ABSTRACT

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Several prominent criminologists have suggested desistance from crime is in many ways similar to desistance from substance use. While a review of this literature supports this proposition in general, most of this research has focused on desistance from either crime or substance use rather than considering change across both behaviors. Indeed, those few studies that consider both behaviors often find individuals persist in substance use despite desistance from crime. Despite this discrepancy, there has yet to be a systematic comparison between desistance from these two behaviors. This dissertation seeks to address this gap by asking (1) whether the same set of social and psychological factors that distinguish crime desisters from persisters also differentiate heavy substance use desisters from persisters and (2) to what extent individuals who are desisting from crime are also desisting from heavy substance use. In addition to addressing these two primary research questions, a set of substance specific and subgroup analyses were performed to assess whether the

results differ across substance type (alcohol, marijuana, and hard drugs) or along the demographics of race and gender. These analyses were performed using data from the National Longitudinal Survey of Youth 1997 cohort. Desisters were identified using group-based trajectory modeling while multinomial logistic regression was used to examine the factors associated with desistance from each of these behaviors. The results of the analyses indicate that desistance from crime is associated with differences in social bonds and reduced levels of strain, while desistance from substance use is primarily associated with reduced levels of strain and individual personality differences. The substance specific analyses suggest different factors are associated with desistance from the use of different substances, while the race- and gender-specific analyses suggest differences across these demographics. The implications of these results for theories of desistance from crime and substance use are discussed as are the limitations of this dissertation and suggestions for future research.

DESISTANCE FROM CRIME AND SUBSTANCE USE: A UNIVERSAL
PROCESS OR BEHAVIOR-SPECIFIC?

By

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Dedication

To my parents for all of their support over the years

Acknowledgements

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Chapter One: Introduction

The study of desistance from crime is an increasingly popular topic of interest among criminologists. Although desistance from crime is clearly relevant to the concept of a criminal career (Blumstein, Cohen, Roth, & Visher, 1986), it did not receive much attention when this concept was first introduced in criminology. Indeed, Loeber and LeBlanc (1990) had characterized desistance as the "least studied process" in the criminal career paradigm (p. 407). That characterization may have changed with the emergence of developmental and life course theories of crime.

Both developmental and life course theories of crime attempt to explain within-individual change and continuity in offending throughout the life span (Piquero, Farrington, & Blumstein, 2003). Since desistance from crime represents change in offending, it is unsurprising that proponents of this theoretical perspective would display the greatest interest in this subject. While a variety of theories have been proposed to explain desistance from crime (e.g. Giordano, Cernkovich, & Rudolph, 2002; Laub & Sampson, 2003; Maruna, 2001; Paternoster & Bushway, 2009), Sampson and Laub's (1993) age-graded informal social control theory has perhaps been most responsible for generating the greatest interest in the study of desistance from offending. According to their theory, desistance from criminal behavior in adulthood can be explained by the formation of adult social bonds with institutions of social control, e.g. marriage, employment, military service (Sampson & Laub, 1993). Since Sampson and Laub (1993) first introduced their theory, there has been a substantial body of literature that has examined the impact of these social institutions on adult offending (Siennick & Osgood, 2008).

Besides age-graded informal social control theory, several other theories have been proposed to explain desistance from crime. One way to think about these theories is to categorize them according to the mechanism for change that is emphasized. Desistance theories primarily emphasize change in either internal or structural factors[1]. Internal theories stress the role of psychological factors, such as human agency or risk perceptions, in desistance and suggest that desistance is primarily due to identity change or cognitive transformations (e.g. Giordano et al., 2002; Maruna, 2001; Paternoster & Bushway, 2009). Theories in the other category stress the role of structural changes, such as changes in social bonds or time spent with peers, in bringing about desistance from crime (e.g. Laub & Sampson, 2003; Warr, 1998). Marriage, parenthood, and employment have received the most attention from researchers, although other factors such as student status and living arrangements have garnered some attention as well (Siennick & Osgood, 2008).

While these theories of desistance emphasize different mechanisms for change, they all attempt to explain the same phenomenon: desistance from criminal offending. The definition of desistance itself, though, has been subject to debate as to whether it represents a static state of zero offending or whether it represents a process where offending frequency declines until ceasing altogether or reaching a very low level (Laub & Sampson, 2001). If desistance occurs when a low level of offending is reached, the question then becomes what constitutes a sufficiently low level of offending. This distinction has important implications for how we conceptualize and

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[1] It is important to note that although desistance theories may emphasize one change mechanism over another, it is hardly the case that desistance theories suggest a single mechanism for change. Rather, most theories link desistance to changes in both internal and external factors. For instance, while the age-graded theory of informal social control emphasizes change in adult social bonds, it also recognizes the role of human agency in the change process (Laub and Sampson, 2003).

study desistance as it can lead to different groups of individuals being labeled "desisters" and may result in conflicting conclusions being drawn about this phenomenon. Nevertheless, while desistance may be better conceptualized as a process of change in offending rather than a static state or discrete event (Bushway, Piquero, Broidy, Cauffman, & Mazerolle, 2001; Bushway, Thornberry, & Krohn, 2003; Laub & Sampson, 2001), thinking about desistance as representing only a reduction in offending frequency may also be too narrow of a conceptualization of this phenomenon.

Aside from the reduction in offending frequency, research suggests the desistance process may also consist of changes in other criminal career dimensions such as offending versatility. McGloin and colleagues (2011) find that marriage is associated with within-individual declines in offending versatility among Dutch offenders. Massoglia (2006) also finds evidence that offending versatility changes during the transition from youth to adulthood in the National Youth Survey (NYS). Massoglia finds that offenders move away from serious violent crimes as well as minor crimes as they transition into adulthood.

Massoglia (2006) also finds evidence of displacement in antisocial behavior rather than "complete" desistance. While most individuals reduced their involvement in violent offending and normative adolescent offending (e.g. vandalism, theft) as they transitioned from adolescence to adulthood, most individuals also either initiated or continued their involvement in other problem behaviors such as substance use. This study, as well as that of McGloin and colleagues (2011), would seem to suggest

that the desistance process may involve both qualitative changes in offending

versatility as well as a reduction in offending frequency.

The finding that desistance may also be characterized by qualitative changes

in offending patterns raises a related question that has received little attention: Is the

observed change in criminal offending part of a broader pattern of behavioral change?

The focus on criminal behavior neglects the possibility that other problem behaviors

may continue unabated or start anew which is precisely what Massoglia (2006) found

in the NYS. The failure to consider change across different forms of problem

behavior is surprising in light of the suggestion of several prominent criminologists

that the process of desistance from crime is similar to desistance processes involved

in other problem behaviors (Fagan, 1989; Laub & Sampson, 2001).

Several studies have found evidence that even though criminal offending may

cease, individuals continue to participate in other problem behaviors such as

substance use or fighting (e.g. Massoglia, 2006; Nagin, Farrington, & Moffitt, 1995).

If criminal behavior is just one manifestation of a larger underlying pattern of

antisocial behavior such as problem behavior syndrome (Jessor & Jessor, 1977) or

some latent trait (Gottfredson & Hirschi, 1990; Rowe, Osgood, & Nicewander, 1990),

then it is important to consider whether we observe changes in other problem

behaviors. The failure to consider changes in different problem behaviors makes it

difficult to evaluate theories such as Gottfredson and Hirschi's (1990) general theory

of crime which purports to explain both criminal and analogous behaviors. Since

these theories argue that crime and delinquency are just one behavioral manifestation

of an underlying syndrome or propensity, the exclusive focus on one particular form of behavior fails to capture whether or not there are changes in similar behaviors.

For these reasons, it is important to examine whether the factors that are associated with desistance from crime are also associated with desistance from other problem behaviors such as substance use. A comparison of desistance from substance use with desistance from crime is appropriate for several reasons. First, both criminal behavior and substance use are strongly related to age. Although there are some differences in the development of each of these behaviors over the lifespan, such as the age of peak involvement, both criminal and substance use behavior usually begin during adolescence and drop off as individuals transition into adulthood (Chen & Kandel, 1995; Piquero et al., 2002). Peak involvement in substance use tends to occur later than peak involvement in crime, although the timing of peak involvement in each of these behaviors often depends on how crime and substance use is measured. For instance, peak involvement in violent crime occurs somewhat later than peak involvement in non-violent offending (Piquero et al., 2002). Similarly, peak involvement in the use of hard drugs tends to occurs later in the life course than use of alcohol or marijuana (Chen & Kandel, 1995). Nevertheless, the strong correspondence between each of these respective behaviors and age suggest that similar factors may be associated with change in each of these behaviors.

Another reason to compare desistance from these two problem behaviors is that both the criminological and substance use literature have produced similar findings on the factors associated with desistance. Upon review of this literature, both Fagan (1989) and Laub and Sampson (2001) conclude desistance from crime is

similar to desistance from substance use. Their reviews of the research on desistance from crime identifies many similar findings with research on desistance from substance use. However, most of the studies on which they base their conclusions examined either criminal behavior or substance use. There have been comparatively fewer studies that have examined change across both criminal involvement and substance use. Research that has examined both crime and substance use often find individuals desist from crime, yet continue their involvement in substance use.

The remainder of this chapter discusses the relationship between criminal offending and substance use and considers the question of whether desistance from these problem behaviors can be explained by the same factors. This discussion will show that while it appears that common factors underlie desistance from these different problem behaviors, there is some evidence that indicates otherwise. These discrepant findings raise an important question about whether desistance is a "universal" phenomenon whereby the same factors lead to cessation of different problem behaviors or whether desistance processes are behavior-specific. This chapter will conclude with a description of this dissertation.

Criminal Offending and Substance Use

The relationship between substance use and criminal offending is well established. Multiple studies have found a positive correlation between these two behaviors suggesting that those most likely to become involved in delinquent and criminal behavior are also those most likely to use drugs and alcohol (see White & Gorman, 2000 for a review). Research also indicates that increased frequency of substance use is associated with increased frequency in offending (McGlothlin,

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Anglin, & Wilson, 1978; Nurco, Hanlon, Kinlock, & Duszynski, 1988; Welte, Barnes, Hoffman, Wieczorek, & Zhang, 2005). Studies that employ more advanced statistical methods, such as growth curve modeling or latent class growth analysis, also find a strong correspondence in the development of these two behaviors over the life course (e.g. Dembo, Wareham, & Schmeidler, 2007; Sullivan & Hamilton, 2007).

While there is a consensus that substance use and criminal behavior are related, the nature and direction of this relationship is less straightforward. There are a variety of mechanisms by which criminal behavior may be linked to substance use (Mulvey, Schubert, & Chassin, 2010). The relationship between these two behaviors may be reciprocal such that involvement in one behavior increases the likelihood of involvement in the other behavior. For instance, substance use can affect individual's decision-making processes by lowering inhibitions and increasing the likelihood of offending. Crime may also be a means by which to support a substance use habit. If these behaviors reinforce each other, then it would be expected that change in one behavior should be accompanied by change in the other behavior. Cessation of substance use would eliminate the need for instrumental crime to support a drug habit and would presumably restore inhibitions against criminal behavior.

Alternatively, the relationship between these two behaviors may be due to a common cause. This common cause may be a latent trait such as low self-control (Gottfredson & Hirschi, 1990) or problem behavior syndrome (Jessor & Jessor, 1977). Factors in the social context, such as neighborhood social disorganization or deviant peers, may also explain the co-occurrence of these two behaviors. If these behaviors share a common cause such as a latent trait, then it does not necessarily

follow that change in one problem behavior should be accompanied by change in other behaviors. Latent trait theories which propose to explain a broad range of problem behaviors, such as Gottfredson and Hirschi's (1990) general theory of crime, allow for the possibility that some problem behaviors would continue. According to these theories, the opportunities for particular forms of problem behavior may change over the life course such that some problem behaviors become less likely, but the underlying propensity would remain relatively stable. Since the propensity remains relatively stable, it would be expected that that propensity would result in other behavioral manifestations.

Desistance from Crime and Substance Use

The idea that desistance from crime is similar to desistance from other problem behaviors such as substance use has existed for some time. Winick (1964) was the first to suggest that the same factors may explain change in both criminal behavior and substance abuse. Winick compared the phenomenon of "maturing out" of narcotic addiction to aging out of delinquency and psychosis. Winick (1964) speculated that:

> "It is therefore within the realm of possibility that the same underlying forces that contribute to the settling down of delinquents or to their change from aggressive criminalism to petty offences of the nuisance type underlie both the phenomenon of de-recidivism and the analogous phenomenon of de-addiction. It is possible that de-addiction is simply one facet of de-recidivism." (p. 2)

The idea that the same factors may account for desistance from different problem behaviors did not garner any attention for more than two decades. Fagan (1989) was the next to pick up on this idea when he suggested that the processes related to the cessation of family violence were similar to the processes related to desistance from

other problem behaviors. Fagan acknowledged that although the origins of problem

behaviors may be different, the processes involved in the cessation of such behaviors

appeared to be similar. Fagan draws parallels between the processes involved in

cessation of family violence with desistance processes in other problem behaviors

including opiate addiction (Biernacki, 1986; Waldorf, 1983), alcoholism (Stall, 1983;

Tuchfeld, 1981), eating disorders and smoking (Stall & Biernacki, 1986).

Fagan (1989) concludes that even though these behaviors vary in their level of

severity and may have different etiologies, there appears to be considerable overlap in

the process of change as well as which factors are associated with cessation of each of

these behaviors. Cessation from these behaviors are typically characterized by a

three-stage process: building the motivation to stop, making and publicly disclosing

that decision, and maintaining new behaviors and building new social networks (Stall

& Biernacki, 1986). Fagan (1989) notes that negative consequences are often

associated with building the initial motivation to stop. In contrast, conventional ties,

new social networks, and substitution of other problem behaviors were among the

common factors associated with the maintenance of changed behavior.

More recent claims have been made regarding common elements in desistance

from crime and substance use. Maruna (2001) suggests that criminal behavior and

substance use are so closely related that the study of desistance is "almost necessarily

a study of abstaining from both types of behavior" (p. 64). This claim implies that the

same factors promote desistance from both problem behaviors and that the desistance

process is characterized by a reduction in problem behaviors in general rather than a

reduction in a particular problem behavior. Yet, there is evidence that other forms of

problem behaviors including substance use persist even as individuals desist from criminal offending (Massoglia, 2006; Nagin et al., 1995).

Laub and Sampson (2001) also suggest processes of desistance from crime may be similar to those involved in desistance from substance use and other problem behaviors. They review some of the research that has examined desistance from drug and alcohol abuse and find considerable similarities between those factors that are predictive of desistance from crime and those that are predictive of desistance from substance use. In particular, Laub and Sampson identify these common elements of desistance from crime and other problem behaviors as "the decision or motivation to change, cognitive restructuring, coping skills, continued monitoring, social support, and general lifestyle change, especially new social networks" (p. 38).

Although these claims suggest there are common elements in desistance from different problem behaviors, empirical research on the question of whether the same factors can account for desistance from both criminal behavior and substance use is scarce. Instead, most research has focused on desistance from a particular problem behavior; either criminal offending *or* substance use, rather than considering changes in *both* behaviors. Indeed, studies of desistance from different problem behaviors have proceeded largely along disciplinary boundaries. Criminologists study criminal careers and treat substance use as a covariate that negatively affects desistance from crime rather than as an outcome of interest in itself (e.g. Hussong, Curran, Moffitt, Caspi, & Carrig, 2004; Schroeder, Giordano, & Cernkovich, 2007). Substance use research usually focuses on the natural history of substance use and seeks to determine the factors associated with cessation of use rather than criminal behavior.

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As a result of this division of labor, there are large bodies of empirical research that have explored which factors are associated with desistance from criminal offending as well as which factors are associated with cessation of substance use. There has been comparatively less empirical research that has directly investigated the extent to which the same factors could be used to explain desistance from both behaviors. While a review of both literatures suggests similar processes may be at work, most studies focus exclusively on either criminal behavior or substance use. The measurement of just one problem behavior leaves open the possibility that other problem behaviors may persist. Indeed, there is some evidence to suggest that other problem behaviors persist even as offenders desist from criminal offending. Few studies have sought to address the question of whether desistance from crime is accompanied by desistance from other problem behaviors. As a result, our knowledge of whether there exists a "universal" desistance process for different problem behaviors or whether desistance represents a behavior-specific phenomenon is limited.

Is Desistance a "Universal" Phenomenon?

There is a strong correspondence between age and involvement in both crime and substance use. Involvement in crime and the use of alcohol and tobacco both usually begin during early adolescence, reach a peak in late adolescence, and decline during the transition to adulthood (Chen & Kandel, 1995; Hirschi & Gottfredson, 1983). Early onset of offending and substance use are also associated with longer careers in each respective behavior (Grant & Dawson, 1998; Piquero, Farrington &

Blumstein, 2007). These similarities suggest the same factors may produce similar effects on different problem behaviors.

The strong relationship between these problem behaviors and age initially led to similar theoretical explanations for the observed decline in criminal behavior and substance use. Early theories identified the process of maturation as an explanation for the decline in these behaviors over the life course. Glueck and Glueck (1974) proposed a delayed maturation hypothesis in which the "natural process of maturation [is the] chief explanation of the improvement of conduct with the passing of years" (p. 149). Matza (1964) also used the idea of "maturational reform" to explain why most adolescents cease delinquent involvement.

Maturation hypotheses also emerged in substance use research. Winick (1962) suggested maturation could explain the phenomenon of "natural recovery" in the addiction field. Using data from the Federal Bureau of Narcotics on all known opiate addicts in the United States, Winick (1962) discovered that contrary to the prevailing belief that addiction was a lifetime affliction; opiate addiction resembled something more of a "self-limiting process" where most addicts eventually cease their opiate use. Winick found that approximately two-thirds of addicts had ceased opiate use in their thirties. Winick (1962) offered a maturation hypothesis to explain cessation from opiate addiction. According to Winick, those in their late teens and twenties who begin to use opiates do so as a means to cope with the challenges and problems of early adulthood. Winick speculates that cessation of opiate use is associated with a reduction in these pressures associated with adulthood.

Besides these maturation hypotheses, several other theoretical frameworks have been proposed to explain desistance from crime and substance use. Laub and Sampson (2001) identified five theoretical frameworks that have been applied to the study of desistance from crime: maturation and aging, developmental, life course, rational choice, and social learning. In their view, the life course perspective offers "the most promising approach for advancing the state of knowledge regarding desistance from crime and other problem behavior(s)" (p. 38). Elder (1985) defines the life course as "pathways through the age differentiated life span" which "is manifested in expectations and options that impinge on decision processes and the course of events that give shape to life stages, transitions, and turning points" (p. 17: as quoted in Sampson & Laub, 1993).

The life course perspective has been applied to the study of both criminal behavior (Sampson & Laub, 1993) and substance use (Hser, Longshore & Anglin, 2007), although it has not been used as much in substance use research. Even though the life course perspective has not been as widely used in substance use research, there exists a substantial body of empirical research that has explored which factors are predictive of desistance from substance use. This body of research has largely advanced through a risk factor approach in which investigators examine a variety of factors to determine which ones are associated with cessation of use (e.g. Best, Ghufran, Day, & Loaring, 2008; Kandel & Raveis, 1989). Nevertheless, life course studies of both criminal and substance use behavior tend to find similar factors are associated with desistance from both behaviors.

Life course studies of criminal offending often focus on the impact of transitions from adolescence to adult roles such as spouse, parent, and employee. Criminologists have primarily studied the roles of marriage, parenthood, and employment on criminal offending; although other factors such as student status and living arrangements have been investigated as well (Kazemian & Maruna, 2009; Siennick & Osgood, 2008). Of these different role transitions, marriage seems to have the most consistent effects on adult offending (Siennick & Osgood, 2008). Although marriage is often associated with reductions in offending, certain aspects of marriage, such as the level of marital attachment (Sampson & Laub, 1993) and the conventionality of the spouse (Giordano et al., 2002), are often better predictors of desistance from offending.

The effects of parenthood and employment on adult offending have not been as consistent as those of marriage (Siennick & Osgood, 2008). Research on the impact of parenthood suggests it may be a more important factor in explaining desistance from crime among females than among males, although recent research suggests otherwise (Kerr, Capaldi, Owen, Wiesner, & Pears, 2011). Employment has also been associated with desistance from offending, although its effect is often dependent on other individual characteristics such as age (Uggen, 2000) or race (Piquero, Brame, Mazerolle, & Haapanen, 2002). Similar to marriage, certain aspects of employment, such as employment stability, appear to be more strongly associated with desistance from criminal offending (Sampson & Laub, 1993).

Studies of desistance from substance use have found similar effects of adult role transitions. Marriage has been linked with desistance from the use of various

substances including marijuana (Duncan, Wilkerson, & England, 2006; Kandel & Raveis, 1989; Labouvie, 1996; Maume, Ousey, & Beaver, 2005; Ragan & Beaver, 2010), alcohol (Duncan et al., 2006; Miller-Tutzauer, Leonard, & Windle, 1991), and tobacco (Chen, White, & Pandina, 2001). Parenthood has also been associated with suspension or reduction in drug use (Esbensen & Elliott, 1994; Kandel & Raveis, 1989; Kerr et al., 2011; Labouvie, 1996). Social ties to school, family, religion and the labor market also appear to be significant factors in desistance from the use of hard drugs including cocaine (Hamil-Luker, Land, & Blau, 2004; Waldorf, Reinarman, & Murphy, 1991; White & Bates, 1995) and heroin (Biernacki, 1986).

It would thus appear that adult role transitions are associated with reductions in both criminal offending and substance use behavior. However, most of the research on which this observation is based has focused on *either* criminal offending *or* substance use. Studies that consider multiple problem behaviors provide some evidence that adult role transitions may exert different impacts on different problem behaviors. For instance, Knight, Osborn, and West (1977) found that while marriage did not reduce criminal offending, it reduced other forms of antisocial behavior such as drinking and drug use. O'Connell (2003) found employment was associated with reduced drug use, but was unrelated to arrests among a sample of 577 incarcerated drug offenders.

Other research suggests that the factors associated with desistance from crime may differ depending on the seriousness of the behavior. Gunnison and Mazerolle (2007) find some differences in which factors were predictive of desistance form serious delinquency and those that promote desistance from general delinquency.

They did not include any measure of substance use however. If the factors that are associated with desistance from serious delinquency differ from those related to general delinquency, then it is also plausible that the factors that are associated with desistance from crime differ from those related to desistance from substance use.

These inconsistent findings may also be the result of the failure to consider other possible factors that may be associated with desistance from problem behaviors. Aside from adult role transitions, desistance from crime and substance use has been linked to psychological changes in personality, self-control, and risk perceptions. Recent work in the substance use field has found smoking cessation and reductions in problem drinking are associated with decreased levels of impulsivity and neuroticism and increased levels of constraint (Littlefield & Sher, 2012; Littlefield, Sher, & Steinley, 2010; Welch & Poulton, 2009). Increases in self-control have been linked to cessation of marijuana use in adulthood (Ragan & Beaver, 2010). Further, several theoretical perspectives predict a relationship between increased risk perceptions and desistance from problem behaviors (Gartner & Piliavin, 1988; Shover, 1985), although the evidence for this relationship has been less than supportive (Gunter et al., 2012; Shover & Thompson, 1992).

In sum, there appears to be considerable overlap in which factors are predictive of desistance from crime and substance use. However, most of the research on which this observation is based takes a narrow focus in which either crime or substance use is treated as an outcome. Studies that treat both behaviors as outcomes often find substance use persists even after an individual has desisted from criminal offending. These discrepant findings raise the question of whether the

process of desistance from crime is similar to the process of desistance from substance use.

The Current Study

The purpose of this dissertation is to explore the extent to which desistance from crime is similar to desistance from substance use. This is accomplished by asking two research questions: (1) are the factors associated with desistance from crime similar to the factors associated with desistance from substance use and (2) to what extent are individuals desisting from crime also desisting from substance use? These questions are addressed by applying group-based trajectory modeling to data from the National Longitudinal Survey of Youth 1997 cohort.

Group-based trajectory modeling is used to identify developmental trajectories of both crime and substance use. This method provides posterior probabilities of group membership which may be used to hard-classify individuals into the trajectory group with which they have the greatest probability of membership. Group profiles of a set of social and psychological factors were next developed and compared across trajectory groups. Multinomial logistic regression is then used to identify which factors are associated with desistance from each behavior.

An extension of this method, the dual trajectory model, is used to identify whether there are different patterns of desistance from crime and substance use. That is, are there some individuals who desist from crime but persist in substance use, some who desist from substance use but not crime, and some who desist from both forms of problem behavior? If desistance is a "universal" phenomenon, then it is

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expected that those classified as desisters from crime are also highly likely to be classified as desisters from substance use.

The answers to these two research questions and the ones raised above will better inform our understanding of desistance by focusing on change *across* problem behaviors. This is seldom done in existing research on desistance from crime and similar behaviors. Further, the results of this dissertation have important implications for theories of desistance. This is particularly true for general theories which propose to explain more than just criminal behavior. For instance, Gottfredson and Hirschi's (1990) general theory of crime allows for the possibility for persistence in some problem behaviors even if one has desisted from criminal behavior. It would be more difficult for the general theory to explain desistance or cessation of problem behavior altogether.

This dissertation consists of four remaining chapters. Chapter Two reviews the existing literature on desistance from crime and substance use. This review discusses (1) the various theoretical perspectives that have been proposed to explain desistance and (2) the body of research on desistance from crime and substance use. This chapter also identifies three common research findings that suggest the factors associated with desistance may differ across crime and substance use. Chapter Three details the research questions, hypotheses, dataset and analytic method used in this dissertation. Chapter Four presents the results of the statistical analyses. Chapter Five discusses (1) how the results of this dissertation fit within the existing literature on desistance from crime and substance use, (2) the limitations of this dissertation and (3) directions for future research on desistance from crime and substance use.

