order to account for loss of data across time.

Latent Class Growth Analyses

Latent class growth analyses were used to examine class membership and patterns in arrest probability across time. Latent class growth analyses estimate a model that identifies latent or unmeasured classes characterized by similar patterns based on unique growth curves (Muthén, 2003, 2004; Vermunt & Magidson, 2002, 2003). First, a baseline growth curve model (one class) is run to identify the mean growth curve for the sample. Next, additional classes are added to the model, and cases are group based on similar patterns (remaining stable, increasing, decreasing) over time. Fit indices are employed to determine which model is the best fit for the data. The Log Likelihood (Ho value) and Bayesian Information Criterion (BIC) are commonly used benchmarks which indicate model fit. Smaller numbers indicate a better fitting model. The BIC uses the log likelihood value but also adjusts for sample size. While these are important benchmarks, both tend to decrease as classes are added and thus, other fit indices are needed to choose the best model (Jung & Wickrama, 2008; Muthén, 2003, 2004). Another fit statistic is entropy, which essentially measures how easy it is to classify cases into classes. Entropy ranges from 0-1 with values closer to one indicating a clearer delineation of classes. Similarly, latent class probabilities indicate the degree of certainty in classification of cases. Latent class probabilities also range from 0-1 with values closer to one indicating more confidence that cases are placed in the correct classes.

Finally, the Lo-Mendell-Rubin (LMR) is another indicator of model fit. The LMR test compares a given model (k) to a model with one fewer class (k-1). The LMR test compares a given model (k) to a model with one fewer class (k-1). Thus, it can only be calculated for

models with two or more classes. When p values from the LMR are not statistically significant (>0.05), this means that the (k-1) model is a better fit for the data than the current model (k). Essentially, the LMR helps indicate whether the addition of another class is beneficial or not. However, some research indicates that the LMR test sometimes overestimates the number of classes (Jung & Wickrama, 2008; Nylund, Asparouhov, & Muthén, 2007). Therefore, it is important to consider all of the fit indices together when determining the best model. For example, while the LMR may indicate that a 5-class solution is acceptable ($p<.05$), the entropy and latent class probabilities may be low compared to other models with fewer classes. While there is no exact rule of thumb, when latent class probabilities drop considerably from one model to the next and/or begin to drop below 70, we have less confidence that we are appropriately classifying cases (Nylund, Asparouhov, & Muthén, 2007; Muthén, 2003, 2004) and may want to consider a model with fewer classes. These fit indices are standard and have been used in several studies, but theory and the totality of fit indices are important when choosing a solution for latent class growth analyses (Jung & Wickrama, 2008; Muthén, 2003, 2004; Vermunt & Magidson, 2002, 2003).

Latent Class Regressions

Latent class regression models simultaneously estimate latent classes as well as the ability of various covariates to predict membership in those classes. Three models were run for each sample (younger cohort, older cohort, males, females, Whites, Blacks, Hispanics). The first model was a base model which included only the demographics of race, sex, and poverty. The second model added the combined risk scale. Finally, the third model replaced the combined risk scale with the individual risk variables in order to see which were most salient for predicting class membership in arrest probability over time.

Additional Analyses

There were two potential limitations with this longitudinal dataset that needed to be assessed. First, the question of whether nonrandom attrition affected the results needed to be considered. A second concern was that the analysis should account for "street or exposure time." In this case, the effect of incarceration on arrest probability in a given year needed to be controlled. Piquero et al. (2001) examined arrest rates among 272 paroled offenders from ages 18-33 comparing models which made adjustments to exposure time to those that did not. While overall trends in arrest rates were not affected, failing to control for exposure time underestimated a sample of about 20% of offenders who remained active during the time of the study who in the unadjusted model were counted among those who began to desist in their late teens and early 20s. Thus, after Piquero et al. (2001), it has been generally advised to try and control for exposure time whenever possible. For the present study, the main concern was that arrest probability may be underestimated for individuals who were incarcerated in a given year and thus, not able to be arrested.

An adjusted latent class growth model incorporating the effect of incarceration on arrest probability was estimated for both the younger and older cohorts. The adjustment was set so that incarceration at time one would predict arrest at time two. Arrest at time two measured if the individual had been arrested in the previous 12 months. Results from these adjusted latent class growth analyses revealed nearly identical solutions to the unconditional models. Thus, incarceration did not appear to substantively affect the estimation of trajectories in arrest probability. When attempting an additional adjustment to the model which involved correlating incarceration with arrest probabilities, the model would not converge. This was likely due to a lack of variance in the incarceration variable as a very small proportion (mean=1.1%) were

incarcerated at any given wave. This small proportion of incarcerated individuals is to be expected with a nationally representative sample (Barnes et al., 2015). Therefore, while only partially able to control for exposure time, it did not appear to substantively affect the models due in large part to the lack of variation in incarcerations.

To address issues regarding nonrandom attrition, three types of missing analyses were conducted. Nonrandom attrition can be problematic because it may result in a biased sample which violates the assumption of random sampling and has potential effects on correlated error and spuriousness. A biased sample can substantively affect the results and their generalizability. For example, if we are studying the effect of early substance use on arrest outcomes and if, over time, we systematically lose more individuals who have been arrested multiple times, our sample loses a very important group of chronic offenders, and the effects of substance abuse on arrest outcomes will likely be underestimated. Therefore, to be confident in our results, we must assess problems associated with nonrandom attrition. It is challenging to determine the nature of nonrandom sampling as parceling out whether the probability of being in the sample/responding on the dependent variable y is contingent on another variable x, another variable x and another separate variable y, or some combination of both. In other words, it is difficult to know whether the probability of missing on arrest is due to a correlation with a covariate such as age, race, sex, or education, an interaction of these variables, or other combinations. However, what we can assess are the effects of nonrandom sampling on means, variances, and correlations (Goodman & Blum 1996; Little, 1995).

Two basic ways that researchers have approached the issue of missing data are by examining mean differences on key variables between those that are missing and those that are not missing and by statistical correction or data imputation. Simple list wise deletion or complex

imputation are appropriate only when data are missing at random—MCAR—and not when data are missing due to non-random or systematic exclusion (Avern & Le Broque, 2005; Goodman & Blum, 1996; Little, 1995). Unfortunately, past research has not thoroughly addressed the issue of nonrandom attrition/missing data (Davey, Shanahan,& Schafer, 2001l Goodman & Blum, 1996; Little, 1996). Furthermore, attempting to assess nonrandom attrition by using t-tests of independent samples or chi square tests examining mean differences between those missing to those who were not missing is incomplete because nonrandom attrition can have separate and independent effects on means, variances, and correlations between variables (Avern & LeBroque, 2005; Goodman & Blum, 1996), and mean differences between missing and non-missing groups may not necessarily bias results (Miller & Wright, 1995).

A more thorough investigation of nonrandom attrition was put forth by Heckman (1979, 1990) involving a two-step estimation method. For this type of analysis, the first step is to create outcome variables for each wave where the data are coded 0=not missing and 1=missing on the dependent variable of interest. This dummy variable is then used as the outcome variable in a series of regressions including all key predictors. If none of the key variables significantly predict the probability of missing on the dependent variable, one can assume that the results will not be biased for those variables of interest (Davey, Shanahan, & Schafer, 2001; Goodman & Blum, 1996). If variable do predict missing outcomes, predicted values are saved and entered as independent variables. While Heckman's two-step method has received criticism for potential problems with multicollinearity and the assumption of joint normality of errors (Bushway, Johnson, & Slocum, 2007; Dow & Norton, 2003; Puhani, 2000), many adapted versions of this selection correction have been used in social science.

Given that there were numerous missing patterns in the NLSY97 and considering all of the potential problems nonrandom attrition can cause, the effects of nonrandom attrition were assessed in three ways. The first missing analysis conducted was very similar to Heckman's two-step method using logistic regression. From 1997 through 2011, the dummy arrest variables were coded 0=not missing and 1=missing for each separate wave. Separate logistic regressions were then run with the missing dummy variable as the outcome and the covariates of race, sex, poverty, and the various risk variables (delinquency, substance use, negative peers) for each wave. This was done separately for the younger and the older cohort.

Results indicated that for both cohorts, most variables were not significantly associated with exclusion from the sample and those that were had weak and inconsistent effects across waves. For instance, lower scores on the PIAT Math test was statistically related to a higher probability of missing in all but the initial (1997) and last (2011) waves for the younger cohort, but the effect was very weak (OR=.99) and likely driven by sample size. Negative peers had occasional weak effects (OR=1.04-1.05), and increased problem behavior was modestly related (OR= .88-.80) to the probability of missing in about half of the waves in the younger cohort. Being male was modestly related to a higher probability of missing in eight waves (OR= 1.22.-1.42), and the most consistent and strongest predictor was race with Whites being more likely to be missing than Blacks and Hispanics (OR= .85-.71) in all but two waves. For the older cohort, there were even fewer significant effects. The most consistent predictors were race and sex. Being male was modestly related to missing in six waves (OR= 1.28-1.44), and being white was moderately related to a higher probability of missing in ten waves (OR= .84-.77). Overall, white males had a higher probability of missing on the arrest variable, but these effects were inconsistent and did appear to substantively bias the sample. Appendix B.1 displays the logistic

regression estimates and odds ratios across waves for the younger cohort and Appendix B.2 displays the results for the older cohort.

As an extension of the two-step method, the missing on arrest variables were modeled in latent class analyses to examine the probability of missing patterns for both cohort samples. A similar method was used by Davey, Shanahan, and Schafer (2001) with the Children and Young Adult's National Longitudinal Survey of Youth 1986. They modeled missing patterns for behavioral problems in children over six years using factor analyses and found four distinct patterns of missing. While missing at the initial wave was not correlated with missing over time, the other three patterns were inter-correlated, suggesting that nonresponse was moderately related to more nonresponse over time (Davey, Shanahan, & Schafer, 2001). Furthermore, demographic characteristics could predict some patterns of missing, suggesting that the sample grew less representative over time regarding the variables of interest.

While the NSLY97 is an entirely different sample, a similar approach was taken, but with latent class analyses in place of factors analysis. Results from the latent class analyses revealed four distinct patterns of missing data for arrest outcomes for each cohort. Essentially, there was a majority group that was never missing for the entire time (67-73%), a group that went missing after the first wave and then remained missing for the remainder of the study (7-9%), a group that went missing about half way through (6.5-9%), and a group that exhibited intermittent missing patterns in the middle waves (11-17%). Figures 2.1 and 2.2 depict the latent growth curves for the probability of missing for both cohorts. Multinomial logistic regressions using the non-missing class as the reference group revealed that nearly all predictors were non-significant and among those that were, effects were small and inconsistent across class comparisons. As with the logistic regression analyses, being a white male was predictive of being placed in the

class with the highest probability of missing on arrest. However, this effect was not strong or consistent across model comparisons.

Figure 2.1 Younger Cohort Missing on Arrest Latent Class Growth Figures
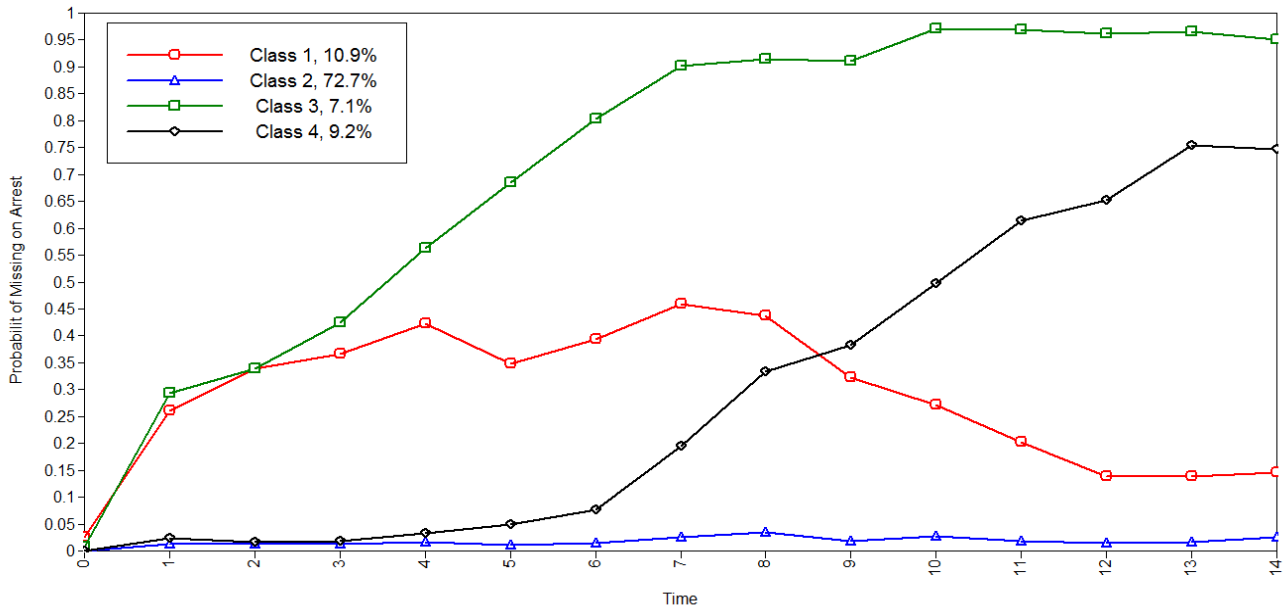
Figure 2.2 Older Cohort Missing on Arrest Latent Class Growth Figures
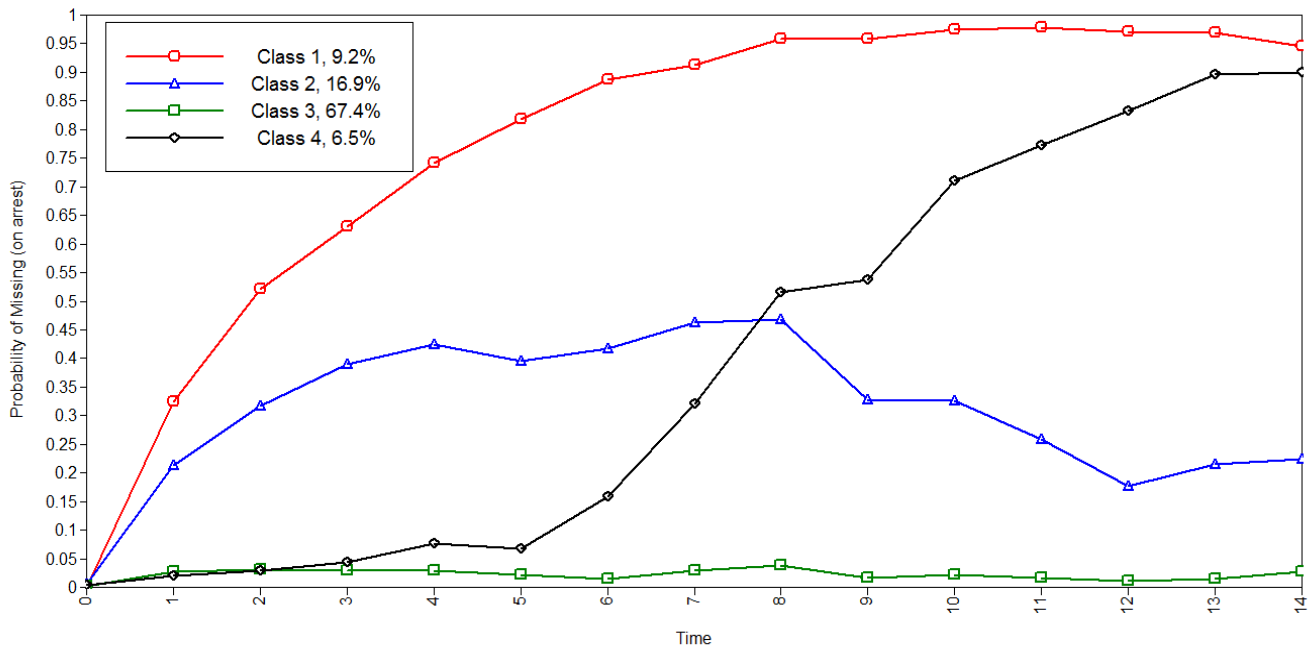
The final method used to assess the impact of missing data was Manski (1990) bounding. Manski (1990) put forth a conservative test to examine how missing data may influence results at

the extremes. While Manski's technique was primarily used for assessing the differences in expected and treatment outcomes, it can be applied to the present case to estimate a worst case scenario for missing data bias. In this case, the Manski bounding procedure imputes the missing cases based on two extremely unlikely scenarios: 1) assuming *all* missing cases had been arrested; and 2) the reverse situation where *all* missing cases were assumed to have no arrest. In this way, the Manski procedure allows for complete observation of all the cases, but under the two most extreme situations for data imputation. In latent class analyses, those cases that are missing across all waves of data were excluded from the Manski analysis. However, data was imputed for those who had missed seven or fewer responses on the arrest outcome variable.

Separate arrest variables were created where those missing on seven or fewer waves were coded 1, as having been arrested in place of their missing response. Another set of arrest variables was created where the same individuals missing at seven or fewer waves were coded 0 for not having been arrested in place of their missing response. Latent class analyses were then run using the upper Manksi bound (where all missing cases were assumed to have been arrested) and then another set of latent class analyses were run using the lower Manski bound (where all missing cases were assumed to have no arrest). These models were then compared to the original latent class solutions to assess whether the substantive conclusions were sensitive to the different missing data imputation procedures.

For both the younger and older cohort, growth patterns between the original models and the Manski lower bound models were virtually identical in shape and the distribution of classes across classes. In other words, the substantive findings were not sensitive to the lower bound version of the Manski procedure. The upper bound Manski models differed slightly in shape for one class, which exhibited a considerably higher probability in arrest over time than in the

original models cohorts. This is to be expected given that many arrests were added to the data. However, the distribution across cases and the shape of the other two classes were similar. Furthermore, all models, original and Manski, resulted in a 3-class solution. Fit indices and figures for the younger cohort Manksi bounding analyses are available in Appendix C.1 and Appendix C.2. Fit indices and figures for the older cohort Manski bounding are available in Appendix C.3 and Appendix C.4. Overall, Manski bounding results indicated that the missing cases were unlikely to have substantively skewed the results of the latent class growth analyses.

In sum, considering the totality of all missing analyses employed, the missing responses on the arrest variables do not appear to systematically bias the results of either the latent class growth analyses or the latent class regressions.

CHAPTER 3

MAIN RESULTS

This chapter presents results from the latent class growth analyses (LCGA) and latent class regressions, which examined patterns and predictors of criminal involvement. The first section presents the LCGA results from the younger cohort, followed by those of the older cohort. The next section presents results from the latent class regressions of class membership in arrest probability across time. Results from the younger cohort are presented, followed by those from the older cohort.

Chapter 4 presents supplemental analyses by sex. First, sample descriptives by sex are presented, younger females and younger males first, followed by older females and older males. LCGA results by sex are presented in the same order, followed by the latent class regressions. Similarly, Chapter 5 presents supplemental analyses by race. Sample descriptives by race are first presented for Whites, Hispanics, and Blacks from the younger cohort, followed then by the results for Whites, Hispanics, and Blacks from the older cohort. LCGA results by race are presented in the same order, followed by the latent class regressions in the same order.

Latent Class Growth Analyses

Class solutions were chosen based on standard fit indices. Table 3.1 presents the fit indices for the younger cohort's LCGA. While there is a slight drop in entropy when moving from two to three classes, the latent class probabilities and the Lo-Mendall Rubin (LMR) value is acceptable for a three-class solution. The LMR value is non-significant ($p > .05$) in the four-class

model, indicating that a three-class provides a relatively better fit. Given the totality of the fit

indices, a three-class solution was chosen. Appendix D.1 presents means for risk variables,

arrest, and incarceration outcomes by class for the younger cohort.

Table 3.1 Fit Indices for Latent Class Growth Analyses- Younger Cohort N=5378

# classes	-LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-14290.82	29681.20	1.00	1.00	
2	-13456.37	26952.63	.77	.96 .85	.00
3	-13405.95	26866.02	.72	.72 .77 .92	.05
4	-13385.76	26841.88	.73	.70 .63 .90 .71	.15
5	-13381.16	26848.92	.74	.56 .61 .70 .64 .89	.42

Figure 3.1 presents the three classes and their trajectory patterns across the 15-year time

span. The majority of the younger cohort (77.3%) were placed in an abstainer group, exhibiting a

very stable zero probability in arrest across time. About 16% of the sample was placed in a group

which exhibited a lower level adolescent-limited pattern, peaking with a 25% probability of

arrest from ages 13-15 years-old, and slowly declining, remaining at about 20% until 17-19

years-old and then declining to below a 10% arrest probability by 23-25 years-old. Finally, the

last and smallest class (6.7%) was a moderate level chronic group which increased in arrest

probability over time. The moderate chronic group began at just below the adolescent-limited

group with about a 20% probability of arrest at the initial wave. The probability of arrest

increased steadily, peaking at about a 40% probability of arrest at 21-23 years-old and leveling

off at about 30% probability in arrest by the last wave (26-28 years-old). Apart from the first two

waves where the adolescent limited and moderate chronic groups were similar, the groups remained distinct from one another across time.

Figure 3.1 Younger Cohort Latent Class Growth Analysis Figures
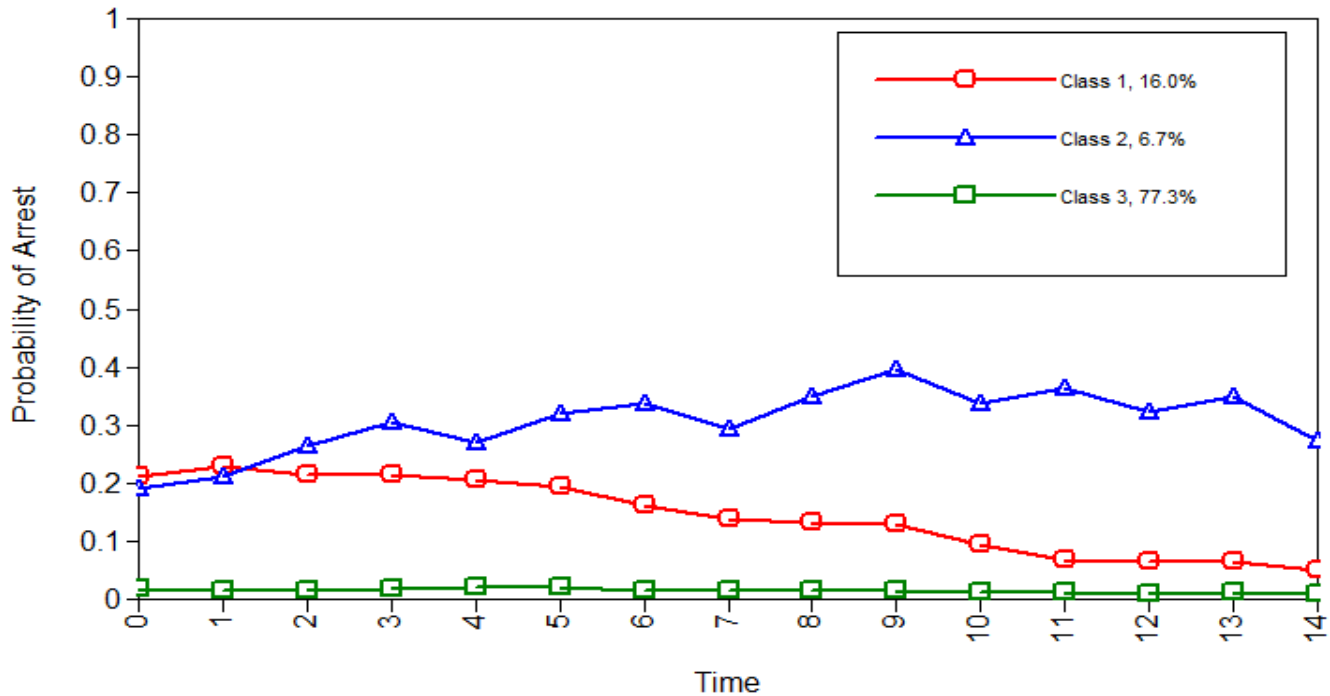
Table 3.2 presents the LCGA fit indices for the older cohort. While the LMR value allows for a four-class solution, the latent class probabilities for the additional classes drop into the 60s, indicating less precision in class placement. While there is no specific benchmark for latent class probabilities, the lower the value the less confident we can be that individuals were placed in the correct group. Furthermore, the additional class essentially reflected a split between abstainers and those at a slightly higher but still very low probability in arrest (<10%), a group that did not appear theoretically meaningful and was better placed with the abstainer group. Overall, a 3-class solution provided the best fit.