Chapter Two: Literature Review

The interest in desistance from crime began with the well-established relationship between age and crime first discovered by Quetelet (1831). Subsequent studies on the age-crime relationship have shown the invariance of the age-crime curve across time and place (Hirschi & Gottfredson, 1983). Goring (1919) suggested the age-crime curve is a "law of nature". The Gluecks (1974) and Matza (1964) suggested the age-crime curve is an indicator of a normative process of maturational reform. Hirschi and Gottfredson (1983) referred to it as one of the "brute facts of criminology" and suggested "no fact about crime is more widely accepted" (p. 552). Since its discovery, however, interest in the age-crime curve has focused mainly on identifying which factors account for the initiation and escalation in criminal involvement in adolescence rather than its decline.

The concept of desistance from crime emerged relatively recently as criminologists have begun to direct more attention to understanding the development of criminal offending over the entire life course. The concept of desistance itself has been subject to debate regarding its conceptualization and definition. The main issue concerns whether desistance should be defined as a point, or end state, or whether it should be considered as a process of reduced criminal involvement (Bushway et al., 2001). The choice of whether to define desistance as a process or end state is important as these different conceptualizations can lead to different individuals being identified as desisters (Bushway et al., 2003). Bushway, Thornberry and Krohn (2003) note that the conceptualization of desistance as a process allows us to study

the onset of desistance, its steepness, and whether there are any instances of upticks in offending.

Desistance has been defined in a variety of ways. Shover (1996) defined desistance as "the voluntary termination of serious criminal participation" (p. 121). Farrall and Bowling (1999) suggested desistance occurs at the "moment that a criminal career ends" (p.253). Maruna (2001) defined desistance as the "long-term abstinence from crime among individuals who had previously engaged in persistent patterns of criminal offending" (p. 26). Bushway and colleagues (2001) defined desistance as "the process of reduction in the rate of offending (understood conceptually as an estimate of criminality) from a nonzero level to a stable rate empirically indistinguishable from zero" (p. 500).

Common to all of these definitions is the notion that offenders move from a state of non-trivial offending to a state of non-offending. In other words, desistance is associated with a reduction in offending frequency. This focus on frequency overlooks other changes that may be part of the desistance process. Loeber and LeBlanc (1990) have suggested desistance from offending is marked by reductions in frequency (deceleration), variety (specialization), seriousness (de-escalation) and reaching a ceiling in the seriousness of offending. Thus far, research on desistance has largely focused on deceleration in offending.

By focusing so much on change in offending frequency and criminal behavior in particular, we may be missing out on other important features of the desistance process such as the possibility of behavioral substitution. That is, individuals may become increasingly involved in other similar behaviors even though they are

decreasing their involvement in criminal behavior. If individuals are substituting criminal behavior with similar problem behaviors, then what does that mean for how we think about desistance? Does change really occur or is it just a displacement of behavior? These questions have clear implications for theoretical perspectives that contend criminal and delinquent behavior represent just one manifestation of an underlying propensity for problem behavior in general (Gottfredson & Hirschi, 1990; Jessor & Jessor, 1977).

Some of the answers to these questions may be found by examining the literature on cessation and recovery from substance use problems. Although desistance is primarily a criminological term and rarely used in the substance use literature, desistance from crime and cessation of substance use appear to operate according to similar processes (Fagan, 1989; Laub & Sampson, 2001). The substance use literature is replete with a variety of terms used to describe cessation from substance use including natural recovery, natural remission, spontaneous remission, spontaneous recovery, and self-change. These terms have all been used to describe the process whereby individuals with alcohol and/or drug problems reduce or terminate their substance use absent any treatment. For the sake of consistency, desistance will be used throughout this chapter to represent both a reduction in criminal involvement as well as the phenomenon of unassisted change in substance use behaviors.

Our understanding of desistance rests largely on a fragmented body of literature that focuses on change in one particular behavior at the exclusion of others. The failure to consider change across multiple problem behaviors represents a large

gap in our understanding of desistance. Mulvey and colleagues (2004) suggested it is important to consider multiple forms of problem behaviors when studying desistance because:

> "limiting the study of desistance to the study of change in only one particular behavior or set of behaviors would be of limited usefulness because it would not take into account the process of crime substitution…measuring change over time across several different types of antisocial behavior and relating those patterns of change to each other is necessary to make the distinction between behavior specific and more global desistance" (p. 222).

Thus, it is important to consider problem behaviors in general when studying desistance. Jessor and Jessor (1977) defined problem behavior as "behavior that is socially defined as a problem, a source of concern, or as undesirable by the norms of conventional society and the institutions of adult authority, and its occurrence usually elicits some kind of social control response" (p. 33). Problem behavior can thus take multiple forms including delinquency, crime, substance use, risky driving, etc. For the purposes of this dissertation, problem behavior is used to refer to delinquent and criminal behavior as well as drug and alcohol use.

This chapter is divided into three main sections. The first section discusses the theoretical frameworks that have been proposed to explain desistance from crime and substance use. This discussion highlights the various social and psychological factors that have been linked to desistance. The second section reviews the body of existing research on desistance from crime and substance use. This review will show that many of the parallels between desistance from crime and desistance from substance use come from research focusing on either crime or substance use as an outcome. Research that considers both crime and substance use often finds change in criminal behavior, but little change in substance use behavior. The third section will

identify some of the important differences between these two bodies of literature, such as the role of strain and the prevalence of behavioral substitution, that have important implications for how we think about desistance from problem behaviors.

Theories of Desistance from Crime and Substance Use

Even though the concept of desistance from crime has emerged relatively recently, there has long been speculation about what explains the downward slope in the age-crime curve. Early explanations identified processes associated with aging as the principle factor accounting for desistance. These early explanations focused on the various physical and mental changes that accompany aging (Goring, 1919; Quetelet, 1831). Quetelet (1831) suggested "age is undoubtedly the cause which operates with most energy in developing or subduing the propensity to crime" (p. 27). Quetelet (1831) speculated that the peak in crime is reached when physical development ceases and increasing intellectual and moral development weakens criminal propensity:

> "The fatal propensity seems to develop in proportion to the intensity of physical strength and passions in man. It attains its maximum around 25 years, a period where physical development is pretty nearly ended. Intellectual and moral development, which takes place with more slowness, then moderates the propensity for crime which diminishes still more slowly by the weakening of man's physical strength and passion." (p. 65)

Since this early speculation, the number of explanations for desistance from crime has grown considerably.

Laub and Sampson (2001) previously reviewed the different theoretical frameworks that have been proposed to explain desistance from crime and the body of research testing such theories. Two new theories have emerged since their review

that propose desistance from crime is primarily associated with changes in identity and cognition (Giordano et al., 2002, 2007; Maruna, 2001; Paternoster & Bushway, 2009). These cognitive/identity theories are similar to Shover's (1985) theory and Maruna's (2001) theory in that they emphasize the role of changes in individual self-perceptions and cognitions over time in the desistance process. Since the focus of this dissertation is on the social and psychological factors associated with desistance from crime and substance use rather than the desistance process itself, the following theoretical discussion will exclude theories that emphasize subjective changes in identity and cognitions (Biernacki, 1986; Giordano et al., 2002, 2007; Paternoster & Bushway, 2009; Waldorf, 1983).

This section discusses four theoretical frameworks that have been used to explain desistance from crime including maturation/aging, developmental, rational choice, and life course[2]. Although cognitive/identity theories are not reviewed here, it is important to note that these theories share two things in common with these other theoretical frameworks. First, cognitive/identity theories have been used to explain desistance from both crime (Giordano et al., 2002, 2007; Paternoster & Bushway, 2009) and substance use (Biernacki, 1986; Waldorf, 1983). Second, these theories incorporate change in both social and psychological factors in their explanation for desistance from crime and substance use even though they prioritize subjective changes in identity and cognitions.

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[2] These are four of the five theoretical frameworks described in Laub and Sampson's (2001) review. Their review also includes social learning theory as a possible theoretical explanation for desistance from both crime and substance use (Akers, 1998). The following theoretical discussion excludes social learning theory since this dissertation does not test social learning theory due to a lack of available data. This limitation is further discussed in Chapter Five.

Maturation/Aging.

Early theories of desistance suggested maturational reform was responsible for desistance from crime. Sheldon and Eleanor Glueck (1940) first proposed the idea that desistance from crime is due to maturation. Maturation has also been used to explain desistance from substance use. Winick (1962) suggested desistance from opioid addiction is akin to desistance from delinquency as both of these behaviors serve as coping mechanisms for individuals experiencing difficulties during the transition from adolescence to adulthood. Once individuals improved their ability to cope with the demands placed on them during adulthood, they would cease involvement in such problem behaviors.

Sheldon and Eleanor Glueck (1940) developed their maturation hypothesis based on two studies: one with juvenile delinquents and one involving reformatory inmates. The Gluecks observed several interesting findings from these studies. First, they examined 63 different factors and found that age was the only factor that was significantly associated with behavioral reformation. Second, they found that it wasn't at any particular age that offenders desisted. Rather, they found that the passage of a certain amount of time from initial criminal involvement was associated with desistance. For the Gluecks (1945), it is "not age per se, but rather the acquisition of a certain degree of what we have called 'maturation' regardless of the age at which this is achieved among different groups of offenders, is significantly related to changes in criminalistic behavior once embarked upon" (p. 84).

This characterization suggests the Gluecks thought of delinquent and criminal behavior as a duration-dependent phenomenon. That is, criminal behavior is

something like a disease that will eventually run its course over time. This led Glueck and Glueck (1974) to suggest desistance from crime is normative and any delays in maturation are due to mental deviation. Changes in life circumstances, such as improved family relations and assumption of economic responsibilities, accompanied this process of maturation rather than being responsible for reformation. As such, changes in social roles are correlated with maturation rather than being causally related.

The Gluecks (1974) provide few details regarding what the maturation process entails. Rather, they describe maturation as a complex developmental process characterized by various changes including an increase in self-control and forethought, an increased ability to defer gratification, and perseverance and self-respect. Since this process is complex and involves numerous changes, they indicated the importance of collaboration among researchers in various disciplines (biochemistry, psychology, anthropology, physiology, sociology, psychiatry, neurology, biology) to study the maturation process. The vague description of maturation offered by the Gluecks led Wootton (1959) to suggest the concept of maturation represents more of a label rather than an explanation for this phenomenon.

Maturation has also been proposed as an explanation for desistance from drug and alcohol use. The maturation hypothesis in the substance use literature is attributed to Winick (1962; 1964) who suggested that maturation can explain desistance from narcotic addiction. Using data from the Federal Bureau of Narcotics of all known addicts in the nation, Winick (1962) discovered that most addicts seemed to become inactive in their thirties. At a time when addiction was thought to

be a lifelong affliction, Winick (1962) found evidence suggesting that narcotic addicts often overcome their addiction.

Like the Gluecks, Winick (1962) described maturation as a somewhat vague process. He speculated that addicts initially begin their drug use as a means to cope with the demands of early adulthood and to avoid many of its accompanying decisions involving employment and marriage. As these demands become less pressing with advancing age, addicts are able to improve their ability to handle these decisions and their accompanying stresses and consequently reduce their drug use. Winick also suspected delinquent behavior is used to meet many of these same needs as drug use. For Winick, maturing out of narcotic use is akin to maturing out of other problem behaviors including delinquency.

Aging. Gottfredson and Hirschi (1990) offer an explanation of desistance from crime similar to the maturation hypothesis proposed by the Gluecks and Winick. According to Gottfredson and Hirschi (1990), the decline in criminal involvement with age is due to the "inexorable aging of the organism". While Gottfredson and Hirschi offer little explanation for what this means other than to say that "age has a direct effect on crime", they suggest the decline in criminal involvement is due to changes in opportunities. Indeed, Gottfredson and Hirschi (1990) are highly skeptical of the idea that adult social institutions such as employment and marriage are capable of changing people.

This position of Gottfredson and Hirschi (1990) on desistance from crime is slightly different from the maturational hypothesis offered by the Gluecks. The difference between these positions can be found in the distinction that Gottfredson

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and Hirschi (1990) draw between crime and criminality. Gottfredson and Hirschi (1990) suggested that the frequency of criminal offending declines with age, while criminality remained relatively stable throughout the life course. In contrast, the Gluecks' maturation hypothesis implies that criminality changes with age as well as criminal involvement. While the Gluecks provide few details on what maturation entails, they suggest maturation is accompanied by developmental changes such as increased self-control and forethought. This characterization of maturation suggests the Gluecks thought that criminality or the propensity for crime, rather than the opportunity for crime, changed with age.

While Gottfredson and Hirschi (1990) acknowledge the decline in criminal offending with age, the distinction they make between crime and criminality suggests that criminality may continue to manifest itself in behaviors analogous to crime. To illustrate this point, Gottfredson and Hirschi (1990) note that alcohol and drug use increases through the adolescent years at the same time that delinquency involvement is declining. They suggest that crime and alcohol and drug use are all manifestations of low self-control. Gottfredson and Hirschi (1990) clearly state that changes in the frequency in which one activity is performed does not imply change in the frequency with which others are performed: "nor does change in the frequency with which one of these pleasures is pursued necessarily imply change in the general propensity of the person to pursue such pleasures as a whole" (p. 140). Gottfredson and Hirschi find support for their position in research by Glueck and Glueck (1937) and McCord and McCord (1959) which shows that increased arrests for drunkenness almost made up for observed decreases in other crime types.

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The distinction that Gottfredson and Hirschi (1990) draw between crime and criminality thus has important implications for how their "age theory" should be tested. A proper test of their theory requires that both criminal involvement and criminality are measured over time. Thus far, most research on desistance for crime has focused on changes in criminal involvement over the life course where involvement is measured by number of convictions or arrests. Consideration of behaviors analogous to crime, such as alcohol and drug use, have largely been ignored in the criminological literature.

Developmental.

The Gluecks (1959) maturation hypothesis may be considered a precursor to another theoretical framework which suggests desistance from problem behaviors may be explained by human development. While the Gluecks did not formally define maturation, their description of maturation suggests that it is a complex process that involves changes in a variety of factors that are part of human development. Developmental theories of desistance focus on the biological, psychological, and sociological changes that accompany aging. Gove (1985), Shover (1985), and Moffitt (1993) have each proposed developmental theories of desistance from crime.

Gove (1985) contends that any explanation for desistance from crime must incorporate biological, psychological, and sociological factors. For Gove, any explanation of desistance that neglects to incorporate all of these factors is insufficient. Gove suggested that criminal involvement peaks in adolescence for multiple reasons including uncertainty surrounding adult roles, high levels of autonomy and freedom, and low levels of responsibility. Gove compared these

stresses faced by adolescents to the disruptive and turbulent state of Durkheim's (1897) anomie. Gove (1985) suggested that individuals go through a period of anomie during adolescent as they transition from children into adults just as societies experience anomie as they transition from mechanical to organic societies: "If the concept of anomie is applied to the human life course, then the period of late adolescence and early adulthood can be seen as having the least social structure and normative guidance" (p. 126).

As adolescents transition into young adulthood and become more familiar with their role in this world, they become increasingly satisfied with their life situation. This results in several positive psychological developments which contribute to desistance from crime including a shift from self-absorption to concern for others, increasing acceptance of societal values, increased comfort with social relations, increased concern for others in the community and increased concern for the meaning of life (Gove, 1985).

While adult psychological development may explain desistance from deviance during the transition to adulthood, Gove (1985) suggested psychological development is unable to account for the abrupt change in behavior since developmental stages last for some time. Instead, Gove attributes the abrupt drop-off in criminal behavior to biological changes including decreased physical strength, energy, and the need for stimulation. While adrenaline highs may be pleasurable for adolescents, they become increasingly undesirable for older people.

Shover (1985) also proposed a developmental theory to explain desistance from problem behavior. For Shover (1985), "the process of change for aging

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offenders…is a social and interactional one" (p. 101). Shover's theory of desistance is similar to that of Gove's (1985) theory in that it incorporates both psychological and social factors in the change process. Shover (1983) attributed desistance to subjective changes in identity and self-concept and objective changes in social roles and routine activities. However, Shover's theory does not incorporate the biological process of aging. Rather, Shover focuses on the change in perspective that accompanies aging.

Shover (1985) suggested desistance from crime is marked by orientational and interpersonal changes. In his study of fifty aging property offenders, Shover (1985) found that desisters from crime experienced at least one of four orientational changes including (1) a new perspective on the self, (2) a growing awareness of time, (3) changes in aspirations and goals, and (4) a growing sense of tiredness. As offenders age, they begin to view their past offending as foolish and wasted time. This is combined with an increasing awareness of the diminishing amount of time that they have left. Finally, Shover (1985) found many men simply became tired of involvement in criminal activity and the criminal justice system. As such, desisters sought to fill their remaining time with more productive activities such as legitimate employment and building meaningful social relationships.

In addition to these orientational changes, Shover (1985) suggested desisters also experience changes in interpersonal contingencies such as increased attachment to more conventional others and greater involvement in conventional routine activities. In particular, Shover draws attention to the role of "satisfying" relationships and employment in developing a sense of commitment to conventional

behavior. These orientational and interpersonal changes, in turn, affect the criminal

decision making process by making problem behavior an increasingly costly option.

Aging offenders with long criminal histories realize that they risk lengthy

incarceration if they continue to offend. In the end, Shover (1985) suggested that

internal change is more important than external social controls:

> "Age contributes to and changes the calculus of ordinary perceived crime.
> With advancing age, men increasingly become deterred, not so much because
> of the nature of external social control, but primarily because of changes
> within themselves. These changes in expectations and perceived social
> controls appear to be more important, ultimately, in deterring criminal
> behavior than is objective variation in the social control apparatus and
> process." (p. 125).

Moffitt's (1993) dual taxonomy also provides a developmental explanation for

desistance. According to Moffitt's taxonomy, offenders may be classified as either

life course persisters or adolescent limited offenders. Moffitt suggests life course

persisters will be involved in problem behaviors throughout their lives. Since

Moffitt's taxonomy considers problem behaviors in general, life course persisters

may at some point desist from crime but they would continue to be involved in other

problem behaviors including substance use. If this is indeed the case, a test of

Moffitt's theory requires an examination of change in multiple problem behaviors

over the life course.

On the other hand, problem behaviors should be confined to the period of

adolescence for adolescent limited offenders. Problem behaviors by this group are

due to the maturity gap in society that restricts adolescents from involvement in adult

social institutions. As adolescents transition into young adulthood and acquire adult

social roles, the maturity gap that was the original cause of offending is no longer

relevant. In this way, adult social roles such as employee, spouse, or parent should be associated with desistance from problem behaviors for adolescent limited offenders since these roles serve as social indicators of adulthood, thus negating the maturity gap which was the original cause of such behavior. Nevertheless, adolescent limited offenders may persist in their involvement in problem behaviors beyond adolescence if they get caught up in snares, such as a criminal record, that make it more difficult to enter into such adult roles.

Rational Choice.

The rational choice perspective has also been applied to the explanation of desistance from problem behaviors. According to this perspective, desistance occurs when there is a shift in the balance between the costs and benefits of the behavior in question. Individuals should desist from problem behaviors when the benefits provided by such activities no longer outweigh their costs.

Cusson and Pinsonneault (1986) interviewed 17 former felony property offenders to understand the decision-making process involved in desistance from crime. Cusson and Pinsonneault developed a rational choice explanation for desistance from crime based on the common themes of these interviews. First, the decision to quit offending is due to a "shock", a "delayed deterrence" process, or both. This shock often involves a negative experience resulting from offending itself which makes offenders reconsider their involvement in crime. Sometimes this happens during the last crime committed, such as being involved in a shootout, or it can be a shock to the larger social environment, such as a spouse leaving or getting sent to prison for a long period of time.

Cusson and Pinsonneault (1986) also described a process of "delayed deterrence" which they define as "the gradual wearing down of the criminal drive cause[d] by the accumulation of punishments" (p. 76). This process is characterized by an increased perception of punishment certainty, a reduced ability to serve time, an increased difficulty with serving time in prison, and increased fear and dissatisfaction associated with the criminal lifestyle. Either together or separately, the shock and delayed deterrence process lead offenders to reassess their involvement in crime and reconsider their life goals. Recognizing that crime is a bridge to nowhere, offenders choose to stop offending and pursue other goals.

Oftentimes after this initial decision is made, offenders may come across temptations to reoffend such as experiencing financial problems or criminal peers. Sometimes these temptations are so powerful that offenders may reoffend even though an initial decision was made earlier to quit crime. Cusson and Pinsonneault (1986) use the term "backsliding" to describe this relapse in offending. Counteracting these temptations are constraining influences provided by social roles such as spouse or employee. These social roles provide offenders with incentives to maintain their conventional behavior. In this way, social roles are more important for maintaining desistance from crime rather than influencing the initial decision.

This characterization of desistance from crime is consistent with much of the literature on recovery from addictive behaviors. The substance use literature often breaks down the recovery process into a series of stages that separate the decision to quit from the maintenance strategies used to maintain abstinence (White & Kurtz, 2006). Cusson and Pinsonneault (1986) characterize desistance from crime as a two-

stage model: (1) the initial decision to abstain and (2) a maintenance stage. The factors associated with the initial decision are often strains, while those associated with maintenance of non-offending are usually positive and involve some form of social control and social support.

Gartner and Piliavin (1988) suggested a rational choice model could be used in conjunction with the life course perspective to explain the relationship between age and crime. According to this model, the age-crime relationship is a result of a decision-making process structured by changes to objective and subjective contingencies. The decline in offending with age, then, may occur through two possible mechanisms: interactively or indirectly. An interaction effect occurs if the effects of perceptions about the risks and rewards of crime vary by age. Thus, older adults should become increasingly fearful of the costs of crime, derive fewer pleasures from crime, and place greater value on conventional behavior. An indirect effect occurs where the effect of age on crime is mediated by perceptions of risks and rewards of crime.

The rational choice perspective has also been applied to explain desistance from substance use. Upon reviewing the literature on substance use, Bennett (1986) suggested the initiation of opioid use, its continuation, and cessation may be explained though rationality and choice. Changes in social roles sometimes contribute to this shift by increasing the costs of substance use relative to its benefits. In other cases, the drawbacks associated with substance use are enough to make users reduce their use.

Bennett (1986) examined the relevance of the rational choice perspective to opioid use behavior in a sample of 135 addicts. Since all of the addicts in this study were still current users, Bennett could not examine which factors were associated with desistance from opioid use. Instead, addicts were asked whether they would eventually cease use, and if so, under which conditions. About half responded that they would continue to use opioids throughout their lives as their life was generally better on opioids. The other half of respondents indicated they would cease use within the next ten years either conditionally or unconditionally. Among the conditions mentioned were a stable relationship, movement away from drug-using peers, and pregnancy among female addicts.

Life Course.

The life course perspective has also been proposed to explain desistance from problem behaviors. Of the different perspectives they review, Laub and Sampson (2001) suggest this perspective offers the most promising theoretical framework for understanding desistance from crime. The life course perspective also holds promise for explaining desistance from substance use, although it has not been as widely applied in this area as it has in the criminology literature (Hser et al., 2007). The life course perspective seeks to explain desistance by focusing on the timing, ordering, and duration of major life events.

Key concepts of the life course perspective include trajectories, transitions, and turning points (Elder, 1985). Trajectories represent pathways or lines of development throughout the life span. Transitions are embedded within trajectories and represent changes in status that are marked by major life events such as getting

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married or entering the workforce. Turning points reflect changes in long-term trajectories of development. Turning points may be abrupt or "part of a process over time and not as a dramatic lasting change that takes place at any one time" (Pickles & Rutter, 1991, p. 134). Turning points may also be either positive, such as getting married or finding a good job, or negative, such as getting divorced or arrested.

Sampson and Laub (1993) adopt the life course perspective in their age-graded theory of informal social control. According to their theory, changes in criminal behavior may be explained by changes in social bonds throughout the life course. Similar to other control theories, Sampson and Laub's theory begins with the assumption that crime results when an individual's bonds to society are weak or broken. According to Sampson and Laub, desistance from crime occurs because individuals build or strengthen their bonds to society.

Sampson and Laub (1993) have primarily focused on changes in social bonds that typically occur during the transition from adolescence to adulthood. In particular, they suggest that changes in the social roles of marriage, employment, and military service represent opportunities for offenders to build social bonds. The idea that changes in social roles promote desistance from offending has existed for quite some time however. For instance, Trasler (1980) suggested that social roles such as spouse or parent provide an alternative "source of achievement and social satisfaction" for offenders.

Sampson and Laub (1993), however, go further in saying that it is not changes in social bonds that are key in promoting desistance, but rather direct attention to the quality of the attachment of the bond and the social capital that such bonds provide to

offenders. High levels of attachment to others can promote desistance from problem behaviors through a variety of mechanisms. Laub and Sampson (2003) identified four ways in which high quality social bonds can promote desistance from offending: (1) "knifing off" the past from the present; (2) providing supervision, monitoring, and opportunities for social support and growth; (3) bringing change and structure to routine activities; and (4) providing opportunities for identity transformation. While Laub and Sampson (2003) place greater emphasis on changes to external life circumstances provided by adult social bonds, they also recognize the importance of choice or human agency in the desistance process.

The life course perspective has also been applied to explain desistance from substance use, although it has not been as widely used as in criminology (Hser et al., 2007). Instead, the substance use field has mostly applied a career framework that has focused on describing patterns of change and continuity in substance use. A career paradigm has also been widely used in the criminological literature (Piquero et al., 2003), although it has been criticized for its atheoretical approach and its focus on describing patterns of offending rather than explaining them.

Granfield and Cloud (1996) adopt a life course perspective to examine natural recovery from addiction to alcohol and drugs. Granfield and Cloud (1996) proposed a four stage model of natural recovery from addiction based on interviews with 46 individuals who naturally recovered from alcohol and drug problems. In the first stage, initial concerns about alcohol and drug use were usually triggered by strains that were a direct result of substance use. In many cases, intimate partners and friends help initiate this strain by raising their concerns about the effects of substance

use on the individual. Other strains include getting arrested and experiencing financial difficulties and health problems. These strains provoke individuals to reassess their substance use behaviors and often serve as catalysts for change.