Table 3.2 Fit Indices for Latent Class Growth Analyses- Older Cohort N=3565

# classes	-LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-9451.23	18917.47	1.00	1.00	
2	-8569.44	17168.88	.78	.95 .87	.00
3	-8503.93	17052.88	.74	.92 .81 .71	.00
4	-8482.43	17024.88	.71	.74 .90 .69 .65	.02
5	-8471.05	17017.13	.76	.92 .47 .80 .71 1.00	.79

Figure 3.2 illustrates the class trajectories for the three classes in the older cohort. The majority of the older cohort (79.4%) was placed in an abstainer group which exhibited a very stable zero probability in arrest probability across time. About 11.4% of the sample was placed in a class that mirrored an adolescent-limited pattern with a peak arrest probability of 50% at the initial wave when participants were 15-17 years-old. The next year there was a drop to 35-38% and then a drop to 30% arrest probability the next two waves from 17-21 years-old. After that, the adolescent-limited group steadily declined over time reaching a zero probability in arrest by 24-26 years-old. The smallest class (9.2%) was a moderate chronic group which began at and generally maintained about a 30% arrest probability across time. Arrest probabilities varied over time with three peaks of just under 40% probability at 18-20 years-old, 20-22 years-old, and 24-26 years-old. Overall, the moderate chronic group exhibited a relatively stable 30% probability in arrest across time. Appendix D.2 presents means for risk variables, arrests, and incarceration outcomes by class for the older cohort.

Figure 3.2 Older Cohort Latent Class Growth Analysis Figures
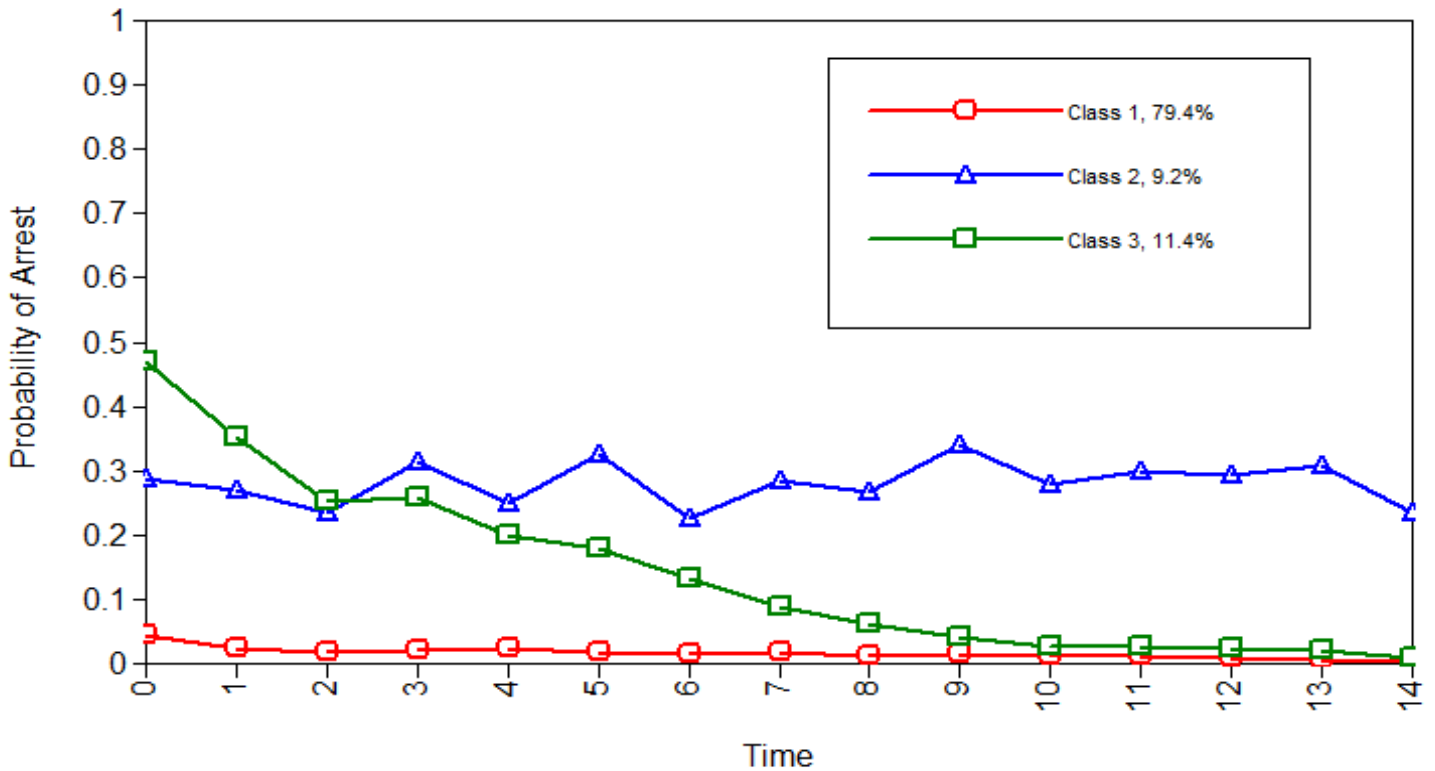
Latent Class Regressions

For all latent class regressions, the dependent variable is class membership in arrest probability. The reference class for all models is the abstainer group with zero probability of arrest. Therefore, all independent variables are predicting the likelihood of being in a class with higher than 0 arrest probability (ex. adolescent-limited group or chronic group) relative to the abstainer group. There are three models. The first is the base model which included sex, race, and poverty. Model 2 includes the combined risk factor scale. Finally, model 3 removed the combined risk scale and added the individual risk factors which made up the combined scale.

Younger Cohort

Table 3.3 presents the results of the latent class regressions for the younger cohort.

Adolsecent-Limited versus Abstainer Group.

For the base model comparison between the adolescent-limited and abstainer group, sex, race, and poverty were all statistically significant. Males were six times more likely to be in the adolescent-limited group compared to females. Being a minority (OR=1.28) and higher levels of poverty (OR=1.00) were weakly related to arrest probability. In the second model with the combined risk scale added, only sex and the risk scale are statistically significant, accounting for the effects of poverty and race. Being male was strongly predictive (OR=4.71) and having a higher combined risk score was moderately related (OR=1.58) to being placed in the adolescent-limited versus the abstainer group. In the final model which included the various individual risk factors, sex, family risk, substance use, and delinquency were statistically significant. Those with a more risky family environment (OR=1.62) were moderately more likely to be placed in the adolescent-limited group, and those with more reported substance-use were nearly two times as likely to be placed in the adolescent-limited group relative to the abstainer group. Being male (OR=4.02) and elevated delinquency scores (OR=4.86) were both strong predictors of being placed in the adolscent-limited group. Overall, prior self-reported delinquency was the strongest predictor, stronger than sex and the combined risk scale.

Table 3.3 Younger Cohort Latent Class Regression of Sex, Race, Poverty, and Risk Factors on Class Membership in Arrest Probability 1997-2011

Model	1 N=3939			2 N=3547			3 N=3547		
	Est.	S.D.	O.R.	Est.	S.D.	O.R.	Est.	S.D.	O.R.
Adolescent-Limited									
Sex (1= male)	1.80***	.15	6.05	1.55***	.31	4.71	1.39*	.69	4.02
Race (0= W, 1=H, 2=B)	.25**	.08	1.28	.06	.12	1.28	.26	.14	1.30
Household Income ratio	-.001**	.00	1.00	-.001	.001	1.00	-.002	.001	1.00
Risk Scale				.46***	.08	1.58			
PIAT Math standard score							-.17	.39	.84
Problem Behavior							.19	.17	1.21
Family Routine Index							-.13	.21	.88
Family Risk index							.48**	.16	1.62
Delinquent Peers							.32	.22	1.38
Substance Use							.68***	.21	1.97
Delinquency							1.58***	.59	4.86

Moderate Chronic

Sex (1= male)	2.29***	.32	9.88	2.56***	.40	12.94	2.29***	.26	9.88
Race (0= W, 1=H, 2=B)	.14	.15	1.15	.16	.11	1.17	.24	.17	1.27
Household Income ratio	-.004**	.001	1.00	-.001	.001	1.00	-.002*	.001	1.00
Risk Scale				.35	.18	1.42			
PIAT Math standard score							-.26	.30	.77
Problem Behavior							.05	.14	1.05
Family Routine Index							-.02	.23	.98
Family Risk index							.08	.31	1.08
Delinquent Peers							-.03	.40	.97
Substance Use							.58	.45	1.79
Delinquency							.69	.24	1.99

Abstainer group is the reference class and is the class with zero probability of arrest.

* p< .05 ** p<.01 *** p<.001

Moderate Chronic versus Abstainer Group.

In the base model, sex and poverty were statistically significant. While poverty had a weak effect (OR=1.00), males were nearly ten times more likely to be placed in the moderate chronic group compared to females. In the second model, which inclued the summated risk index, only sex retained statistical significance. The parameter estimate for sex increased in strength (OR=12.94). In the final model none of the individual risk factors were statistically significant. Poverty was weakly but significantly predictive. Once again, being male was strongly predictive. Males were 9.88 times more likely to be placed in the moderate chronic relative to the abstainer class. Being male was the only substantive predictor of arrest probability in the model comparison between the moderate chronic and the abstainer group. Overall, sex and delinquency were the best predictors of class membership in arrest probability for the younger cohort.

Older Cohort

Table 3.4 presents the latent class regression for the older cohort model comparisons.

Adolescent-Limited versus Abstainer Group.

In the base model, sex and poverty were statistically significant. While higher poverty levels were weakly related (OR=1.00) to being in the adolescent limited group, being male was strongly related (OR=3.74) to arrest probability. In model 2, only sex and the combined risk scale retained statistical significance. With the combined risk measure in the model, the effect of being male increased to OR=5.66. The combined risk measure was associated with an OR of 2.17. In the final model, sex, grades in the 8th grade, and self-reported delinquency were statistically significant. While still strong, the effect of being male decreased (OR=3.01). Individuals with higher grades were twice as likely to be placed in the abstainer versus the

adolescent-limited group (OR=.49), and those with higer levels of delinquency were 6.22 times more likely to be placed in the adolescent-limited relative to the abstainer group. Overall, deliquency was the best predictor of class membership in arrest probability followed by grades in the 8th grade.

Chronic versus Abstainer Group.

In the base model, sex, race, and poverty were all statistically significant. Higher poverty was weakly related (OR=1.00), being a minority was moderately related (OR=1.42), and being male was very strongly related (OR=19.11) to being placed in the moderate chronic group. In model 2, all but poverty retained statistical significance. The effect of being male decreased, but was still very strong with males 15 times more likely to be placed in the moderate chronic group relative to the abstainer group. Being a minority was associated with a 1.55 higher odds, and higher risk scores were associated with a 2.46 higher odds of being placed in the moderate chronic relative to the abstainer group.

In model 3, all variables except poverty and delinquent peers were statistically significant. While decreasing substantially, being male was still the strongest predictor of class membership in arrest probability (OR=8.65). Having negative expectations for the future (OR=1.82), being a minority (OR=1.71), and increased substance use (OR=1.85) were moderately related to being placed in the moderate chronic relative to the abstainer group. Having higher grades was strongly related (OR=.41) to being placed in the abstainer group, and higher self-reported delinquency (OR=5.88) was strongly related to class membership in the moderate chronic group. Being male was the strongest predictor of class membership across models, followed by delinquent behavior, and then grades in the 8th grade for the older cohorts.

Table 3.4 Older Cohort Latent Class Regression of Sex, Race, Poverty, and Risk Factors on Class Membership in Arrest Probability 1997-2011

Model	1 N=2533			2 N=2269			3 N=2269		
	Est.	S.D.	O.R.	Est.	S.D.	O.R.	Est.	S.D.	O.R.
Adolescent-Limited									
Sex (1= male)	1.32***	.17	3.74	1.73***	.34	5.66	1.10*	.53	3.01
Race (0= W, 1=H, 2=B)	.04	.09	1.04	.03	.20	1.03	.05	.25	1.06
Household Income ratio	-.001**	.00	1.00	.00	.00	1.00	.00	.00	1.00
Risk Scale				.78***	.07	2.17			
8th Grade grades							-.72***	.19	.49
Negative Expectations							.48*	.18	1.62
Delinquent Peers							.17	.19	1.19
Substance Use							.44	.30	1.55
Delinquency							1.83***	.30	6.22
Moderate Chronic									
Sex (1= male)	2.95***	.30	19.11	2.71***	.68	15.00	2.16***	.62	8.65

Race (0= W, 1=H, 2=B)		.35**	.12	1.42	.44**	.15	1.55	.54**	.16	1.71
Household Income ratio		-.003**	.001	1.00	-.002	.00	1.00	-.001	.001	1.00
Risk Scale					.90***	.18	2.46			
8th Grade grades								-.90***	.23	.41
Negative Expectations								.60**	.20	1.82
Delinquent Peers								.24	.21	1.27
Substance Use								.62**	.19	1.85
Delinquency								1.77***	.50	5.88

Abstainer group is the reference class and is the class with zero probability of arrest.

* p< .05 ** p<.01 *** p<.001

Across both cohorts and all models, race, family variables, and delinquent peers were generally insignfiicant. Poverty had only weak and inconsistent effects. While the PIAT math scores were not significant in the younger cohort, grades in the 8th grade were moderate to strong predictors in the older cohort. Substance abuse had modest effects across some models in both cohorts. With one exception, the combined risk scale was statistically signficnat and moderately related to arrest probability across models. Overall, being male and engaging in delinquent behavior had the strongest and most consistent effects across cohort and models. Furthermore, delinquency scores were a better predictor of class membership than the combined risk scale in all but one model, and was the strongest predictor among all risk variables.

CHAPTER 4

SUPPLEMENTAL ANALYSES RESULTS BY SEX

Sample Desciptives

Table 4.1 presents the sample descriptives for the females in the younger cohort, and

Table 4.2 presents the sample descriptives for the males in the younger cohort. Appendix E.1

provides a statistical comparison of sample means for the younger cohort males and females.

Overall, the younger females and males were statistically similar on age, race, PIAT scores, and

family factors. The largest differences between young males and young females were in self

reports of delinquency, arrests, and incarceration. As expected, males had higher mean

delinquency scores (1.47) than females (.81), higher mean arrests (1.62) than females (.55), and

males had higher mean incarceration totals (.18) than females (.04). A higher proportion of males

had also been arrested (44%) and incarcerated (10.3%) as compared to the proportion of females

that had been arrested (20.2%) and arrested (2.5%).

Table 4.1 Descriptive Statistics for Younger Females N= 2601

	Mean	S.D.	Proportions
Age in years (1997)	13.00	.82	
Race (0= White, 1=Hispanic, 2= Black)	1.74	.85	51.7% (W) 22.1% (H) 26.1% (B)
Poverty Ratio	269.59	252.11	
PIAT Math standardized score	98.06	18.85	
Family Routine index (0-28)	14.91	5.61	
Family Risk index (0-21)	2.82	2.35	
Delinquent Peers (5-25)	10.06	4.59	
Behavior Problems (standardized)	.00	1.00	
Substance Use (0-3)	.71	1.01	
Delinquency (0-10)	.81	1.35	
Risk Scale (0-14)	3.15	2.62	
Ever Arrested (0=no)	.20	.40	79.8% (no)
Ever Incarcerated (0=no)	.03	.16	97.5% (no)
Arrest Total (1997-2011)	.55	1.77	
Incarceration Total (1997-2010)	.04	.29	

Table 4.2 Descriptive Statistics for Younger Males N= 2777

	Mean	S.D.	Proportions
Age in years (1997)	13.00	.82	
Race (0= White, 1=Hispanic, 2= Black)	1.73	.85	53.2% (W) 21.2% (H) 25.7% (B)
Poverty Ratio	282.27	269.93	
PIAT Math standardized score	98.27	19.45	
Family Routine index (0-28)	15.16	5.44	
Family Risk index (0-21)	2.79	2.31	
Delinquent Peers (5-25)	9.13	4.15	
Behavior Problems (standardized)	.00	1.00	
Substance Use (0-3)	.79	1.01	
Delinquency (0-10)	1.47	1.87	
Risk Scale (0-14)	3.31	2.68	
Ever Arrested (0=no)	.44	.50	56.0% (no)
Ever Incarcerated (0=no)	.10	.31	89.7% (no)
Arrest Total (1997-2011)	1.62	3.58	
Incarceration Total (1997-2010)	.18	.64	

Table 4.3 provides sample descriptives for the older cohort females, and Table 4.4 provides the sample descriptives for older cohort males. Appendix E.2 provides a statistical comparison of sample means for the older cohort males and females. Overall, the older cohort females and males were similar on age, race, poverty, and substance use. Females had higher mean grades in the 8th grade and also reported higher mean proportions of delinquent peers than males. Similar to the younger cohort, males had higher mean scores on delinquency (2.07) than females (1.14), higher mean arrest totals (1.84) than females (.56), and higher mean scores on incarceration totals (.26) than females (.05). Additionally, males reported higher mean levels of negative expectations, and a higher proportion of males had been arrested (44.9%) and incarcerated (13.8%) as compared to the proportion of females that had been arrested (21.6%) and incarcerated (3%).

Table 4.3 Descriptive Statistics for Older Females N= 1764

	Mean	S.D.	Proportions
Age in years (1997)	15.50	.50	
Race (0= White, 1=Hispanic, 2= Black)	1.76	.86	52.0% (W) 20.1% (H) 28.0% (B)
Poverty Ratio	294.94	288.19	
8th Grade grades (1-8)	6.02	1.67	
Delinquent Peers (5-25)	13.84	4.34	
Negative Expectations	99.89	93.75	
Substance Use (0-3)	1.39	1.18	
Delinquency (0-10)	1.14	1.67	
Risk Scale (0-10)	2.97	2.24	
Ever Arrested (0=no)	.22	.41	78.4% (no)
Ever Incarcerated (0=no)	.03	.17	97.0% (no)
Arrest Total (1997-2011)	.56	2.44	
Incarceration Total (1997-2010)	.05	.36	

Table 4.4 Descriptive Statistics for Older Males N= 1801

	Mean	S.D.	Proportions
Age in years (1997)	15.50	.50	
Race (0= White, 1=Hispanic, 2= Black)	1.73	.84	52.3% (W) 22.0% (H) 25.7% (B)
Poverty Ratio	293.25	279.04	
8th Grade grades (1-8)	5.39	1.78	
Delinquent Peers (5-25)	12.88	4.43	
Negative Expectations	114.8	104.23	
Substance Use (0-3)	1.46	1.18	
Delinquency (0-10)	2.07	2.25	
Risk Scale (0-10)	3.52	2.48	
Ever Arrested (0=no)	.45	.50	
Ever Incarcerated (0=no)	.14	.35	55.1% (no)
Arrest Total (1997-2011)	1.84	4.28	86.2% (no)
Incarceration Total (1997-2010)	.26	.77	

Younger Cohort Females

Table 4.5 provides the fit indices for the LCGA for younger cohort females. Entropy, latent class probabilities, and the LMR value were acceptable for a 3-class solution. The LMR value indicates that a 4th class does not improve model fit. A 3-class solution was chosen for the younger females.

Table 4.5 Fit Indices for Latent Class Growth Analyses- Younger Females N=2621

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-4559.13	9127.6	1.00	1.00	
2	-4135.34	8294.16	.85	.85 .98	.00
3	-4111.02	8259.60	.84	.83 .96 .73	.00
4	-4107.94	8267.52	.85	.66 .74 .96 .69	.83

Figure 4.1 illustrates the latent class trajectories for the younger female classes. The majority of the younger female sample (88.9%) was placed in a very stable abstainer group with zero probability of arrest across time. About 6.3% fit an adolescent-limited-like group which peaked with about 33% probability of arrest at 13-15 years-old and steadly decreased over time, nearing zero probability of arrest around 23-25 years-old. The smallest group (4.7%) generally reflected a moderate chronic group which increased in arrest probabilty across time. Although starting at a lower probability than the adolescent-limited group (15% probability), the moderate chronic group increased slightly and surpassed the adolescnt-limited group at 17-19 years-old and experienced three peaks with about a 35% arrest probability, one at 21-23 years-old, one at

23-25 years-old, and the other at 25-27 years-old. The moderate group experienced a few increases and decreases but generally remained at about a 25-30% arrest probabilty across time.

Figure 4.1 Younger Female LCGA Figures N=2621
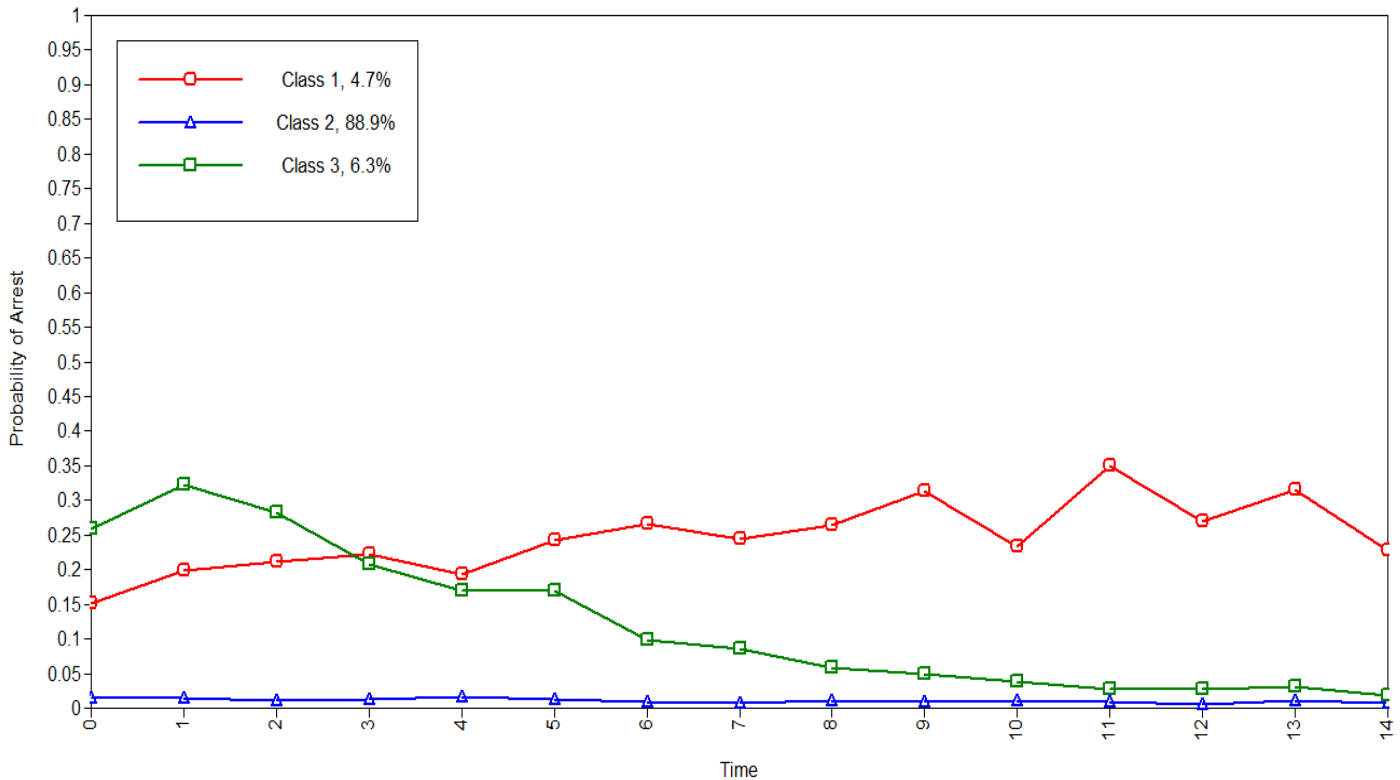
Younger Cohort Males

Table 4.6 presents the fit indices for the LCGAs for the younger male cohort. Given the drop in entropy and the non-significant LMR value ($p > .05$) when moving from a 2-class to a 3-class solution, a 2-class solution was chosen for the younger male cohort. While the LMR value for the 4-class is below the crtical value, it is generally inadvisable to continue adding classes once the LMR value has dropped below statistical significance, as it had with the addition of a third class.