The second stage involves addicts experiencing turning points that are disruptive to their substance use and creating a feeling that change is necessary. These turning points often were experiences that involved other people, particularly those close to the individual. Among the turning points described by Granfield and Cloud (1996) are deaths of loved ones, responsibilities to children, and "bottom hitting" events. Often times, turning points involving the deaths of loved ones are related to substance use by the deceased.

In the third stage, desisters pursued a variety of cessation strategies including involvement in alternative activities, relying upon relationships with family and friends, and avoiding social cues associated with drug and alcohol use including other users. While most respondents mentioned alternative activities that were religious in nature, most of the non-religious activities involved social roles associated with education, work and community life. Involvement in alternative activities contributed to desistance from substance use by allowing individuals the opportunity to develop relationships with non-users and to avoid other drug users. In the fourth and final stage, individuals realize the benefits of abstaining from drug and alcohol use. This is exemplified by improved relationships with friends and family, increased attachment to and involvement in society, and increased life satisfaction in general (Granfield & Cloud, 1996).

This characterization of natural recovery from addiction describes a process that is primarily a result of changes in the social environment rather than psychological willpower. For Granfield and Cloud (1996), natural recovery from addiction is "a product of…social interactions with others and the related social capital derived from these relationships" (p. 194). Social capital, however, is not the only resource which promotes recovery from addiction. Granfield and Cloud (1996) propose that other forms of capital – physical capital, human capital and cultural capital – also serve to promote natural recovery from addiction.

Granfield and Cloud (1999) subsume these four forms of capital under a more general construct of recovery capital. Granfield and Cloud (1999) define recovery capital as the amount and quality of resources that one can use to initiate and sustain recovery from addiction. While recovery capital is not sufficient in itself for individuals to recover from their drug and alcohol problems, those who make a decision to quit and have large amounts of recovery capital will be more successful than someone with low levels of recovery capital.

Summary.

Various theoretical frameworks have been proposed to explain desistance from crime and substance use. Early theoretical accounts of desistance from these behaviors offered by the Gluecks and Winick suggested psychological maturation as a possible explanation. Developmental theories link desistance with changes in biological, psychological, and sociological factors. Rational choice theories suggest desistance can be explained by changes in the perceived costs and benefits of

offending. Life course theories suggest changes in informal social controls in adulthood promote desistance from problem behaviors.

These different theoretical frameworks share several common themes. First, these theoretical perspectives have been applied to explain desistance from both crime and substance use. Second, each of these frameworks incorporate change in both social and psychological factors in their explanation of desistance even though the emphasis differs across perspectives. Third, each of these perspectives suggest a dynamic between psychological and social change, whereby either psychological or social change reinforces an individuals' ability to experience the other type of change. For instance, offenders who get married or have children (social change) often change how they think about themselves (psychological change).

There are also some prominent differences between theories of desistance from crime and cessation of substance use. Theories of desistance from crime mostly focus on the impact of positive changes in individual lives, such as becoming involved in a good marriage or job. Theories of desistance from substance use also recognize the role of positive life events. However, theories of desistance from substance use have often focused on the impact of negative experiences in the desistance process as well. Only two criminological theories – rational choice (Cusson & Pinsonneault, 1986) and identity theory (Paternoster & Bushway, 2009) – discuss the role of negative life experiences in the desistance process.

Another prominent difference between theories of desistance from crime and theories of desistance from substance use is whether desistance is a general process. Criminological theories tend to suggest desistance represents a general process

although the particular form of that process may vary. For instance, Sampson and Laub's age-graded theory of informal social control links change in criminal offending to the development of adult social bonds. Although the type of bond may differ across individuals (e.g. marriage for one individual and employment for another), desistance from offending is due to the formation of this social bond. In contrast, theoretical accounts of desistance from substance use often suggest multiple pathways to desistance. For instance, Biernacki's (1986) identity theory suggests that some individuals may need to hit bottom before the change process can begin, whereas others may draw on social capital that is already available to them.

Research on Desistance from Crime and Substance Use

Based on the theoretical review, it is apparent that similar explanations have been proposed to explain desistance from both crime and substance use. Laub and Sampson's (2001) review of desistance theory and research also suggests desistance from different problem behaviors are subject to similar factors. Laub and Sampson (2001) find that desistance from crime and substance use share several common elements including "the decision or motivation to change, cognitive restructuring, coping skills, continued monitoring, social support, and general lifestyle change, especially new social networks" (p. 38).

However, our understanding of desistance is largely based on studies that focus on a particular problem behavior. Research on desistance from some specific type of problem behaviors often neglects the possibility that other problem behaviors may begin to manifest even as individuals desist from a particular problem behavior. Research that considers multiple problem behaviors suggests that there may be some

displacement of problem behaviors rather than complete desistance. For instance, many recovering alcoholics go on to become heavy smokers. If we focus just on their drinking behavior, we might conclude that since they are sober they have desisted from alcohol use and change has occurred. But when we consider the fact that an individual is now a heavy smoker rather than an alcoholic, how does this affect our conclusions? Has this individual changed? If so, how much have they changed if they still partake in other problem behaviors?

Further, research that considers desistance across multiple problem behaviors suggests there may be differences in desistance processes. Studies that consider multiple forms of problem behavior often indicate that some problem behaviors continue despite desistance from other behaviors. In addition, some research suggests different factors may be associated with desistance from different problem behaviors. Thus, our understanding of desistance greatly depends on how we define our dependent variable. Research that narrows its focus to certain forms of problem behavior suggests similarity across desistance processes, while research that examines multiple problem behaviors suggests possible differences in desistance.

The remainder of this section reviews the body of research on desistance from crime and substance use. This section is broken into two subsections. The first subsection reviews research on the relationship between desistance and change in social factors. The second subsection reviews research on the role of psychological changes in the desistance process.

Social Factors.

Most research on desistance from problem behaviors has focused on the changes in social roles that occur during the transition from adolescence to young adulthood. It is during this transition that the age-crime curve reaches a peak and begins its downward trend. This is also the time when individuals begin to enter into various adult social roles. Transitions in adult social roles have been linked to desistance from crime (Siennick & Osgood, 2008) and substance use (Kandel & Yamaguchi, 1993). Transitions into adult social roles are thought to facilitate desistance from problem behaviors through a variety of mechanisms including: (1) providing offenders with stakes in conformity that they wouldn't want to jeopardize through continued criminal involvement, (2) reducing the amount of time spent with peers, (3) reducing the amount of time spent in unstructured socializing and (4) initiating an orientational change or identity shift (Siennick & Osgood, 2008). The most common social roles that have been linked to desistance from crime and substance use include marriage, parenthood, employment, and education.

Marriage. Of all adult social institutions, marriage has received the most empirical attention from criminological researchers. Research suggests that the "marriage effect" on crime produces the strongest and most consistent effect among all adult social institutions (Siennick & Osgood, 2008). This research has explored various dimensions of marriage including marital status, marital quality, and partner's normative orientation. Another line of research has focused on identifying the mechanism(s) by which marriage affects crime. While most research suggests

marriage is associated with reduced offending, there is also some evidence that this effect may be moderated by other factors.

There is some evidence that links marital status with desistance from crime. McGloin and colleagues (2011) find marriage is associated with within-individual reductions in offending versatility even after controlling for offending frequency in the Dutch Criminal Career and Life-Course Study. Sampson, Laub, and Wimer (2006) examined the causal effect of marriage on criminal offending in the 500 Glueck delinquents. Using inverse probability treatment weighting, Sampson and colleagues find being in a state of marriage is associated with a 35% reduction in the odds of offending compared to being in an unmarried state. The effect of marital status on criminal offending, however, may depend on whether offenders are living with their partners. Using monthly data on a group of more than 600 serious male offenders, Horney and colleagues (1995) find criminal offending is less likely during those months where they are living with their spouse compared to those months where they were not.

However, Sampson and Laub (1993) suggest marital attachment is more important than marital status itself in producing change in offending. Sampson and Laub (1993) suggest "good marriages" promote desistance from crime because of the informal social control and social support provided by a spouse. Using data on the 500 delinquents originally studied by the Gluecks, Laub, Nagin, and Sampson (1998) find quality marriages were associated with desistance from crime rather than marriage itself and that this "good marriage" effect grew stronger over time.

Relationship quality has also been linked to desistance from crime for those involved in non-marital romantic relationships. Massoglia and Uggen (2007) find relationship quality was significantly associated with a variety of different operationalizations of desistance. Simons and colleagues (2002) find the quality of a romantic relationship was predictive of female, but not male, offending.

There are other possible mechanisms by which marriage may reduce crime besides providing social control and social support. Warr (1998) suggests marriage is associated with reduced crime because it reduces the amount of time spent with deviant peers. Using data from the NYS, Warr (1998) finds marriage is accompanied by a reduction of about 50% in the amount of time spent with friends and reduced exposure to delinquent peers. The negative relationship between marital status and several indicators of minor delinquency became non-significant when controlling for peer associations. However, Warr's (1998) analysis focused on marital status rather than marital quality.

Simons and Barr (2012) identified another possible mechanism by which marriage may promote reduced offending. Although they did not study marriage per se, Simons and Barr (2012) find high quality romantic relationships were associated with desistance from crime in a sample of 589 African American young adults. This effect operated primarily through its impact on the "criminogenic knowledge structure" of individuals rather than its impact on time spent with delinquent peers. The "criminogenic knowledge structure" consists of a hostile, distrusting view of people and relationships, concern with immediate gratification and a cynical view of conventional conduct norms. Thus, Simons and Barr (2012) suggest the effect of

romantic relationships on desistance from crime is due to changing cognitions rather than changing opportunities for offending.

However, some research suggests the quality of the attachment may be less important than the normative orientation of the spouse. Giordano and colleagues' (2002) criticized Sampson and Laub's (1993) work for failing to consider the normative orientation of the partner. Partners who also commit crime or use drugs may not promote conventional behavior in an individual who is already involved in such behaviors. Indeed, research suggests that the partner's normative orientation matters when it comes to desistance (Schroeder et al., 2007; Siennick & Osgood, 2008).

Research on the effect of non-marital relationships also suggests the partner's normative orientation affects offending behavior. Capaldi, Kim, and Owen (2008) find an association between romantic partner's antisocial behavior and persistence in offending in adulthood using data from the Oregon Youth Study. Although there is some evidence that the partner's normative orientation may be more strongly related to female offending (Simons & Barr, 2012; Simons, Stewart, Gordon, Conger, & Elder, 2002).

Other factors, such as the seriousness of the offender or involvement in other social roles may moderate the effect of marriage on criminal offending. Using data from the Dutch Criminal Career and Life-Course Study, Blokland and Nieuwbeerta (2005) find marriage was associated with reduced conviction rates among low-rate offenders, but had no impact on high-rate offenders. Conversely, King, Massoglia and MacMillan (2011) find marriage is associated with the largest reductions in

offending among the most serious offenders whom were also the least likely to get married.

Demographic factors such as gender and race may also moderate the effect of marriage on offending. Graham and Bowling (1995) find marriage increased the probability of desistance from crime among females, but was not significantly associated with male offending. Bersani, Laub, and Nieuwbeerta (2009) find marriage is associated with desistance from offending for both genders, although its effect was stronger for males. Piquero, MacDonald and Parker (2002) find the marriage effect operates similarly across race except for nonwhite offenders involved in common law marriages. Among nonwhites, common-law marriage was positively associated with total, violent, and nonviolent arrests.

Marriage has also received considerable attention in the substance use literature. Marriage has been linked to desistance from the use of various substances including alcohol (Duncan et al., 2006; Karlamangla, Zhou, Reuben, Greendale, & Moore, 2006; Labouvie, 1996; Miller-Tutzauer et al., 1991), marijuana (Duncan et al., 2006; Maume et al., 2005), and cocaine (Hamil-Luker et al., 2004). Cigarette smoking seems to be an exception (Duncan et al., 2006), although some research suggests marriage to a non-smoker may be linked to smoking cessation (Chen et al., 2001).

Research has consistently linked lower levels of substance use among married persons compared to non-married persons (Chen et al., 2001; Kandel, 1980; Labouvie, 1996; Miller-Tutzauer et al., 1991; Nielsen, 1999). Nielsen (1999) finds married persons get drunk less frequently than single persons. White and Bates

(1995) find cocaine desisters were more likely to be married, although this relationship disappeared when controlling for peer use. Ragan and Beaver (2010) find married persons are more likely to desist from marijuana use than unmarried persons even after controlling for individual differences in self-control.

Much of the research on marriage and desistance from substance use has focused on the effects of change in marital status. Research often finds the transition from single to married is often accompanied by reduced substance use. Hajema and Knibbe (1998) find the acquisition of a spouse role is associated with a decrease in weekly alcohol consumption and the frequency of heavy drinking in a general population sample of 1,327 individuals living in the Dutch province of Limburg. Karlamangla and colleagues (2006) find getting married is associated with a reduction in heavy drinking in a general population sample of 14,127 participants aged 25-75 years at baseline. Dawson and colleagues (2006) find entry into a first marriage is associated with an increased likelihood of non-abstinent recovery from alcohol dependence in the three years following marriage. Temple and colleagues (1991) find becoming married is associated with reduced alcohol consumption in a meta-analysis of twelve longitudinal studies on the relationship between role changes and alcohol consumption.

Some research suggests the effect of transitions in marital status on substance use may be moderated by various social and demographic factors. Temple and colleagues (1991) find the impact of transitions in marital status is moderated by age and gender. For younger individuals and older men, not getting married and becoming unmarried are associated with increased consumption. For older women,

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only becoming unmarried was associated with increased consumption. Transitions in marital status may also have different effects on the use of different substances. For instance, Kandel and Raveis (1989) find becoming married was a significant predictor of cessation of marijuana use but not cocaine use.

The timing of marriage in the life course may also determine its impact on substance use behavior. Labouvie (1996) finds early entry into marriage (ages 21-24) was not linked to reductions in substance use in a general population sample of 839 adolescents. In contrast, later entry into these roles (ages 28-31) was associated with reduced substance use even after controlling for past use and friends' concurrent use. Labouvie suggests these disparate findings may be explained by the difficulty that younger couples have in finding other young couples with whom to associate.

A similar line of research in the substance use field has focused on the proximity between the timing of marriage and change in substance use behavior. Duncan, Wilkerson and England (2006) find the greatest reductions in alcohol use occur in the years surrounding marriage relative to the years prior and after marriage. Some research suggests an anticipatory effect of marriage in which substance use patterns change prior to change in marital status (Miller-Tutzauer et al., 1991). Miller-Tutzauer and colleagues (1991) examined the relationship between changes in marital status and alcohol use using data from the National Longitudinal Survey of Youth 1979 cohort. They find that alcohol consumption dropped in the year prior to marriage and remained relatively stable following the first year of marriage. This effect held for three different outcomes: alcohol consumption, mean days of heavy drinking and proportion of heavy drinkers. Miller-Tutzauer and colleagues (1991)

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suggest that changes in behavior around the time of marriage may reflect a "role transition phase" before marriage rather than the constraints that marriage places on opportunities to drink.

However, Curran, Muthen and Harford (1998) failed to replicate this "anticipatory" effect in their analysis of the same sample. Instead, Curran and colleagues find the decrease in alcohol consumption occurred within and continued beyond the first year of marriage. This finding is consistent with the work of Laub, Nagin, and Sampson (1998) who also find the effect of marriage on criminal offending is gradual and becomes stronger over time.

The impact of various dimensions of marriage, such as marital attachment, has received some attention in the substance use literature, although these have not been as widely explored as they have been in the criminological literature. Maume, Ousey and Beaver (2005) find a relationship between marital attachment and desistance from marijuana use in the NYS. They find that those who enter marriages with high quality attachments are more likely to desist from marijuana use than those who remained single and those involved in low-quality marriages. Maume, Ousey, and Beaver (2005) also find no evidence to support Warr's (1998) contention that the marriage effect is due to its impact on time spent with peers.

Aside from marital attachment, there has been some research that has examined the relationship between marital stability and substance use (Harford, Hanna, & Faden, 1994; Labouvie, 1996; Miller-Tutzauer et al., 1991). Harford, Hanna, and Faden (1994) find an inverse relationship between length of marriage and alcohol consumption except among women with a history of heavy drinking. Power

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and Estaugh (1990a) also find a relationship between stable partnership and alcohol consumption.

There is also support in the substance use literature that the normative orientation of the partner may determine the direction of the marriage effect (Anglin, Booth, Kao, Harlow, & Peters, 1987; Anglin, Kao, Harlow, Peters, & Booth, 1987). Hser (2007) finds long-term stable recovery (5 years) from heroin addiction is less likely among individuals whose spouses also abused drugs. Kandel and Raveis (1989) find spouse/partner's cocaine use had a substantial, but insignificant, effect on women's cessation of cocaine use.

The acquisition of non-marital romantic relationships has also been linked to desistance from substance use (Valliant, 1995; Waldorf, 1983). Valliant (1995) finds new love relationships are often associated with abstinence: "Just as a stable marriage is important for motivating abstinence and treatment, just so a new love relationship…becomes valuable in maintaining abstinence" (p. 244). These new relationships were not just limited to spouses however; they also included special relationships with a nonprofessional, helping person or mentor. Nearly two-thirds of recovered heroin addicts studied by Valliant (1966) mentioned the formation of new relationships while overcoming their addiction.

There have been few studies that have explored the mechanism(s) by which marriage is associated with reduced substance use. Bachman, O'Malley and Johnston (1984) suggest the reductions in substance use behaviors that accompany marriage are due to changes in living arrangements. In their study of substance use during the transition from adolescence to young adulthood, Bachman and colleagues (1984) find

substance use decreased among those who moved out of the parents' house and married, remained stable among those who remained living with their parents, and increased among those who left home but remained single (either cohabited or other living arrangement).

A handful of studies have examined whether the marriage effect differs for crime and substance use. This research has primarily focused on marital status rather than the strength of the marital bond or duration of marriage. For the most part, these studies indicate marriage has consistent effects across problem behaviors. O'Connell (2003) finds no marriage effect for either arrests or drug use in a sample of previously incarcerated drug offenders. Kerr and colleagues (2011) find marital status is associated with less self-reported crime, fewer arrests and reduced tobacco and marijuana use in a sample of 206 at-risk youth. Marital status, however, was unrelated to alcohol use.

Knight, Osborn and West (1977) used data from the Cambridge Study in Delinquent Development to study the impact of early marriage on various problem behaviors. While marriage was unrelated to change in delinquent behavior, marriage was associated with reductions in some problem behaviors including heavy drinking, drug use, and sexual promiscuity. Other problem behaviors including smoking, aggression, hostility towards police and liability of being unemployed were unrelated to marital status. The fact that some problem behaviors persisted despite reductions in other behaviors suggests the effect of marriage may be limited to the constraints it imposes on opportunities for offending rather than affecting criminality or the propensity for problem behavior.

Parenthood. Parenthood has also been linked to desistance from problem behaviors. The effect of parenthood on criminal offending has not been as consistent as that of marriage. The lack of consistency may be due to the fact that considerably less attention has been given to the effect of parenthood on offending compared to that of marriage. Existing studies suggest that if parenthood is related to desistance from crime, it may be more important in explaining desistance from crime among female offenders (Siennick & Osgood, 2008).

Most research on the effects of parenthood on criminal offending has found no relationship. Warr's (1998) analysis of the NYS showed no difference in offending between unmarried parents and non-parents or between married parents and non-parents. Blokland and Nieuwbeerta (2005) find no relationship between parenthood and offending in a sample of Dutch offenders or in a general population sample from the Netherlands. Giordano and colleagues (2002) find attachment to children was unrelated to offending for males and females, although the effect was in the expected negative direction and a small sample size may have resulted in inadequate statistical power.

Research that has identified a parenthood effect on criminal offending usually finds an effect for females, but not males. Graham and Bowling (1995) find that females who stayed home to care for their children in the evening were three times more likely to desist than females who did not spend their time this way. In contrast, responsibility for childcare was unrelated to male offending. Using data from the National Supported Work Demonstration Project, Uggen and Kruttschnitt (1998) find that women with children at the beginning of the project had lower levels of illegal

earnings than those women without children. However, this effect was not found for males and did not hold for arrests of either sex.

One study has linked parenthood with reduced offending among males. Savolainen (2009) finds parenthood was significantly associated with fewer convictions in a sample of Finnish male offenders. However, this study suggests the effect of parenthood on male offending may be contingent on whether male offenders were married or cohabiting with a partner. Parenthood and marriage had a cumulative effect in this study such that union formation (marriage or cohabitation) and children was associated with fewer convictions, while there was no relationship for unions without children.

Parenthood has received more empirical attention in regards to substance use behavior than criminal behavior. As a result, there is more evidence that links parenthood with reduced substance use. Parenthood has been linked to the reduced use of some substances, but not all. Research has shown that parenthood is associated with decreased use of alcohol (Dawson et al., 2006; Esbensen & Elliott, 1994; Hajema & Knibbe, 1998; Labouvie, 1996; Power & Estaugh, 1990a), cocaine (White & Bates, 1995), and marijuana (Kandel & Raveis, 1989). Like marriage, parenthood seems to be unrelated to smoking cessation (Chen et al., 2001).

Parenthood appears to be linked to desistance from substance use through its effects on peer associations. White and Bates (1995) find desisters from cocaine use were more likely to have children. However, this effect disappeared when controlling for peer's cocaine use. Using data from the NYS, Esbensen and Elliott (1994) find those who reported first parenthood were four times more likely to stop using alcohol

and almost twice as likely to stop using marijuana compared to those who did not have children. This finding may also reflect a peer effect since parents were also more likely to report a decrease in the number of drug-using friends.

The effect of parenthood on substance use behavior may be moderated by factors such as gender or the timing of parenthood. Kandel and Raveis (1989) find parenthood is associated with desistance from marijuana use in women, but not men. Labouvie (1996) finds early parenthood (21 to 24 years) was unrelated to desistance from substance use while later entry (28 to 31 years) into the parent role was associated with reductions in substance use. Labouvie (1996) attributes this finding to the difficulty that young parents have in finding other young parents with whom to associate.

One recent study has investigated the effects of parenthood across different problem behaviors. Kerr and colleagues (2011) examined the impact of first fatherhood on crime and substance use trajectories in a school-based sample of 206 at-risk youth whom they followed from 12-31 years. They find that men engaged in less self-reported criminal behavior and reduced their use of alcohol and tobacco following the birth of their first child. However, there was no evidence of change according to either official arrest records or marijuana use following first fatherhood.

Kerr and colleagues (2011) also find evidence that the timing of fatherhood may moderate its impact on problem behavior. The older men were when they first became fathers, the greater the reduction in crime and alcohol use. Conversely, tobacco and marijuana use declined more among those men who became fathers at

younger ages. Younger fatherhood also was associated with more of a gradual decline in offending rather than an abrupt turning point.

In post-hoc analyses, Kerr and colleagues (2011) find this fatherhood effect may be explained by co-residence with children. Criminal offending was lower during those times when fathers were living full-time with their children. Once controlling for co-residence, the effect of fatherhood on reoffending disappeared. This result suggests that parenthood may affect problem behaviors through the constraints it places on opportunities to offend or use drugs and alcohol.

Employment. Employment is another social institution that has been linked to desistance from both crime and substance use. Like parenthood, the effects of employment on offending have been mixed with some evidence suggesting its effect may be moderated by individual characteristics such as age or gender. Other research suggests that, like marriage, the quality of the attachment to employment may be more important than employment status itself.

Several studies have linked unemployment with criminal offending. Using data from the Cambridge Study in Delinquent Development, Farrington and colleagues (1986) find offending behavior was higher during periods of unemployment than periods of employment. Stouthamer-Loeber and colleagues (2004) find that youth who are neither involved in school nor working in young adulthood were more likely to persist in offending. Laub and Sampson (2003) find unemployment was associated with multiple forms of offending, from predatory crime to alcohol and drug related crime.

Some research indicates employment is associated with desistance from crime. Ouimet and LeBlanc (1996) find a relationship between legal employment and desistance in a sample of 238 adjudicated youth followed from 18 to 31 years of age. Savolainen (2009) finds employment attainment was a stronger predictor of the number of new convictions for a sample of Finnish offenders released from prison than marriage or parenthood.

Other factors, such as age or race, may moderate the effect of employment on criminal offending. Uggen (2000) finds employment is associated with reduced reoffending among offenders older than 27 using data from the National Supported Work Demonstration Project (NSWD), a randomized experiment on the effects of providing employment to marginalized populations. In contrast, employment was unrelated to repeat offending among younger participants. While employment was linked to lower offending among older individuals in the NSWD project, it had no effect on drug use among any of the subgroups (Manpower Development Research Corporation, 1980).

Piquero, MacDonald, and Parker (2002) find the effects of full-time employment differ across race and offense type in a sample of serious offenders. White offenders who were employed full-time were less likely to be arrested for violent offenses than those not working. Employment was unrelated to offending among nonwhite offenders or to the number of total and nonviolent arrests. Horney and colleagues (1995) also find offenders are less likely to commit assault during months of full-time employment, although property crime increased during these times.

Like the marriage effect, the quality of attachment to employment seems more strongly related to offending behavior than employment status itself. Sampson and Laub (1990) find job attachment reduces the odds of persistent offending in adulthood among a group of serious juvenile delinquents. Kazemian, Farrington, and LeBlanc (2009) find improvements in job attachment and employment stability were associated with patterns of de-escalation in official records, but not self-reports, in the CSDD and Montreal Two Samples Longitudinal Study. Simons and colleagues (2002) find job attachment was negatively related to offending among males, but was unrelated to female offending.

Employment has received considerable attention in the substance use literature. Early studies focused on the association between employment status and substance use. Kandel (1980) reviewed much of this early literature and found that the unemployed have the highest rates of use of most drugs, especially alcohol and drugs other than marijuana. However, Kandel's (1980) review is mostly based on cross-sectional studies that are unable to determine the causal effect of employment on substance use. More recent studies on the relationship between employment and substance use have adopted longitudinal research designs in order to determine the causal impact of employment on substance use. Much of this research has produced mixed findings and suggests the effect of employment on substance use, like criminal behavior, may be moderated by factors such as age or sex.

Most research in the substance use literature that has examined the role of employment has focused on alcohol. Several studies have linked employment with decreased alcohol use and unemployment with increased consumption (Kandel, 1980;

Nielsen, 1999; Power & Estaugh, 1990b). Nielsen (1999) finds employed persons got drunk less frequently than unemployed persons in a general population sample. Power and Estaugh (1990b) find long-term unemployment (6+ months) was significantly associated with heavy drinking in men.

However, some research finds the exact opposite relationship with drinking greater among employed persons and lower among unemployed persons. Temple and colleagues (1991) find long-term unemployment was associated with reduced alcohol consumption in a meta-analysis of twelve longitudinal studies on the relationship between social role changes and alcohol consumption. Long-term unemployment means less income may be used to maintain a drinking habit. Hajema and Knibbe (1998) find employment is associated with increased alcohol consumption in a general population sample of Dutch individuals. Employment may also be conducive to alcohol consumption as co-workers often make good drinking buddies and work-related stress may drive some individuals to drink.

These disparate findings suggest the effect of employment on substance use may differ across population subgroups in such a way that it increases consumption among some individuals and reduces consumption for others. Temple and colleagues (1991) find employment is associated with increased consumption except among young females. They also find that becoming unemployed was associated with an increase in consumption among younger males, but decreased consumption among older men and women.

Several studies have found employment is unrelated to desistance from substance use. Chen and colleagues (2001) find full-time employment was not

predictive of smoking cessation. White and Bates (1995) find no differences in employment status between cocaine stoppers and those who continue to use. D'Amico, Ramchand and Miles (2009) find no relationship between employment activity and desistance from substance use in a sample of males released from a long-term residential substance abuse treatment provider for adolescents.

The relationship between employment and desistance from substance use may depend on the operationalization of employment. Most studies have operationalized employment using employment status rather than characteristics of employment such as job stability or attachment. Hamil-Luker, Land, and Blau (2004) find attachments to employment as measured by the number of jobs and percentage of weeks employed were associated with reduced cocaine use in the NLSY1979. Wright and Cullen (2004) examined the relationship between several different dimensions of employment and changes in criminal behavior and drug use in the NYS. Wright and Cullen find job stability and the number of weeks worked in the past year were associated with reductions in drug use. Job commitment and hourly wage, on the other hand, were unrelated to changes in drug use.

Few studies have examined whether employment similarly affects criminal behavior and substance use. Wright and Cullen (2004) find employment has mostly similar effects on offending and substance use. In their study, job commitment and hourly wage were unrelated to changes in offending and substance use, while the number of weeks worked in the past year was associated with reductions in these problem behaviors. Conversely, job stability was related to reductions in substance use, but not criminal offending. O'Connell (2003) also finds employment has a

significant negative effect on drug use, but not offending in a sample of previously incarcerated drug offenders.

Education. Education is another social institution that may promote desistance from crime and substance use. However, few studies have examined the relationship between education and desistance from these problem behaviors. This has made it difficult to draw strong conclusions regarding the effects of education on crime and substance use. Existing research suggests education status may be negatively related to offending but has little to no relationship with substance use behavior.

Several studies have linked education with reductions in offending behavior. Blokland and Nieuwbeerta (2005) find school attendance is associated with reduced offending in a Dutch general population sample. Graham and Bowling (1995) find high school completion was associated with desistance from offending for females, but not males. Horney and colleagues (1995) find periods of school attendance were associated with a reduced likelihood of offending in a sample of convicted offenders. Uggen and Kruttschnitt (1998) find being a student was negatively related to risk of arrest, but was unrelated to the risk of illegal earnings.

Most studies that examine the relationship between education and substance use find no relationship. Chen, White and Pandina (2001) find college graduation is unrelated to smoking cessation. Maume, Ousey and Beaver (2005) find no relationship between entering college and desistance from marijuana use. Gunter and colleagues (2012) find no relationship between education and desistance from prescription drug abuse. White and Bates (1995) find school status is unable to

differentiate cocaine stoppers from cocaine users. However, Hamil-Luker, Land, and Blau (2004) find high school completion and return to school were associated with reduced cocaine use in the NLSY79.

Two studies have examined the relationship between education and offending and substance use (D'Amico et al., 2009; O'Connell, 2003). Both studies indicate these problem behaviors share a similar relationship with education. O'Connell (2003) finds school attendance is associated with a lower likelihood of drug use and arrest in a sample of previously incarcerated drug offenders. D'Amico and colleagues (2009) find receiving a high school diploma was unrelated to either criminal or substance use behavior. These mixed findings indicate a need for more research that examines the relationship between education and different problem behaviors.

Substance Use and Desistance from Crime. Although the proposed study seeks to ascertain the similarities between desistance from crime and substance use, it is important to discuss research on the role of substance use itself in the process of desistance from crime. Since this body of research treats substance use as an independent variable rather than a dependent variable, these studies are unable to address the question of whether desistance from crime is similar to desistance from substance use. Instead, this line of research can provide some insight into whether individuals who are desisting from substance use are also desisting from crime.

Studies have consistently shown that substance use decreases the probability of desistance from crime (Graham & Bowling, 1995; Hussong et al., 2004; Kerner, Weitekamp, Stelly, & Thomas, 1997; Stouthamer-Loeber et al., 2004). In fact,

substance use may be one of the best predictors of persistence in offending. Ouimet and LeBlanc (1996) examined the impact of a variety of life experiences (marriage and family, work, incarceration, and substance use) on offending in a sample of 238 court-involved juveniles. Of these various life experiences, Ouimet and LeBlanc (1996) find that the best predictor of persistence in offending was substance use.

The effect of substance use on persistence in crime has been found true for various substances including alcohol (Graham & Bowling, 1995; Hussong et al., 2004; Kerner et al., 2004), hard drugs (Graham & Bowling, 1995; Piquero et al., 2002; Stouthamer-Loeber et al., 2004), and marijuana (Hussong et al., 2004). This relationship has also been found in various populations including serious adolescent offenders (Mulvey et al., 2010; Piquero et al., 2002), adult offenders (Horney, Osgood, & Marshall, 1995; Kerner et al., 1997), and general population samples (Graham & Bowling, 1995; Hussong et al., 2004; Stouthamer-Loeber et al., 2004).

It is possible that offenders who use substances may be more serious offenders than those who do not use substances. Kerner and colleagues (1997) find that the most serious offenders were also the most likely to be heavy drinkers. This suggests that offending behavior and heavy drinking may be indicators of a general deviant lifestyle or propensity. Using data from the Dunedin Multidisciplinary Health and Development Study, Hussong and colleagues (2004) find that men with higher levels of substance use at the end of adolescence showed a greater amount of antisocial behavior across young adulthood. Mulvey and colleagues (2010) find substance use differentiated low-level from high-level offenders.

Several studies have found that reductions in substance use were associated with behavioral improvements in other areas including criminal offending (Kazemian et al., 2009; Kerner et al., 1997; Mulvey & LaRosa, 1986). In an exploratory study of desistance, Mulvey and LaRosa (1986) find cessation of drug use was associated with a broader pattern of behavioral change including desistance from offending in a group of ten 15-20 year old males. The reduction in substance use was accompanied by changing attitudes toward use and social network changes. Mulvey and LaRosa (1986) suggest desistance from delinquency is part of a broader pattern of behavioral change: "Delinquent behavior must be investigated as one aspect of a behavioral constellation, rather than as individual crime activities…cessation of delinquency occurs as part of a broader behavioral change" (p. 221).

Three more studies indicate that desistance from substance use is accompanied by other positive behavioral changes. Kazemian, Farrington and LeBlanc (2009) find reductions in substance use were cotemporaneous with de-escalation in offending behavior in both the Cambridge Study in Delinquent Development and the Montreal Two Samples Longitudinal Study. Kerner and colleagues (1997) find reductions in alcohol use were associated with reduced offending behavior. Stouthamer-Loeber and colleagues (2004) find desisters from crime experience positive outcomes in many life domains including work, education, relationships, and reduced substance use.

Research also suggests that the effect of substance use on desistance from crime may differ by the type of substance being used. Schroeder, Giordano and Cernkovich (2007) contend that illicit drug use may be more of a hindrance to

desistance from offending than alcohol use since the social context associated with illegal drug use brings offenders into greater contact with deviant peers. Using data from a sample of 254 institutionalized adolescents, Schroeder and colleagues (2007) find that drug use was more closely related to criminal offending than alcohol use, although both alcohol and drug use were associated with reduced odds of desistance. The effect of drug use was mediated by romantic partner criminality, whereas neither occupational prestige or partner happiness were related to offending behavior.

The problem with many of these studies is that they focus on the effect of substance use on criminal offending and neglect to investigate whether the changes in substance use behavior are a result of the same factors that produce a reduction in offending behavior. This is problematic because the factors that are predictive of substance use and criminal offending may differ. While Kerner and colleagues (1997) find the most serious offenders were also the most likely to be heavy drinkers, there were differences in which factors were predictive of each behavior. Thus, even though substance use is correlated with persistence in crime, these studies can't tell us whether the changes in each of these respective behaviors are being driven by similar factors.

In sum, desistance from problem behaviors has been linked to a variety of changes in social roles that occur during the transition to adulthood. Marriage has been shown to have the most consistent relationship with desistance from crime and substance use, although there are several factors, such as relationship quality, that may moderate its effect. The effect of other social bonds (employment, student status, parenthood) on problem behaviors is less clear and may be moderated by a

variety of other factors. Another strong predictor of desistance from offending is substance use. The effect of substance use on desistance from criminal behavior has been consistent to this point. Substance use is associated with persistence in offending, although the extent to which substance use affects desistance seems to differ by substance type with illicit drug use being the most detrimental to desistance processes.

Psychological Factors.

While most research has focused on the role of sociological factors in the desistance process, a smaller body of research has examined the role of psychological factors. Most of this literature is qualitative and is based on interviews with ex-offenders and former addicts or alcoholics. Recently, researchers have begun to apply quantitative methods to study the role of psychological factors in desistance from problem behaviors. The psychological factors thought to be associated with desistance from problem behaviors include self-control, personality, and risk perceptions.

Two studies have examined the relationship between Gottfredson and Hirschi's (1990) construct of self-control and desistance from problem behaviors. Both studies suggest a link between self-control and desistance from problem behaviors. Doherty (2006) finds self-control in childhood is a strong predictor of the likelihood of desistance from crime in adulthood even after controlling for adult social bonds. Ragan and Beaver (2010) find increases in self-control over time increased the likelihood of desistance from marijuana use.

Personality traits may also be related to desistance from problem behaviors. Recent research links personality change with desistance from substance use during the transition to young adulthood. Welch and Poulton (2009) find smoking cessation was associated with steep decreases in negative emotionality and large increases in constraint during the transition to adulthood. Similar research has linked decreases in drinking problems to decreases in impulsivity and neuroticism (Littlefield et al., 2010). Littlefield and Sher (2012) examined the relationship between smoking behavior and personality change in a sample of 489 first-year college students followed for 17 years. Individuals who stopped smoking during this time experienced large decreases in neuroticism and impulsivity.

Some research suggests psychological factors are more strongly related to desistance from problem behaviors than social factors. Morizot and LeBlanc (2007) find personality and self-control factors were better predictors of desistance from crime than changes in social controls in the Montreal Two Sample Longitudinal Study. Specifically, high levels of extraversion and negative emotionality were associated with accelerated desistance from offending. Hser (2007) finds stable recovery from heroin addiction was better predicted by psychological factors, such as self-efficacy and psychological distress, than social factors.

Another psychological factor that may be related to desistance from crime and substance use is risk perceptions. Several theoretical perspectives suggest desistance from problem behaviors is accompanied by a change in risk perceptions (Gartner & Piliavin, 1988; Shover, 1985). Most of the evidence for the role of changing risk perceptions in the desistance process comes from qualitative studies with former

offenders and addicts. Although changes in risk perceptions often go unmeasured in quantitative studies of desistance, those studies that examine this relationship have found little support. Shover and Thompson (1992) find perceived risk was unrelated to desistance from crime in a sample of released inmates. Gunter and colleagues (2012) find perceptions of harm and perceptions of punishment were unrelated to desistance from prescription drug abuse.

Discrepancies in Desistance Research

The above review identified a variety of social and psychological factors that have been linked to desistance from crime and substance use. For the most part, the factors associated with desistance from crime appear similar to those factors associated with desistance from substance use. It also appears that desistance from substance use goes hand-in-hand with desistance from crime. Reductions in substance use appear to be accompanied by positive changes in other life domains including family, employment, and reduced criminal offending.

There are, however, three common findings which suggest possible discrepancies between desistance from crime and desistance from substance use and that desistance from one problem behavior does not necessarily imply desistance from other problem behaviors. The first finding comes from research that compares desistance across different crime types and drug types. Thus far, these studies have found differences in desistance across different offense and drug types. A second finding concerns the role of strain in the desistance process. Although research suggests strains are important in promoting desistance from substance use, they have received little attention in the criminological literature which has primarily

emphasized the role of social bonds. This is despite the fact that several criminological theories suggest strains play a central role in desistance from crime (Cusson & Pinneausault, 1986; Paternoster & Bushway, 2009; Shover, 1985).

The third finding concerns that of behavioral substitution or displacement. A common finding in research on recovery from substance use problems is the formation of a substitute dependency. That is, while individuals may be reducing the use of one substance, they may simultaneously be developing problematic use of other substances. The criminological literature has barely begun to explore whether a similar phenomenon is involved in desistance from crime.

Desistance across Offense and Drug Type.

Few studies have investigated whether there are differences in desistance across type of offense or substance. Results from these studies suggest factors associated with desistance from one offense type differ from those associated with desistance from other offense types. Likewise, substance use research suggests that the factors associated with desistance from the use of one substance differ from those associated with desistance from the use of other substances.

Two studies from the criminological literature suggest there may be differences in desistance across offense types (Gunnison & Mazerolle, 2007; Piquero et al., 2002). Using data from the NYS, Gunnison and Mazerolle (2007) find similar factors could be used to distinguish between desisters from general and serious delinquency and persisters in these behaviors. Compared to persisters, desisters from both general and serious delinquency had stronger marital bonds, lower delinquent dispositions, were less likely to have delinquent peer associations, less negative

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relations with adults, perceived a higher certainty of punishment, and were less likely

to have used drugs or alcohol. However, the factors associated with desistance from

serious delinquency differ slightly from those associated with desistance from general

delinquency. Desistance from general delinquency was predicted by age, sex, a high

perception of punishment severity, and having less negative relations with adults. In

contrast, desistance from serious delinquency was associated with unemployment,

lower perceptions of the certainty of punishment, and drug and alcohol use.

The factors associated with desistance from violent crime appear to differ

from those associated with desistance from nonviolent crime. Piquero and colleagues

(2002) find changes in local life circumstances were related to some types of

offending, but not all. Stakes in conformity, for instance, were associated with

nonviolent, but not violent, offending. Heroin dependence was positively associated

with nonviolent arrests, but was unrelated to the number of violent arrests.

Most studies of desistance from substance use focus on a particular substance

such as alcohol or heroin. As such, there have been few studies that have examined

whether factors involved in desistance from the use of one substance are similar to

those involved in other substances. A comparison of research on desistance from the

use of various substances suggests, however, that there are considerable similarities in

desistance processes across substances (Stall & Biernacki, 1986; Walters, 2000).

Stall and Biernacki (1986) reviewed studies of spontaneous remission from the

problematic use of alcohol, opiates, tobacco, and food. Common factors involved in

desistance from each of these substances include the negative consequences of use

(health, financial, family), social pressure from and the support of significant others,

religiosity, substitute dependencies, and "positive feedback" mechanisms in the form of improved social, economic, and emotional status after ending problematic use.

Stall and Biernacki (1986) use these common elements to develop a three-stage model that describes the process of desistance from problem substance use. The first stage involves the building up of motivation to quit problematic substance use. Stall and Biernacki suggest motivation building is primarily done through economic factors in the sense that continued problematic use will result in increased costs in terms of health/family/financial problems, and social sanctions. The motivation to quit use may be quickly built up in cases of "significant accidents" which serve as "a powerful catalyst to irrevocably change and reorient the remitter's self-concept and corresponding perspective" (p. 16). The second stage involves making a public commitment to end the problematic use of substances. Support from significant others and those in one's social network are important in maintaining the resolve for change. The third stage is the maintenance stage and involves the management of a new identity and "integration into a nonusing life-style". Support of significant others, increased religiosity, and "positive feedback" (improved social, economic, and emotional status after ending problematic use) are important factors for maintenance.

Walters (2000) reaches mostly similar conclusions in a review of research on spontaneous remission from alcohol, tobacco, and other drugs. Common factors for the initiation decision include health concerns, pressure from friends and family, and extraordinary events. Social support, non-drug-using friendships, willpower and identity transformation were the most important factors for maintaining abstinence. Walters (2000) finds some evidence that desistance from problematic alcohol and

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other drug use may differ from desistance from tobacco use. Tobacco self-remitters were more likely to rely on self-confidence, substitute activities, and willpower; whereas alcohol/illicit drug abusers were more likely to rely on social support, new relationships, and identity transformations.

Other research suggests that desistance processes may differ across substances. Beenstock (2004) finds some evidence to suggest that desistance from cannabis use is an age-dependent phenomenon while desistance from hard drug use is duration-dependent. Age was significantly associated with desistance from marijuana use, but not hard drug use. Rather than age, the duration of hard drug use was a significant predictor of desistance. Beenstock (2004) also finds that desistance from cannabis use was associated with change in social factors, such as the frequency of pub visits, while desistance from hard drug use was only associated with the duration of hard drug use. These findings may also reflect differences between those who use cannabis and those who use hard drugs.

Best and colleagues (2010) interviewed 269 former alcohol-, heroin-only and daily alcohol and heroin users about their reasons for quitting. They find individuals in these three groups report different reasons for quitting. Drinkers were most likely to report work and social reasons while drug users were more likely to report criminal justice reasons for stopping use. For sustaining abstinence, alcohol users were more likely to report partner support and drug users were more likely to report peer support and moving away from substance using peers. Users of both alcohol and heroin were least likely to cite partner factors in sustaining recovery, but more likely to report the need to move away from using friends.

Further evidence that desistance processes may differ across substance type comes from studies of long-term trajectories of drug use. Hser, Longshore and Anglin (2007) found marijuana and methamphetamine show linear declines with age in a sample of drug abusers. Cocaine use increased from age 20 until the mid-30s and declined after the late thirties, whereas heroin use increased with age. The question of why substance users persist in the use of one substance yet discontinue the use of other substances has received little attention. Differences in long-term trajectories of use suggest different factors may be involved in desistance from different substances.

"Hitting Bottom" and Other Strains.

One prominent difference between the substance use and crime literatures is the attention given to negative life events in the desistance process. Thus far, criminologists have focused almost exclusively on the role of positive life events, specifically the acquisition of informal social controls, in changing offending behavior. Considerably less empirical attention has been given to the role of negative life events or strains in desistance from crime. In contrast, negative turning points such as "hitting bottom" are often found in studies of desistance from substance use.

There have been two studies that have examined the association between strains and desistance from criminal offending and both find support for strain theory (Eitle, 2010; Gunnison & Mazerolle, 2007). Eitle (2010) examined whether changes in strain and personal and social resources can explain changes in self-reported offending. Using data from a school based sample of adolescent males, Eitle (2010) finds that reductions in strains were associated with desistance from offending even after controlling for marital status, labor force participation and education. In

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contrast, marital status, employment and education were unrelated to desistance from offending.

Gunnison and Mazerolle (2007) examined factors associated with desistance from general and serious delinquency, including strains, using data from the NYS. Among the strains studied by Gunnison and Mazerolle (2007) are occupational strain, neighborhood problems, negative life events (respondent and parents) and negative relationships with adults. Of these strains, only negative relationships with adults distinguished desisters from general and serious delinquency from persisters. Based on these two studies, it is difficult to draw any tentative conclusions regarding whether negative life events or strains are related to desistance from crime.

In contrast, the substance use literature has given considerable attention to and has found good support for the role of negative life events in desistance from substance use. One negative life event in particular, "hitting bottom", is commonly found to be associated with desistance from alcohol and drug use. These negative events, however, are more often associated with initiating desistance while positive life events are more often associated with abstinence maintenance. Research into the role of negative life events in desistance from substance use problems suggests their effects may be moderated by other factors such as the severity of the substance use problem or an individuals' stakes in conformity.

Substance use research often finds that hitting bottom or experiencing other problems as a result of use provides the initial motivation for change (Cloud & Granfield, 2004; Ludwig, 1985; Tuchfield, 1981; Waldorf, 1983). Best and colleagues (2008) interviewed 107 former heroin users and found the most common

reasons for quitting was "being tired of the lifestyle" and experiencing psychological

problems as a result of use. White and Bates (1995) find those who stop using

cocaine were more likely to experience the negative consequences of use (lost job,

treatment entry) than those who continued to use. Matzger, Kaskutas, and Weisner

(2005) surveyed 659 former problem drinkers to understand (1) the reasons

associated with drinking less and (2) whether there are differences in desistance

processes between those who recovered with treatment and those who naturally

recovered. In both samples, the same three reasons were predictive of sustained

remission from problem drinking: hitting bottom, experiencing a traumatic event and

undergoing a spiritual awakening.

Veenstra et al. (2006) find mixed results in their review of literature on the

effects of stressful life events on alcohol use in the general population. Crime

victimization, health problems, and financial problems were consistently associated

with higher levels of use. Other events including divorce and financial problems

were sometimes associated with increased use and sometimes associated with

decreased use. These mixed findings may be indications that the effect of negative

life events may be moderated by certain factors.

The relevance of negative life events to desistance from substance use

problems may depend on the severity of the problem. Cunningham and colleagues

(2005) examined whether the severity of alcohol problems is related to self-reported

reasons for recovery. The authors examine three broad categories of recovery factors

including (1) "consequence driven reasons" (e.g. particular life events,

health/financial problems), (2) drifting-out reasons (e.g. role changes, growing older,

moving, having kids, finishing school), and (3) "reflective maturational reasons" (e.g. not getting anywhere in life). The authors find that those with the most severe alcohol problems were significantly more likely to identify "consequence driven reasons" than those with the least serious alcohol problems. Those with the least serious problems were most likely to identify drifting-out reasons. Reflective maturational reasons were not sensitive to problem severity.

Negative events or strains may be more important in the desistance process for those who already have strong stakes in conformity. Waldorf, Reinarman and Murphy (1991) studied cocaine use over the life course in a sample of mostly middle-class users who already held jobs and families and found that users moved toward quitting their use when it started to disrupt their daily lives. Self-reported reasons for quitting cocaine use most often mentioned health problems, financial problems, work problems, and pressure from their partner. Desistance from cocaine use appeared to be more of a phenomenon of "burn out" from excessive use rather than maturing out of use:

> "More often than not our quitters decided to stop using after concluding that the increasing negative effects they were experiencing, combined with the interaction of such effects with their lives and identities, simply made continued cocaine use undesirable" (p. 239)

It is possible that hitting bottom or experiencing other negative life events may represent one of multiple paths to desistance from substance use. Waldorf (1983) identified six different pathways to recovery from heroin addiction including maturing out, drift, retirement (due to threat of prison), religious or political conversion, becoming alcoholic or mentally ill, and situational change such as

discontinuing relationships with other addicts. Thus, negative life events may be necessary for some individuals to desist from substance use, but not others.

Shaffer and Jones (1989) differentiate two types of cocaine quitters: "rock bottom quitters" and "structure builders". Rock bottom quitters are those individuals who become so immersed in the drug culture that they lose all sense of conventional life. For these individuals, hitting bottom may be necessary to initiate the desistance process. Structure builders, on the other hand, maintain involvement in conventional life and don't become immersed in the drug culture. As such, these individuals desist from substance use by replacing their cocaine use with other activities and drawing on existing social support of family and friends.

It is rarely the case, however, that hitting bottom or experiencing some sort of crisis is sufficient in itself for individuals to desist from alcohol and drug use. Successful desistance from alcohol and drug use is often accompanied by positive changes in the social environment. Even though many former alcoholics and heroin addicts identify "hitting bottom" and being "tired of the lifestyle" as important components of the desistance process, Valliant (1995) is skeptical about the relative importance of such factors in the change process. Instead, he suggests changes in social circumstances or "temporally related contingencies", such as the formation of new relationships or increased involvement in religious organizations, are more important in the desistance process:

> "…the profound behavioral switch from alcohol dependence to abstinence is mediated not by hitting some mysterious "bottom" but rather by forces that can be identified and understood by social scientists and harnessed by health professionals. One thing is clear…abstinence is achieved through the help of others" (p. 246).

In an exploratory study of desistance from problem drinking, Tuchfield (1981) finds former problem drinkers identified negative life events or consequences of use as providing the impetus for change. Positive changes in the social environment, such as reduced involvement in alcohol-related social and leisure activities and the acquisition of informal social controls, are more often mentioned as being important in abstinence maintenance. Tuchfield suggests that changes in the social environment activate and reinforce the psychological commitment to change. In particular, Tuchfield (1981) hypothesizes that "informal social controls are necessary to the resolution of alcohol problems" (p. 639).

In their interviews with former alcoholics and heroin addicts, Cloud and Granfield (2004) find positive changes in the social environment are more often important for abstinence maintenance rather than initiating change. Best and colleagues (2008) also find that social support from family and friends and movement away from drug using friends was more important for abstinence maintenance than it was for triggering change in a sample of former heroin addicts.

Other research suggests that problem behaviors increase in response to negative life events. Blokland and Nieuwbeerta (2005) find separation and divorce were associated with increased offending in the Dutch CCLS. Divorce and separation have also been linked to increased substance use (Hanna, Faden and Harford, 1993; Labouvie, 1996; Miller-Tutzauer et al., 1991). Hanna, Faden and Harford (1993) find increased alcohol consumption among women who became separated or divorced in the National Longitudinal Study of Youth 1979 cohort. Hajema and Knibbe (1998) find the loss of a spouse role was associated with increased heavy drinking among

women, but not men. Bachman and colleagues (1984) also find transitions out of marriage were associated with increased substance use.