Figure 4.2 presents the LCGA figures for the younger male cohort 2-class solution. The majority of the sample (75.6%) was placed in a very low-level probability class which exhibited a stable arrest probabilty of below 5% across time. The remainder of the sample (24.4%)

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exhibited a relatively stable low to moderate probability in arrest across time generally remaining at about a 25% arrest probability.

Table 4.6 Fit Indices for Latent Class Growth Analyses- Younger Males N=2798

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-9899.35	19808.23	1.00	1.00	
2	-9166.97	18357.73	.70	.84 .93	.00
3	-9137.77	18313.61	.57	.72 .78 .83	.12
4	-9118.94	18290.23	.58	.67 .70 .72 .82	.002

Figure 4.2 Younger Males LCGA Figures N=2798
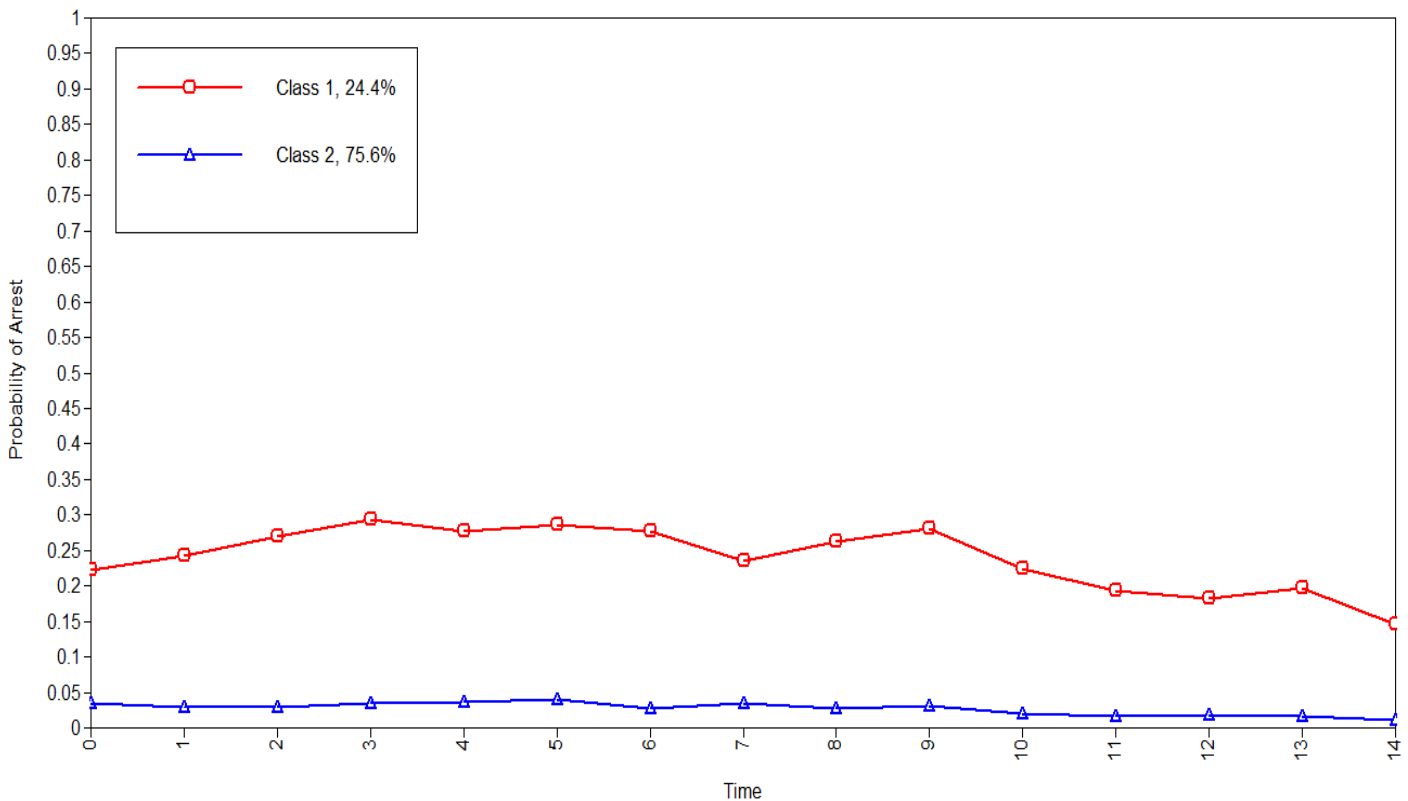
Older Cohort Females

Table 4.7 presents the LCGA fit indices for the older cohort females. The older females were the most challenging to classify. Fit indices are acceptable for two to four classes. However, on closer examination, the fourth female class contained a very small number of individuals-- essentially creating another very low-level arrest probability group that was almost identical to another existing class. The additional fourth class did not appear to add a theoretically meaningful group to the model and thus, a 3-class solution was chosen.

Table 4.7 Fit Indices for Latent Class Growth Analyses- Older Females N=1764

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-2777.34	5563.29	1.00	1.00	
2	-2575.34	5172.17	.82	.86 .97	.00
3	-2551.85	5138.08	.58	.83 .80 .91	.00
4	-2542.21	5131.69	.60	.84 .70 .76 .86	.03

Figure 4.3 illustrates the trajectory figures for the older female 3-class solution. The majority of the sample (66.4%) were placed in an abstainer group with a 5% arrest probability at the initial wave that immediately declined to a stable zero probability in arrest across time. About 30.7% of the older female sample exhibited a very low-level arrest probability with a peak of about a 12% arrest probability at the initial wave when participants were 15-17 years-old and then dropping and stabilizing at about about an 8-10% until about 25-27 years-old where arrest probability was at or below 5% for the duration of the observation period. The third and very small group (2.9%) exhibited considerable intermittancy in arrest probability with several increases and decreases across time. For this class, the two highest peaks were the initial wave

and at 20-22 years-old with about a 40% arrest probability. After the initial wave, there was a

steep drop to just under 30% and then to 15% arrest probability at 17-19 years-old, followed by

another increase to 30% and decrease to 15% before hitting the second peak at 20-22 years-old.

After the second peak, there was a decrease to about 25% arrest probability until 25-27 years-old

where there was an increase to 35% arrest probability. The last few years there was a slight

decrease, and this group leveled off to around a 30% arrest probability.

Figure 4.3 Older Female LCGA Figures N=1764
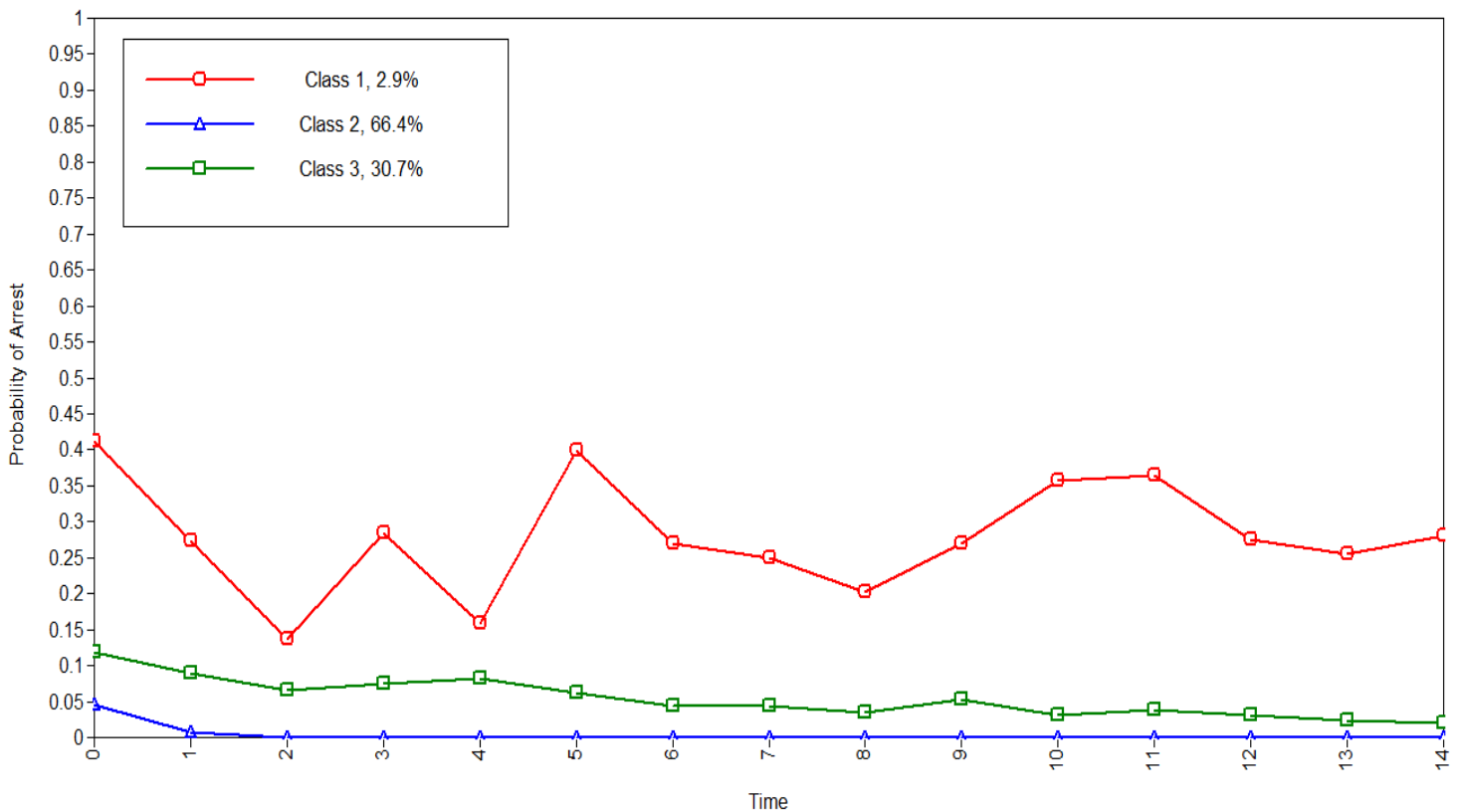
Older Cohort Males

Table 4.8 provides the LCGA fit indices for the older male cohort. While LMR values

were acceptable for a 4-class solution, there was a considerable drop in entropy, and latent class

probabilities dropped to the 60s, indicating less certainty in class placement. Therefore, a 3-class

solution was chosen as the best fit for the older male cohort.

Table 4.8 Fit Indices for Latent Class Growth Analyses- Older Males N=1801

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-6250.19	12509.01	1.00	1.00	
2	-5747.96	11517.51	.72	.93 .88	.00
3	-5699.7	11433.94	.69	.71 .91 .83	.00
4	-5683.71	11414.93	.56	.69 .78 .82 .65	.01

Figure 4.4 presents the LCGA figures for the older males's three classes. As expected, the majority of the sample (72.7%) fell into an abstainer group which had a 5% arrest probability at the initial wave when participants were 15-17 years-old and then declined to nearly zero arrest probability across time. About 15% of the sample followed an adolesent limited pattern with a high peak at the initial wave with a 50% arrest probability. Arrest probability steadily decreased, reaching 35% when participants were 17-19 years-old, dropping to 15% at 22-24 years-old, and decreasing to 5% or less at 26-28 years-old for the rest of the observation period. The final class made up about 12.4% of the older male sample and exhibited a moderate chronic arrest probability with some intermittancy across time. The third class had about a 28% arrest probability at the intial wave and increased to 35% at 18-20 years-old (same as the adolescent-limited group) and then continued around a 30-35% arrest probability with some slight increases and decreases across time. The third class experienced at peak at 24-26 year-old with about a 40% arrest probability and then leveled off at about a 30% arrest probabilty for the rest of the observation period (through 29-31 years-old).

Figure 4.4 Older Males LCGA Figures N=1801
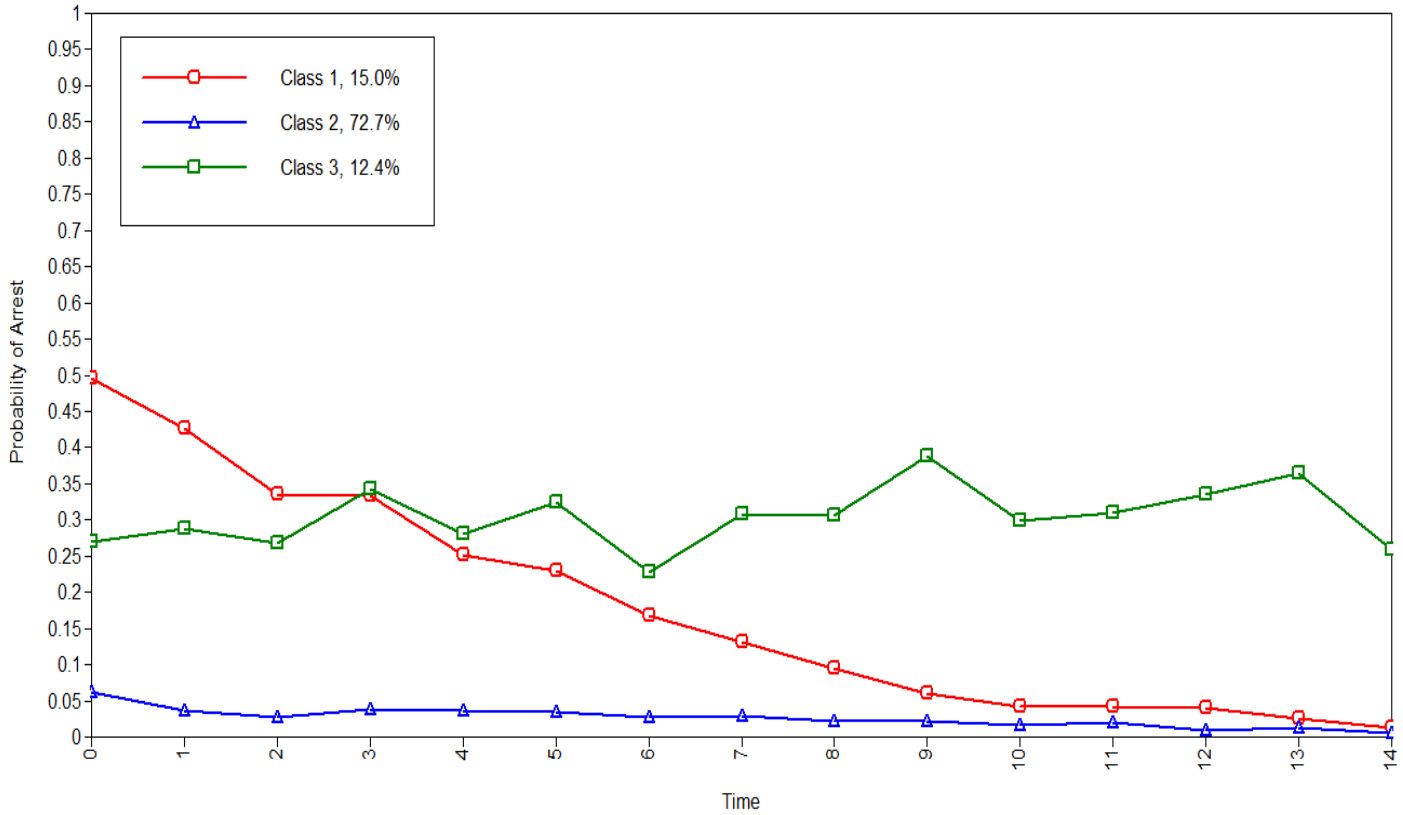
Latent Class Regressions

Younger Cohort Females

Table 4.9 presents the latent class regressions for the younger cohort females for both class comparisons. For all models, the reference group is the abstainer group with a zero probability of arrest. Thus, independent variables predict the probability of being in a given class (adolescent-limited or moderate chronic) relative to being placed in the abstainer class.

Table 4.9 Younger Cohort Females Latent Class Regression of Race, Poverty, and Risk Factors on Class Membership in Arrest Probability 1997-2011

Model	1 N=1911			2 N=1731			3 N=1731		
	Est.	S.D.	O.R.	Est.	S.D.	O.R.	Est.	S.D.	O.R.
Adolescent-Limited									
Race (0= W, 1=H, 2=B)	.05	.18	1.05	.04	.16	1.04	-.08	.18	.92
Household Income ratio	-.01***	.00	1.00	-.001	.001	1.00	.00	.00	1.00
Risk Scale				.38***	.05	1.46			
PIAT Math standard score							-.001	.00	1.00
Problem Behavior							.13	.10	1.14
Family Routine Index							-.02	.03	.98
Family Risk index							.001	.001	1.00
Delinquent Peers							.06*	.03	1.06
Substance Use							.43**	.14	1.54
Delinquency							.54***	.11	1.72
Moderate Chronic									

Race (0= W, 1=H, 2=B)	-.39	.37	.68	-.29	.29	.75	-.61	.46	.54
Household Income ratio	-.001	.002	1.00	-.002	.002	1.00	-.002	.002	1.00
Risk Scale				.38*	.09	1.46			
PIAT Math standard score							-.01	.02	.99
Family Routine Index							.02	.04	1.02
Family Risk index							.002	.001	1.00
Delinquent Peers							-.01	.07	.99
Substance Use							.41*	.21	1.51
Delinquency							.71***	.18	2.03

Abstainer group the reference class and is the class with zero probability of arrest.

* p< .05 ** p<.01 *** p<.001

Adolescent-Limited versus Abstainer Group.

For the younger females' base model comparison between the abstainer and adolescent-limited group, only poverty was statisticall significant (OR=1.00). In the second model with the combined risk scale, only the combined risk scale was statistically significant. As expected, higher risk scores were moderately predictive (OR=1.46) of being placed in the adolescent-limited as compared to the abstainer group. In the final model with the individual risk factors seperated, delinquent peers, substance use, and delinquency were statistically signficant. Having more delinqunet peers was weakly associated (1.06) with being placed in the adolescent-limited group, and increased substance use (OR=1.54) and delinquency (1.72) were moderately predictive of placement in the adolescent-limited group versus the abstainer group. Overall, delinqunecy was the best predictor of class membership in arrest probability.

Moderate Chronic versus Abstainer Group

For the base model comparison between the moderate chronic and abstainer group, none of the varaibles were statistically significant. In model 2, higher scores on the combined risk scale were associated with a 1.46 higher odds of being placed in the moderate chronic group relative to the abstainer group. In model 3 with all risk variables, only substance use and delinquency were statistically significant predictors. Those with increased substance use were about 1.5 times more likely and those with increased delinquency were about twice as likely to be placed in the moderate chronic group as compared to the abstainer group. As in the other model comparison, self-reported delinquency was the best predictor of class membership in arrest probability.

Younger Cohort Males: Moderate Chronic v. Low-Level/ Abstainer Group

Table 4.10 provides the latent class regression results for the younger male cohort.

Table 4.10 Younger Cohort Males Latent Class Regression of Race, Poverty, and Risk Factors on Class Membership in Arrest Probability 1997-2011

Model	1 N=2054			2 N=1849			3 N=1849		
	Est.	S.D.	O.R.	Est.	S.D.	O.R.	Est.	S.D.	O.R.
Moderate Chronic									
Race (0= W, 1=H, 2=B)	.31***	.08	1.36	.36***	.09	1.43	.36***	.10	1.43
Household Income ratio	-.001**	.00	1.00	-.001**	.00	1.00	-.001*	.001	1.00
Risk Scale				.32***	.03	1.38			
PIAT Math standard score							-.01*	.00	.99
Problem behavior							.03	.06	1.03
Family Routine Index							.01	.02	1.01
Family Risk index							.001	.00	1.00
Delinquent Peers							.01	.02	1.01
Substance Use							.32**	.10	1.38
Delinquency							.51***	.06	1.67

The Low-Level/Abstainer group is the reference class and is the class with the lowest arrest probability.
* p< .05 ** p<.01 *** p<.001

For the base model comparison between the moderate chronic and abstainer group, both race and poverty were statistically signficant. Higher levels of household poverty were weakly associated (OR=1.00) and being a minority was weakly to moderately associated (OR=1.36) with being placed in the moderate chronic group. In model 2, race and poverty retained statistical significance as did the combined risk scale. The effect of being minority increased slightly (OR=1.46), poverty remained weakly predictive, and a higher score on the combined risk scale was related to a 1.38 higher odds of being placed in the moderate chronic relative to the abstainer group.

In model 3, poverty and PIAT score were significant but very weakly related to arrest probability (OR= 1.00, .99), and race, substance use, and delinquency were also significantly related to arrest probability. Being a minority (OR=1.43) and increased substance use (OR=1.38) were moderately related to being grouped in the moderate chronic group. Delinquency was the strongest predictor. The parameter estimate associated with delinquent behavior increased the odds of being placed in the moderate chronic group by 1.67. Overall, race was consistently statistically significant for males but not for females in the younger cohort, and substnace use was moderately predictive for both sexes. Delinquency remained the strongest predictor of class membership in arrest probability across models for both males and females in the younger cohort.

Older Cohort Females

Table 4.11 provides the results from the latent class regression model comparisons for the older female cohort. As with all other models, the abstainer group is the reference class.

Table 4.11 Older Cohort Females Latent Class Regression of Race, Poverty, and Risk Factors on Class Membership in Arrest Probability 1997-2011

Model	1 N=1263			2 N=1129			3 N=1129		
	Est.	S.D.	O.R.	Est.	S.D.	O.R.	Est.	S.D.	O.R.
Low Decreasing									
Race (0= W, 1=H, 2=B)	-.13	.15	.88	-.61	.33	.54	-.40	.35	.67
Household Income ratio	-.003**	.00	1.00	-.002*	.001	1.00	.00	.00	1.00
Risk Scale				.64***	.10	1.90			
8th Grade grades							-.28*	.13	.76
Negative Expectations							.004	.002	1.00
Delinquent Peers							.03	.05	1.03
Substance Use							-.19	.25	.83
Delinquency							1.19***	.18	3.29
Intermittent/Chronic									
Race (0= W, 1=H, 2=B)	-.18	.35	.84	-.02	.24	.98	-.02	.28	.98
Household Income ratio	-.001	.00	1.00	-.003**	.001	1.00	-.003*	.001	1.00

Risk Scale	.58***	.11	1.79
8th Grade grades	-.16	.12	.85
Negative Expectations	.004	.002	1.00
Delinquent Peers	.07	.05	1.07
Substance Use	.28	.25	1.32
Delinquency	.95***	.28	2.59

Abstainer group is the reference class and is the class with zero probability of arrest.