Behavioral Substitution.

One of the most common findings in studies on desistance from substance use is that of substitute dependencies. While research shows that many former alcoholics and addicts go on to substitute constructive activities like exercise or meditation for alcohol or drug use, it appears that most former alcoholics and addicts substitute their problematic substance use for the use of other illegal drugs such as marijuana and heavy cigarette smoking. While their use of these substances may not become as serious as their original alcohol or drug problem, these behaviors are characteristic of individuals who are low in self-control and suggest continuity in problem behavior.

Substitute dependencies are common among individuals recovering from serious drug and alcohol problems. Waldorf (1983) found high levels of alcohol and marijuana use were common for individuals who were recovering from their heroin addiction. About 40% of the 201 former addicts reported heavy drinking during the first six months of recovery and nearly 40% reported using marijuana 1000 times or more during their recovery.

Valliant (1995) finds substitute dependencies are common among recovering problem drinkers. In most cases, these substitute dependencies are behaviors characteristic of individuals with low self-control including candy binges, benzodiazepine use, marijuana use, compulsive gambling, compulsive eating and chain smoking. One of the most common substitute dependencies was heavy

smoking. On average, those men who abstained from alcohol use continued to smoke cigarettes about as often as those who continued to drink.

If the substitution of other drugs represents part of the desistance process in substance use, it raises the question of whether a similar phenomenon is involved in desistance from crime. That is, are those individuals who desist from criminal behavior substituting similar behaviors for their criminal activity? The question of whether heterotypic continuity or behavioral displacement is part of the desistance process from crime has received little attention in the criminological literature although there is some evidence of this phenomenon.

Evidence for behavioral displacement rather than desistance from crime can be found in both the work of the Gluecks (1943) and the McCords (1959). Many of the serious property offenders studied by the Gluecks went on to become petty "nuisance" offenders. Most of these nuisance offenses were related to alcoholism. According to Robins' (1966) recalculation of desistance in the Gluecks' (1943) study, 45% of offenders fit a pattern of de-escalation from major to minor crimes, while only 16% went on to complete reform. McCord and McCord (1959) observe a similar phenomenon of decreased property offending being replaced by increases in alcohol related offenses in the Cambridge-Somerville Youth Study.

A relatively recent study by Massoglia (2006) offers further evidence of behavioral displacement. Using data from the NYS, Massoglia (2006) finds more evidence suggesting displacement in offending behavior during the transition from adolescence to young adulthood rather than complete desistance. As youth transition from adolescence to adulthood, Massoglia finds that most youth moved away from

normative adolescent delinquency (e.g. vandalism) and violence and either initiated or continued their involvement in substance use. Massoglia (2006) concludes that "individuals are much more likely to shift their behavior towards different types of criminal acts rather than to display different manifestations of the same general acts" and that the transition to young adulthood represents a "shifting of behaviors rather than a pure desistance pattern." (p. 232). Massoglia's (2006) study, however, suffers from several problems including the use of data from just two time points.

Further evidence of possible behavioral substitution or displacement may be found in studies that examine the relationship between trajectories of offending and trajectories of substance use (Dembo et al., 2007; Sullivan & Hamilton, 2007; White, Jackson & Loeber, 2009). These studies find some similarities between trajectories of offending and trajectories of substance use, although there is evidence of independence of these two behaviors. In general, these studies find trajectories of offending trend downward while trajectories of substance use tend to remain stable or increase during the transition from adolescence to adulthood. This pattern of stable or increased substance use despite decreased offending suggests substance use may be acting as a substitute for criminal behavior.

Dembo, Wareham, and Schmeidler (2007) used growth curve modeling to study changes in heavy alcohol and marijuana use and self-reported delinquency in a sample of 278 justice-involved juveniles. While the authors find evidence that increased drug use was associated with increased offending, they also find that trajectories of delinquency involvement and drug use diverge over the long term.

Trajectories of substance use increased while delinquency involvement decreased over the four-year follow-up.

Sullivan and Hamilton (2007) used latent class growth analysis to study the longitudinal relationship between crime and substance use in a sample of 524 young offenders released from the California Youth Authority. The authors find a five group model provided the best fit to the data and that for most groups, criminal offending and substance use followed similar patterns. However, there was evidence of independence in these two problem behaviors. Some groups reduced their offending, yet persisted in some forms of substance use. In general, relatively few offenders abstained from alcohol and drug use, but most desisted from criminal behavior.

Sullivan and Hamilton's (2007) study, however, is limited in several important respects. First, their measures of criminal offending and substance use are based on official records. The use of official records fails to capture offending or substance use that goes unreported to authorities. Second, their measure of substance use is dichotomous and only indicates whether an offender used any of four different substances (heroin, alcohol, uppers/downers, and mind-altering drugs) in the past year. This dichotomous measure of substance use fails to capture the extent of substance use such as the frequency of use. As such, the indicator of "any use" may represent either the use of marijuana on one occasion in the past year or it may represent daily use of marijuana. Their dichotomous measure of "any use" is also unable to capture whether or not there are any reductions in the frequency of substance use.

Further, the aggregation of different substance into one measure does not allow researchers to examine the extent to which use of different substances may vary over the life course. This aspect of their study is particularly limiting since research suggests that trajectories of substance use differ by substance type (Hser et al., 2007). In addition, their use of joint latent class analysis restricts latent class membership such that all members of a latent class share similar trajectories for both crime and substance use. This assumption may be overly restrictive if there is a great deal of heterogeneity in developmental trajectories of problem behaviors. That is, there may be individuals with similar trajectories for one problem behavior but whose trajectories differ for another problem behavior. Finally, their study provides limited information regarding desistance from crime and substance use since their sample of serious offenders was only followed through to their late twenties. This dissertation extends the work of Sullivan and Hamilton's (2007) analysis by using more finely tuned measures of substance use, an analytical method that makes less stringent assumptions regarding latent class membership, and a longer follow-up period.

Summary.

This chapter sought to compare desistance from crime with desistance from substance use. This was accomplished through a review of the various theoretical frameworks that have been used to explain desistance from crime and substance use as well as the corresponding body of research in each field. Based on this review, it seems that desistance from crime is in many ways similar to desistance from substance use. Desistance from both behaviors seems to be associated with changes in social roles during the transition from adolescence to young adulthood. There is

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also some evidence that links psychological changes to desistance from problem behaviors.

Our understanding of desistance from crime and substance use, however, rests largely on a fragmented body of literature that focuses on change in one particular problem behavior at the exclusion of others. Research that examines multiple problem behaviors often suggests differences in desistance across these behaviors. It is this body of research that calls into question the notion that desistance from offending is similar to desistance from substance use.

This review identified three common findings that indicate possible differences between desistance from crime and desistance from substance use. First, research has found differences in factors associated with desistance across drug and offense type. A second finding concerns the role of strains. Strains are often found to be associated with desistance from substance use. Although several theoretical perspectives link strain with desistance from crime, there has been little empirical research that has sought to test this proposition. The third finding concerns the question of heterotypic continuity. Although substitute dependencies are often part of desistance from substance use, it is not clear whether a similar phenomenon occurs with desistance from crime. The lack of research on behavioral substitution or displacement in the criminological literature reinforces the need for studies that explore whether offenders become involved in other problem behaviors despite desistance from crime. The next chapter will describe this dissertation that seeks to explore these discrepancies.

Chapter 3: Data and Methods

This chapter describes the dataset and analytical method that are used in this dissertation. The purpose of this dissertation is to explore the degree to which desistance from crime is similar to desistance from substance use. If there is a common or shared desistance process, we would expect to observe similarities in those factors that differentiate desisters from persisters for each of these behaviors. Further, if the desistance process is global or universal and is manifested across concurrent declines in crime and substance use, then we would expect that individuals desisting from crime are also desisting from substance use. Thus, the two research questions that this dissertation seeks to address are:

1) Do the same set of social and psychological factors that distinguish crime desisters from persisters also differentiate substance use desisters from persisters?

2) To what extent are those individuals who are desisting from crime also desisting from drug and alcohol use?

The literature review in Chapter Two suggests desistance from crime and substance use is associated with change in both social and psychological factors. The first research question asks whether the association between desistance and these factors is consistent across these different behaviors. Since the focus is on the association between these social and psychological factors and desistance, this

dissertation does not address any possible causal relationship between these factors and desistance from these behaviors. The discussion in Chapter Two on "turning points", which does imply a causal relationship, was used to inform the selection of an appropriate set of social and psychological factors for the current study.

Hypotheses

Based on the literature review in Chapter Two, a series of eight hypotheses were generated to address the above two research questions. The first seven hypotheses pertain to the first research question. Four of these hypotheses address the expected relationship between desistance from crime and substance use and the adult social bonds of marriage, parenthood, employment, and education. Previous research suggests each of these bonds is either associated or thought to be associated with desistance from crime and substance use. Thus, the first four hypotheses indicate that those who desist from these two behaviors will have stronger social bonds in these domains relative to those who continue to offend or use.

H1:   There is a positive association between marriage involvement and desistance.

H2:   There is a positive association between parenthood involvement and desistance.

H3:   There is a positive association between employment involvement and desistance.

H4:   There is a positive association between educational involvement and desistance.

One of the three discrepancies discussed in Chapter Two concerns the role of strain in the desistance process. The role of strain in the desistance process has received little attention in the criminological literature, but has received extensive attention in the substance use literature. According to this literature, strains often act to initiate the desistance process but have less of a role in maintaining desistance. For instance, many individuals identify the problems that resulted from substance use as an important motivator for quitting. Once the initial decision to quit has been made, we should expect to see a decline in the number of strains that arose from use itself. Thus, it is expected that desistance will be associated with a decrease in strains over time.

H5:   Reduced levels of strain are positively associated with desistance.

The next two hypotheses pertain to the expected relationship between psychological factors and desistance from crime and substance use. Chapter Two reviewed three psychological characteristics that have been linked to desistance including self-control, personality traits, and risk perceptions. Desistance from both crime and substance use has been linked to either personality change or increased self-control. As such, we would expect that desisters should have personality traits characteristic of those high in self-control. We would also expect that individuals who desist from crime and substance use would perceive greater risks resulting from such behaviors.

H6:   There is a positive association between traits related to self-control and desistance.

H7:   There is a positive association between punishment certainty and severity and desistance.

        The eighth hypothesis pertains to the extent to which desistance from crime is accompanied by desistance from substance use. The phenomenon of behavioral substitution, as discussed in Chapter Two, suggests that individuals may persist in some problem behaviors despite desistance from similar behaviors. Since substance use persists later into the life course than criminal offending, the final hypothesis suggests desistance from crime is unlikely to be accompanied by desistance from substance use.

H8:   There is a positive association between desistance from crime and desistance from substance use.

        If desistance is a "universal" phenomenon, then we would expect to observe two general patterns of results. First, we would expect support for each of the first seven hypotheses to be consistent across crime and substance use. That is, the same factors that distinguish crime desisters from other offending trajectories should also distinguish substance use desisters from other trajectories of use. Second, we would expect that individuals desisting from crime are also highly likely to be desisting from substance use.

Dataset

This dissertation uses data from the National Longitudinal Survey of Youth 1997 cohort (NLSY97). The NLSY97 is sponsored and directed by the Bureau of Labor Statistics and consists of a nationally representative sample of U.S. residents between the ages of 12 and 16 during 1997. Respondents were first interviewed in 1997 and subsequently interviewed every year. This dissertation used data from the first fifteen waves.

The original sample of the NLSY97 includes 8,984 respondents. Due to problems with missing data, several criteria were applied to determine the size of the analysis sample. Respondents missing data for three or more consecutive waves of either arrest or substance use outcomes (n = 3,019) were dropped from the original sample. In addition, respondents who were missing data for any of the independent variables were also excluded from the analytic sample (n = 2,586). These exclusions resulted in a final sample size of 3,379 respondents.

The decision to drop cases with missing data has important implications for the generalizability of the results if there are significant differences between dropped cases and those in the analytic sample. Indeed, there are several significant differences between dropped respondents and those included in the analysis in both arrest and substance use outcomes, although the direction of the differences varies across outcome. Involvement in criminal behavior was greater among dropped cases compared to those included in the analysis. Compared to the analytic sample, dropped cases had a significantly greater lifetime prevalence of arrest (0.35 vs. 0.32, chi-square = 5.73, p < .02) and a higher probability of reporting arrest at each wave.

The mean number of arrests was also slightly greater among dropped cases relative to the analytic sample (1.37 vs. 1.00, t = 5.07, p < .001). Thus, even in a general population sample, many of the more serious offenders were dropped because of missing data.

The dropped cases also differed from the analytic sample in substance use, although the direction of the difference differed across substance type. Lifetime prevalence of binge drinking was slightly greater in the analytic sample (0.79 vs. 0.70, chi-square = 84.31, p < .001) and individuals in the analytic sample were more likely to report binge drinking at each wave beginning at wave 3. Lifetime prevalence of marijuana use was also slightly greater in the analytic sample (0.49 vs. 0.45, chi-square = 11.39, p < .001), although there were no significant differences in annual marijuana use until wave 14. There were no significant differences between the analytic sample and dropped cases in lifetime prevalence of hard drug use (0.23 vs. 0.24, chi-square = 0.68, p = .40) or hard drug use at any wave.

There were also some demographic differences between those in the analytic sample and dropped cases. Dropped cases were slightly more likely to be male (0.52 vs. 0.49, chi-square = 6.78, p < .01) and were slightly younger at the first wave (14.32 vs. 14.41, t = -2.65, p < .01). There were no significant differences between dropped cases and the analytic sample in race or ethnicity. These differences between the analytic sample and dropped cases in demographics and the outcomes of crime and substance use have important implications for the generalizability of the results. The implications of these differences are further discussed in Chapter Five.

Several features of the NLSY97 make it appropriate for use in this dissertation. First, the NLSY97 captures the period where crime and substance use reach their peak in the life course. The NLSY97 also captures the transition from adolescence to adulthood when many individuals begin to desist from these behaviors and enter into adult social roles such as marriage and employment. In addition to capturing these significant life changes, the NLSY97 contains data on several psychological variables that are theoretically associated with desistance from crime and substance use including personality traits and risk perceptions. Finally, the use of a nationally representative sample suggests the results may be generalizable to the general population.

There are, however, several disadvantages to using the NLSY97 to study desistance from these two behaviors. First, general population samples likely contain few serious criminal offenders or heavy substance users. As such, the results of this study may not be generalized to individuals with serious drug or alcohol problems or chronic offenders. In addition, the substance use items in the NLSY97 are limited to questions of involvement and frequency of use. The NLSY97 contains no information on any problems that may have been a result of substance use. As discussed in Chapter Two, the problems associated with substance use often serve to provide the initial motivation for change.

Another disadvantage that is specific to the use of the NLSY97 in studying desistance is that the oldest subject in this sample is only 31 at the most recent available wave. Although most individuals likely desist from crime and substance use during their early twenties when they enter into these adult social roles, this is not

always be the case. As such, the use of the NLSY97 makes it impossible to draw any

conclusions regarding the similarities in desistance that occurs beyond age 30. Thus,

the results of this study may not be generalized to individuals who persist in crime or

substance use beyond this age.

Measures

Dependent Variables.

This dissertation is focused on desistance from crime and heavy substance

use. Criminal behavior is measured at each wave using a dichotomous indicator of

whether the individual self-reported an arrest in the previous year (1 if yes). Heavy

substance use is a dichotomous measure coded 1 if the respondent is a heavy

substance user and 0 otherwise. Heavy substance use is defined as either (1) binge

drinking five or more days in the past month, (2) marijuana use more than 21 days in

the past month, or (3) hard drug use more than six times in the past year.

Since desistance from substance use may differ across substance types,

substance specific measures were created for alcohol, marijuana, and hard drug use.

Frequency measures were used to operationalize the use of each of these three

substances. Alcohol use is measured on a five-point scale as the number of days in

the past month in which the respondent reported drinking five or more alcoholic

beverages: (0) 0 days, (1) 1-2 days, (2) 3-4 days, (3) 5-8 days, or (4) 9 or more days.

Marijuana use is measured on a four-point scale as the number of days in the past

month the respondent reported using marijuana: (0) 0 days, (1) 1-4 days, (2) 5-20

days, or (3) 21 or more days. Hard drug use is measured on a three-point scale as the

number of times in the past year the respondent reported using hard drugs: (0) 0 times, (1) 1-5 times, or (2) 6 or more times.

Independent Variables.

The literature review in Chapter Two identified a variety of social and psychological factors that have either been linked to desistance from crime and/or substance use or are thought to be associated with such change. This dissertation examines five social domains (marriage, parenthood, employment, education, and strain) and two psychological domains (personality and risk perceptions). Descriptive statistics for each of these measures are found in Table 1.

Marriage. Prior research suggests marital status, the timing of marriage, and marital attachment are related to desistance from both crime and substance use. Marital status is operationalized as the proportion of the fifteen waves in which the respondent reported being married. The timing of marriage is measured as the respondent's age in years at first marriage. Since the NLSY97 contains no measures of marital attachment, it is not possible to assess its impact on criminal behavior and substance use. This is particularly problematic since research suggests marital attachment is a better predictor of desistance than marital status (Sampson and Laub, 1993).

However, two measures may be used as indirect measures of marital attachment including marital duration and marital disruption. Although marital duration may be a poor indicator of marital quality, this measure captures whether being in the state of marriage for a longer period of time is associated with desistance. Marital duration is measured as the duration in years of the respondent's first

marriage. Marital duration for respondents who were still married at their most recent interview is calculated as the time between the date of marriage and the date of the most recent interview. Marital disruption also provides an indirect measure of marital attachment where disrupted marriages indicate poor marital quality. Marital disruption is measured as a dichotomous indicator coded 1 if the respondent reported any instances of separation or divorce during the observation period.

Parenthood. Parental status and the timing of parenthood may also be associated with desistance from crime and substance use. Parental status is measured as the proportion of the fifteen waves in which the respondent reported living with a child. The timing of parenthood is measured as age in years at first parenthood.

Employment. Employment involvement and attachment to employment have also been linked to desistance from both crime and substance use. Employment involvement is operationalized as the number of weeks worked in all jobs since age 20. Employment attachment is measured using two items: the number of jobs held since age 20 and job satisfaction. Job satisfaction is measured by asking respondents how they feel about their jobs. Respondents' answers were coded on a five point scale from "like it very much" (1) to "dislike it very much" (5). Respondents answered this item for each employer at each wave of the study. The mean rating for all jobs held in all waves was used to calculate an overall job satisfaction score.

Education. Educational attainment and involvement may also be associated with desistance from crime and substance use. Educational attainment is measured with a dichotomous indicator coded 1 for respondents who are high school graduates. Educational involvement is operationalized as the proportion of the fifteen waves that

a respondent reported enrollment in a secondary or post-secondary educational program.

Strains. Strains may also be linked to desistance from crime and substance use. Strains are measured using seven items that ask respondents whether they experienced any of the following stressful life events in the past five years: family death, violent crime victimization, homelessness, hospitalization of family members, incarceration of friends/family, unemployment among family members, and parental divorce. Respondents were coded 1 if they reported experiencing the event and 0 otherwise. A summed scale (0-7) was created to measure the number of strains that the respondent experienced in the past five years. Respondents were asked about strains at waves six and eleven.

Personality. Personality is measured using the Ten-Item Personality Inventory (TIPI) which was administered to respondents during wave twelve of the NLSY97. The TIPI is a brief measure of the personality dimensions of the Five Factor Model (Gosling, Rentfrow, & Swann, 2003). The Five Factor Model, or the Big Five, consists of the dimensions of Extraversion, Conscientiousness, Agreeableness, Neuroticism, and Openness to experience (Digman, 1990). The TIPI consists of a list of ten pairs of personality traits that are provided in Table 2. For each of the trait pairs, respondents rated the extent to which they agreed each of the traits applied to them using a seven point scale that ranged from strongly disagree (1) to strongly agree (7). Scores for each of the five dimensions were calculated by

taking the average score of the two trait pairs that represent the polar characteristics of each of the five personality dimensions[3].

Risk Perceptions. Risk perceptions were measured using two items that assess perceived certainty and severity of punishment. Perceived certainty of punishment is measured with an item that asks respondents to report the percent chance they would be arrested if they stole a car. Perceived severity of punishment is measured with an item that asks respondents to report the percent chance they would receive jail time if they were arrested for auto theft. Respondents answered both items in each of the first five waves. Change in risk perceptions is measured by taking the difference between the respondents' reported percentages in the first and fifth wave.

Two dichotomous variables were then created for both perceived certainty and severity to indicate whether there was an increase in risk perceptions. Risk certainty is coded 1 if the perceived risk of arrest increased between waves one and five and coded 0 if perceived certainty decreased or remained stable. Risk severity is coded 1 if the perceived risk of jail increased between waves one and five and coded 0 if perceived severity decreased or remained stable.

Demographics. In addition to these social and psychological variables, three demographic measures are included to denote gender, race, and ethnicity. Gender is a dichotomous variable coded 1 if the respondent is male and 0 if the respondent is female. Race is a dichotomous variable coded 1 if the respondent is black or mixed race or 0 if the respondent is white. Ethnicity is a dichotomous variable coded 1 if the respondent is Hispanic and 0 if non-Hispanic.

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[3] Since each of these trait pairs represent the polar opposites of each of the five personality dimensions, five of the ten items were reverse coded to maintain consistency.

Analytic Method

This dissertation uses semi-parametric group-based trajectory modeling (Nagin, 2005) to address the two research questions. Group-based trajectory modeling has been applied to the study of a variety of behavioral phenomena, including criminal behavior and substance use, over the life course (Piquero, 2008). Group-based trajectory modeling is particularly useful for studying desistance when it is conceptualized as a process rather than as a static state (Bushway et al., 2001). Indeed, Bushway and colleagues (2001) suggest methods that capture dynamic change in behavior are preferable to those that apply subjective criteria in studying desistance.

Besides group-based trajectory modeling, there are several other analytic techniques capable of capturing developmental trajectories including hierarchical modeling (Bryk & Raudenbush, 1987, 1992) and latent class analysis (Meredith & Tisak, 1990). Both hierarchical modeling and latent class analysis assume a continuous distribution of trajectories within a population and that all individuals within the population follow the same general pattern of development. These methods thus seek to identify that general pattern of growth and the parameters that cause individuals to deviate from that general pattern. Since the population is assumed to follow one general trajectory, these methods are not suitable for identifying subgroups that may have unique developmental trajectories within a population (Nagin, 2005). Since one of the objectives of this dissertation is to explore whether there are characteristics that distinguish patterns of desistance from other patterns of offending and substance use, these methods were deemed inappropriate.

In contrast, group-based trajectory modeling assumes the population is composed of distinctive subgroups or clusters of developmental trajectories that may reflect different etiologies (Nagin, 2005). As such, this method is capable of capturing heterogeneity in trajectories of offending and substance use. This feature is useful for the proposed study because the present aim is to identify whether there are factors that distinguish individuals following trajectories of desistance from those following other trajectories or patterns of problem behavior.

Another advantage to this method is that it allows for the calculation of posterior probabilities of group membership. Posterior probabilities of group membership may be used to classify offenders into each of the different trajectory groups. Once classified into trajectory groups, group profiles may be created and compared across trajectory groups to determine if there are any characteristics that distinguish one trajectory group from another. Multinomial logistic regression may then be used to assess whether there are any factors associated with group membership. This procedure will be used to address the first research question.

The second research question pertains to the extent to which individuals who are desisting from criminal behavior are also desisting from substance use.   An extension of trajectory modeling, the dual trajectory model, may provide insight into this question. The dual trajectory model captures the interrelationship between two distinct, but related, outcomes over time (Nagin, 2005; Nagin & Tremblay, 2001). Another statistical technique capable of capturing the interrelationship between two related behaviors, joint latent class growth analysis, has previously been applied to the study of the development of crime and substance use over the life course (Sullivan

& Hamilton, 2007). However, joint latent class growth analysis was deemed inappropriate for this dissertation as groups identified by this method would be defined based on the joint consideration of their trajectories of crime and substance use. That is, each latent class would be composed of individuals with similar trajectories of crime and substance use behavior. In contrast, the dual trajectory model approach accounts for uncertainty in group membership and allows for members of a trajectory group for one behavior to belong to different trajectory groups for another behavior. Since this study seeks to explore the extent to which desistance from one behavior is accompanied by desistance from a related behavior, dual trajectory modeling was deemed a more appropriate statistical technique.

One of the key outputs of the dual trajectory model is a set of probabilities that connect membership in trajectory groups across behaviors. These probabilities may be used to assess the extent to which individuals who are desisting from crime are also desisting from substance use. These probabilities are used to address the second research question.

Statistical Model

Group-based trajectory modeling is an application of finite mixture modeling (Nagin, 2005). This analytic method makes two important assumptions. The first assumption pertains to the distribution of the behavior of interest in the population. As an application of finite mixture modeling, GBTM assumes the population is composed of a mixture of J distinct trajectory subgroups such that

$$P(Y_i) = \sum_{j}^{J} \pi_j P^j(Y_i)$$

where $P(Y_i)$ is the probability of observing individual's i longitudinal series of criminal offending or substance use trajectories, $P^j(Y_i)$ is the probability of Y_i given membership in group j and π_j is the probability of belonging to group j.

Another important assumption of this modeling strategy is that of conditional independence at the trajectory group level. According to this assumption, for each individual within trajectory group j the distribution of the outcome y_{it} for time t is independent of prior outcomes y_{it-1}, y_{it-2}, etc. That is, this method assumes that individual-level deviations from the group trend are uncorrelated. Since this assumption is made at the group level, it still allows for serial dependence at the population level. Thus, behavior during prior periods may still be correlated with behavior during following periods (Nagin, 2005).

The particular form of the general model is dependent on the nature of the distribution of the outcome variable (Nagin, 2005). This general model has been adapted to accommodate outcome distributions that are censored normal, Poisson, or binary. In order to adapt the general model to accommodate these types of outcomes, it is necessary to specify a link function that relates the outcome of interest with age or time. Thus, link functions need to be specified for each of the criminal and substance use outcomes.

This dissertation examines five outcomes in total. The crime and heavy substance use outcomes are binary, while the outcomes for the different substances (alcohol, marijuana, and hard drugs) are coded on a censored normal scale. Since the crime and heavy substance use outcomes are binary, trajectories of these behaviors are assumed to follow the binary logit distribution given by the equation:

$$\alpha_{it}^{j} = \frac{e^{\beta_0^j + \beta_1^j Age_{it} + \beta_2^j Age_{it}^2 + \beta_3^j Age_{it}^3}}{1 + e^{\beta_0^j + \beta_1^j Age_{it} + \beta_2^j Age_{it}^2 + \beta_3^j Age_{it}^3}}$$

In contrast, trajectories for use of each of the three substances are assumed to follow the censored normal distribution given by the equation:

$$y_{it}^{*j} = \beta_0^j + \beta_1^j Age_{it} + \beta_2^j Age_{it}^2 + \beta_3^j Age_{it}^3 + \epsilon_{it}$$

This analytic method produces two key outputs including the shapes of trajectories themselves and the probability of group membership (π_j). Trajectory shapes are determined by the order of the polynomial. Flat trajectories are indicated by a zero-order polynomial, linear trajectories are represented by a first-order polynomial, while curvilinear and cubic trajectories are given by second- and third-order polynomials, respectively. The probability of group membership represents the proportion of the population that belongs to each trajectory group. The probability of group membership, π_j, is calculated as:

$$\pi_j = \frac{e^{\theta_j}}{\sum_{j=1}^{j} e^{\theta_j}}$$

Group based trajectory modeling also allows for the calculation of posterior probabilities of group membership (Nagin, 2005). Posterior probabilities represent the probability that an individual belongs to each of the trajectory groups in the model given their individual trajectory of behavior. Although posterior probabilities of group membership, $\hat{P}(j|Y_i)$, cannot be calculated directly from the model's parameter estimates, a related probability, $\hat{P}(Y_i|j)$, may be directly calculated. This probability represents the probability that individual i's behavior would be observed given that

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they belong to trajectory group j. This probability may then be used to calculate

posterior probabilities with the following equation:

$$\hat{P}(j|Y_i) = \frac{\hat{P}(Y_i|j)\hat{\pi}_j}{\sum_j^J \hat{P}(Y_i|j)\hat{\pi}_j}$$

where Y_i is a vector of individual i's behavior, and $\hat{\pi}_j$ is the estimated proportion of

the population in group j.

Posterior probabilities of group membership have several uses (Nagin, 2005).

First, they can be used to hard classify individuals into the trajectory groups which

they have the greatest likelihood of membership. Once sorted into groups, group

profiles may be created and used to determine whether there are any factors that

distinguish between trajectory groups. This classification technique, however, does

not account for uncertainty in group assignment. An alternative would be to calculate

group-specific weighted averages using posterior probabilities as a weight to account

for group uncertainty. Group-specific weighted averages can be calculated using the

following equation:

$$\bar{x}^j = (1/(N * \hat{\pi}_j)) \sum_{i=1}^N P(j|Y_i)x_i$$

Posterior probabilities may also be used to assess model fit. For instance, the

average posterior probability of assignment may be used to assess the certainty of

trajectory group assignment. Higher average posterior probabilities indicate greater

certainty in group assignments. Nagin (2005) recommends a minimum average

posterior probability of at least .7 for all trajectory groups. Average posterior

probabilities below this threshold indicates greater uncertainty in group membership

and poor model fit. In this case, the use of posterior probabilities to hard classify

individuals into trajectory groups would be inappropriate. A more appropriate

method would be to calculate group-specific weighted averages using the above equation.

Finally, an extension of this analytical approach is the dual trajectory model (Nagin, 2005; Nagin & Tremblay, 2001). The dual trajectory model is useful for the study of distinct, but theoretically related, behaviors. In addition to providing the outputs of trajectory shape and probability of group membership, the dual model allows us to determine the joint probability of membership in trajectory groups across criminal offending and substance use. These joint probabilities may then be used to ascertain whether individuals who most likely belong to a trajectory group of desistance from criminal offending are also likely to be on a trajectory of desistance from substance use. Joint probabilities may also provide some indication of the prevalence of behavioral displacement. An example of behavioral displacement would be evidenced by membership in a desisting crime trajectory group and membership in a trajectory group of increasing substance use.

Analytic Plan

The statistical analysis consists of two stages. In the first stage, separate trajectory models were estimated for criminal behavior, heavy substance use, alcohol use, marijuana use and hard drug use. Developmental trajectory models were estimated using the PROC TRAJ procedure available in SAS (Jones, Nagin, & Roeder, 2001). Once the models were estimated, trajectory shapes were used to inform the decision on what constitutes a desisting trajectory. Next, the posterior probabilities of group membership were used to assign individuals into the trajectory group which they have the highest probability of membership.

Once categorized into trajectory groups, group profiles of the social and psychological variables described above were created. In the event that the model is a poor fit (e.g. average posterior probability below .7), group profiles were generated using group-specific weighted averages rather than the hard classification scheme discussed above. Groups were then compared across these variables to determine whether there are any features that distinguish trajectories of desistance from other developmental trajectories. Multinomial logistic regression was next used to assess which factors distinguish desisters from persisters. This process was repeated for each of the five outcomes. Finally, the results were compared across each behavior to determine the extent to which the same factors can be used to distinguish desisters from other developmental trajectories for each of the problem behaviors. These comparisons address the first research question.

In the second stage, a dual trajectory model was estimated for criminal behavior and heavy substance use. In addition to providing trajectory shapes and posterior probabilities of group membership for each behavior, the dual trajectory model produces a set of probabilities that link membership in trajectory groups across behaviors (Nagin, 2005). One of these probabilities, π_{jk}, is the joint probability of belonging to trajectory group j and k. These joint probabilities were used to address the second research question of whether desistance from problem behaviors is global or behavior-specific. If the joint probability of belonging to a desisting trajectory group of criminal behavior and substance use is high, then it is likely a global process. On the other hand, if there is little overlap between those desisting from both behaviors, then this would suggest desistance is a behavior-specific process.

Model Selection.

Determination of the most appropriate model requires two important decisions to be made regarding (1) the number of groups to include and (2) the order of the polynomial for each trajectory group. Nagin (2005) suggests a two-stage model selection process that was used for the statistical analysis. The first stage involves identifying the optimal number of groups to include in the model by testing models composed of j groups where the order of each trajectory is kept constant between models. For each outcome, a cubic functional form was specified to estimate between two- and six group models to determine the optimal number of groups to include in the final model.

The Bayesian Information Criterion (BIC) was used to inform the decision regarding the best fitting model (Nagin, 2005). The BIC statistic is calculated as:

$$BIC = \log(L) - 0.5 k \log(N),$$

where L is the value of the model's maximum likelihood, k is the number of parameters in the model and N is the sample size. The first component measures how well the model fits the observed data, while the second component balances the improvement in model fit that is gained by adding parameters by penalizing by the number of parameters that are added. The optimal number of groups was determined by selecting the model with the largest BIC statistic. In addition to the BIC, the final model was selected using other substantive considerations such as parsimony and adequate trajectory group size.

The second stage of the model selection process involves identifying the appropriate functional form for each of the j trajectory groups. Once the optimal

number of groups was determined, several alternative specifications were applied for each of the trajectory groups including a zero-, first (linear), second (quadratic), and third order (cubic) polynomial. The final trajectory model was determined using the same three criteria discussed above. This procedure was used to determine the best fitting models for each of the criminal behavior and substance use outcomes.

Subgroup Analyses

Separate subgroup analyses were conducted in addition to the main analysis in order to assess the robustness of the results for each of the five outcomes in regards to race and sex. These analyses were performed for two reasons. First, prior research indicates trajectories of substance use during the transition to adulthood differ across race and sex (Chen and Jacobson, 2012; Lee et al., 2010). Although trajectories of substance use tend to be similar in shape across gender, there does seem to be a difference in amplitude such that peaks are higher for males than females. Race- and sex-specific analyses were also performed since prior research discussed in Chapter Two suggests the association between many of these social bonds and crime and substance use may be moderated by these demographic characteristics.

Chapter 4: Results

This chapter presents the results of the analyses and is divided into four sections. The first section compares the results of the analyses for self-reported arrest and heavy substance use that address the question of whether desistance from these behaviors is associated with similar social and psychological factors. The second section examines whether the factors associated with desistance from substance use are consistent across three different substances including alcohol, marijuana, and hard drugs. The third section presents the results of the subgroup analyses conducted to determine whether the results for each of the five outcomes differ across race or sex. The final section of this chapter presents the results of the dual trajectory model that explores the extent to which desistance from crime is accompanied by desistance from heavy substance use.

Desistance from Arrest and Heavy Substance Use

 Model Selection.

  The first stage of the model selection process involves identifying the optimal number of groups to include in the model by examining between two and six group solutions. The top panel of Table 3 presents the results of this stage for self-reported arrest and heavy substance use. This table includes two BIC values, one based on the total number of observations and one based on the total number of respondents, as well as the size of the smallest trajectory group belonging to each n-group model.

  Self-reported arrest. The top panel in Table 3 indicates a three group model provides the best statistical fit as indicated by the lowest BIC value. Since the

difference in BIC scores between the three and four group models is modest, both three and four group models were further explored in the second stage of the model selection process. A four group model was selected over a three group model because it captured greater heterogeneity in the population as described below and provided a better statistical fit as indicated by its lower BIC value and slightly higher average posterior probability of assignment. In addition, the three group model included one trajectory group whose average posterior probability of membership was below Nagin's (2005) recommended threshold of .70, while the average posterior probabilities of membership for each of the trajectory groups in the four group model are above .70.

The four group solution depicted in Figure 1 features one zero, one linear, one quadratic, and one cubic order trajectory. Those in Group 1 are best categorized as conformers which represents the majority of the population (76%) who consistently self-report a zero probability of arrest throughout the observation period. Group 2 makes up 6% of the population and may be characterized as a late riser group whose probability of arrest begins to rise during late adolescence, peak during the early twenties and decline thereafter. Group 3 makes up approximately 14% of the population and are best considered desisters as their probability of arrest peaks during mid- to late adolescence and declines to a near zero probability during the transition to adulthood. The final group, Group 4, makes up approximately 3% of the population and is best characterized as persisters as they consistently self-report a relatively high probability of arrest throughout the observation period. The

alternative three group solution featured similar trajectories with the exception of the late riser trajectory group.

Heavy substance use. Unlike the arrest outcome, the statistical fit of models for heavy substance use improved with each additional group as shown in Table 3. According to Table 3, the six group model provided the best statistical fit. However, a six group model was rejected because three groups had similarly shaped trajectories, two of which differed in magnitude only, as well as a trajectory group which consisted of less than 3% of the population. The five group model provided the next best statistical fit and was selected as the model for further analysis.

Figure 2 depicts the five group trajectory model for the heavy substance use outcome. In this model, group 1 makes up approximately 60% of the sample and is best characterized as a non-heavy/non-user group as this group's trajectory remains flat throughout the observation period with a zero probability of heavy substance use. Group 2 makes up approximately 6% of the population and are best characterized as a high desister group since the peak probability of heavy substance use rises to above chance and declines during the transition to adulthood. Group 3 makes up about 15% of the population and are best characterized as low desisters since it shares a similar shape with group 2, although the peak probability of heavy substance use is small relative to group 2. Group 4 consists of approximately 13% of the population and are best characterized as a late riser group as they begin the observation period at a low probability of heavy substance use that rises to a peak probability of about .40 at the end of the observation period. Finally, Group 5 makes up 7% of the population and may be characterized as heavy users since they reach a peak probability of

approximately .80 for heavy substance use around the early twenties which remains high throughout the observation period.

Group Profiles.

Self-reported arrest. Once the above models were selected, individuals were hard classified into trajectory groups using the maximum probability classification rule. While this approach fails to account for uncertainty in group membership, the results of this approach should not differ much from what would be obtained using group specific weighted averages as long as the average posterior probability of group membership for each of the trajectory groups is sufficiently high. Table 4 provides the group profiles for the four group arrest model using each of the independent variables. This model appears to provide a good fit to the data according to Nagin's (2005) criterion of .70 as the average posterior probability of group membership for each of the trajectory groups is between .72 and .89 with the overall average probability of group membership for the model at .87.

As might be expected, the greatest differences in many of the social variables are observed when comparing the two extreme trajectory groups: conformers and persisters. Persisters had the smallest proportion of individuals ever married, the earliest mean age at first marriage, shortest marriage duration, and a higher proportion who experienced marital disruption compared to each of the other groups. Persisters also had the lowest mean age at first parenthood and were the most likely to report having children. Persisters also reported the lowest job satisfaction, greatest work instability, and fewest weeks worked compared to each group. Persisters also had the lowest proportion of high school graduates and spent the least amount of time

enrolled in an educational program. We also observe that the means for most of the social variables of the desister group fall somewhere in between those of the conformers and persisters. The one exception to this pattern is mean time spent in parenthood which is greatest among desisters relative to the other groups.

A similar pattern is observed for both strain measures and, to a lesser extent, risk perceptions. Persisters reported experiencing the greatest strain at both waves, while conformers reported the least strain with desisters falling somewhere in between. The desister group did experience the largest decrease in mean strains compared to the other groups. For risk perceptions, slightly more persisters and desisters reported increased certainty and severity of punishment compared to conformers, although the difference is modest.

There appears to be less consistency between each of the personality factors and arrest trajectory group membership particularly for the extreme groups of conformers and persisters. Mean levels for each of the personality dimensions for persisters all fall somewhere in between the other groups, although they do have lower levels of conscientiousness and higher levels of neuroticism compared to the other groups. Interestingly enough, the late riser group reported the lowest levels of conscientiousness and the highest levels of neuroticism. Desisters did report the lowest mean levels for extraversion and agreeableness, while there were no differences across groups in openness to experience.

Finally, the groups appear similar in terms of racial and ethnic makeup, but differ in terms of sex. Approximately one-third of the members in each group are black, while Hispanics make up approximately 20% of each group. Males make up

approximately three quarters of each group with the exception of conformers where they account for less than half of group membership.

Heavy substance use. Table 5 shows the group profiles for the five group heavy substance use model. This model also satisfies Nagin's (2005) criterion of .7 for an average posterior probability of group membership as the posterior probabilities for each group are between .77 and .90 with the overall average for the model at .87. Similar to the results for arrest trajectories, the greatest differences in groups are observed when comparing the two extreme trajectory groups of non-heavy/non-users and heavy users. In some cases, the relationship between social variables and heavy substance use is consistent with that observed in the arrest model. For instance, persisters in the arrest model and heavy users in the substance use model had the smallest proportion of ever married individuals and shortest mean first marriage duration, while conformers had the highest proportion of ever married individuals and longest mean first marriage duration.

However, there are many social variables in which the association with heavy substance use is opposite to that which was observed for arrest. For instance, mean age at first marriage was greatest among heavy users compared to each of the other groups, whereas the persistent offenders in the arrest model had the earliest mean age at first marriage. Although heavy users had the lowest proportion of ever married individuals, they also had the smallest proportion of individuals reporting marital disruption and also worked the greatest number of weeks relative to the other groups. This is opposite of what was observed in the group profiles for the arrest outcome.

The difference between several other factors and substance use trajectory group membership also appears to be smaller than that observed for the arrest trajectory groups. Each of the five groups share similar means for job satisfaction, both education measures, and perceived certainty of punishment. While there is little difference between the non-heavy/non-users and heavy users for both strain variables, both the high level and low level desisters initially reported the highest mean levels of strain at wave 6 and reported the lowest levels of strains at wave 11. This result is similar to that observed for arrest in which the desisters also experienced the greatest decrease in strain over time.

The personality measures seem to do well in distinguishing non-heavy/non-users from heavy users. Heavy users have the lowest mean scores for conscientiousness and agreeableness and the highest scores for extraversion and neuroticism. The non-heavy/non-users have the opposite personality profile with the highest mean scores in conscientiousness and agreeableness and the lowest mean scores for extraversion and neuroticism. The heavy users also appear to differ from the non-heavy/non-users in openness, with the heavy users demonstrating higher openness scores. The means of the personality traits for both desister groups all fall somewhere in between these two groups.

Table 5 also shows some demographic differences in group membership. The proportion of males in the heavy user group is twice as great as the proportion of males in the non-heavy/non-user group. The proportion of blacks was greatest in the non-heavy user group and considerably smaller in the high-level desister and heavy user group. Finally, each of the five heavy substance use trajectory groups contain a

similar proportion of Hispanics. These results are somewhat consistent with those observed in the arrest model. In both models, males make up a greater proportion of trajectory groups with higher levels of substance use and offending and each trajectory group consists of a similar proportion of Hispanics. Blacks also make up a greater proportion of the late rising trajectory groups in each model. However, the proportion of blacks is greatest in the persister group in the arrest model; whereas the proportion of blacks is greatest in the non-heavy/non-user group in the heavy substance use model.

Predictors of Group Membership.

Multinomial logistic regression models were next run to examine whether any of the social or psychological factors are associated with trajectory group membership. Table 6 provides the correlation matrix of the social and psychological variables included in the model. Multicollinearity does not seem to be a problem as none of the correlation coefficients are above .50. The highest correlation (.45) is between high school graduation status and the amount of time enrolled in an educational program during the observation period.

Self-reported arrest. The results of the model for arrest trajectory group membership are presented in Table 7. As might be expected, most of the significant differences in group membership are observed when comparing the conformers with the persisters. Further, most of the significant differences between these two groups are observed for the social factors. Statistically significant differences between conformers and persisters were observed for each of the social factors examined with the exception of job satisfaction and time in parenthood. Strains also differentiated

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membership in these trajectory groups, although the effect of strains at wave 6 does not quite reach statistical significance at the .05 level.

There were considerably fewer psychological differences observed between the conformer and persister groups. Conscientiousness was the only personality factor that distinguished persisters from conformers while extraversion is marginally significant. Higher conscientiousness is associated with greater likelihood of membership in the conformer trajectory group relative to the persisters. Finally, being male was also associated with a greater likelihood of membership in the persister group relative to the conformer group.

Many of these same factors were significant in the comparison between desisters and persisters. The results of this model indicate marriage, employment, education and strains are significantly associated with group membership in the contrast between desisters and persisters. Specifically, membership in the desister trajectory group was associated with greater time spent in marriage and enrolled in an educational program. In addition, desisters were less likely to experience marital disruption, employment instability, and reported fewer strains in adulthood. Individuals who experienced marital disruption were 61% more likely to be classified as persisters rather than conformers. Each additional job is associated with a 9% decrease in the probability of being classified as a desister, while each additional strain in adulthood is associated with a 25% decrease in the odds of being classified as a desister relative to a persister. Neither risk perceptions, personality dimensions, nor demographic characteristics were significantly associated with group membership in the contrast between desisters and persisters.

Heavy substance use. Table 8 presents the results of the multinomial logistic regression model for heavy substance use. Similar to the arrest model, most of the significant differences are observed when comparing the non-heavy/non-users with the heavy users. Unlike the arrest model, however, most of the significant differences between these two groups are observed for the psychological factors and demographic characteristics rather than the social factors. The only social factors that differentiated membership in the heavy user group from that of the non-heavy/non-user group are marriage duration, education duration, and employment stability. Individuals who spent less time in marriage and enrolled in an educational program and who also experienced greater employment instability were more likely to be classified as heavy users than non-heavy/non-users.

Nearly all of the personality and demographic factors distinguished membership in the heavy user group from the non-heavy/non-user group. Relative to the non-heavy/non-users, membership in the heavy user group is associated with lower levels of conscientiousness and higher levels of openness, extraversion, and neuroticism. The other personality dimension, agreeableness, was marginally significant with lower levels associated with membership in the heavy user group. Arrest risk was the only psychological factor that failed to significantly differ between the non-heavy/non-users and heavy users.

All three of the demographic factors are significant predictors of group membership. Males are more likely to belong to the heavy user group relative to each of the other groups. Blacks were more likely to belong to the non-heavy/non-user group and the late rising group relative to the heavy user group; however, they were

less likely to belong to the high desister group.   Finally, Hispanics were more likely to belong to the non-heavy/non-user group relative to the heavy user group.

The findings are somewhat similar when comparing membership in each of the desister groups with that of the heavy user group. Marital duration differentiated low desisters from heavy users while it was not quite significant at the .05 level in distinguishing high desisters from heavy users. The number of weeks worked was the only other social factor that differentiated either of the desister groups from the heavy user group. Individuals with longer work histories are less likely to be categorized as low desisters relative to heavy users. This is contrary to what was found for the arrest outcome where more weeks worked was associated with a greater probability of being classified as a desister.

The contrast between each desister group and the heavy user group indicates levels of strain are also associated with group membership. Each additional strain at wave 6 is associated with a 20% and 27% increase in the respective odds of being classified as a low desister and high desister relative to a heavy user. It is also worth noting that the sign of the coefficient for strains at wave 11 is opposite to that observed for wave 6, although the effect of strains at wave 11 was not significant. The reversal in sign suggests desistance from heavy substance use is associated with a reduction in strain over time. This result also differs from what was observed for arrest where greater strains at both waves were associated with a greater probability of being classified as a persister relative to each of the other trajectory groups.

There are also some differences between desisters and heavy users in personality. Higher levels of conscientiousness and lower levels of neuroticism were

associated with a greater likelihood of membership in the low desister group, although neither distinguished high desisters from heavy users. Both extraversion and agreeableness were marginally significant in distinguishing high desisters from heavy users, while openness was unrelated to membership in either desister group.

Summary.

The results of this stage of the analysis that compared desistance from criminal behavior with desistance from heavy substance use can be summed up in three main points. First, most of the significant differences in group membership are observed when comparing conformers with persisters for the arrest model and non-heavy/non-users with heavy users for the heavy substance use model. Second, many of the same variables that distinguish membership in the two extreme trajectory groups for each respective behavior also distinguish desisters from persisters in these behaviors. Third, there are differences in which factors distinguish desisters from persisters in each of the two behaviors. Social factors appear to do a better job of distinguishing desisters from persisters in arrest, while psychological factors and demographic characteristics better distinguish desisters from heavy substance use from heavy users. Only one factor, marital duration, is associated with a greater probability of desistance across both outcomes.

Strains also appear to distinguish desisters from persisters for both behaviors; however, the effect of strain is inconsistent across outcomes. Increased strains at wave 6 were associated with a greater likelihood of desistance from heavy substance use, while increased strains at wave 11 were associated with a reduced likelihood of desistance from crime. In addition, the signs of the coefficients for each strain

variable change from positive to negative over time in the model for heavy substance

use suggesting that desistance from this behavior is associated with a reduction in

strain over time. In contrast, the signs of the coefficients for the strain variables are

both negative in the arrest model indicating fewer strains at both time points are

associated with increased odds of desistance from crime.

Desistance across Substance Type

The above results compared the factors associated with desistance from crime

with those associated with desistance from heavy substance use. The use of a broad

outcome such as heavy substance use, however, fails to capture whether the factors

associated with desistance from substance use are common across substance type.

Since prior literature suggests that trajectories of substance use differ by substance

type, this section examines whether the factors associated with desistance differ

across three different substances: alcohol, marijuana, and hard drugs.

Model Selection.

Binge drinking. The bottom panel of Table 3 indicates a six group model

provides the best statistical fit for trajectories of binge drinking. This model,

however, was rejected since it featured two low, flat trajectories that remained at near

zero levels of binge drinking throughout the observation period. A five group model

provides the next best statistical fit and was selected since it contains similar

trajectories to those found in the six group model with the exception of a flat, near

zero binge drinking group. This model appears to provide a good fit as the average

posterior probability of group membership in this model is .87 with the average

posterior probabilities of group membership for each trajectory group ranging from .81 to .93.

This five group model is depicted in Figure 3 and features one zero, one quadratic, and three cubic trajectories. Group 1, composed of 35% of the population, is the flat trajectory and consists of non-bingers who never report binge drinking during the observation period. Group 2 consists of about 20% of the population and is characterized by a low rising trajectory that peaks during the early twenties and remains at this low-level through the end of the observation period. Group 3 makes up about 16% of the population and is represented by a trajectory of binge drinking that peaks at a relatively low level in adolescence and declines to near zero levels by the end of the observation period. Although this group does not appear to ever reach high levels of binge drinking during the observation period, they are best characterized as a desister group since they are the only trajectory group in this model that reduced their use during the observation period. Groups 4 and 5, represented by 19% and 8% of the population, respectively, are similarly shaped and appear to differ in magnitude only. Group 4 may be characterized as late risers whose peak level of drinking occurs slightly later and is slightly lower than that of group 5 which are best characterized as heavy drinkers.

Marijuana use. Table 3 also indicates a six group model provides the best fit for trajectories of marijuana use. Similar to the six group model for binge drinking, however, the six group model for marijuana use also featured two flat, very low trajectories of use. As such, the five group model was selected as the model for further analysis since it featured five distinct trajectories. This model appears to

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provide a good fit to the data as the average posterior probability of group

membership for each trajectory group falls within the range of .85 to .93 with the

overall average posterior probability of group membership for the model at .90.

Trajectories for the five group model for marijuana use are depicted in Figure

4. Group 1 (abstainers) makes up slightly more than half of the population (52%) and

is characterized by a flat trajectory indicating no marijuana use during the observation

period. Group 2 (steady risers) is characterized by a trajectory that steadily rises from

no marijuana use in early adolescence to slightly more than occasional use by the end

of the observation period and makes up about 7% of the population. Group 3,

composed of about 8% of the population, is best characterized as a desister group as

the peak use of marijuana occurs in late adolescence and declines to near zero use by

the end of the observation period. Group 4 comprises about 6% of the population and

may be considered the heavy users as marijuana use reaches a peak in the early

twenties and remains at a relatively high level throughout the observation period.