* p< .05 ** p<.01 *** p<.001

Low Decreasing versus Abstainer Group.

In the base model comparison between the low decreasing abstainer group, only poverty was associated with class membership (OR=1.00). In model 2, poverty retained the same weak relationship, and those individuals with higher scores on the combined risk scale were nearly twice as likely to be placed in the lower decreasing group relative to the abstainer group. In the last model with the risk variables seperated, only grades in the 8th grade and self-reported delinquency were significantly predictive of class membership. Lower grades were moderately related to arrest probability (OR=.76) while delinquency was strongly related (OR=3.29) to being placed in the class with a higher arrest probability. Delinquency was the strongest predictor of class membership in arrest probability.

Intermittent/Chronic versus Abstainer Group.

Neither poverty nor race were statistically significant in the base model for the intermittent/chronic v. abstainer group comparison. In model 2, higher household poverty was weakly related to class membership (OR=1.00). A higher score on the combined risk scale was associated with a 1.79 higher odds of being placed in the intermittent/chronic group relative to the abstainer group. In the third model with the risk variables seperated, only poverty and delinquency were statistically significant predictors of class membership. Poverty retained the same very weak relationship while higher delinquency scores were strongly related (OR=2.59) to being placed in the class with higher arrest probability. Overall, delinquency was the best predictor of class membership in arrest probability for females in the older cohort.

Older Cohort Males

Table 4.12 presents the results from the latent class regressions for the older males.

Table 4.12 Older Cohort Males Latent Class Regression of Race, Poverty, and Risk Factors on Class Membership in Arrest Probability 1997-2011

Model	1 N=1270			2 N=1116			3 N=1116		
	Est.	S.D.	O.R.	Est.	S.D.	O.R.	Est.	S.D.	O.R.
Adolescent-Limited									
Race (0= W, 1=H, 2=B)	.22	.22	1.32	.20	.22	1.22	.29	.22	1.33
Household Income ratio	-.002	.00	1.00	-.001	.001	1.00	.00	.001	1.00
Risk Scale				.52***	.06	1.68			
8th Grade grades							-.44***	.10	.64
Negative Expectations							.002	.002	1.00
Delinquent Peers							.03	.04	1.03
Substance Use							.45*	.17	1.57
Delinquency							.63***	.10	1.87
Moderate Chronic									
Race (0= W, 1=H, 2=B)	.43***	.14	1.54	.50**	.16	1.65	.59**	.18	1.80
Household Income ratio	-.001*	.00	1.00	-.003*	.001	1.00	-.002	.001	1.00
Risk Scale				.40***	.07	1.49			

8th Grade grades	-.51***	.11	.60
Negative Expectations	.002	.001	1.00
Delinquent Peers	.04	.04	1.04
Substance Use	.32*	.16	1.38
Delinquency	.61***	.12	1.83

Low-Level/Abstainer group is the reference class and is the class with the lowest probability of arrest.

* p< .05   ** p<.01   *** p<.001

Adolescent-Limited versus Low-Level/ Abstainer Group.

For the base model comparison between the adoelscent limited class and the abstainer class, neither race nor poverty were statistically significant. In model 2, the combined risk scale was moderately predictive (OR=1.68) of being placed in the adolescent-limited class relative to the abstainer class. In the third model with the risk variables seperated, lower grades in the 8th grade (OR=.64) and increased substance use (OR=1.57) were moderately associated with being placed in the class with higher arrest probability. Delinquency was again the strongest predictor with higher delinquency scores associated with a 1.87 higher odds of being placed in the adolescent-limtied group relative to the abstainer group.

Moderate Chronic versus Low-Level/Abstainer Group.

Both race and poverty were statistically significant in the base model. While poverty was very weakly associated (OR=1.00), being a minority was associated with a 1.54 increased odds of being placed in the moderate chronic relative to the abstainer group. In model 2, all three variables retained statistical significance. The effect of being a minority increased slightly (OR=1.65). Higher household poverty maintained weak effects. The combined risk scale measure was moderately related (OR=1.49) to placement in the class with higher arrest probability. In the final model, race, grades in 8th grade, substance use, and delinquency were significantly related to arrest probability. Lower grades (OR=.60) and increased substance use (OR=1.38) were moderately related to being placed in the moderate chronic group, and being a minority (OR=1.80) and delinquency (1.83) were more strongly related to being placed in the moderate chronic relative to the abstainer class. Overall, race and delinquency were the best predictors of class membership in arrest probability for males from the older cohort.

As seen in the younger cohort, race was consistently non-signifcant for females, but was significantly related to arrest probability in some models for males. Poverty maintained weak and inconsistent effects across models while grades in 8th grade maintained moderate effects across models. Delinquency maintained the strongest and most consistent effects across sex in both cohorts, stronger than the combined risk scale and all other predictors.

CHAPTER 5

SUPPLEMENTAL ANALYSES RESULTS BY RACE

Sample Descriptives

Younger Cohort

Table 5.1 presents the sample descriptives for younger cohort White participants. Table 5.2 provides the sample descriptives for the younger cohort Hispanics, and Table 5.3 provides the sample descriptives for the younger cohort Black participants.

ANOVA results indicated that younger cohort White, Hispanic, and Black participants were statistically similar in age, sex, family routines, and delinquency. Appendix F.1 presents t-test mean comparisons between White and Hispanic participants. Whites had statistically higher mean PIAT scores, lower poverty scores, and higher mean levels of substance use. Hispanics had statistically higher mean proportions of delinquent peers, higher mean behavior problems, higher combined risk scores, and higher mean arrests than White participants. There were no statistically signifincant differences regarding incarcerations.

Appendix F.2 presents t-test mean comparisons between White and Black participants. Black participants had statistically higher mean scores on family risk, delinqunet peers, arrest outcomes, incarceration outcomes, and the overall risk scale. Blacks had statistically lower mean scores on the PIAT and poverty measures compared to White participants. There were no statistically significant differences in substance use or behavioral problems between Black and White participants

Table 5.1 Descriptive Statistics for Younger Whites N=2801

	Mean	S.D.	Proportions
Age in years (1997)	13.00	.81	
Sex (0=Female)	.52	.50	52% Male; 48% Female
Poverty Ratio	353.72	287.97	
PIAT score	104.42	17.29	
Family Routine index	15.05	5.00	
Family Risk index	2.19	2.13	
Delinquent Peers	9.05	4.15	
Behavior Problems (standardized)	-.05	.99	
Substance Use	.83	1.05	
Delinquency	1.15	1.71	
Risk Scale	2.81	2.66	
Ever Arrested (0=no)	.29	.45	70.7% No
Arrest Total (1997-2011)	.93	2.65	
Ever Incarcerated (0=no)	.05	.22	94.9% No
Incarceration Total (1997-2010)	.09	.48	

Table 5.2 Descriptive Statistics for Younger Hispanics N=1153

	Mean	S.D.	Proportions
Age in years (1997)	13.00	.83	
Sex (Male=1)	.51	.50	51% Male; 49% Female
Poverty Ratio	175.35	161.76	
PIAT score	92.7	18.50	
Family Routine index	15.07	5.57	
Family Risk index	3.32	2.36	
Delinquent Peers	9.78	4.51	
Behavior Problems (standardized)	.10	1.00	
Substance Use	.72	1.01	
Delinquency	1.08	1.63	
Risk Scale	3.60	2.66	
Ever Arrested (0=no)	.33	.47	67% No
Arrest Total (1997-2011)	1.15	2.89	
Ever Incarcerated (0=no)	.07	.25	93% No
Incarceration Total (1997-2010)	.11	.53	

Table 5.3 Descriptive Statistics for Younger Blacks N=1383

	Mean	S.D.	Proportions
Age in years (1997)	13.00	.82	
Sex (0=Female)	.51	.50	51% Male; 49% Female
Poverty Ratio	178.57	184.22	
PIAT score	90.01	18.77	
Family Routine index	15.01	6.45	
Family Risk index	3.69	2.33	
Delinquent Peers	10.51	4.60	
Behavior Problems (standardized)	.02	1.00	
Substance Use	.62	.90	
Delinquency	1.20	1.61	
Risk Scale	3.85	2.45	
Ever Arrested (0=no)	.39	.49	61.3% No
Arrest Total (1997-2011)	1.41	3.35	
Ever Incarcerated (0=no)	.10	.30	90.2% No
Incarceration Total (1997-2010)	0.15	0.55	

Appendix F.3 provides t-test comparisons between Hispanic and Black participants. Hispanic participants had statistically higher mean PIAT scores, behavioral problem scores, and self-reported subtance use. Black participants had higher mean family risk and delinquent peers scores, and slightly higher mean risk, arrest, and incarceration instances. There were no statistically significnat differences between Black and Hispanic poverty means or the proportion that had been incarcerated.

Overall, Black and Hispanic participant differences were small in magnitude. The largest statistical differences were between minority and White participants. In particular, White participants were considerably less impoversihed on average (353.72) compared to Hispanic (175.35) and Black (178.57) particpants, and White participants also had significantly higher PIAT Math scores (104.42) than Hispanic (92.7) and Black (90.01) participants.

Older Cohort

Table 5.4 presents the sample descriptives for the older cohort White participants, Table 5.5 presents the descriptives for the older cohort Hispanic participants, and Table 5.6 presents the descriptives for the older cohort Black participants.

ANOVA results indicated that older cohort White, Hispanic, and Black participants were similar on age, sex, delinquency and the combined risk scale. Appendix G.1 provides the t-test comparisons between White and Hispanic participants. Hispanics reported statistically higher mean negative expectations while White participants were statistically less impoverished and had statistically higher mean grades in 8th grade and higher mean substance use scores. There were no statistically significant differences between White and Hispanic participants regarding delinquent peers or arrest and incarceration outcomes.

Table 5.4 Descriptive Statistics for Older Whites N= 1842

	Mean	S.D.	Proportions
Age in years (1997)	15.50	.50	
Sex (0=Female)	.51	.50	51% Male; 49% Female
Poverty Ratio	375.43	313.25	
8th Grade grades	5.91	1.69	
Delinquent Peers	12.98	4.10	
Negative Expectations	100.39	92.91	
Substance Use	1.59	1.17	
Delinquency	1.66	2.01	
Risk Scale	3.19	2.43	
Ever Arrested (0=no)	.31	.46	69.3% No
Arrest Total (1997-2011)	.98	2.88	
Ever Incarcerated (0=no)	.07	.25	93.4% No
Incarceration Total (1997-2010)	.11	.51	

Table 5.5 Descriptive Statistics for Older Hispanics N= 744

	Mean	S.D.	Proportions
Age in years (1997)	15.50	.50	
Sex (0=Female)	.53	.50	53% Male; 47% Female
Poverty Ratio	187.26	209.87	
8th Grade grades	5.47	1.74	
Delinquent Peers	13.12	4.65	
Negative Expectations	118.49	107.86	
Substance Use	1.37	1.17	
Delinquency	1.59	2.15	
Risk Scale	3.38	2.47	
Ever Arrested (0=no)	.33	.47	67% No
Arrest Total (1997-2011)	1.21	3.40	
Ever Incarcerated (0=no)	.09	.28	91% No
Incarceration Total (1997-2010)	.16	.67	

Table 5.6 Descriptive Statistics for Older Blacks N= 947

	Mean	S.D.	Proportions
Age in years (1997)	15.50	.50	
Sex (0=Female)	.48	.50	48% Male; 52% Female
Poverty Ratio	199.65	198.99	
8th Grade grades	5.30	1.51	
Negative Peers	14.26	4.71	
Delinquent Expectations	111.97	103.16	
Substance Use	1.16	1.14	
Delinquency	1.52	2.00	
Risk Scale	3.26	2.17	
Ever Arrested (0=no)	.38	.49	61.6% No
Arrest Total (1997-2011)	1.63	4.67	
Ever Incarcerated (0=no)	.12	.32	88.2% No
Incarceration Total (1997-2010)	0.22	0.71	

Appendix G.2 presents the t-test comparisons between White and Black participants. White participants were statistically less impoverished, had statistically higher mean 8th grade grades, and statistically higher mean levels of substance use. Black participants had statistically higher mean scores on negative expectations, delinquent peers, and arrest and incarceration outcomes than White paricipants.

Appendix G.3 presents t-test comparisons between Hispanic and Black participants. There were no statistically significant differences between Black and White participants on poverty, 8th grade grades, delinquent peers, negative expectations, or total incarcerations. Hispanic participants reported statistically higher mean levels of substance use while Black participants reported statistically higher means on delinquent peers, arrest outcomes, and the proportion that had been incarcerated.

Overall, the magnitude of differences between Black and Hispanic participants was relatively small. The larger statistic differences were between minority and White participant comparisons. White participants were considerably less likely to be impoversihed on average (375.43) than both Hispanic (187.26) and Black (199.65) participants.

Latent Growth Class Analyses

Younger Cohort White Participants

Table 5.7 presents the LCGA fit indices for the younger cohort White participants. While the entropy and latent class probabilities were acceptable for a 3-class solution, the LMR value indicated that the addition of a third class does not improve model fit. Thus, a 2-class solution was chosen.

Table 5.7 Fit Indices for Latent Class Growth Analyses- Younger Whites N=2801

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-7085.02	14179.55	1.00	1.00	
2	-6384.35	12792.50	.79	.97 .85	.00
3	-6357.75	12753.59	.74	.77 .78 .92	.11
4	-6347.75	12747.86	.78	.79 .77 .92 .62	.12

Figure 5.1 provides the LCGA figures for the younger cohort White participants. The majority of the sample (84.1%) was placed in an abstainer group with a very stable nearly zero arrest probabilty across time. The rest of the sample (15.9%) was placed in a low to moderate level chronic group which increased steadily from about a 20% arrest probability after the initial wave where participants were 12-14 years-old. This class remained relatively stable at about a 20-25% arrest probability with minor increases and decreases over time with a peak of about 28% at 17-19 yyears-old and a low of aobut 15% arrest probability at the last wave when participants were 26-28 years-old.

Figure 5.1 Younger Whites LCGA Figures N=2801
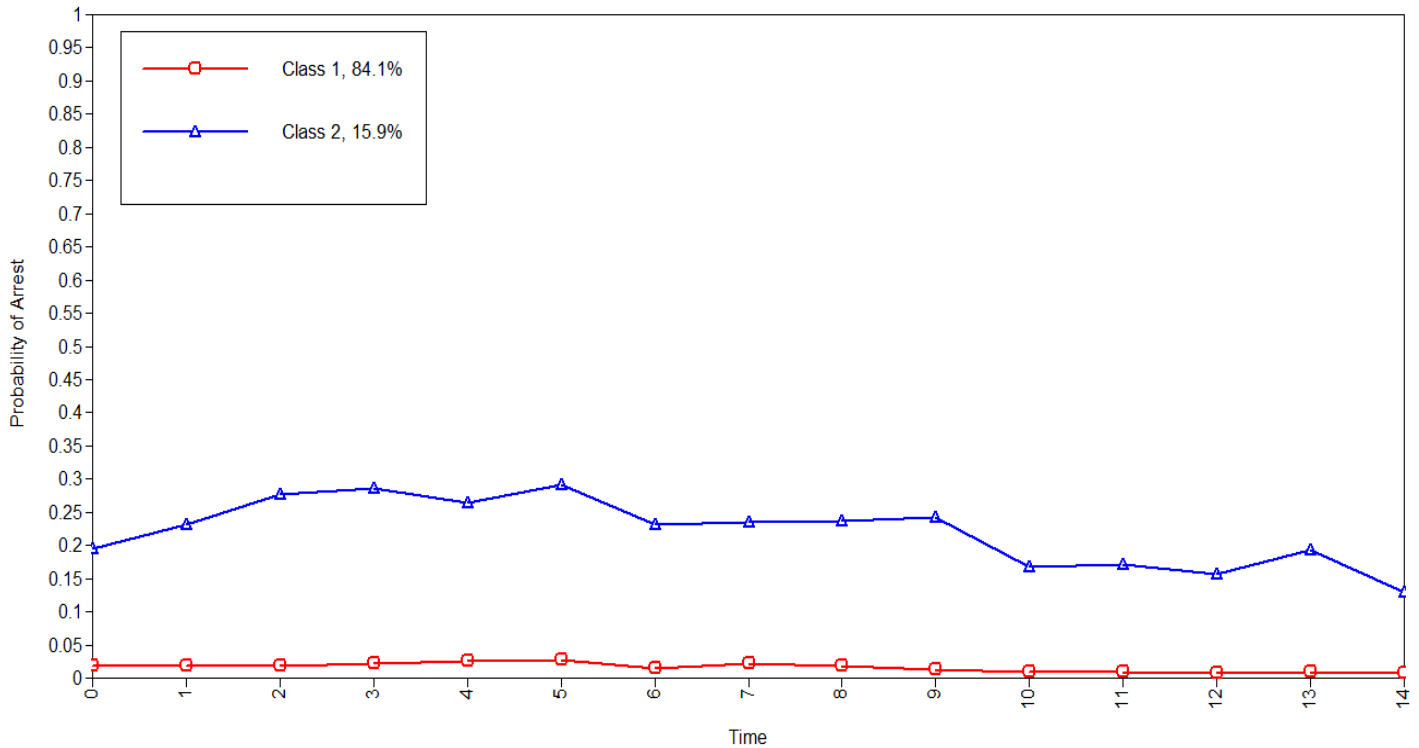
Younger Cohort Hispanic Participants

Table 5.8 presents the LCGA fit indices for the younger cohort Hispanic participants. While the entropy and latent class probabilities were acceptable for a 3-class solution, the LMR value was non-significant ($p<.05$), indicating that the addition of a third class does not improve model fit. Therefore, a 2-class solution was chosen.

Figure 5.2 illustrates the LCGA figures from the 2-class solution. About 83% of the sample can be described as an abstainer group with below 5% arrest probability and very near zero across all waves. The remainder of the sample (17%) was placed in a low to moderate chronic group similar to those in the younger cohort White sample. This group began with about a 25% arrest probability at 12-14 years of age and remained relatively stable at a 25% arrest probability with minor increases and decreases across time. The peak was about a 30% arrest probability at 15-17 years-old, and the lowest point was just above a 15%

arrest probability at the last wave when participants were 26-28 years-old.

Table 5.8 Fit Indices for Latent Class Growth Analyses- Younger Hispanics N=1153

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-3158.71	6235.16	1.00	1.00	
2	-2873.92	5767.22	.78	.83 .96	.00
3	-2857.94	5746.87	.78	.68 .83 .94	.06
4	-2850.19	5743.00	.59	.69 .86 .83 .68	.07

Figure 5.2 Younger Hispanics LCGA N=1153
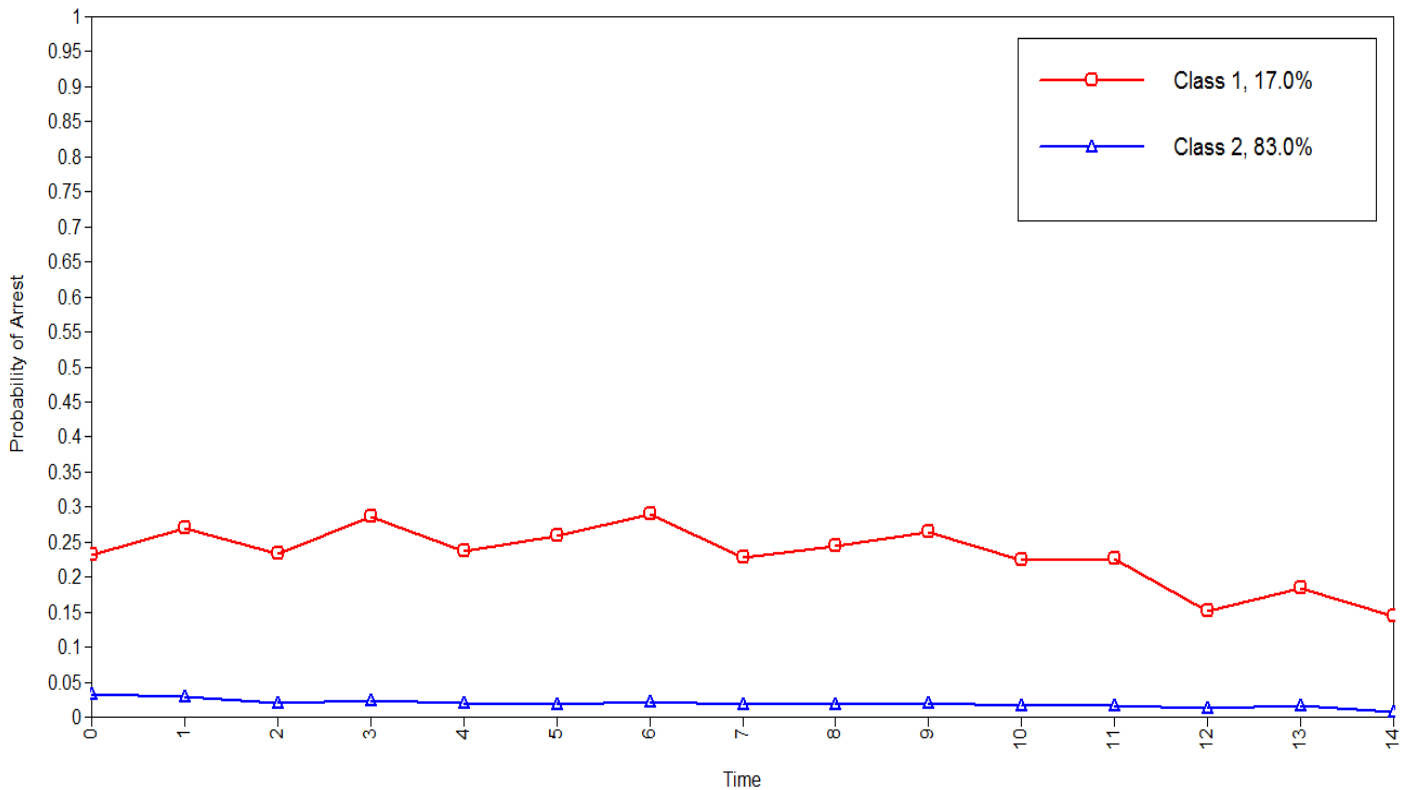
Younger Cohort Black Participants

Table 5.9 provides the LCGA fit indices for the younger cohort Black participants. As with the other groups in the younger cohort, a 2-class solution was chosen because the LMR value indicated that the addition of a third class worsened the model fit.

Table 5.9 Fit Indices for Latent Class Growth Analyses- Younger Blacks N=1383

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-4412.62	8833.34	1.00	1.00	
2	-4043.92	8108.13	.74	.95 .85	.00
3	-4032.52	8096.55	.68	.68 .75 .91	.18
4	-4027.13	8098.88	.71	.66 .71 .90 .63	.13

Figure 5.3 presents the LCGA figures for the younger Black cohort's two classes.