Group 5 consists of about 26% of the population and is characterized by little

marijuana use during adolescence that declines to no use during the transition to

adulthood. This group is best characterized as experimenters as peak use is

infrequent and usage is mostly restricted to adolescence.

Hard drug use. According to Table 3, a four group model provides the best

statistical fit for hard drug use. However, this four group model contained one

trajectory group that made up just 2% of the population. As such, this model was

rejected in favor of a three group model whose smallest group was around 5%. This

model also appears to provide a good fit to the data as the average posterior

probability of group membership is .93 with an average posterior probability of group membership for each trajectory group falling within the range of .82 to .96.

Figure 5 depicts the three group model chosen for further analysis. For this model, group 1 (abstainers) makes up 77% of the population and is represented by a flat trajectory that indicates no hard drug use during the observation period. Group 2, made up of 18% of the population, may be characterized as a desister group as peak use occurs in adolescence and declines during the transition to adulthood. Group 3 makes up about 5% of the population and are best characterized as heavy users whose peak use occurs in the early twenties and declines thereafter.

Group Profiles.

Binge drinking. Group profiles for the five group binge drinking model are presented in Table 9. The overall pattern of the profiles is similar to that observed for the heavy substance use outcome. The greatest mean differences are observed when comparing the non-bingers with the heavy users while the means for each of the other trajectory groups fall somewhere in between these two groups. Non-bingers reported the longest first marriage duration, mean time married, mean time as parent, and greatest employment stability although they worked the fewest number of weeks; whereas the heavy drinkers had the opposite profile. The groups do not appear to differ in job satisfaction or on either of the education measures. There also does not appear to be a relationship between strain and binge drinking trajectory group membership. The groups have similar mean levels of strain at both waves, although the heavy drinkers experienced the lowest level of strains at both waves and experienced the largest decrease in strain compared to the other groups.

A similar pattern is observed for the psychological factors. The non-binger and heavy user trajectory groups often had the extreme values for each of the psychological measures with the exception of neuroticism which was greatest among the low riser group. The heavy drinkers also had the highest proportion of individuals who reported an increase in the perceived certainty and severity of punishment, while the non-bingers had the smallest proportion of individuals who reported increases in perceived certainty and severity of punishment. Heavy drinkers also had the highest mean scores of openness and extraversion and the lowest scores for conscientiousness and agreeableness while the non-bingers had the opposite profile.

The groups also differ along the dimensions of sex and race. Males make up a majority of the heavy drinkers and late riser groups, while only about one-third of the non-binger group is male. Further, blacks make up a larger share of the less frequent binge drinking groups (non-bingers and low risers) relative to the groups characterized by more frequent binge drinking. For instance, blacks make up approximately 40% of the non-binger group, while only making up 3% of the heavy drinker group. Each group contains a similar proportion of Hispanics.

Marijuana use. The group profiles for the five group marijuana use model are found in Table 10. The patterns observed in this table are mostly similar with those previously observed with the two extreme groups, abstainers and heavy users, having the extreme values for many of the social and psychological factors. Abstainers had the longest first marriage duration, spent greater periods of time in marriage and parenthood, reported the highest level of job satisfaction and employment stability, and had the greatest proportion of high school graduates.

While the heavy user group often had the opposite profile along these dimensions, this is not always case. Indeed, the desister group often had the extreme values. For instance, desisters reported the highest mean age at first marriage and first parenthood and contained the highest proportion of ever married individuals. The desister trajectory group also had the shortest mean first marriage duration and the smallest proportion of high school graduates.

The findings for both strain measures are similar to those observed for heavy substance use. The lowest levels of strain are found in the abstainer group, while the highest levels of strain are observed for the groups which report greater marijuana use. Each group experiences a decrease in strain over time, with the exception of heavy users who experience a slight increase in strain. As observed in the heavy substance use and arrest trajectory group profiles, the desister group experienced the largest decrease in strain over time.

The personality variables also appear to distinguish the abstainers from the heavy users. Heavy users had the lowest mean levels of conscientiousness and agreeableness, while having the highest levels of extraversion and neuroticism. Abstainers, on the other hand, had the opposite personality profile. Although the desisters' values for personality fall in between the extreme groups, their profile looks similar to that of the heavy users with the exception of agreeableness; the agreeableness value for desisters is closer to that of the abstainers than the heavy users.

The groups also differ along demographic characteristics. Males make up a majority of the groups that report the greatest levels of marijuana use including the

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heavy users, desisters, and steady risers. While blacks make up a third of the

abstainer and steady riser groups, they make up about 20% of the experimenter and

desister groups. Hispanics make up a similar proportion of each group, although they

appear slightly less likely to be categorized as either steady risers or heavy users.

Hard drug use. The group profiles for the three group model of hard drug use

are provided in Table 11. The patterns in this table are similar to those previously

observed with the extreme values for each of the social and psychological variables

found in the abstainer and heavy user groups. The abstainer group contained the

highest proportion of ever married individuals and parents as well as the greatest

mean time spent in marriage and parenthood. Abstainers also had the highest mean

job satisfaction, greatest employment stability, and greatest number of weeks worked.

The abstainer group also included the highest proportion of high school graduates and

spent the greatest amount of time enrolled in an educational program.

While the heavy user group often had the direct opposite profile of the

abstainer group, the desister group did report the greatest level of marital disruption,

fewest number of weeks worked, as well as the lowest proportion of high school

graduates and least amount of time enrolled in an educational program. Although the

difference is rather small, desisters also reported the earliest mean age at both first

marriage and first parenthood.

The patterns observed for strain and risk perceptions are similar to those

observed for the other substances. The greatest levels of strain are observed in the

heavy user group across both waves. Table 11 also indicates each of the groups

reported reduced levels of strain over time, with the desister group experiencing the

largest decrease in strain. The relationship between risk perceptions and hard drug use also appears similar to that observed for binge drinking and marijuana use with a greater proportion of the heavy users reporting an increase in the perceived certainty and severity of punishment over time.

The relationship between each of the personality variables and group membership is also mostly similar to what was observed for binge drinking and marijuana use. Similar to what was observed for marijuana use, the heavy user group reported the lowest levels of conscientiousness and agreeableness while having the highest levels of openness, extraversion and neuroticism.

The demographic makeup of each group is also similar to what was observed for binge drinking and marijuana use. Males make up a greater proportion of heavy users than abstainers. Also, blacks comprise a larger proportion of the abstainer group than the desister or heavy user groups. Finally, Hispanics make up a similar proportion of each trajectory group.

Predictors of Group Membership.

Multinomial logistic regression models were run for each of the three different substances to identify predictors of trajectory group membership. Although the group profiles are highly similar across each substance type, there are clear differences in which factors distinguish desisters from heavy users for each of these three substances.

Binge drinking. Table 12 presents the results of the multinomial logistic regression model predicting group membership for the binge drinking outcome. Most of the significant differences are observed when comparing the non-bingers with the

heavy drinkers. Social, psychological and demographic factors are significant predictors of group membership in the comparison between non-bingers and heavy drinkers. Relative to the heavy user group, membership in the non-binger group is associated with more time married and enrolled in an educational program, higher job satisfaction, greater employment stability, and fewer weeks worked. Non-bingers were also less likely to report an increase in the severity of punishment and reported higher levels of conscientiousness and lower levels of extraversion and neuroticism. Females, Hispanics, and blacks were also more likely to be classified as non-bingers than heavy users.

There are several factors that predict group membership in the contrast between desisters and heavy drinkers. Individuals who spent greater time married and fewer weeks worked were more likely to be classified as desisters relative to heavy drinkers. Desisters from binge drinking also reported lower levels of extraversion and neuroticism relative to heavy drinkers. Further, blacks and females are about four times more likely to be classified as desisters rather than heavy drinkers. Sex and race, along with extraversion, are the only factors associated with group membership in each of the contrasts included in Table 12.

Marijuana use. Table 13 presents the results of the multinomial logistic regression model predicting trajectory group membership for marijuana use. The results for the comparison between the abstainers and heavy marijuana users are mostly similar to those observed for the comparison between non-bingers and heavy drinkers for the binge drinking outcome. There are two notable differences however. In the model for marijuana use, strains at wave 11 and openness are both significant

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predictors of group membership while they are not significant in the model for binge drinking. In addition, the sign of the coefficients for both strain measures in the model for marijuana use are opposite those observed in the model for binge drinking. The other difference is in weeks worked which was a significant predictor of group membership in the contrast between non-bingers and heavy drinkers but which does not distinguish marijuana abstainers from heavy marijuana users.

Table 13 indicates just one significant difference in the contrast between desisters from marijuana use and heavy users. Greater strain at wave 6 is associated with a higher likelihood of being classified as a desister relative to a heavy user. Each additional strain at wave 6 is associated with a 23% increase in the odds of membership in the desister trajectory group. Although the measure of strain at wave 11 does not quite reach statistical significance at the .05 level, the sign of the coefficient for this measure is opposite to that observed for strain at wave 6. This suggests that greater strain in the mid-twenties is associated with a reduced likelihood of being classified as a desister. Taken together, these results suggest desistance from marijuana use is associated with a reduction in strain over time.

Hard drug use. The results of the multinomial logistic regression model predicting trajectory group membership for hard drug use are presented in Table 14. As observed for the other outcomes, most of the significant differences are found in the comparison between the abstainer and heavy user groups. The significant differences in this contrast are mostly similar to those observed for the contrasts between the equivalent groups for the binge drinking and marijuana use outcomes. Compared to heavy users, abstainers from hard drug use spend more time married and

enrolled in an educational program, experience greater employment stability, are less likely to report an increase in punishment severity, and report higher levels of conscientiousness and lower levels of extraversion and neuroticism. Blacks are also more likely to be categorized as abstainers than heavy users.

There are some differences in the model for hard drug use compared to those for binge drinking and marijuana use. The results of the model for hard drug use indicate greater time as a parent is associated with an increased probability of membership in the abstainer group relative to the heavy user group. Time as parent was unrelated to trajectory group membership in the binge drinking model, although it did distinguish marijuana experimenters from heavy marijuana users. The level of strain at wave 6 was also associated with group membership in the contrast between abstainers and heavy hard drug users, whereas strains at wave 6 were unrelated to trajectory group membership for the binge drinking outcome.

The only predictor of group membership in the contrast between desisters from hard drug use and heavy users is in the personality dimension of openness. Individuals who score higher on openness have a reduced likelihood of being classified as a desister relative to a heavy user. Openness was unrelated to trajectory group membership in the binge drinking model, although it did distinguish abstainers from marijuana use from heavy marijuana users.

Summary.

The results of the analyses by substance type may be summarized in five points. First, the model selection process indicates greater heterogeneity in patterns of binge drinking and marijuana use than in hard drug use over the life course. The

models for binge drinking and marijuana use included five trajectory groups while the model for hard drug use includes just three. Second, individuals who abstain from the use of these substances experienced the most positive social outcomes while the heavy users often experienced the worst. Across each substance, abstainers spent the most time (a) married, (b) as a parent, and (c) enrolled in an educational program; whereas heavy users spent the least amount of time in these states. Abstainers were also the least likely to experience marital disruption and employment instability, while heavy users of each substance were the most likely to experience marital disruption and employment instability. The profiles for the other trajectory groups, including desisters, fall somewhere in between these groups in terms of the social factors.

Third, there appear to be clear differences in personality between abstainers and heavy users of these substances. For each substance, heavy users had the highest levels of openness, extraversion, and neuroticism and the lowest levels of conscientiousness and agreeableness while abstainers had the opposite personality profile. As observed for the social factors, the personality profile of the desister trajectory groups usually falls somewhere in between these two groups. Fourth, whites and males make up a larger proportion of the trajectory groups with the highest levels of substance use, while Hispanics make up a similar proportion of each trajectory group across each outcome.

Fifth, the multinomial logistic regressions predicting trajectory group membership for each of the substances indicate different factors are associated with desistance from the use of different substances. Desistance from binge drinking is

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associated with greater time married, a shorter work history, and lower levels of

extraversion and neuroticism. Desistance from marijuana use is associated with a

reduction in strain over time, while individuals who desist from hard drug use have

lower levels of openness compared to those who persist in use.

Subgroup Analyses

Separate subgroup analyses were performed for each of the five outcomes

examined in the two previous sections to determine whether and, if so, how the

results differ across race and sex. The results of these subgroup analyses are

presented in turn by each outcome.

Self-reported Arrest.

Race. The results of the first stage of the model selection process for whites

are presented in the top panel in Table 15. According to this table, either the three or

four group model provides the best statistical fit to the data. The BIC score for the

total number of observations suggests a three group model provides the best fit,

whereas the BIC score for the number of respondents indicates a four group model

provides the best statistical fit. This result is similar to that found for arrest

trajectories for the main sample. As such, both three and four group models were

further investigated. The four group model was selected for further analysis because

it reveals an interesting offending trajectory group and ultimately provided the better

statistical fit when compared against the best three group model. This model appears

to provide a good fit as the average posterior probability of group membership is .84

with the average posterior probability of group membership for each trajectory group falling within the range of .75 to .87.

In contrast, trajectories of self-reported arrest among blacks appear to be better represented by either a two or three group model. A three group model was selected over the two group model since the latter did not contain a desister trajectory group. In addition, the three group model provides a better statistical fit to the data as indicated by a smaller BIC score. The average posterior probability of group membership for this model is similar to that observed for the model for whites with the overall posterior probability at .83 with an average posterior probability of group membership for each trajectory group falling in the range of .75 to .86.

The four group model for whites is presented in Figure 6 while the three group model for blacks is depicted in Figure 7. Although there are some similarities between the two models, visual inspection of these figures indicates some differences in the trajectories of arrest for whites and blacks. Both figures contain a trajectory group (Group 1) made up of approximately two-thirds of the population that never self-reports an arrest during the observation period. Both models also feature a small trajectory group that reports a relatively high level of offending over time (Group 4 in Figure 6 and Group 3 in Figure 7), although the shape of this trajectory group differs in each model. For whites, persisters start with a relatively high probability of self-reported arrest which declines till the mid-twenties where it remains relatively stable at a non-zero probability for the remainder of the observation period; whereas, the persister group in the model for blacks experiences a linear increase in the probability of self-reported arrest over time.

Both models also feature a desister group which has a peak probability of self-reported arrest at the beginning of the observation period. The size of this group is slightly larger in the model for blacks than whites (30% vs. 24%). The decrease in probability of self-reported arrest for this trajectory group in the model for blacks is also more gradual than it is for the corresponding group in the model for whites. Finally, the model for whites features an additional small, late-onset trajectory group whose peak probability of arrest occurs in the early to mid-twenties and declines thereafter.

Separate multinomial logistic regression models were next run to examine whether the factors associated with trajectory group membership differ across race. The results of the multinomial logistic regression model for whites are presented in Table 16 and are largely similar to those observed in the main sample. The only difference in the comparison between conformers and persisters between whites and the analysis sample is in personality. Among whites, persisters were more likely to report higher scores for agreeableness and neuroticism, whereas conscientiousness was the only significant personality difference in the main analysis. The results of the comparison between persisters and desisters among whites are also mostly similar to those found in the main analysis. The only difference is in agreeableness and sex which distinguish desisters from persisters among whites; although they were not statistically significant at the .05 level in the main analysis.

The results of the multinomial logistic regression model for blacks are presented in Table 17. The results for the comparison between conformers and persisters among blacks are largely similar to those found in the main analysis.

Marriage, employment and education factors all differentiate conformers from persisters. The main difference between the model for blacks and the main analysis is the role of strain and personality factors. In the model for blacks, neither strain measure was found to be significant, whereas strains at wave 11 distinguished conformers from persisters among whites. In the main analysis, conscientiousness was the only personality trait that differentiated these two groups, whereas neuroticism was the only significant difference in personality between these two groups in the model for blacks.

Table 17 indicates few significant differences between desisters and persisters among blacks. Only sex and employment factors distinguished these two groups in the model for blacks. Black females are about three times more likely to be classified as desisters than persisters. Each additional job worked is associated with a 16% decrease in the odds of being classified as a desister rather than a persister, although a longer work history is associated with increased odds of classification as a desister rather than a persister. Thus, employment duration is associated with a greater likelihood of desistance among blacks, although employment instability is associated with a reduced likelihood of desistance.

Sex. The bottom panel of Table 15 presents the results of the first stage of the model selection process for males and females. This table indicates a three group model provides the best statistical fit to the data for males. We also observe that the four group model appears to provide about as good of a statistical fit as the three group model. This pattern is similar to what was observed for the main analysis as well as to the arrest trajectories for whites only. The three group model was selected

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over the four group model for further analysis since the three group model provided a slightly better statistical fit as indicated by a lower BIC score and higher average posterior probability of group membership. In addition, the four group model included one trajectory group whose average posterior probability of membership was below Nagin's (2005) recommended threshold of .70. The average posterior probability of group membership for the three group model is .83 with each trajectory group having an average posterior probability of group membership between .70 and .88.

In contrast, Table 15 indicates a two group model provides the best statistical fit for trajectories of self-reported arrest among females. The difference in BIC scores for the next best-fitting model, a three group model, was modest, so this model was further investigated as well. A three group model was selected over the two group model for further analysis because the three group model contained a desister trajectory group in addition to trajectories of persistence and noninvolvement as well as ultimately providing a better statistical fit according to the BIC score. The average posterior probability of group membership in this model is .85 with the average posterior probabilities for each trajectory group falling within the range of .70 to .88.

The three group models for males and females are presented in Figure 8 and Figure 9, respectively. There are considerable similarities between the two models although there are clear differences in group size and trajectory shape. First, both models contain a modal group which never self-reports an arrest during the observation period, although the size of this group is somewhat larger in the model for females (77% vs. 63%). Second, both models feature a relatively small persister

group whose trajectory of self-reported arrest remains high throughout the observation period. The size of this trajectory group in the model for males is about three times the size of the corresponding group in the female model. Further, the trajectory of this group is flat in the model for females while it is curvilinear in the model for males with a peak probability of arrest occurring around 20 years. The peak probability of arrest for persisters is relatively low in both models, although the persister group in the model for males reaches a slightly higher peak probability of arrest.

Both models also feature a desister group whose peak probability of self-reported arrest occurs at the beginning of the observation period and declines to zero during the transition to adulthood. This reduction in arrest probability occurs more gradually in the model for males than in the model for females. The peak probability of arrest for this trajectory group is also slightly higher in the model for males (.22 vs. .18).

Results for the separate multinomial logistic regression models for males and females are presented in Table 18 and Table 19, respectively. Table 18 shows the results of the model for males are largely similar to those found in the main analysis. Once again, marriage, employment, education and strain factors were found to differentiate conformers and desisters from persisters. There are two differences between the analysis for males and the main analysis. The first difference is in perceived severity of punishment. Males who reported an increase in perceived severity were 30% less likely to be classified as conformers relative to persisters. One other factor, agreeableness, was found to be significantly different between

desisters and persisters among males only, although it was not significant in the main analysis. Higher levels of agreeableness are associated with a reduced likelihood of being classified as a desister relative to a persister.

The results for females in Table 19 are somewhat similar to those observed for males. Marriage, employment, education and strain factors are all statistically significant predictors of group membership in the comparison between conformers and persisters. However, the female model also indicates significant differences between conformers and persisters in the traits of conscientiousness and neuroticism as well as in race and ethnicity, while the male model revealed no significant differences in these factors. The contrast between female desisters and persisters indicates that the only significant differences were related to marriage and the personality trait of neuroticism. Female desisters spent more time in marriage, were less likely to report marital disruption and reported lower levels of neuroticism relative to persisters.

Heavy Substance Use.

Race. The results of the model selection process for the race-specific trajectory models for heavy substance use are found in the top panel of Table 20. The top panel of this table indicates that BIC scores for the model of heavy substance use among whites improved with each additional trajectory group. A five group model for heavy substance use among whites was selected over the six group model, however, as the addition of a sixth group did not contribute any distinct pattern of use from those already featured in the five group model. The average posterior probability of group membership in this model is .86 with the average posterior

probability of group membership for each trajectory group falling between .72 and .91.

In contrast, a four group model provides the best statistical fit for heavy substance use among blacks. This model was selected for further analysis as it appears to provide a good fit to the data as the average posterior probability of group membership for the model is .94 with each trajectory group having an average posterior probability of group membership in the range of .79 to .96.

Figure 10 displays the five group model of heavy substance use among whites, while Figure 11 illustrates the four group model of heavy substance use among blacks. Although the model for whites contains one more trajectory group, similarly shaped trajectories are found in both models. First, both models contain a zero order trajectory group (Group 1) that never reports heavy substance use during the observation period. While a majority of both blacks and whites are categorized in this trajectory group, the size of this trajectory group is greater in the model for blacks (76% vs. 53%).

Both models also feature trajectories of desisters, although the model for whites features two such groups while the model for blacks only contains one desister group. Group 2 in both models are best characterized as low desisters (13% for whites, 8% for blacks) who achieve a relatively low peak probability (.3 for whites and .4 for blacks) of heavy substance use during the transition to adulthood which declines to a zero or near zero probability by the end of the observation period. The peak probability of heavy use among blacks occurs around 21 years, a few years later than the peak of 18 years for whites. The additional group in the model for whites,

group 4, is best characterized as a high desister group. While the trajectory of this group is similarly shaped to that of Group 2, the peak probability of heavy substance use for this group is around .7 and the increase in probability of heavy substance use during adolescence closely corresponds with the increase observed for the heavy user group.

Finally, both models contain two trajectory groups that persist in substance use although at different levels. Trajectories for heavy users in both models (Group 5 for whites & Group 3 for blacks) are marked by a rise in the probability of heavy substance use during adolescence which remains high and stable throughout the twenties. The size of this group is twice as great in the model for whites compared to that of blacks. Both models also contain a trajectory group (Group 3 for Whites, Group 4 for blacks) characterized by an increase in the probability of heavy substance use during the transition to adulthood, but which peaks at a more moderate level (.30 – .40) in the mid- to late twenties and remains relatively stable. Although the trajectories for these groups appear to be similarly shaped, there are some differences. For instance, the increase in heavy substance use for blacks begins later than that of whites and appears to still be increasing at the end of the observation period while the corresponding group for whites maintain a stable level of use during their twenties.

The results of the multinomial logistic regression model predicting group membership for whites are presented in Table 21 and are mostly consistent with those found in the main analysis. The model for whites indicates the greatest differences are observed in the comparison between non-heavy/non-users and heavy users. This comparison indicates non-heavy/non-users differ from heavy users across social,

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psychological, and demographic factors. Consistent with the results of the main analysis, the psychological variables appear to do a better job of differentiating non-heavy/non-users from heavy users than the social factors. Each of the personality factors and one of the two risk perception measures are significant predictors of group membership in the comparison between non-heavy/non-users and heavy users.

As found in the main analysis, fewer differences are observed when comparing each of the desister groups with the heavy user group. The amount of time married and the number of weeks worked were the only social factors that distinguished low desisters from heavy users. None of the social factors were found to be significant predictors of group membership in the comparison between high desisters and heavy users, although the amount of time married and the level of strains at wave 6 falls just short of statistical significance at the .05 level.

Higher conscientiousness was also associated with a greater likelihood of being classified a low desister relative to a heavy user, although it did not differentiate membership in the high desister group from that of the heavy user group. The other significant difference in the comparison between each desister group and heavy users was sex, with females having a greater probability of being classified into either of the desister groups relative to the persister group. White females are about three times more likely to be classified as low desisters than heavy users and about twice as likely to be classified as high desisters rather than heavy users.

The results of the multinomial logistic regression model predicting heavy substance use trajectory group membership among blacks shown in Table 22 indicate few statistically significant differences between the heavy users and any of the other

trajectory groups. With the exception of strain at wave 11, individuals classified as heavy users did not differ from any of the other groups along any of the social factors examined here. The only significant differences were found for strains, personality, and sex. Non-heavy users experienced fewer strains at wave 11 and scored higher on the personality dimension of conscientiousness and lower on the dimensions of extraversion and neuroticism. Females were also more likely to be classified as non-users relative to heavy users in the model for blacks. No factors were found to be statistically significant predictors of group membership in the comparison between desisters and heavy users, although the personality traits of conscientiousness and neuroticism approached statistical significance at the .05 level.

Sex. The bottom panel of Table 20 presents the results of the first stage of the model selection process for trajectories of heavy substance use among males and females. As observed for race, there are differences across sex in terms of which n-group model provides the best statistical fit for heavy substance use. For males, model fit improved with each additional trajectory group giving the six group model the best statistical fit. This six group model, however, contained two similarly shaped trajectory groups and was rejected in favor of a five group model. The average posterior probability of group membership for this model is .81 with the average posterior probability of group membership for each trajectory group falling within the range of .76 to .90.

The bottom panel of Table 20 indicates a five group model provides the best statistical fit for heavy substance use among females. Since the five group model contained one group small in size ($< 3\%$) as well as two similarly shaped trajectories,

this model was rejected in favor of the more parsimonious four group model. This model appears to provide a good fit to the data as the average posterior probability of group membership is .93 with the average posterior probabilities for each trajectory group falling within the range of .83 and .96.

The five group model of heavy substance use for males and the corresponding four group model for females are found in Figure 12 and Figure 13, respectively. These models are similar along several dimensions. First, a majority of both males and females have a low probability of reporting heavy substance use at any time during the observation period. Nearly three-quarters of females and two-thirds of males either report no heavy substance use or a stable low probability of heavy use. Second, both models feature a small sized group of heavy users whose probability of heavy substance use increases through adolescence and remains high and relatively stable throughout the twenties. Although the trajectory shape for this group is similar in both models, the peak probability is higher for males and the size of this group in the male model is twice as large as in the female model (10% vs. 5%).

Both models also feature desister and late riser trajectory groups. The shapes of these respective trajectories are similar across models, although they differ in terms of magnitude with the peaks greater for these trajectories in the male model than the female model. The desister and late riser trajectory groups in each model are also comparable in size, although the late riser group is slightly larger in the model for males (13% vs. 9%), while the desister group is slightly larger in the model for females (10% vs. 14%).