Figure 5.3 Younger Blacks LCGA Figures N=1381
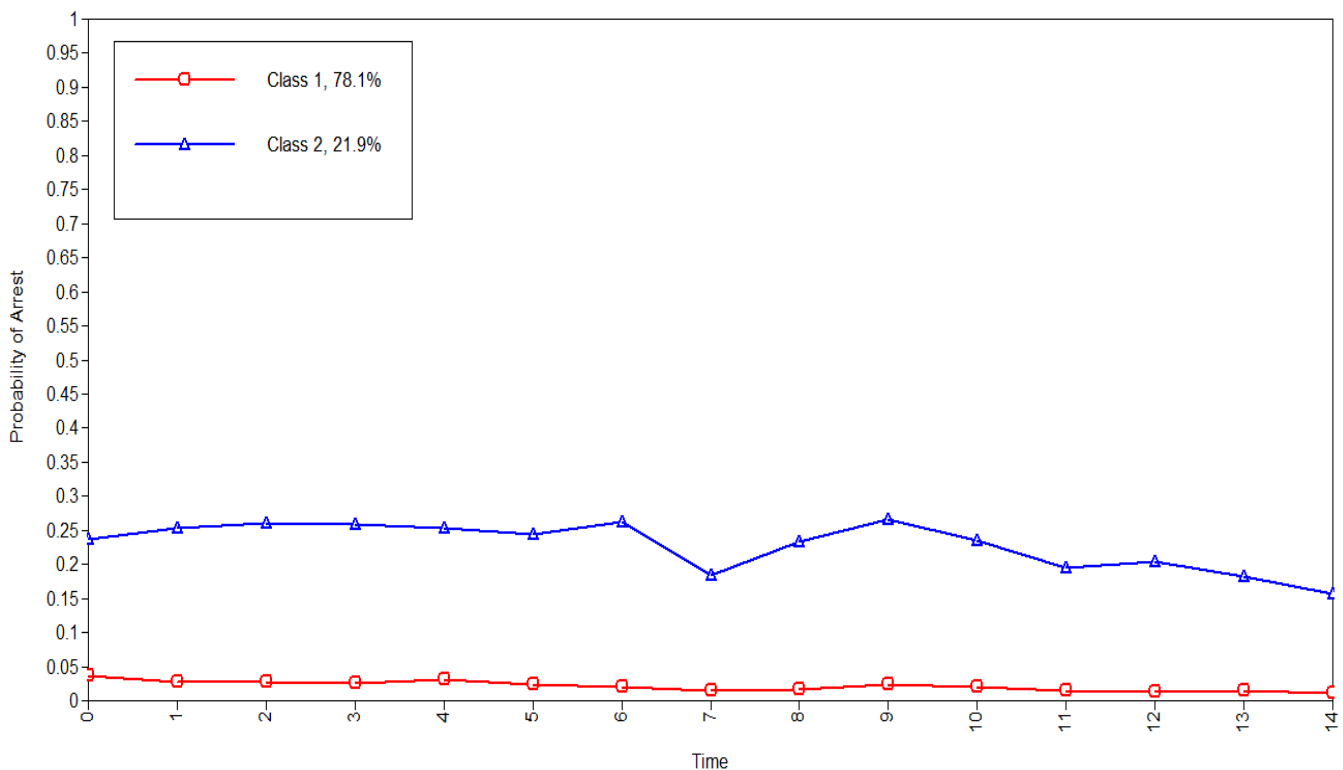
Similar to the younger White and Hispanic cohort participants, ther majority of the

sample (78.1%) was placed in a very stable abstainter group with essentially a zero probability of

arrest across time. The other group can be described as a low to moderate level chronic group

with a 25% arrest probability at the initial wave. This low/moderate chronic group remained

relatively stable across time with no distinct peak, but a slightly distinct decrease to 20% arrest

probability at 19-21 years of age and then a 20% arrest probability at the last wave.

Overall, there was remarkable consistency across race in the younger cohort regarding

the number of latent classes and trajectory patterns. A two-class solution including a stable

abstainer group and a relatively stable low to moderate chronic group was consistent across race.

The chronic group among Black, White, and Hispanic participants shared similar arrest

probabilities, ranging from 20-30% across time.

Older Cohort White Participants

Table 5.10 provides the LCGA fit indices for the older cohort White participants. While

the LMR value was acceptable for a 4-class solution, there was a considerable drop in entropy in

the latent class probabilities when moving from a three to a four-class solution. Given the totality

of the fit indices, a 3-class solution appeared to be the best fit.

Table 5.10 Fit Indices for Latent Class Growth Analyses- Older Whites N=1842

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-4326.20	8661.09	1.00	1.00	
2	-3929.46	7880.63	.76	.95 .87	.00
3	-3893.28	7821.28	.73	.73 .92 .83	.00
4	-3883.83	7815.42	.56	.87 .65 .70 .79	.01

Figure 5.4 illustrates the LCGA figures for the three classes. The majority of the sample (79.4%) was placed in a stable abstainer category with an initial 5% arrest probability. The probability of arrest for this group decreased rapidly and remained at zero across time. About 10.8% of the sample exhibited an adolescent-limited pattern with a very high initial peak of 50% probability of arrest when participants were 15-17 years of age. The arrest probability decreased to about 40% the next wave and then to about 25% when participants were 17-21 years-old. After 18-21 years of age, arrest probability steadily decreased, reaching zero arrest probability at 22-24 years of age. The other group (9.8%) can be described as a moderate chronic group which exhibited about a 30% arrest probability at the initial wave. This moderate chronic group remained relatively stable at about a 30% arrest probability across time with no distinct peak but two low points of a 20% arrest probability at 17-19 years-old and at the last wave when participants were 29-31 years of age.

Figure 5.4 Older Whites LCGA Figures N=1842
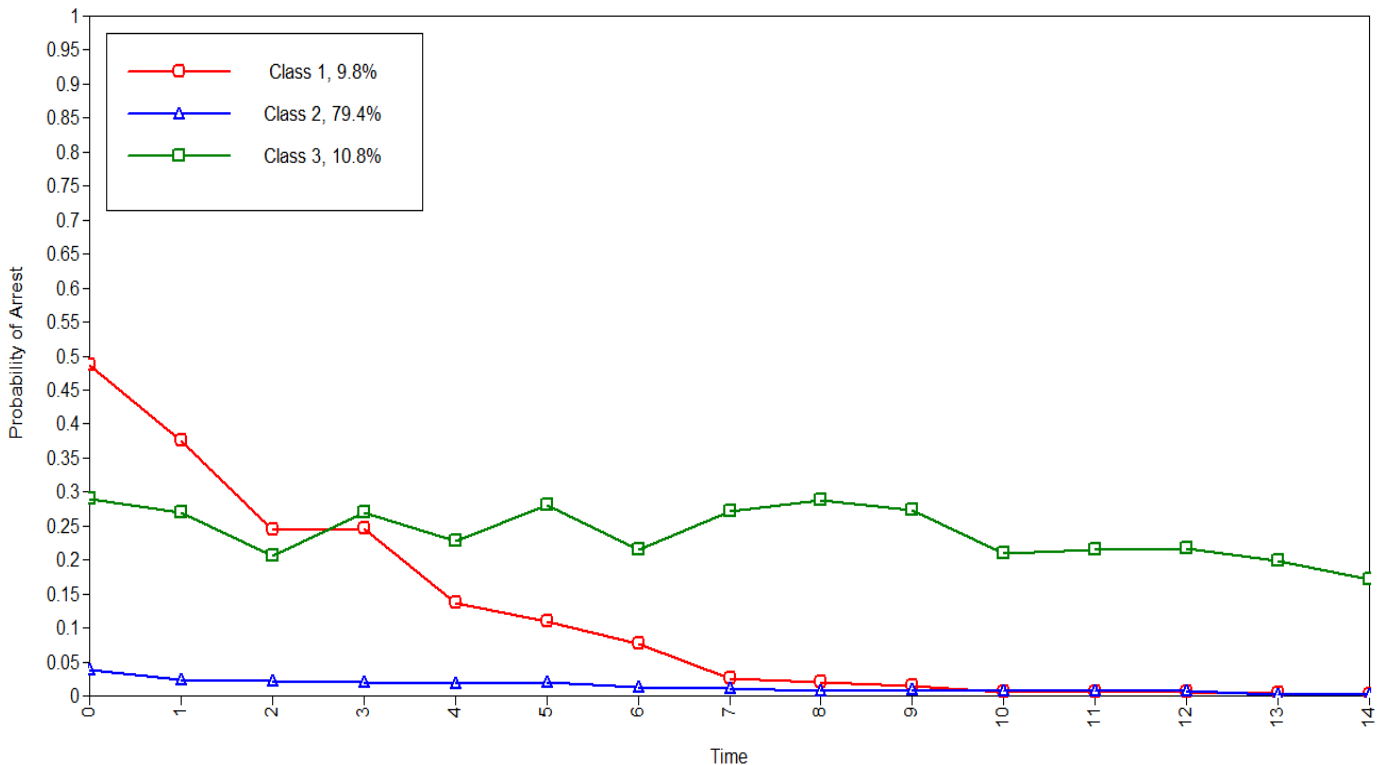
Older Cohort Hispanic Participants

Table 5.11 presents the LCGA fit indices for the older cohort Hispanic participants.
There was a considerable drop in entropy when moving from a two to three-class solution, but
more importantly, the LMR value indicated that the two-class solution provides a better model
fit. Thus, a two-class solution was chosen.

Table 5.11 Fit Indices for Latent Class Growth Analyses- Older Hispanics N=744

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-1899.55	3805.98	1.00	1.00	
2	-1740.07	3497.31	.78	.85 .96	.00
3	-1727.64	3482.77	.52	.85 .81 .74	.27
4	-1716.71	3471.22	.57	.76 .81 .81 .71	.07

Figure 5.5 illustrates the LCGA trajectories for the two classes. Like all other groups, the
majority of the sample (84.4%) was placed into a low level/abstainer group exhibited just under a
10% arrest probability at the initial wave when participants were 15-17 years of age and then
decreased to a zero probability for the remainder of the observation period. The remaining 15.6%
of the sample exhibited a steady decrease in arrest probability with a peak of 40% arrest
probability at the initial wave. After the initial wave, this group generally decreased in arrest
probability with some increases and decreases. The lowest point was the last wave when
participants were 29-31 years of age and exhibited about a 10% arrest probability.

Figure 5.5 Older Hispanics LCGA N=744
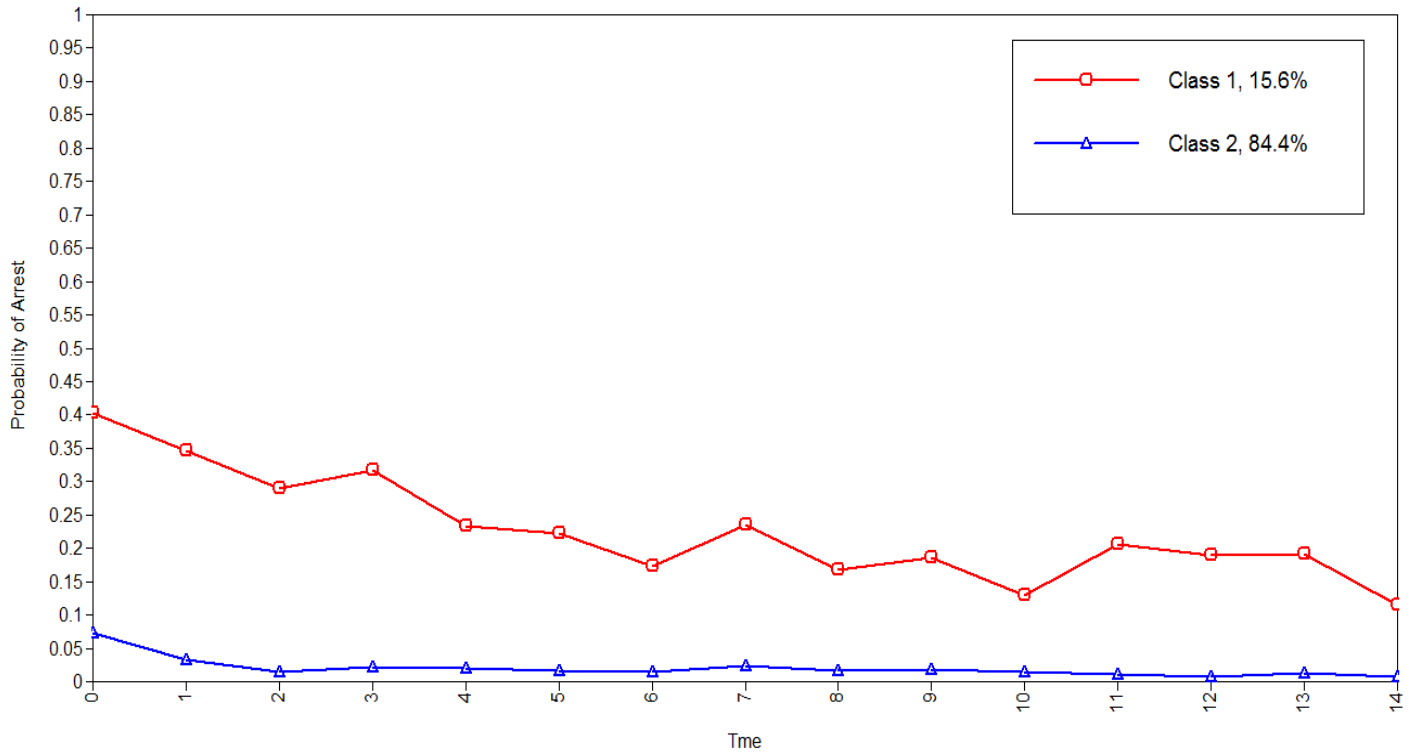
Older Cohort Black Participants

Table 5.12 provides the LCGA fit indices for the older cohort Black participants. While the entropy and the latent class probabilities were acceptable for a 4-class solution, the LMR value was non-significant, indicating that the addition of a fourth class did not improve model fit. Therefore, a 3-class solution was chosen.

Table 5.12 Fit Indices for Latent Class Growth Analyses- Older Blacks N=947

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-2988.54	5984.43	1.00	1.00	
2	-2680.75	5379.89	.80	.91 .95	.00
3	-2656.95	5343.32	.60	.82 .76 .91	.01
4	-2638.85	5318.15	.69	.91 .85 .78 .83	.10

Figure 5.6 presents the LCGA trajectories for the 3-class solution.

Figure 5.6 Older Blacks LCGA Figures N=947
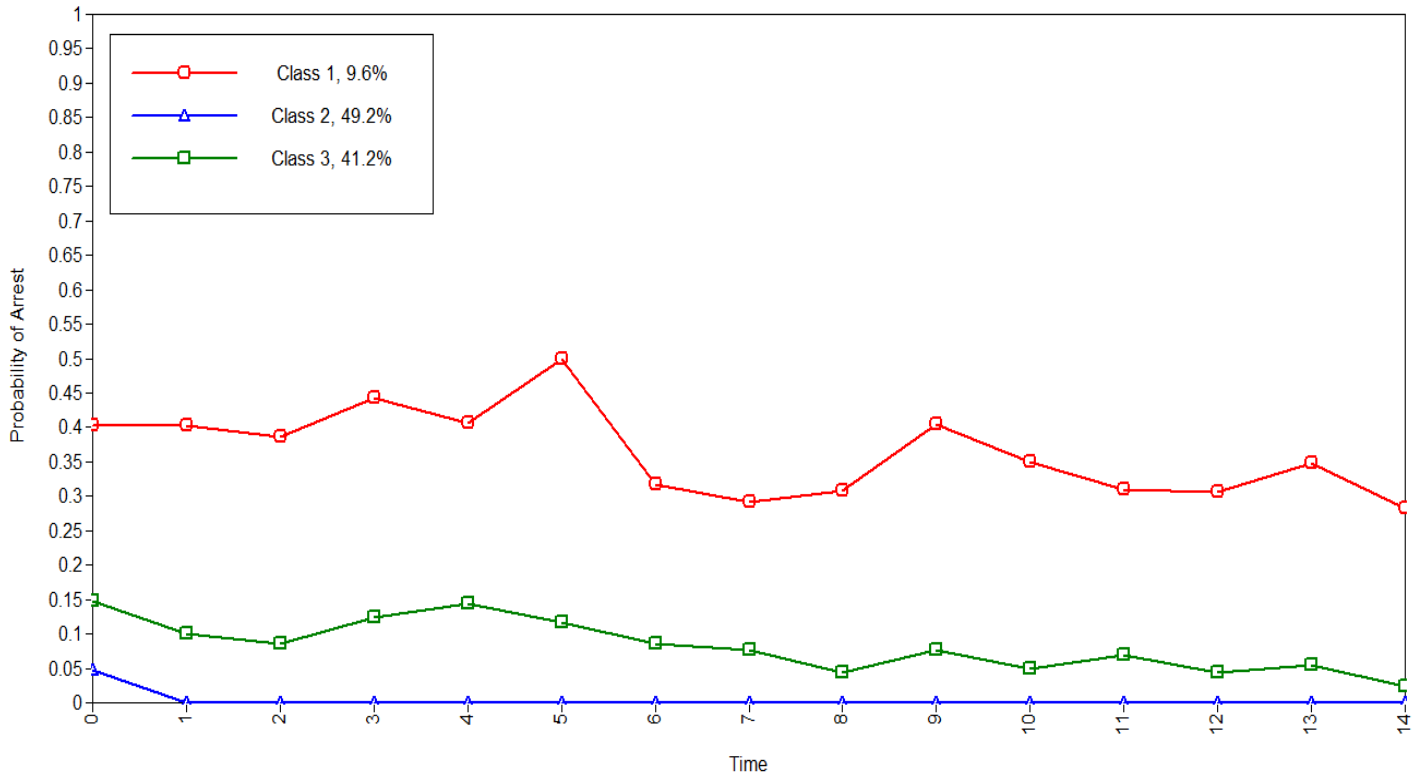
The largest proportion of the sample (49.2%) was placed in an abstainer group that

exhibited about a 5% arrest probability at the initial wave and then a zero arrest probability

across time. While the abstainer group represents the largest proportion of Black participants,

nearly half of the sample exhibited an elevated arrest probability. About 41.2% of the sample can

be described as a relatively stable but low-level decreasing group. This group had a 15% arrest

probability at the initial wave which remained relatively stable, decreasing to about 10% and

then increasing back up to 15% across time. At 24-26 years of age and after, this group remained

below a 10% arrest probability and continued to decrease to nearly zero by the last wave when

participants were 29-31 years-old. The smallest group (9.6%) can be described as a high chronic

group. While the group exhibited intermittency in arrest probabilities over time, the group also

showed elevated and prolonged arrest probabilities across time. This group had a 40% arrest

probability at the initial wave when participants were 15-17 years—old. Arrest probabilities peaked to 50% at 20-22 years of age. After this peak, there was a steep decrease to 30% which remained stable for about three years until increasing again to nearly 40% at 24-26 years-old. After this second increase, there was another slight decrease, ending with a 30% arrest probability when participants were 39-31 years-old.

<div align="center">

Latent Class Regressions

</div>

As with the other models, all latent class regressions used the abstainer or lowest probability of arrest group as the reference class. Therefore, all independent variables are predicting the likelihood of being placed in a higher arrest probability class relative to an abstainer class. A base model with sex and poverty was first estimated, followed next by the addition of the combined risk scale. In the third and final model, the combined risk scale was removed and the individual risk variables were added to the analysis.

Younger Cohort White Participants

Low/Moderate Chronic versus Abstainer Group.

Table 5.13 presents the latent class regression for the younger cohort White participants. In the base model, both sex and poverty were statistically significant. While higher household poverty was very weakly predictive (OR=1.00), males were 4.80 more likely than females to be placed in the low/moderate chronic class relative to the abstainer class. In model 2, all variables were statistically predictive of class membership. Sex remained the strongest predictor (OR=5.33) followed by the combined risk scale (OR=1.41). In the final model with the risk variables enumerated, the effect of being male decreased considerably (OR=1.15). Poverty remained weakly predictive (OR=1.00) as did the effect of lower PIAT scores (OR.99). Higher

delinquency scores (OR=1.63) was the strongest predictor of class membership, followed by

higher substance use scores (OR=1.57). Overall, being male was highly predictive of being

placed in the class with a higher arrest probability until substance use and delinquency were

added to the model. In the final model, delinquency was the strongest predictor of class

membership.

Table 5.13 Younger Cohort Whites Latent Class Regression of Sex, Poverty, and Risk Factors on Class Membership in Arrest Probability 1997-2011

Model	1 N=2178			2 N=2003			3 N=2003		
	Est.	S.D.	O.R.	Est.	S.D.	O.R.	Est.	S.D.	O.R.
Class 1									
Sex (0=Male)	1.57***	.16	4.80	1.67***	.19	5.33	.14***	.20	1.15
Household Income ratio	-.001**	.00	1.00	-.001**	.00	1.00	.00*	.00	1.00
Risk Scale				.34***	.03	1.41			
PIAT Math standard score							-.01*	.01	.99
Problem behavior							.12	.10	1.13
Family Routine Index							.01	.02	1.01
Family Risk index							.05	.05	1.05
Delinquent Peers							-.02	.03	.98
Substance Use							.45***	.10	1.57
Delinquency							.49***	.06	1.63

Abstainer group is the reference class and is the class with nearly zero probability of arrest.
* p< .05 ** p<.01 *** p<.001

Younger Cohort Hispanic Participants

      Low/Moderate versus Abstainer Group.

      Table 5.14 provides the results from the latent class regressions for the younger cohort Hispanic participants. Higher household poverty was weakly predictive (OR=1.00) and sex was strongly predictive (OR=11.59) of being placed in the class with a higher arrest probability. In model 2, both poverty and sex retained similar relationships, and the combined risk scale was moderately predictive of class membership (OR=1.52). In the final model, being male remained highly predictive (OR=12.43) of class membership. Lower PIAT scores exhibited a weak effect (OR=.98), while substance use (OR=1.52) and delinquency scores (OR=1.67) were moderately predictive of class membership. Overall, being male was by far the strongest predictor of class membership for the younger cohort Hispanic participants.

Table 5.14 Younger Cohort Hispanics Latent Class Regression of Sex, Poverty, and Risk Factors on Class Membership in Arrest Probability 1997-2011

Model	1 N=793			2 N=702			3 N=702		
	Est.	S.D.	O.R.	Est.	S.D.	O.R.	Est.	S.D.	O.R.
Class 1									
Sex (0=Male)	2.45***	.30	11.59	2.63***	.34	13.87	2.52***	.38	12.43
Household Income ratio	-.003**	.001	1.00	-.002	.001	1.00	-.002	.001	1.00
Risk Scale				.42***	.06	1.52			
PIAT Math standard score							-.02*	.01	.98
Problem behavior							-.002	.18	1.00
Family Routine Index							-.04	.03	.96
Family Risk index							.001	.001	1.00
Delinquent Peers							-.02	.04	.98
Substance Use							.42*	.20	1.52
Delinquency							.51***	.13	1.67

The abstainer group is the reference class and is the class with nearly zero probability of arrest.
* p< .05 ** p<.01 *** p<.001

Younger Cohort Black Participants

  Low/Moderate Chronic versus Abstainer Group.

  Table 5.15 presents the results from the latent class regressions for the younger cohort

Black participants. Sex was strongly predictive (OR=9.03) of being placed in the low/moderate

chronic group versus the abstainer group. In model 2, the effect of sex was associated with an

odds ratio for males that translates into a difference that is 11 times greater than females. The

combined risk scale (OR=1.35) was modestly related to arrest probability. In the final model,

sex, delinquent peers, substance use, and delinquency were statistically significant predictors.

Sex remained the strongest predictor with an odds ratio for males reflecting a 9.39 greater chance

of placement in the low/moderate chronic class. Having more delinquent peers was weakly

predictive (OR=1.06), substance use was modestly predictive (OR=1.36), and higher

delinquency scores were moderately predictive (OR=1.73) of class membership. Overall, being a

delinquent male was predictive of being placed in the low/moderate chronic class relative to the

abstainer class for the younger cohort Black participants.

  In sum, delinquency was a moderate and consistent predictor of class membership across

race. Substance use was a consistent yet modest predictor across race. Being male was a very

strong predictor of class membership in arrest probability for Hispanic and Black participants but

interestingly, a relatively weak predictor for White participants.

Table 5.15 Younger Cohort Blacks Latent Class Regression of Sex, Poverty, and Risk Factors on Class Membership in Arrest Probability 1997-2011

Model	1 N=968			2 N=864			3 N=864		
	Est.	S.D.	O.R.	Est.	S.D.	O.R.	Est.	S.D.	O.R.
Class 1									
Sex (0=Male)	2.20***	.23	9.03	2.40***	.27	11.02	2.24***	.29	9.39
Household Income ratio	-.002	.00	1.00	-.003	.00	1.00	.00	.00	1.00
Risk Scale				.30***	.05	1.35			
PIAT Math standard score							.001	.01	1.00
Problem behavior							-.06	.14	.94
Family Routine Index							.02	.02	1.02
Family Risk index							.08	.06	1.08
Delinquent Peers							.06*	.03	1.06
Substance Use							.31*	.14	1.36
Delinquency							.55***	.11	1.73

The abstainer group is the reference class and is the class with nearly zero probability of arrest.
* p< .05 ** p<.01 *** p<.001

Older Cohort White Participants

Table 5.16 presents the results from the latent class regression for the older cohort White participants.

Adolescent-Limited versus Abstainer Group.

In the base model, higher household poverty was weakly predictive (OR=1.00), and being male was strongly predictive (OR=3.33) of class membership. In model 2, the effect of being male increased (OR=4.91) with the addition of the combined risk scale which was moderately predictive (OR=1.76) of class membership. In the third model, sex was no longer statistically significant. Having more negative expectations was weakly predictive of arrest probability (OR=1.01). Lower grades in the 8th grade (OR=.71) and increased substance use (OR=1.42) were moderately related to being placed in the adolescent-limited versus the abstainer group. The strongest predictor of class membership was delinquency (OR=2.15).

Moderate Chronic versus Abstainer Group.

In the base model, being male was strongly predictive of being placed in the moderate chronic group (OR=8.19), and higher household poverty was very weakly related (OR=1.00) to class placement. In model 2, poverty and sex maintained similar relationships with class membership, and higher scores on the combined risk scale were moderately predictive of class membership (OR=1.61). In the third model, the effect of being male decreased but was still very strong with an odds ratio for males reflecting a 5.87 greater chance of placement in the moderate chronic relative to the abstainer class. Having more negative expectations was weakly associated with arrest probability, and lower grades in the 8th grade was a moderately strong

Table 5.16 Older Cohort Whites Latent Class Regression of Sex, Poverty, and Risk Factors on Class Membership in Arrest Probability 1997-2011

Model	1 N=1398			2 N=1293			3 N=1293		
	Est.	S.D.	O.R.	Est.	S.D.	O.R.	Est.	S.D.	O.R.
Adolescent-Limited									
Sex (0=male)	1.20***	.22	3.33	1.59***	.30	4.91	.85	.57	2.34
Household Income ratio	-.001**	.00	1.00	-.001	.001	1.00	-.01	.00	1.00
Risk Scale				.57**	.08	1.76			
8th Grade grades							-.34**	.10	.71
Negative Expectations							.01*	.003	1.01
Delinquent Peers							.04	.05	1.04
Substance Use							.35*	.17	1.42
Delinquency							.76***	.23	2.15
Moderate Chronic									
Sex (0=male)	2.10***	.36	8.19	2.17***	.46	8.78	1.77**	.68	5.87
Household Income ratio	-.001**	.00	1.00	-.003*	.001	1.00	-.002	.001	1.00

Risk Scale	.48***	.11	1.61			
8th Grade grades				-.52***	.15	.60
Negative Expectations				.01*	.003	1.01
Delinquent Peers				.07	.06	1.07
Substance Use				.24	.21	1.27
Delinquency				.78*	.38	2.18

The abstainer group is the reference class and is the class with zero probability of arrest.

* p< .05 ** p<.01 *** p<.001

predictor of class membership. Of the risk variables, delinquency was the strongest predictor (OR=2.18). Sex was a strong predictor of placement in the chronic offender group but not the adolescent-limited group for older cohort White participants. Delinquency had the strongest and most consistent effects of the risk variables, stronger than the combined risk scale.

Older Cohort Hispanic Participants

Table 5.17 presents the results from the latent class regression for the older cohort Hispanic participants.

Decreasing versus Abstainer Group.

In the base model, males were eight times more likely than females to be placed in the class with the higher arrest probability. In model 2, the effect of being male decreased but was still quite strong (OR=6.69). The combined risk scale had a moderate effect on arrest probability (1.86). In the final model, only sex and delinquency were statistically significant predictors. The effect of being male increased, with an odds ratio for males reflecting a 9.68 greater chance of placement in the decreasing versus the abstainer group. Increased delinquency was also strongly predictive (OR=2.77). Overall, sex was by the far the strongest predictor, followed by delinquency for older cohort Hispanic participants.

Table 5.17 Older Cohort Hispanics Latent Class Regression of Sex, Poverty, and Risk Factors on Class Membership in Arrest Probability 1997-2011

Model	**1** N=503			**2** N=437			**3** N=437		
	Est.	S.D.	O.R.	Est.	S.D.	O.R.	Est.	S.D.	O.R.
Decreasing									
Sex (0=Male)	2.09***	.43	8.09	1.90***	.41	6.69	2.27***	.60	9.68
Household Income ratio	.001	.001	1.00	.001	.001	1.00	.001	.001	1.00
Risk Scale				0.62***	.08	1.86			
8th Grade grades							-.05	.17	.95
Negative Expectations							.004	.00	1.00
Delinquent Peers							-.02	.06	.98
Substance Use							.23	.25	1.26
Delinquency							1.02***	.22	2.77

The abstainer group is the reference class and is the class with nearly zero probability of arrest.

* p< .05 ** p<.01 *** p<.001

Older Cohort Black Participants

Table 5.18 provides the results from the latent class regressions from the older cohort Black participants.

Low-Level Adolescent-Limited versus Abstainer Group.

In the base model, sex exhibited a very strong effect with males 12.18 times more likely than females to be placed in the class with a higher arrest probability. The addition of the combined risk scale increased the effect of sex (OR=13.20), but the combined risk scale was moderately predictive (OR=1.54) of class membership. In the third model, sex remained the strongest predictor but its effect was slightly reduced (OR=8.32). Higher household poverty had a weak effect on class membership (OR=1.00), and increased delinquency moderately predictive (OR= 1.86) of class membership. Overall, sex was the strongest predictor of class membership, followed by delinquency.

High Intermittent Chronic versus Abstainer Group.

In the base model, poverty was not statistically significant and the effect of sex could not be estimated because only eight females were placed in the higher intermittent chronic group. Thus, sex was essentially a constant and its effect not calculated for any of the models. Clearly, being male was a strong predictor for placement in this particular higher chronic intermittent offender class. In model 2, household poverty was very weakly predictive (OR=1.00), and higher scores on the combined risk scale were moderately predictive of class membership (OR=1.63). In the final model, poverty retained the same weak effect. Higher 8th grade grades were inversely related to arrest probability and had a moderately strong effect (OR=.59) on class membership. Higher delinquency scores were strongly predictive (OR=2.09) of class membership.

Table 5.18 Older Cohort Blacks Latent Class Regression of Sex, Poverty, and Risk Factors on Class Membership in Arrest Probability 1997-2011

Model	1 N=632			2 N=522			3 N=522		
	Est.	S.D.	O.R.	Est.	S.D.	O.R.	Est.	S.D.	O.R.
Low-Level Adolescent-Limited									
Sex (0=male)	2.50	.42	12.18***	2.58***	.42	13.20	2.12***	.56	8.32
Household Income ratio	-.002	.00	1.00	-.003	.001	1.00	.00*	.00	1.00
Risk Scale				.43***	.07	1.54			
8th Grade grades							-.10	.14	.90
Negative Expectations							.00	.003	.00
Delinquent Peers							.04	.04	1.04
Substance Use							.38	.23	1.46
Delinquency							.62***	.16	1.86
Higher Chronic/Intermittent									
Sex (0=male)	108.99	.00	NA	28.11***	.42	NA	46.67	.00	NA
Household Income ratio	-.01	.00	1.00	-.01**	.002	1.00	-.01**	.003	.99

Risk Scale	.49***	.13	1.63			
8th Grade grades				-.53*	.24	.59
Negative Expectations				.001	.003	1.00
Delinquent Peers				.10	.07	1.11
Substance Use				.17	.38	1.18
Delinquency				.74**	.28	2.09

The abstainer group is the reference class and is the class with nearly zero probability of arrest.

* p< .05 ** p<.01 *** p<.001

Being male and higher levels of self-reported delinquency were the strongest predictors of arrest probability across race. The effect of being male was generally weakest for White participants and strongest for Hispanic participants. Substance use had modest effects across race (except older cohort Black participants), and lower grades in the 8th grade also had moderate effects across race in the older cohort. Of the risk variables, delinquency was the strongest and most consistent predictor of class membership across race and model comparisons. Given that delinquency had consistently stronger effects than all other risk variables and stronger effects than the combined risk scale, it is likely that delinquency alone drove the effect of the combined risk scale.

Results Summary

1. Regarding the hypotheses for the latent class growth analyses,

   a. As expected, there were at least two classes across models with at minimum a very low probability /abstainer class and a chronic mid-high level arrest probability class. A number of the models resulted in a three-class solution, most of which had an abstainer/low probability of arrest group, an adolescent-limited group, and a mid-high level chronic group.

   b. Contrary to expectations, there was actually one less class in the male sample in the younger cohort. Male arrest probabilities fit a two-class solution while female arrest probabilities fit a three-class solution. In the older cohort, there was an equal numbers of classes, with both male and female samples resulting in a three-class solution.

   c. Results regarding class structure across race were mixed. In the younger cohort, there was a two-class solution across race. In the older cohort, White and Black participants

yielded a three-class solution while Hispanics yielded only a two-class solution. Thus, class structure was consistent in the younger cohort but not in the older cohort.

2. Regarding race and sex effects,

   a. As expected, males were much more likely to be placed in classes with higher arrest probabilities than females across all but one model. The effect was stronger among Hispanic and Black samples than White samples.

   b. Results regarding race were mixed. Race did not have a statistically significant effect in the younger cohort. However, as expected, minorities were moderately more likely to be placed in the moderate chronic relative to the abstainer group in one model comparison in the older cohort. Race had no statistically significant effects in female samples but had expected moderate effects in all but one model with male samples.

3. As expected, poverty often had statistically significant weak effects in the base models but once other risk variables were added, poverty failed to retain statistical significance. Overall, the effects of poverty were in the expected direction but were extremely weak and inconsistent.

4. While the direction of both the family risk and family routine variables were as expected, the family routine variable was never statistically significant. Higher family risk was weak to moderately related to being placed in a class with higher arrest probability in a few models but generally failed to reach statistical significance.

5. As expected, delinquent peers had weak to moderate effects in a few models but surprisingly failed to reach statistical significance in the majority of model comparisons across cohorts, race, and sex.

6. Results regarding school achievement were mixed. While the PIAT unexpectedly failed to reach statistical significance in most models in the younger cohort, 8th grade grades was moderately to strongly related to placement in the lower arrest probability class across most models in the older cohort.

7. Unexpectedly, problem behaviors in the younger cohort failed to reach statistical significance in all models. Negative expectations was a statistically significant moderate predictor of class membership in arrest probability in the older cohort but was weak or did not reach statistical significance in the race and sex specific samples.

8. As expected, substance use had a moderate effect on class membership in arrest probability. With a few exceptions, increased substance use was moderately related to being placed in a class with a higher arrest probability across cohort, race, and sex.

9. As expected, increased delinquency was associated with being placed in a class with a higher arrest probability. Delinquency was statistically significant in all but one model comparison (younger cohort moderate chronics), and was consistently the strongest risk predictor, even stronger than the combined risk scale across cohort, race, and sex.

10. As expected, higher scores on the combined risk scale were associated with class membership in all but one model comparison (younger cohort moderate chronics). The moderate effect of the combined risk scale held across cohort, race, and sex. Unexpectedly, the combined risk scale was not more predictive than the individual risk factors. Specifically, delinquency consistently had stronger effects on class membership than the combined risk scale across cohort, race, and sex.

In sum, most samples resulted in two to three classes all of which contained an abstainer or low-level arrest probability group which made up the majority of the sample. Most also contained a moderate level chronic group which maintained a 20-30% arrest probability across time. One notable difference was that nearly half of the sample of Black participants from the older cohort exhibited an elevated arrest probability. Just under 50% of the older Black sample was placed in the abstainer group, with the remaining participants placed in groups with higher arrest probabilities across time. Samples that yielded an additional third class often had an adolescent-limited group that exhibited higher levels of arrest probability (30-50%) at the earlier waves and then steadily decreased over time.

With few exceptions, the strongest predictors of class membership were sex and self-reported involvement in delinquency. Substance use and the combined risk scale also exhibited moderate effects in most model comparisons. Self-reported delinquency was the most robust risk predictor of class membership across time and across model comparisons.

There were only two notable race and sex-specific differences in prediction. Regarding sex, race was the only variable with noteworthy differential effects. Being a minority was moderately related to an increased arrest probability for males, but race was non-significant for females. Regarding race differences in prediction, the only notable variable was sex. Specifically, being male was very strongly related to higher arrest probability for Hispanic and Black participants, but this effect was considerably smaller or non-significant for White participants. Thus, the race-gap in arrest probability was smaller among females, and the sex-gap was smaller among White participants. There were no other striking differences in risk prediction across race or sex. Among risk variables, delinquency exerted the strongest and most consistent effects, stronger than the combined risk scale, across cohort, race, and sex.

CHAPTER 6

DISCUSSION

Criminal involvement is non-randomly distributed with certain individuals and certain groups disproportionately involved in crime relative to others. This long observed phenomenon demands explanation. Criminologists, among others, have ardently investigated many of these differences. Even so, despite nearly a century of debate, criminologists remain divided in their explanations about these differences.

For many decades, criminology was dominated by traditional static perspectives, such as strain, social learning and social control theories that focused almost exclusively on juvenile delinquency. The monopoly of criminological research by static sociological perspectives can largely be attributed to the Glueck-Sutherland debate, which pitted individual differences against social forces. The Gluecks argued for the importance of individual risk factors while Sutherland asserted that the etiology of crime was rooted in social processes, namely differential association. As the majority of criminologists were sociologically trained, they favored viewing crime as the product of social influences external to the individual, and thus, Sutherland's perspective won the debate (Laub & Sampson, 1991; Sampson & Laub, 2005). Soon after, strain perspectives on structural inequality, refined social learning perspectives, and control theories began to compete for intellectual dominance. All of these perspectives tended to focus on one set of risk factors over another.

The convergence of important research regarding variations in the age-crime curve, the identification of a small group of chronic offenders in numerous data sets, and multidisciplinary

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findings linking problems in childhood to problems in adulthood eventually led to a paradigm

shift from adolescent-limited criminology to a broader life-course perspective—a perspective

that examined factors from birth through late adulthood. Criminologists began turning their

attention to childhood risk factors and experiences, noting continuity in antisocial behavior such

as conduct disorder, aggression, self-control, and delinquency from childhood through adulthood

(Caspi, 2000; Caspi et al., 2003; Loeber, 1982; Robins, 1978; Rutter, 1989). Research also

highlighted the potential for behavioral change in adulthood, attributing change to turning points

and experiences such as employment, marriage, joining the military, and having children

(Sampson & Laub, 1993; 2003; Warr, 2000). Developmental theorists like Patterson and

Yoerger (1989; 1992), Moffitt (1993), and Lahey et al. (1999) put forth theories arguing for the

existence of different types of offenders with different etiologies. Perhaps most notably,

Moffitt's (1993) dual taxonomy which claimed that are two types of offenders, an adolescent-

limited offender and a small subgroup of life-course-persistent offenders, ushered in numerous

empirical tests investigating the potential of unique trajectories in criminal involvement.

Empirical tests of criminological perspectives focused on identification and prediction of

unique patterns of offending across time reflect the ongoing debate in life-course criminology

between general dynamic theorists such as Sampson and Laub and developmental theorists such

as Moffitt, Caspi, Lahey, and Loeber. Developmental theorists assert that there are meaningful

differences in offending patterns and offender types and that there are important differences in

the etiology of different offender types. Different types of offenders, they also argued, could be

prospectively identified in childhood and adolescence. Sampson, Laub, and associates would

argue that while childhood risk factors may influence later life experiences, there is too much

heterogeneity in offending behavior and the distinct possibility of change across life stages to prospectively identify different offender typologies.

In light of the going debate between developmental and dynamic life-course scholars, a central purpose of the current research was to examine the extent to which there exists heterogeneity in criminal involvement and the extent to which unique offending trajectories can be prospectively predicted with various competing risk factors. Using data from the National Longitudinal Study of Youth 1997-2011, this research identified unique trajectories in arrest probability across 15 years, beginning when participants were 12-16 years-old and ending when they were 28-31 years-old. Next, various demographic variables and risk predictors were regressed on these trajectory outcomes to examine the best predictors of class membership in arrest probability. Analyses were estimated separately by race and by sex to identify potentially important differences and consistencies in class structure and prediction of arrest probability. Overall, samples yielded two to three classes in arrest probability that were primarily predicted by sex (male) and by self-reported delinquency.

Heterogeneity in Criminal Involvement

The first research question addressed the degree of heterogeneity in criminal involvement over time. Latent class analyses were employed to investigate the existence of multiple trajectories in arrest probability. Previous research using trajectory analyses has been inconsistent revealing as few as two classes (Brame et al., 2005; Land et al., 2001; Li et al., 2002) to as many as six or more classes (Bongers et al., 2004; Sampson & Laub, 2003; Weisner & Capaldi, 2003) across various samples and measures of criminal involvement. Results from the current study revealed two to three groups in arrest probability. Regarding the trajectories,

findings are consistent with previous studies of general population samples in that all models included a very stable abstainer group with a zero or very low probability of arrest across time and a relatively stable chronic group with a moderate arrest probability across time. Results that yielded a third class generally included a group which mirrored the age-crime curve, peaking in arrest probability in the initial waves and steadily decreasing over the 15 years. There were differences in magnitude of arrest probability. For example, the older cohort had higher peak arrest probabilities than the younger cohort. However, nearly all groups exhibited the same trajectory shapes: an abstainer, a chronic group, and an adolescent-limited group.

The consistent emergence of a small group of relatively stable chronic offenders with moderate arrest probability supports topological theorists such as Moffitt, Lahey, and Patterson. However, it should be noted that the observation period ended when participants were 28-31 years-old. Some individuals may have begun the desistance process shortly after. Future research should focus on longer observation periods, extending into the later adult years to better understand the extent of offending and the process of desistance among the "chronic" offender groups. Overall, findings from the latent class analyses suggest that there is meaningful heterogeneity in offending patterns in the general samples as well as across race and sex.

Relative to previous studies with general population samples, (DÚnger et al., 1998; DÚnger, Land, & McCall, 2002; Land, McCall, & Nagin, 1996), the current study yielded fewer classes. In particular, the younger cohort samples tended to produce two classes with the exception of the general and female sample. In contrast, all older cohort samples, with the exception of the Hispanic sample, produced three classes. This difference may be partially the result of age differences and greater variation in arrest in the older cohort. Participants in the older cohort were 15-17 years-old at the base wave and had more opportunity and variance in

delinquent experiences than the younger cohort whose participants were 12-14 years-old at the base wave. As a whole, fewer distinct classes may have resulted, in part, due to the use of a general population sample. The majority of the general population has never been arrested, which limits variance in offending patterns. The primary distinction for latent class analysis was therefore between offenders and non-offenders. This may indicate that studying multiple groups of offenders is unnecessary. Among those who had been arrested, there were likely fewer notable differences in arrest patterns than might be observed in an offender sample. However, in the models with three classes, there were important distinctions between offender groups, particularly in frequency and in desistance patterns in arrest probability.

While self-reports were used, the measure was not of different acts of offending but of official arrest. As previous studies have shown strong concordance between self-reported arrests and official arrests (Krohn et al., 2013; Piquero, Schubert & Brame, 2014; Thornberry & Krohn, 2003), the self-reported arrest measure was likely reflective of official arrests, which generally result in fewer latent classes (Weisner, Kim, & Capaldi, 2007). Future research should continue to address the factors affecting the number of groups that emerge in latent class analyses.

Predicting Class Membership

The other focus of the current study was prediction of class membership. The emergence of distinct latent classes of arrest probability is noteworthy, but the ability to prospectively distinguish between latent class trajectories is even more meaningful for criminological theory and for identification and intervention efforts in criminal justice. Unsurprisingly and in line with previous research (Lytle, 2013; Stolzenberg & D'Alessio, 2004), males were substantially more likely to be placed in classes with higher arrest probabilities than females. Sex was a strong,

consistent predictor of class membership across all models. The question remains whether this is reflective of leniency towards females or a genuine difference between male and female behavior. All measures were self-reports, and some prior research has shown that females tend to underreport delinquent behavior and analogous outcomes relative to males (Hindelang et al., 1981; Huizinga & Elliot, 1986; Maxfield et al., 2000). Thus, some of the large gap between male and female criminal involvement may be a product of underreporting from females. At the same token, this may simply reflect differential criminal involvement by sex. Future research should continue examining the reason for the male/female gap in criminal involvement.

In contrast to some previous findings (Kochel, Wilson, & Mastrofski, 2011; Lytle, 2013), race was not a consistent or a strong predictor of class membership. Being a minority was modestly predictive of being placed in a class with a higher arrest probability, but this effect was statistically significant in only a few models. Poverty was also an inconsistent and weak predictor of class membership. When statistically significant, poverty had an odds ratio of 1.00, indicating that it did not improve prediction. The occasional statistical significance of the household poverty ratio was likely due to the continuous nature of the measure and the statistical power of the large sample. Overall, the only consistently strong demographic predictor of class membership was sex.

Regarding risk factor prediction, the combined risk factor scale was statistically significant and moderately related to class membership in all but one model. The consistent predictive power of the combined risk scale may imply support for using combined scores from risk instruments to assess the likelihood of offender recidivism. However, use of the combined measure of risk likely masks the factors most strongly related to arrest. Some factors may be

spuriously associated with arrest probabilities or may be less consistent at predicting arrest probabilities.

The combined risk scales also differed between the younger and older cohorts. The younger cohort's combined risk scale included family risk factors while the older cohort's did not. Surprisingly, family risk factors as a whole were not predictive of class membership. This may be due, in part, to the fact that participants were in their adolescent years at the base wave, a time where many individuals begin spending more time outside the home with peers. For instance, a number of twin studies have shown that the influence of common/shared environments, such as the home environment, are important early in the life-course but tend to decrease in importance as youth age and as peer influences and other experiences become more proximate (Beaver et al., 2008; Hopwood et al., 2011). Thus, the effects of family factors may be spurious with stronger risk factors or the influence of the family may decrease as individuals age.

Another important risk factor was school achievement. Interestingly, the PIAT standard math score was not predictive of class membership in the younger cohort, but grades in the eighth grade were consistently predictive of class membership in the older cohort. Each measure was initially conceptualized to capture school achievement, but upon reflection, it is clear that they tap into somewhat different domains. While standardized test scores are commonly used to measure intelligence, the PIAT measure only included the math component of the test. Standardized math scores have been found to only partially capture variation in intelligence. More importantly research has generally found stronger links between verbal intelligence and criminal involvement (Ayduk et al., 2007; Guay & Ouimet, 2005; Stattin & Klackenberg-Larsson, 1993). Thus, the absence of verbal intelligence measures may partially explain the lack of a relationship between the PIAT math score and class membership. Grades in eighth grade, on

the other hand, captures a broad range of academic abilities, behaviors, school and teacher factors as well as commitment to school.

While there were some differences in prediction between the younger and older cohorts, there were also important similarities. Across models, delinquent peers failed to have consistent or strong effects on class membership. Given prior support for the link between delinquent peers and criminal involvement (Pratt & Cullen, 2000; Pratt et al., 2010; Thomas, 2015), these results were unexpected. Coefficients were in the expected direction but often failed to reach statistical significance. Perhaps like family variables, delinquent peer effects may be spurious with stronger risk factors such as individual behavior. One of the most consistent risk factors across models was substance use. More substance use was related to being placed in a class with a higher arrest probability. While the substance use measure did not capture the frequency or magnitude of substance use, it did tap into the onset of drinking, smoking, and marijuana use. The consistent effect of substance use on class membership converged with previous literature (Elliot, 1994; Mukku et al., 2012; Thornberry, Huizinga, & Loeber, 1995) and provided further support for the link between onset of substance use and criminal involvement.

Of all the risk factor variables, one stood out as the strongest and most reliable predictor of class membership: delinquency. Across all but one model, self-reported delinquency had the most robust effect on class membership, even more so than the combined risk scale. Many criminological perspectives advocate for the risk factors tested such as poverty, family factors, and deviant peers without recognizing the possibility that many of these factors may be spurious and that in reality, it is delinquent behavior which generates arrest. Net of other predictors, problem behavior is what appears to elicit negative outcomes such as arrest, conviction, and incarceration. In fact, association with deviant peers, poverty, or substance abuse are likely

byproducts of bad behavior (Makarios, Cullen, & Piquero, 2015; Piquero, Farrington, & Blumstein, 2007; Loeber et al., 2013). Engaging in delinquent behavior can lead to poor choices in the future such as associating with criminal peers, breaking ties with family, and dropping out of school. Poor choices, in turn, have consequences including arrest and incarceration. Arrest and incarceration can affect the ability to assimilate with mainstream society, to find gainful employment, and to establish healthy relationships, thus leading one to continue criminal habits such as substance use and crime. In this way, criminal involvement can become a cycle, one which proves very difficult to break. It is therefore critical to acknowledge the crucial role that early delinquent behavior plays in setting the stage for the rest of the life-course. Failure to acknowledge the deleterious effects of delinquency and problem behavior can yield theoretical misspecification and potentially unfounded and inefficient policies and interventions.

Sex Differences

Debate remains in risk prediction literature regarding the need for gender specific risk assessment versus general assessment. Proponents for gender specific risk assessments argue that general risk assessment tools are ineffective for females because they are based off of predominantly male-centered theories which fail to recognize differential predictors of female criminality such as prior sexual abuse, family conflict, drug use, and sexuality (Belknap & Holsinger, 2006; Daly, 1992; Van Voorhis, 2005). Physical and/or sexual abuse, family problems, and drug use have been consistent predictors of delinquency and criminal involvement in juveniles as well as adult female offenders (Bloom et al., 2002; Gaarder & Belknap, 2002). However, studies of gendered risk assessments like the LSI-R have shown that results are mixed. Overall, gendered risk assessments are more accurate with high-risk female offenders but are

inconsistent with other offenders, sometimes resulting in over-classification of risk (Andrews, Bonta, & Wormith, 2006; Holtfreder & Cupp, 2007; Silver & Miller, 2002). Furthermore, a met-analysis of the predictive validity of general risk assessments conducted by Schwalbe (2008) indicated that overall, general risk assessments were equally predictive for males and females. A very recent study by Yesberg et al. (2015) examined predictive validity of a risk assessment tool designed for female parolees and found that the assessment operated similarly for male parolees, thus supporting a gender-neutral risk perspective.

Proponents of general risk or gender-neutral prediction suggest general risk assessments accurately classify both male and female offenders because they are based off general criminological theories such as social learning theory. Therefore, behavioral assessments and interventions based off general theories can be applied evenly across gender. Furthermore, scholars suggest that males and females share major risk factors such as the "big four" including antisocial peers, antisocial attitudes, antisocial thinking patterns, and antisocial personalities which operate evenly across gender (Andrews & Bonta, 2010; Andrews, Bonta, & Wormith, 2006). In short, the gender-neutral perspective asserts that key demographic and risk variables have uniform effects across sex. Results from the current study echo the general risk or gender-neutral perspective.

There were only two noteworthy differences between the sexes. First, males produced one fewer latent class than females in the younger cohort. This result contrasts previous studies where males tended to yield the same or more latent classes than females. However, as many of the models from the younger cohort tended to yield two classes, it appeared that the two-class solution was more a function of the younger cohort sample than of sex. The second and arguably only relevant difference between males and females was the effect of race. Race had no effect on

females, but being a minority was moderately related to being placed in a class with a higher arrest probability in two of the three models with males. Thus, male minorities have an elevated risk of placement in higher arrest probability trajectories. However, across sex, substance use had a moderate effect, and delinquency exerted the strongest effect on class membership. Overall, with the exception of race, demographic and risk variables operated evenly across sex, supporting a gender-neutral risk perspective.

Race Differences

Some scholars argues that demographic and risk variables may operate differently across race, ethnicity, and/or culture (Holsinger, Lowencamp, & Latessa, 2003; Rembert, Henderson, & Pirtle, 2013). There is comparatively little research on race and ethnicity specific risk assessment. Bonta, LaPrairie, & Wallace-Capretta (1997) examined the predictive validity of a recidivism risk assessment designed for the general Canadian population on Manitoba aboriginal offenders and non-aboriginal offenders. Findings suggested that the risk assessment was equally predictive for both groups and that the assessment specifically designed for Manitoba aboriginal offenders nearly matched the general risk assessment. Key predictors included criminal history, criminal peers, and substance use, and the authors concluded that these risk factors operated uniformly across groups. Some predictive validity tests of the commonly used LSI-R have found that the risk factors assessed (antisocial personality, attitudes, antisocial peers, substance use, school achievement, family factors) operated similarly across Black and White offenders (Schwalbe et al., 2006) while others have found differences between Black, Hispanic, and White offenders (Rembert, Henderson, & Pirtle, 2013). For instance, Holsinger, Lowencamp, & Latessa (2003) found significant differences in many aspects of the LSI-R domains when comparing a

group of Native Americans to White Americans in a Northwestern state. In a follow-up study, Holsinger, Lowencamp, & Latessa (2006) found that while the LSI-R had good predictive validity for their sample as a whole, when examined by race, it was evident that the LSI-R's predictive validity was considerably lower for the Native American population. Thus, the question regarding the need for race and ethnicity specific risk assessments remains unanswered.

Results from the current study support the general risk perspective. The only substantive difference between races was the magnitude of sex as a predictor of class membership. Specifically, being male was strongly predictive of being placed in a class with a higher arrest probability for Blacks and Hispanics, but sex had only moderate effects among White participants. Consistent with the separate analyses by sex, minority males have considerably higher odds of being placed in classes with higher arrest probabilities. Apart from this difference between race and sex, risk variables operated uniformly across race. Namely, substance use was a moderate predictor, and delinquency was the strongest predictor of class membership. While results from the current study support a general risk perspective, further research is needed.

Limitations

Results should be interpreted with the following limitations in mind. First, personality measures were unavailable in the base wave. Antisocial personality has been consistently noted as an important risk factor (Andrews & Bonta, 2010), and unfortunately could not be included in the analyses. It is expected that the ability to control for personality and analogous traits may have altered results. The link between personality and other traits such as self-control and criminal involvement has been well-established theoretically and empirically, and future research should continue investigating individual traits as a vital competing risk factor. Second, the

measures differed by cohort. While measures were appropriately age-graded in the view of the researchers who had collected the data, it would have been advantageous if variables such as family factors or standardized test scores were available for both groups. Finally, participants were followed until 31 years of age only. While the study reflects a 15 year time span, life-course research has highlighted the importance of later life events and experiences, especially when studying stability/change in offending and desistance patterns. It would be interesting to observe what proportion of the chronic groups maintain elevated arrest probabilities into late adulthood.

Conclusion

The current study sought to address three main issues: the degree of heterogeneity in arrest probabilities over time, the ability of competing risk perspectives to prospectively predict latent class membership, and the generalizability of class structure and risk prediction across race and across sex. There was meaningful heterogeneity in criminal involvement. Most latent class analyses resulted in a three class solution consisting of a majority abstainer group, an adolescent-limited group peaking in arrest probability in the early waves and steadily decreasing with time, and a relatively stable moderate chronic group with around a 30% arrest probability across time. Some models from the younger cohort group only yielded two classes: an abstainer and a lower level chronic group with around a 20-25% arrest probability across time. Overall, the consistency of class structure was noteworthy and lends support to developmental theorists like Moffitt, Lahey, and Patterson who have argued the importance of identifying heterogeneity in offending, especially the presence of a distinct stable chronic offender group.

Regarding prediction, sex, the combined risk scale, substance use, and delinquency consistently predicted class membership in all but one model. The effects of race and sex varied slightly, but across all models, delinquent behavior was a robust predictor of class membership, even more robust than the combined risk scale. Despite some small differences in class structure and predictors, all models suggested the same unanimous conclusion: delinquent behavior drives arrest probabilities.

Delinquent behavior can have a profound impact on the life-course. It is critical that criminologists and criminal justice practitioners recognize that delinquency is not just an outcome of varied processes but is also an important predictor of future criminal involvement and a host of life-outcomes. Involvement in delinquent behaviors is the result of and can lead to continued patterns of poor decision making deeply affecting future opportunities for a positive, prosocial life-course. In addition to criminal sanctions, high levels of delinquency often leads to unemployment, unstable relationships, health problems, psychological issues, and poverty (Makarios, 2009; Makarios, Cullen, & Piquero, 2015). While there is certainly the possibility of behavioral change at any stage in the life-course (Sampson & Laub, 2003; Warr, 2001), there is also the distinct potential for remarkably stable delinquent behavior across time (Caspi, 2003; Loeber et al., 2013; Vazsonyi & Huang, 2010). Thus, early identification and intervention with delinquency is critical. Self-reported delinquent behavior in 1997 distinguished life-course trajectories in arrest probability 15 years later. In sum, differential involvement in delinquent behavior emerged as the most consistent and most potent predictor of arrest probabilities over the life-course.

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Appendix A Family Risk Index

This index is made up of a variety of contextual aspects surrounding the home environment and family process. For the items, 0=no risk, 1= risk. The scale ranges from 0-21, with higher values indicating higher family risk.

Home/Physical Environment:
- In the past month, has your home usually had electricity and heat when needed?
  - (Youth report) Yes= no risk, No= risk
- How well-kept is the interior of the home in which the youth responded?
  - (Interviewer's observation) Fairly well/well-kept= no risk, not well kept= risk
- How well kept is the exterior of the home in which the youth responded?
  - (Interviewer's observation) Fairly well/well-kept= no risk, not well kept= risk

Neighborhood:
- How well kept are most of the buildings on the street where the youth/adult responded?
  - (Interviewer's observation) Fairly well/well-kept= no risk, not well kept= risk
- When you went to the respondent's home were you concerned for your safety?
  - (Interviewer's observation) No= no risk, Yes=risk
- In a typical week, how many days from 0 to 7 do you hear gun shots in your neighborhood?
  - (Youth report) 0= no risk, 1+= risk

Enriching Activities: (Youth report)
In the past month, has your home usually had…
- A quiet place to study?
  - Yes= no risk, No= risk
- A computer?
  - Yes= no risk, No= risk
- A dictionary?
  - Yes= no risk, No= risk
- In a typical week, do you watch any television on weekends or weekdays?
- If yes, how many of those days are weekdays?
- About how many hours do you spend watching television per day during weekdays?
  - Fewer than five hours= no risk, five hours += risk

Religious Behavior: (Parent report)
- In the past 12 months, how often have you attended a worship service?
  - More than never= no risk, Never= risk
- In a typical week, how many days from 0 to 7 d you do something religious?
  - More than never= no risk, Never= risk

School Involvement: (Parent report)
In the last 3 years, have you or your spouse/ partner…
- Attended meetings organized at the youth's school?

- o Yes= no risk, No= risk
- Volunteered to help in the classroom?
  - o Yes= no risk, No= risk

Parent Characteristics:
Did the adult have any special circumstances affecting the survey (Interviewer observation):
- Physical disabilities: hard of hearing, unable to see, physically handicapped?
  - o No= no risk, Yes= risk
- Mental disabilities: mentally handicapped, command of English was poor, unable to read?
  - o No= no risk, Yes= risk
- Alcohol/Drug disability: under the influence?
  - o No= no risk, Yes= risk

Parenting: all questions were asked separately about residential mom and/or dad and non-residential parents if applicable. (Youth report)

Monitoring Scale: How much does he/she know about…
0= knows nothing 1= knows just a little 2= knows some things 3= knows most things 4= knows everything
- Your close friends, that is, who they are?
- Your close friends' parents, that is, who they are?
- Who you are with when you are not at home?
- Who your teachers are and what you are doing in school?

  - o Coding: 6+= no risk, <6= risk

Parent-Youth Relationship Regarding your mother/father…
0= strongly disagree 1= disagree 2=neutral 3=agree 4=strongly agree
- I think highly of him/her
- She/he is a person I want to be like.
- I really enjoy spending time with him/her.
How often does he/she…
0= never 1=rarely 2=sometimes 3=usually 4=always
- Praise you for doing well?
- Criticize your ideas?
- Help you do things that are important to you?
- Blame you for his/her problems?
- Make plans with you and cancel for no good reason?

- o Coding: 18+= no risk, <18= risk

<u>Other:</u>
- When you think of how mom/dad acts towards you, is she/he…Very supportive, Somewhat supportive, or Not very supportive?
  - o Very or somewhat= no risk, Not= risk
- In general, would you say she/he is permissive or strict about making sure you do what you are supposed to do?
  - o Strict= no risk, Permissive= risk

Appendix B.1 Logistic Regression Missing Analyses Younger Cohort

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
		-34**	-.22*	-.31***		-.30***		-.16*	-.27***	-.19**	-.23***	-.29***	.26***	-.23**	-.29**
Race	NS	(.71)	(.80)	(.74)	NS	(.74)	NS	(.85)	(.77)	(.83)	(.79)	(.75)	(.77)	(.80)	(.75)
		-.34*						.35**	.25*	.20*	.30**	.32**	.32**	.21*	.26*
Sex	NS	(.71)	NS	NS	NS	NS	NS	(1.42)	(1.29)	(1.22)	(1.35)	(1.38)	(1.38)	(1.24)	(1.29)
														.00*	
Poverty	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	(1.00)	NS
					.08*										
Family risk	NS	NS	NS	NS	(1.08)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		.05**			.04*										
Family routine	NS	(1.05)	NS	NS	(1.04)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
			.05**	.05**	.04*										
Negative Peers	NS	NS	(1.05)	(1.05)	(1.04)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		-.01*	-.01***	-.01*	-.01*	-.01***	-.01*	-.01*	-.01***	-.01**	-.01**	-.01***	-.01**	-.01*	
PIAT Math	NS	(.99)	(.99)	(.99)	(.99)	(.99)	(.99)	(.99)	(.99)	(.99)	(.99)	(.99)	(.99)	(.99)	NS

						-.15*		-.16**		-.19**		-.22***	-.20***	-.13*
Problem Behavior	NS	NS	NS	NS	NS	NS	(.86)	NS	(.85)	NS	(.83)	-.19	(.80)	(.82)	(.88)
Substance Use	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Delinquency	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

* p<.05 ** p<.01 *** p<.001

Appendix B.2 Logistic Regression Missing Analyses Older Cohort

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
				-.18*			-.27**	-.22**	-.23**	-.23**	-.22**	-.18*	-19*	-.23**	-.19(
Race	NS	NS	NS	(.83)	NS	NS	(.77)	(.80)	(.80)	(.80)	(.81)	(.84)	(.83)	(.79)	(.83)
			.32*					.28*	.30**	.29*			.36**		.25**
Sex	NS	NS	(1.38)	NS	NS	NS	NS	(1.32)	(1.35)	(1.34)	NS	NS	(1.44)	NS	(1.28)
														.00*	.00*
Poverty	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	(1.00)	(1.00)
Negative Peers	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
			-.09*	-.08*											
Grades in 8th grade	NS	NS	(.92)	(.92)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Substance Use	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
						-.08*	-.08*			-.08*					
Delinquency	NS	NS	NS	NS	NS	(.92)	(.92)	NS	NS	(.92)	NS	NS	NS	NS	NS

* p<.05 ** p<.01 *** p<.001

Appendix C.1 Manski Bounding Fit Indices for Younger Cohort

Fit Indices for Latent Class Growth Analyses- Younger Cohort original

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-1429.82	29681.20	1.00	1.00	
2	-13456.37	2695.63	.77	.96 .85	.00
3	-13405.95	26866.02	.72	.72 .77 .92	.05
4	-13385.76	26841.88	.73	.70 .63 .90 .71	.15
5	-13381.16	26848.92	.74	.56 .61 .70 .64 .89	.42

Fit Indices for Latent Class Growth Analyses- Younger Cohort Manski Lower Bound

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
2	-13668.03	27373.90	.75	.96 .87	.00
3	-13619.14	27292.32	.73	.72 .93 .75	.00
4	-13604.66	27279.59	.71	.64 .72 .89 .70	.37

Fit Indices for Latent Class Growth Analyses- Younger Cohort Manski Upper Bound

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
2	-24209.01	48455.85	.78	.94 .92	.00
3	-23707.08	47468.22	.80	.88 .85 .94	.00
4	-23579.92	47230.11	.68	.84 .77 .85 .79	.01

Appendix C.2 Manski Bounding LCGA Figures Younger Cohort

Manski Younger Cohort Lower Bound 3-Class Solution:
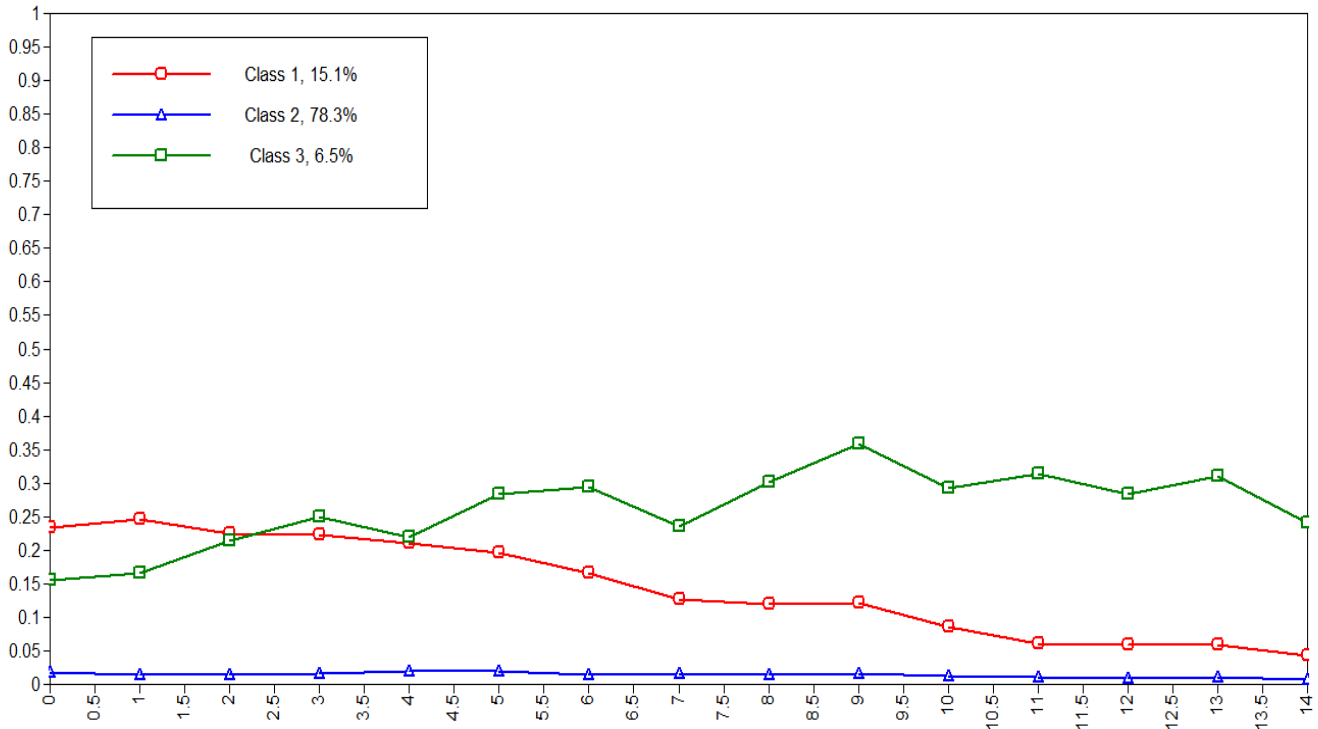
Manski Younger Cohort Upper Bound 3-Class Solution:
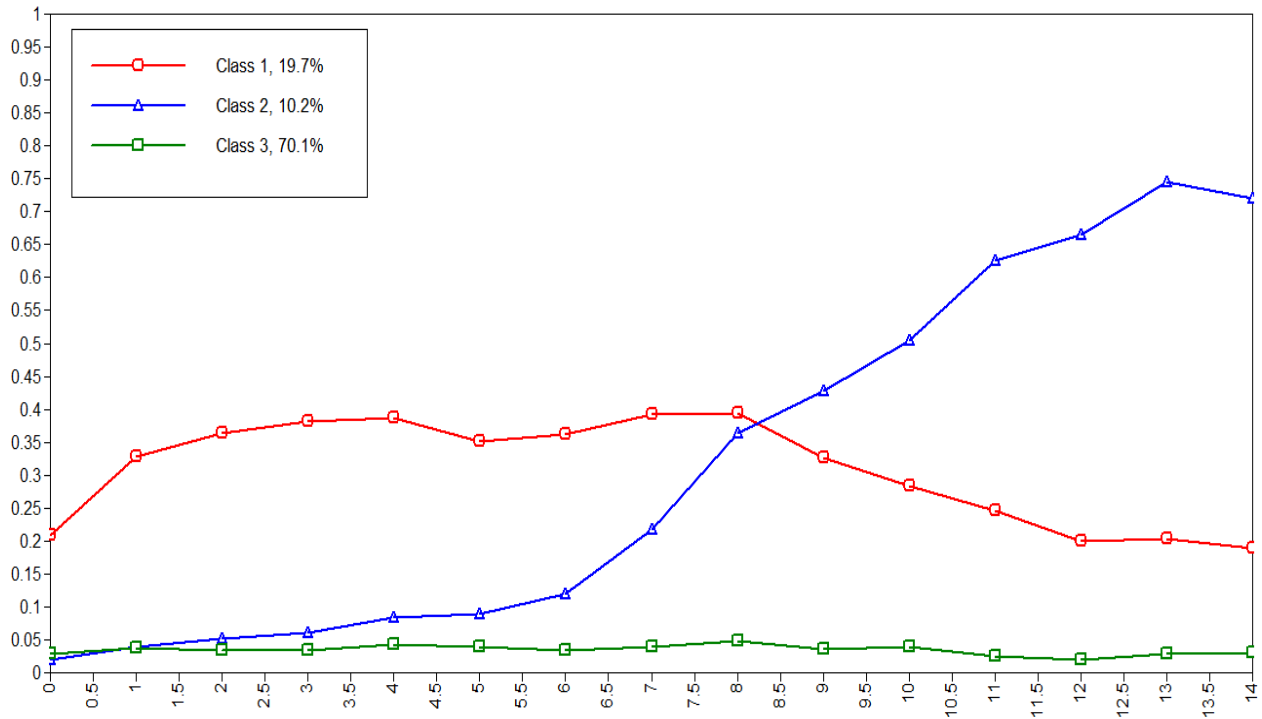
Younger Cohort Original 3-Class Solution:
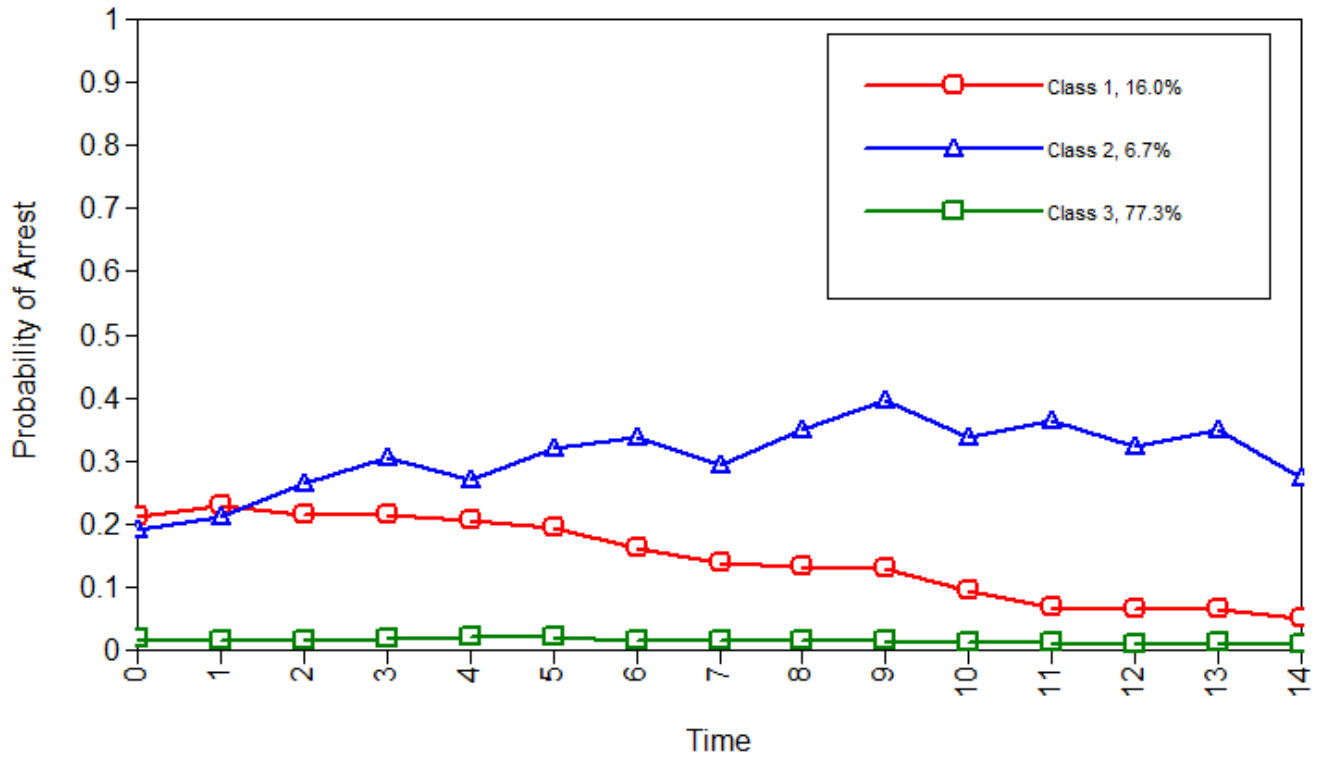
Appendix C.3 Manski Bounding Fit Indices for Older Cohort

Fit Indices for Latent Class Growth Analyses- Older Cohort

# classes	-LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
1	-9451.23	18917.47	1.00	1.00	
2	-8569.44	17168.88	.78	.95 .87	.00
3	-8503.93	17052.88	.74	.92 .81 .71	.00
4	-8482.43	17024.88	.71	.74 .90 .69 .65	.02
5	-8471.05	17017.13	.76	.92 .47 .80 .71 1.00	.79

Fit Indices for Latent Class Growth Analyses- Older Cohort Manski Lower Bound

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
2	-8728.31	17481.63	.75	.95 .86	.00
3	-8677.67	17395.35	.56	.84 .77 .84	.00
4	-8639.00	17333.02	.57	.68 .82 .83 .71	.00
5	-8630.72	17331.44	.63	.82 .67 1.00 .70 .83	.01

Fit Indices for Latent Class Growth Analyses- Older Cohort Manski Upper Bound

# classes	LL (Ho value)	BIC Adjusted	Entropy	Latent Class Probabilities	LMR (p value)
2	-16716.60	33458.20	.77	.94 .92	.00
3	-16369.06	32778.13	.78	.87 .93 .86	.00
4	-16271.14	32603.30	.69	.83 .74 .88 .79	.05
5	-16220.97	32511.96	.69	.86 .69 .65 .89 .79	.02

Appendix C.4 Manski Bounding LCGA Figures Older Cohort

Older Cohort Manski Lower Bound 3-Class Solution:
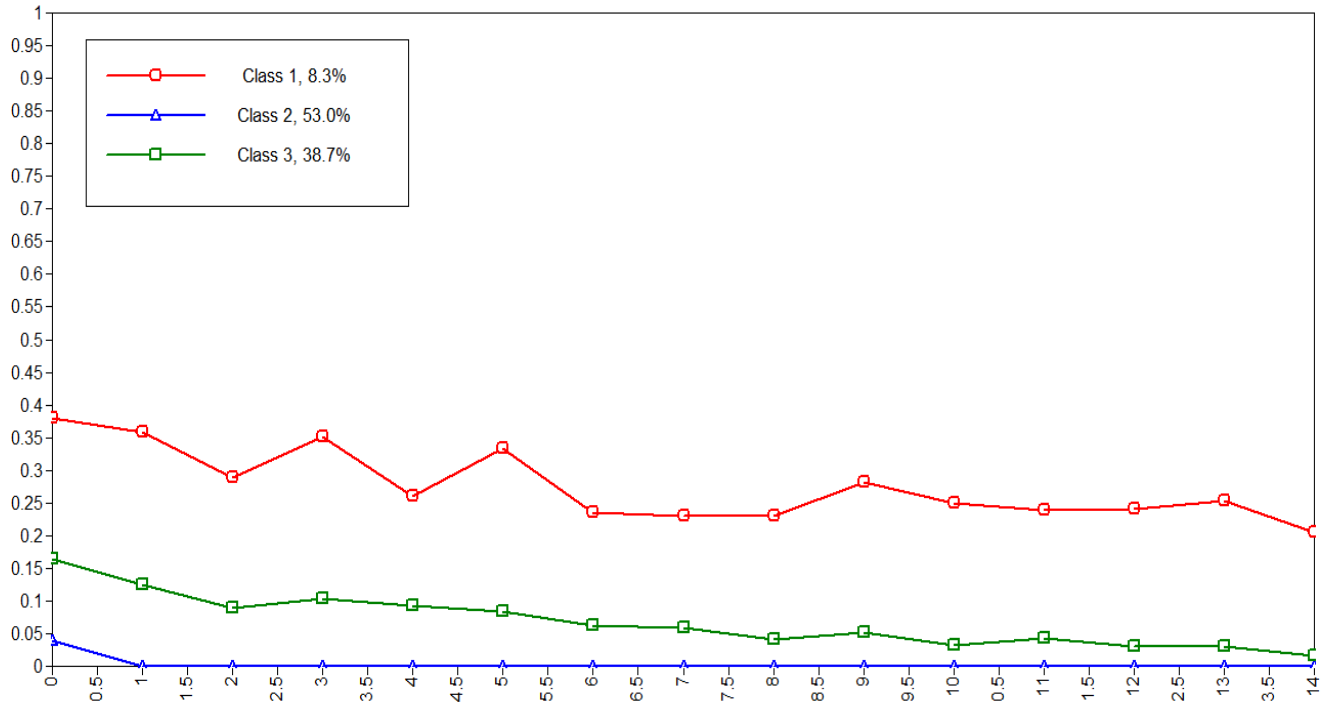
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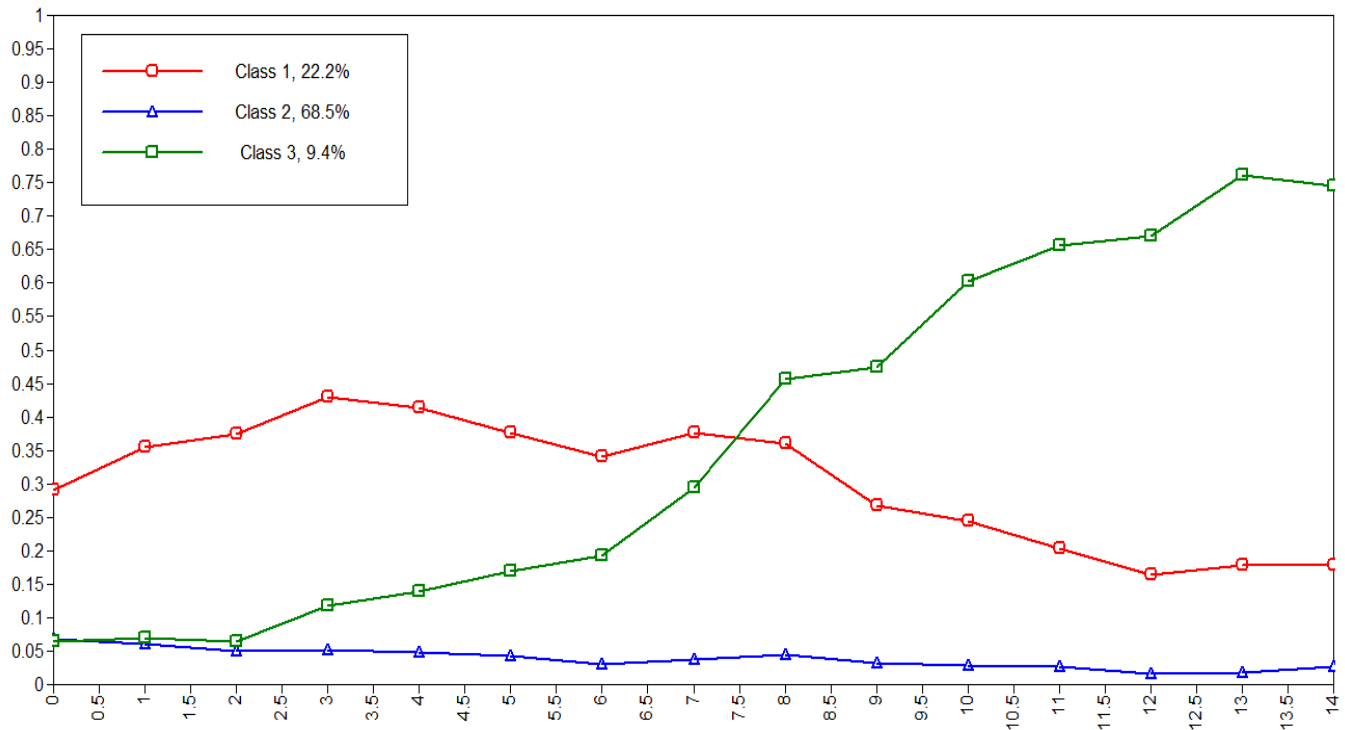
Older Cohort Original 3-Class Solution:
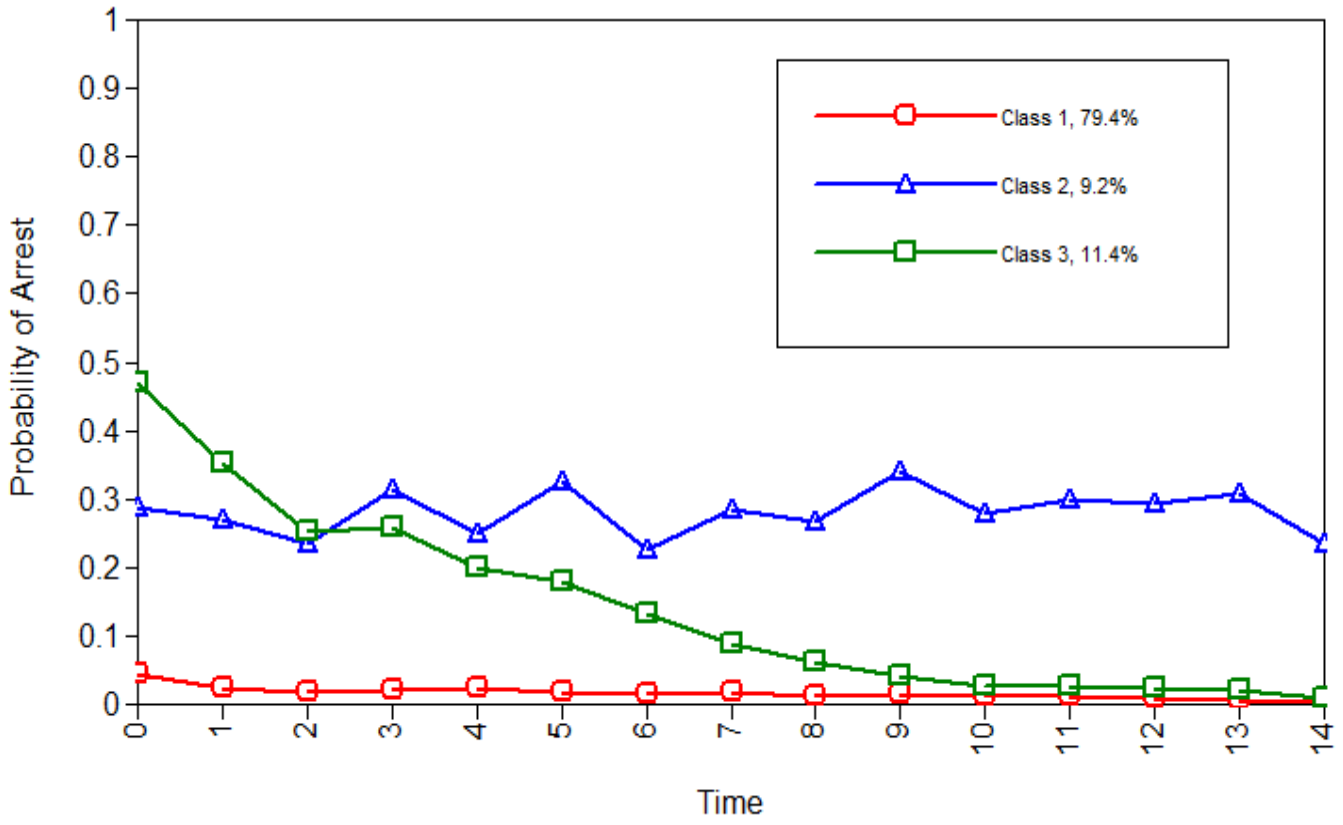
Appendix D.1 Younger Sample N= 5378 Descriptives by Class Membership

Class	Abstainers		ALs		Mod. Chronics	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Age in years (1997)	13.00	.82	13.00	.82	13.00	.82
Race (0= White, 1=Hispanic, 2= Black)	1.71	.84	1.84	.87	1.90	.89
Sex (0=Female)	.46	.50	.77	.42	77	.42
Poverty Ratio	288.39	265.55	221.89	223.06	215.17	258.15
PIAT score	99.39	18.98	92.70	18.73	91.79	19.48
Family Routine index (0-28)	15.18	5.45	14.23	5.72	14.66	6.01
Family Risk index (0-21)	2.62	2.25	3.68	2.45	3.79	2.64
Negative Peers (5-25)	9.34	4.26	10.86	4.84	10.43	4.77
Behavior Problems (standardized)	-.07	.97	.33	1.08	.32	1.04
Substance Use (0-3)	.64	.94	1.31	1.16	1.30	1.14
Delinquency (0-10)	.86	1.31	2.56	2.38	2.48	2.33
Risk Scale (0-14)	2.89	2.44	4.94	2.95	4.74	3.12
Ever Arrested (0=no)	.18	.39	1.00	.00	.99	.12
Ever Incarcerated (0=no)	.01	.10	.24	.43	.53	.50
Arrest Total (1997-2011)	.24	.63	4.19	3.67	7.52	6.90
Incarceration Total (1997-2010)	.01	.12	.39	.85	1.04	1.36

Appendix D.2 Older Sample N= 3565 Descriptives by Class Membership

Class (1= low arrest probability)	1		2		3	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Age in years (1997)	15.50	.50	15.50	.50	15.50	.50
Race (0= White, 1=Hispanic, 2= Black)	1.72	.84	1.80	.88	1.96	.89
Sex (0=Female)	.45	.50	.78	.41	.79	.41
Poverty Ratio	305.16	21.96	250.67	211.81	221.76	241.02
PIAT score	89.8	19.66	83.37	18.29	83.42	17.44
8th Grade grades (1-8)	5.86	1.68	4.80	1.86	4.89	1.94
Negative Peers (5-25)	13.07	4.38	14.99	4.19	14.64	4.48
Negative Expectations	98.04	93.18	163.7	115.04	148.31	115.73
Substance Use (0-3)	1.31	1.15	2.20	1.01	1.90	1.21
Delinquency (0-10)	1.24	1.66	3.99	2.67	3.10	2.59
Risk Scale (0-10)	2.86	2.17	5.64	2.25	4.97	.44
Ever Arrested (0=no)	.21	.41	1.00	.00	1.00	.00
Ever Incarcerated (0=no)	.02	.15	.28	.45	.55	.50
Arrest Total (1997-2011)	.33	1.43	4.80	5.23	6.77	7.57
Incarceration Total (1997-2010)	.03	.21	.47	.93	1.17	1.43

Appendix E.1 T-Test for Independent Samples Difference by Sex: Younger Cohort

	Mean difference	S.D. difference	t value
Race	.02	.02	.82
Poverty	-12.67	8.30	-1.53
PIAT Math Standard Score	-.20	.54	-.37
Family Risk Index	.03	.07	.50
Family Routine Index	-.25	.15	-1.66
Behavioral Problems	.00	.03	-.10
Delinquent Peers	.92***	.12	7.53
Substance Use	-.08**	.03	-2.74
Delinquency	-.66***	.05	-14.81
Risk Scale	-.16	.08	-1.95
Ever Arrested	-.24***	.01	-19.43
Total Arrests	-1.07***	.08	-14.09
Ever Incarcerated	-.08***	.01	-11.68
Total Incarcerations	-.14***	.01	-10.42

Appendix E.2 T-Test for Independent Samples Difference by Sex: Older Cohort

	Mean difference	S.D. difference	t value
Race	.03	.03	.91
Poverty	.88	1.69	.15
Grades in 8th Grade	.63***	.06	10.71
Negative Expectations	-14.90***	3.40	-4.37
Delinquent Peers	.96***	.15	6.43
Substance Use	-.07	.04	-1.77
Delinquency	-.93***	.07	-13.94
Risk Scale	-.55***	.08	-6.50
Ever Arrested	-.23***	.02	-15.26
Total Arrests	-1.28***	.12	-11.02
Ever Incarcerated	-.11***	.01	-11.90
Total Incarcerations	-.21***	.02	-10.37

Appendix F.1 T-Test for Independent Samples by Race: White-Hispanic Younger Cohort

	Mean difference	S.D. difference	t value
Poverty	178.37***	8.43	21.16
PIAT Math Standard Score	12.15***	.66	18.29
Family Risk Index	-1.12***	.09	-12.86
Behavioral Problems	-.15***	.03	-4.23
Delinquent Peers	-.73***	.16	-4.60
Substance Use	.11**	.04	2.97
Risk Scale	-.79***	.11	-7.41
Ever Arrested	-.03*	.02	-2.10
Total Arrests	-.22*	.10	-2.20
Ever Incarcerated	N.S.		
Total Incarcerations	N.S.		

Appendix F.2 T-Test for Independent Samples by Race: White-Black Younger Cohort

	Mean difference	S.D. difference	t value
Poverty	20.48***	175.15	8.55
PIAT Math Standard Score	14.40***	.62	23.09
Family Risk Index	-1.50***	.08	-18.90
Behavioral Problems	N.S.		
Delinquent Peers	-1.46***	.15	-9.72
Substance Use	N.S.		
Risk Scale	-1.05***	.09	-11.29
Ever Arrested	-.09***	.02	-6.00
Total Arrests	-.48***	.10	-4.65
Ever Incarcerated	-.05***	.01	-5.28
Total Incarcerations	-.06***	.02	-3.56

Appendix F.3 T-Test for Independent Samples by Race: Hispanic-Black Younger Cohort

	Mean difference	S.D. difference	t value
Poverty	N.S.		
PIAT Math Standard Score	2.26**	.78	2.90
Family Risk Index	-0.37***	.10	-3.67
Behavioral Problems	.08*	.04	2.11
Delinquent Peers	-0.73***	.19	-3.90
Substance Use	.10*	.04	2.48
Risk Scale	-.25*	.12	-2.15
Ever Arrested	-.06**	.02	-3.14
Total Arrests	-.26*	.12	-2.11
Ever Incarcerated	-.03**	.01	-3.08
Total Incarcerations	N.S.		

Appendix G.1 T-Test for Independent Samples by Race: White-Hispanic Older Cohort

	Mean difference	S.D. difference	t value
Poverty	188.17***	15.05	14.98
Grades in 8th Grade	.51***	.08	6.48
Negative Expectations	-18.1***	4.36	-4.15
Delinquent Peers	N.S.		
Substance Use	.23***	.05	4.43
Ever Arrested	N.S.		
Total Arrests	N.S.		
Ever Incarcerated	N.S.		
Total Incarcerations	N.S.		

Appendix G.2 T-Test for Independent Samples by Race: White-Black Older Cohort

	Mean difference	S.D. difference	t value
Poverty	175.78***	11.53	15.25
Grades in 8th Grade	.61***	.07	8.95
Negative Expectations	-11.58***	4.13	-2.80
Delinquent Peers	-1.28***	.18	-6.97
Substance Use	.43***	.05	9.40
Ever Arrested	-.08***	.02	-4.03
Total Arrests	-.65***	.17	-3.94
Ever Incarcerated	-.05***	.01	-4.34
Total Incarcerations	-.11***	.03	-4.14

Appendix G.3 T-Test for Independent Samples by Race: Hispanic-Black Older Cohort

	Mean difference	S.D. difference	t value
Poverty	N.S.		
Grades in 8th Grade	N.S.		
Negative Expectations	N.S.		
Delinquent Peers	-1.14***	.23	-4.89
Substance Use	.21***	.06	3.66
Ever Arrested	-.06*	.02	-2.35
Total Arrests	-.42*	.20	-2.16
Ever Incarcerated	-.03*	.02	-2.29
Total Incarcerations	N.S.		