Table 23 shows the results of the multinomial logistic regression model for predicting heavy substance use trajectory group membership for males while Table 24 shows the corresponding results for females. The models for both males and females show most of the statistically significant differences between groups are found when comparing the non-heavy/non-users with the heavy users. For both sexes, non-heavy/non-users differ from heavy users along the social factors of marital duration, employment stability, educational enrollment, and the personality characteristics of extraversion and neuroticism. Blacks and Hispanics are also more likely to be classified as non-heavy/non-users relative to heavy users in both models.

There are some sex differences in terms of which factors distinguish non-heavy/non-users from heavy users. Job satisfaction, and the personality dimensions of conscientiousness and openness distinguish non-heavy/non-users from heavy users among males only. Males who report greater job satisfaction, higher conscientiousness and lower openness are more likely to be classified as non-heavy/non-users rather than heavy users. In the model for females, the amount of time spent in parenthood and the personality dimension of agreeableness distinguished non-heavy/non users from heavy users. Females who spend more time in parenthood and have higher levels of agreeableness are more likely to be classified as non-heavy/non-users than heavy users.

For both sexes, the comparison between desisters and persisters reveals few significant differences in any of the social or psychological factors examined here. Among males, the only significant difference found in the comparison between desisters and heavy users was perceived punishment severity. Males who reported an

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increase in punishment severity were 37% less likely to be categorized as desisters relative to heavy users. Among females, the comparison between desisters and heavy users indicates statistically significant differences in marital duration, school enrollment, and the personality dimension of neuroticism. Increased marital duration, school enrollment, and lower levels of neuroticism are each associated with a greater likelihood of being classified as a desister from heavy substance use rather than a heavy user among females.

Binge Drinking.

Race. The top panel of Table 25 shows the BIC scores for each of the n-group models of binge drinking examined for whites and blacks. This table indicates a similar improvement in fit with each additional trajectory group in the models for both whites and blacks. This suggests a six group model provides the best statistical fit to the data for binge drinking for both races. However, the six group models for both races were rejected in favor of more parsimonious solutions. The six group model for whites featured two similarly shaped trajectories of heavy drinking, so this model was rejected in favor of the five group model which featured five distinct trajectories. The average posterior probability of group membership for this model is .87 with each trajectory group having an average posterior probability of group membership within the range of .82 to .92. This five group solution is depicted in Figure 14.

The six group model for blacks was also rejected for featuring similarly shaped trajectories as well as having small size (< 3%) trajectory groups. As seen in Table 24, each of the models with more than three groups consisted of trajectory

groups with less than 3% of the population. Further, each of the additional groups

beyond the three group model were nearly flat and low throughout the observation

period. As such, the three group model presented in Figure 15 was selected as the

model for further analysis. This model provides a good fit to the data as the average

posterior probability of group membership is .94 with each trajectory group having an

average posterior probability of membership within the range of .90 to .96.

A comparison of these models in Figure 14 and Figure 15 reveals substantial

differences in trajectories of binge drinking across race aside from the different

number of groups in each model. First, while both models contain a non-binge

drinking group (Group 1 in both models), the size of this group for blacks is nearly

three times (63%) that of the equivalent group in the model for whites (23%). Both

models also feature a heavy drinker group although the size of this group is twice the

size in the model for whites (12% vs. 6%) and the peak use for blacks occurs a few

years later and is lower than that observed for whites. Another important difference

is that the model for whites contains a desister trajectory group (Group 4), while the

model for blacks does not contain a trajectory group which desists from binge

drinking. Instead, the three trajectory groups for binge drinking in the model for

blacks all indicate relative continuity in binge drinking at three different levels:

abstinence, low chronic, and frequent binge drinking.

The results of the multinomial logistic regression models predicting binge

drinking trajectory group membership for whites and blacks are presented in Table 26

and Table 27 respectively. Both tables show most statistically significant differences

are found in the comparison between non-bingers and heavy users. For both races,

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the social factors of marital duration and weeks worked and the personality traits of openness, extraversion, and neuroticism distinguished heavy drinkers from non-binge drinkers. Males of both races were also more likely to be categorized as heavy drinkers than non-bingers. There were also some differences between races in the comparison between non-bingers and heavy drinkers. Among whites, time as parent, employment stability and time enrolled in an educational program differentiated non-bingers from heavy drinkers. Among blacks, respondents reporting greater job satisfaction and higher conscientiousness were more likely to be categorized as non-bingers relative to heavy drinkers.

Since the model for blacks does not contain a desister trajectory group, it is not possible to assess whether the factors that distinguish desisters from binge drinking from heavy drinkers differs across race. The results of the model for whites shown in Table 26 indicates that whites were more likely to be classified as desisters if they reported greater time married, fewer weeks worked, no high school graduation, and were female. White high school graduates are 47% less likely to be categorized as desisters than heavy drinkers, while white males are 55% less likely to be classified as desisters. Unlike the results of the main model, the results of the model for whites indicate that none of the psychological variables distinguished membership in the desister trajectory group from that of the heavy drinker group.

Sex. The bottom panel of Table 25 indicates that six group models also provide the best statistical fit for trajectories of binge drinking among males and females. The six group model for males, however, was rejected because it contained two pairs of similarly shaped trajectories that differed in magnitude only. Instead, the

five group model depicted in Figure 16 was selected for further analysis as it contained five distinct trajectories and provided the next best statistical fit. The average posterior probability of group membership in this model is .89 with an average posterior probability for each trajectory group falling between .83 and .92.

The six group model for binge drinking among females was rejected for similar reasons as well as having one trajectory group that was very small in size. Instead, the next best fitting model, a four group model shown in Figure 17, was selected as the model for further analysis. This model also appears to provide a good fit as the average posterior probability of group membership is .89 with each trajectory group having an average posterior probability of group membership between .84 and .93.

The models for males and females share several features even though they contain a different number of trajectory groups. First, both models contain a flat trajectory group that never reports binge drinking as well as a modal group (low chronics) that consistently reports a low level of binge drinking throughout the observation period. Both models also contain similarly shaped trajectories of late risers in binge drinking (Group 3 in both models) and heavy drinkers (Group 5 for males and Group 4 for females), although the peak levels of drinking and the size of these trajectory groups are greater in the model for males. The main difference between these sex-specific models of binge drinking is that the model for males contains a desister trajectory group (Group 4) while there is no equivalent group in the model for females.

The results of the multinomial logistic regression models predicting trajectory group membership for binge drinking among males and females are provided in Table 28 and Table 29 respectively. Both models show a familiar pattern in the results with most of the significant differences being found in the comparison between non-bingers and heavy drinkers. Although there are differences between the two sex-specific models, the results of the models for both sexes indicate that non-bingers differ from heavy drinkers along social, psychological, and demographic factors. In the models for both sexes, membership in the non-binger group is associated with greater marital duration, educational enrollment, lower levels of extraversion, and being black. Males who reported lower levels of strain at wave 6 and lower levels of openness are also more likely to be classified as non-bingers relative to heavy users. Females are more likely to be categorized as non-bingers if they spent more time as a parent and reported greater employment stability.

In addition, the psychological factors related to personality appear to do especially well in distinguishing binge drinking trajectory group membership among females. The dimensions of extraversion and agreeableness distinguished group membership in the heavy drinker group relative to each of the other trajectory groups in the model for females. Although the model for males indicated no group differences in agreeableness, the personality dimension of extraversion differentiated heavy drinkers in three of the four comparisons made in the model for males. Both models, then, suggest higher ratings of extraversion are associated with a greater probability of being classified as a heavy drinker.

Since the female model did not contain a desister trajectory group, it is not possible to examine whether the factors associated with desistance from binge drinking are similar across sex. The comparison between desisters and heavy drinkers among males revealed just one statistically significant difference between the groups in strains reported at wave 11. For each additional strain at this wave, the odds of a male being classified as a desister rather than a heavy user increase by 26%. Aside from the number of weeks worked and high school graduation status which approached statistical significance at the .05 level, there are no differences between desisters from binge drinking compared to heavy drinkers in the model for males.

Marijuana Use.

Race. The top panel of Table 30 provides the BIC scores and the size of the smallest trajectory group for each of the n-group models fitted for trajectories of marijuana use by race. Similar to binge drinking and heavy substance use, a six group model appears to provide the best fit for trajectories of marijuana use among whites. However, this model contained three trajectory groups with similar low levels of use which did not reveal any interesting heterogeneity. As such, the more parsimonious five group model for marijuana use among whites depicted in Figure 18 was selected as the model for further analysis. The average posterior probability of group membership in this model is .91 with an average posterior probability of membership for each trajectory group ranging from .85 to .96.

A six group model also provides the best statistical fit for marijuana use among blacks. This six group model featured many similarities with the six group model for marijuana use among whites including multiple groups characterized by

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low levels of use throughout the observation period. Thus, the five group trajectory model of marijuana use for blacks presented in Figure 19 was chosen over the six group model for reasons similar to those just described for the model for whites. The average posterior probability of group membership for each trajectory group falls within the range of .87 to .94 with an overall average posterior probability of group membership for the model of .90.

The five group trajectory models of marijuana use by whites and blacks depicted in Figure 18 and Figure 19, respectively, are largely similar. The modal trajectory group (Group 1) in both models is similar in size and never reports marijuana use during the observation period. Both groups also contain a trajectory group of experimenters (Group 3) that reports some use during adolescence which declines to no use during the transition to adulthood. Approximately 75% of both whites and blacks would be classified into one of these two groups.

The remaining 25% in each model may be classified as either heavy users, late risers, or desisters. Although similar terms may be used to characterize these trajectory groups in each model, there are observable differences across race in terms of trajectory shape and group size. For instance, the heavy user group in the model for whites (Group 5) is slightly smaller than that for blacks (5% vs. 8%) and their trajectory of use increases more rapidly during adolescence and reaches a higher peak than the corresponding group for blacks. The late riser groups in each model (Group 2) are similar in size, although the increase in use is much more gradual for blacks than for whites. Finally, the desister trajectories are similar in size in each model and

peak around the same age, although the peak in marijuana use appears to be slightly greater for blacks than whites.

The multinomial logistic regression models predicting trajectory group membership for marijuana use for whites and blacks are presented in Table 31 and Table 32, respectively. The results of the model for whites are largely similar to those observed in the main analysis. In the comparison between abstainers and heavy users, the only differences between this model and the main analysis are observed for strains at wave 11 and agreeableness. The level of strains at wave 11 did not distinguish abstainers from heavy users in the model for whites, although it was significant in the main analysis. Agreeableness was not significant in the main analysis, although it was found to distinguish abstainers from heavy users in the model for whites.

The personality dimensions do well in distinguishing group membership in the contrast between abstainers and heavy users as well as in the comparison between low desisters and heavy users. The probability of membership in the low desister and abstainer group increased with lower levels of openness and higher levels of conscientiousness and agreeableness relative to the heavy user group. Relative to heavy users, low desisters also reported greater job stability, spent more time married and enrolled in an educational program, and were more likely to be female. There were no statistically significant predictors of group membership in the contrast between high desisters and heavy marijuana users among whites.

The results of the multinomial logistic regression model predicting trajectory group membership for marijuana use among blacks are presented in Table 32. This

table indicates few factors were significant predictors of group membership. Marital duration, employment stability, and the level of strains at wave 11 are the only social factors which distinguished membership in the heavy marijuana user group from that of any of the other trajectory groups. Marital duration is the only social factor associated with a greater likelihood of classification in either desister group relative to the heavy user group among blacks.

Psychological factors related to personality and risk perceptions appear to do slightly better than social factors at distinguishing membership in the heavy marijuana user group from membership in other trajectory groups of marijuana use among blacks. Blacks high in conscientiousness and low in extraversion are more likely to be classified as abstainers or low desisters than heavy marijuana users. Blacks who reported an increase in the certainty of punishment are more than twice as likely to be classified as desisters from marijuana use than heavy users.

Sex. The bottom panel of Table 30 presents the model fit statistics for each of the male and female n-group models explored for marijuana use. This table indicates a five group model provides the best statistical fit for marijuana use trajectories for both sexes. The five group model for marijuana use among males is depicted in Figure 20 while the equivalent model for females is presented in Figure 21. Both models provide a good fit to the data as the average posterior probability of group membership for both models is .90. The average posterior probabilities of group membership for each trajectory group in the model for males fall within the range of .83 to .93 while those for the female model fall within the range of .83 to .95.

As in the race-specific analyses for marijuana use, there are considerable similarities in the sex-specific models for marijuana use. The modal group in both figures (Group 1) never reports marijuana use during the observation period and are best characterized as abstainers. Both models also include a trajectory group that makes up about 25% of the population (Group 5 in Figure 20 and Group 3 in Figure 21) that reports some marijuana use in adolescence which is gradually reduced over time. Most males and females who ever report marijuana use fall into this low desister trajectory group indicative of experimentation during adolescence.

Both models also include trajectory groups of late onset, heavy use and desistance from marijuana use that are mostly similar in size and shape. In both models, Group 2 comprises around 8% of the population and is characterized by an increase in marijuana use over time. Although the groups are similar in size, the increase in marijuana use for males in this trajectory group is linear while the increase for females is quadratic and more stable at the end of the observation period. The smallest size groups in both models (Group 4 in Figure 20 and Group 5 in Figure 21) are characterized by a trajectory of rising marijuana use through adolescence which remains at a high and relatively stable level through the twenties. The desister trajectory groups in both models (Group 3 in Figure 20 and Group 4 in Figure 21) are also similar in size and shape although peak use is slightly greater among males.

The results of the multinomial logistic regression models predicting marijuana use trajectory group membership for males and females are provided in Table 33 and Table 34, respectively. As in the other comparisons, most of the significant differences are observed when comparing the abstainers with the heavy users for both

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males and females. Longer marital duration, fewer jobs worked, and lower openness are associated with an increased likelihood of being categorized as an abstainer relative to a heavy user for both sexes. There are also some sex-specific differences in which factors are predictive of group membership. Males are more likely to be classified as heavy users if they didn't graduate high school, experienced greater strains at wave 11, perceived an increase in punishment severity over time, and reported lower levels of conscientiousness. On the other hand, females are more likely to be classified as heavy users than abstainers if they reported lower job satisfaction, spent greater time enrolled in an educational program and reported higher levels of extraversion and neuroticism. Further, white and non-Hispanic females were also more likely to be classified as heavy users.

The comparison between each desister group and the heavy user group among males indicates few significant differences. Table 33 indicates that males who spent more time married, experienced greater job stability, and reported higher levels of conscientiousness and agreeableness are more likely to be classified as experimenters than heavy users. The only significant differences between male desisters and heavy users are in strain and perceived severity of punishment. For each additional strain at wave 6, the odds of being classified a desister relative to a heavy user increase by 40%. Although not significant, it is worth noting that the coefficient for strain at wave 11 is negative which suggests desistance from marijuana use among males is associated with a reduction in strain over time. Finally, males who reported an increase in the perceived severity of punishment are 44% less likely to be classified as desisters from marijuana use than heavy users.

The results for females in Table 34 indicate even fewer statistically significant differences between desisters and heavy users. Greater time spent as a parent and lower levels of openness increased the likelihood of being classified as an experimenter relative to a heavy user. Time enrolled in an educational program is the only factor that distinguished desisters from heavy users in the model for females. Females who spent more time enrolled in an educational program were more likely to be classified as desisters than heavy users. Lower levels of neuroticism also appear to increase the probability of being categorized as a desister relative to a heavy user, although the effect did not quite reach statistical significance at the .05 level.

Hard Drug Use.

Race. The top panel of Table 35 presents the BIC scores and size of the smallest trajectory group for each of the race-specific n-group models for hard drug use. The top panel of Table 35 indicates a five group model provides the best statistical fit for hard drug use among whites. This five group model was rejected in favor of a more parsimonious four group model since the five group model contained two trajectory groups that made up less than 5% of the population and the additional group did not reveal any interesting heterogeneity. The average posterior probability of group membership in this model is .87 with each trajectory group having an average posterior probability of membership in the range of .78 to .91.

In contrast, a two group model provides the best statistical fit for hard drug use among blacks. However, a three group model was selected over a two group model for further analysis since it featured a trajectory group of desisters while the two group model only included trajectories of abstinence and heavy hard drug use.

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The average posterior probability of group membership in this model is .89 with each trajectory group having an average posterior probability of group membership within the range of .81 to .94.

The four group model for trajectories of hard drug use among whites is depicted in Figure 22 while the corresponding three group model for blacks is featured in Figure 23. These models share several common features, although there are a number of differences as well. First, these models both feature a modal trajectory group (Group 1) that abstains from hard drug use throughout the observation period. Both models also feature a heavy user group (Group 2) similar in size, but considerably different in shape and magnitude. The heavy user trajectory group in the model for whites reports hard drug use at the beginning of the observation period which peaks in the early twenties and then declines to initial levels of use by the end of the observation period. Among blacks, heavy users start out as non-users, reach a peak in the early twenties, and slightly reduce their use by the end of the observation period. Further, the peak in hard drug use for the trajectory group of heavy users in the model for whites is approximately three times as great as the peak for the heavy user trajectory among blacks.

Both models also feature trajectories of desistance from hard drug use. The model for whites in Figure 22 features two desister trajectory groups: low desisters (Group 3) and high desisters (Group 4); while the model for blacks in Figure 23 includes a trajectory group of low desisters (Group 3) only. Most whites and blacks who ever report hard drug use are best categorized as low desisters or experimenters who report some hard drug use during adolescence, but little to no use thereafter. The

trajectory for the high desister group in the model for whites tracks closely with the trajectory for heavy users during adolescence, but diverges during the transition to adulthood.

The results of the multinomial logistic regression model predicting group membership for hard drug use among whites in Table 36 are largely similar to those obtained in the main analysis although there are some differences. As in the main analysis, the comparison between abstainers and heavy users indicates differences along both social and psychological factors. In this comparison, the only difference from the main analysis is that strains at wave 6 are not significant predictors of group membership among whites only.

The results of the contrast between desisters and heavy users in the whites-only model differ from those obtained in the main analysis. Among whites, the only significant predictors of group membership for this comparison are neuroticism and sex. White females have a 44% higher probability of being classified as a desister from hard drug use rather than a heavy user. Lower levels of neuroticism are also associated with an increased probability of being classified as a desister from hard drug use rather than a heavy user. In the main analysis, openness was the only factor that was predictive of group membership in the contrast between desisters and heavy users. The personality factor of openness did not quite reach statistical significance in the model for whites only, although the size and sign of the coefficient are similar to that observed in the main analysis.

Table 37 shows the results of the multinomial logistic regression model predicting hard drug use trajectory group membership among blacks are quite

different from those observed for whites. The only significant predictor of group membership in the contrast between abstainers and heavy users is employment stability. The odds of being classified as an abstainer from hard drug use relative to a heavy user decrease by 9% for each additional job held. There were no statistically significant differences in the contrast between the desister and heavy user groups.

Sex. The bottom panel of Table 35 presents the BIC scores and size of smallest trajectory group for each of the sex-specific n-group models fitted for hard drug use. This table indicates a three group model provides the best statistical fit for males, while a four group model provides the best statistical fit for hard drug use among females. The three group model for males appears to be a good fit as the average posterior probability of group membership is .93 and the average posterior probabilities for each trajectory group are between .92 and .96.

The four group model for females was rejected in favor of a more parsimonious three group model since the four group model for females included one small trajectory group (< 3%) and one trajectory group that indicated relatively stable, low use over the observation period that was not much different from the trajectory of no use. The average posterior probability of group membership for this four group model of hard drug use among females is .94 with each trajectory group having an average posterior probability of group membership between .92 and .96.

The three group trajectory models for hard drug use among males and females are presented in Figure 24 and Figure 25, respectively. These three group models are largely similar in terms of trajectory shapes and group size. Both feature a modal trajectory group (Group 1) that never reports hard drug use during the observation

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period. Both models also feature a desister trajectory group (Group 2) similar in size whose peak use occurs in adolescence and declines during the transition to adulthood. Interestingly enough, the peak probability of hard drug use for this group is higher in the model for females than in the model for males. Finally, both models feature a small heavy user group (Group 3) whose peak use occurs in the early twenties and declines thereafter. The levels of peak use for this group are similar across sex.

The results of the multinomial logistic regression model predicting hard drug use trajectory group membership for males are found in Table 38. The results of this model differ from those obtained in the main analysis in several ways. First, the level of strain at wave 11 is the only social factor that is a statistically significant predictor of group membership among males. Higher levels of strain at wave 11 are associated with a greater probability of membership in the heavy user group relative to either the abstainer or desister groups. For each additional strain at wave 11, the odds of being classified as a desister rather than a heavy user decrease by 25%. In contrast, the main analysis found differences in marital duration, time as parent, time enrolled in an educational program, as well as in employment stability in the contrast between abstainers and heavy hard drug users.

Second, race is a statistically significant predictor of group membership in both group comparisons. Black males are approximately 14 times more likely to be classified as abstainers than heavy users and about 5 times more likely to be classified as desisters than heavy users. This is consistent with the results from the main analysis except that race did not distinguish membership in the desister group from membership in the heavy user group. Finally, males who reported an increase in the

perceived certainty of punishment and who reported higher levels of openness are more likely to be classified as heavy users than abstainers. Unlike the results of the main analysis, however, the dimension of openness is not a significant predictor of group membership when comparing male desisters with heavy hard drug users.

Table 39 shows the results of the multinomial logistic regression model predicting hard drug use trajectory group membership for females. The results of this model are quite different from those just observed in the model for males. First, employment stability, high school graduation status, and the level of strain at wave 6 were the only social factors that predicted group membership. For each additional job and each additional strain reported at wave 6, the odds of being classified as a heavy user relative to an abstainer increase by 10% and 23% respectively. Female high school graduates have a 68% higher likelihood of being categorized as heavy hard drug users rather than desisters from hard drug use. In contrast, the level of strain at wave 11 was the only social factor found to be a statistically significant predictor of group membership for trajectories of hard drug use in the model for males.

Further differences between the sexes are observed in which psychological factors are associated with hard drug use trajectory group membership. The model of hard drug use for females indicates several personality dimensions, particularly conscientiousness and neuroticism, are statistically significant predictors of group membership. Females high in conscientiousness and low in neuroticism are more likely to be classified as abstainers or desisters relative to heavy hard drug users. Lower levels of extraversion are also associated with a greater probability of membership in the abstainer group compared to the heavy user group, although levels

of extraversion did not distinguish desisters from heavy users. In contrast, the results of the model for hard drug use among males indicate openness as being the only statistically significant predictor of group membership in the comparison between desisters and heavy users.

Summary.

The results of the subgroup analyses by race and gender may be summarized in three main points. First, there are differences across race in group size and trajectory shape for each of the outcomes examined with the exception of marijuana use where the models were mostly similar across race. For the other outcomes, the models for whites include more trajectory groups and include smaller size trajectory groups which never report involvement in each outcome compared to the models for blacks. Second, the gender-specific models indicate greater similarity between the sexes than between the races. There are a similar number of trajectory groups for each outcome with the exception of heavy substance use and binge drinking where the model for males had one more trajectory group. The models for males and females also contain similarly shaped trajectories, although the peaks of trajectories are slightly greater in the models for males with the exception of hard drug use.

Third, the results of the multinomial logistic regression models predicting trajectory group membership for each of the outcomes indicate differences across race and sex in terms of which factors are associated with desistance. For the most part, the results of the models for whites and males for each outcome are similar to those observed in the main analysis, while the results of the models for blacks and females largely differ. For instance, the models of self-reported arrest for whites and

males find marriage, employment, education, strain, and agreeableness are significant predictors of group membership in the contrast between desisters and persisters. In contrast, the only significant predictors of group membership for this comparison in the model for blacks are related to employment, while marriage and neuroticism were the only significant predictors in the model for females.

The results of the multinomial logistic regression model for whites for the heavy substance use outcome are also similar to those observed in the main analysis. Low-level desisters report higher levels of conscientiousness and spent greater time married and employed compared to heavy users. None of the factors examined here were found to distinguish desisters from heavy users in the model for blacks. Males who reported an increase in punishment severity over time were less likely to be classified as desisters than heavy users, while females with lower levels of neuroticism and who spent more time married and enrolled in an educational program were more likely to be classified as desisters from heavy substance use.

The models for binge drinking among blacks and females did not contain a desister trajectory group so it was not possible to determine whether the factors associated with desistance from binge drinking are consistent across race or sex. The model for whites indicates desistance from binge drinking is associated with greater time married, a shorter employment history, and no high school graduation. The only difference between desisters and heavy drinkers in the model for males is in the level of strain at wave 11 with greater levels of strain associated with an increased likelihood of being categorized as a desister.

The results of the multinomial logistic regression models for marijuana use among whites and males are also similar to those observed in the main analysis. Compared to heavy users, whites and males who experiment with marijuana use spend more time married, report greater employment stability, and have higher levels of conscientiousness and agreeableness. Whites who spend more time enrolled in an educational program and who have lower levels of openness are also more likely to be classified as experimenters relative to heavy users. Females are more likely to be classified as experimenters than heavy marijuana users if they spent more time in parenthood and reported lower levels of openness.

Unlike the main analysis, however, there were no factors found to distinguish high desisters from heavy marijuana users in the model for whites. The model for blacks also found no significant predictors of group membership in the contrast between desisters and heavy marijuana users. The model for marijuana use among males indicates desisters experienced greater levels of strain as a young adult and were less likely to report an increase in punishment severity than heavy marijuana users. Females who spent more time enrolled in an educational program were more likely to be classified as high desisters than heavy users.

Finally, the subgroup analyses for hard drug use indicate differences across race and gender in which factors are associated with desistance from hard drug use. The only predictors of group membership in the contrast between desisters and heavy users in the model for whites are neuroticism and sex. No significant differences were found in this contrast in the model for blacks. Males who experience fewer strains in their mid-twenties and who are black are more likely to be classified as

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desisters than heavy hard drug users. In contrast, females who desist from hard drug use report greater levels of conscientiousness and lower levels of neuroticism and are less likely to have graduated from high school.

Dual Trajectory Model

The second research question posed in this dissertation is to what extent those who are desisting from crime are also desisting from heavy substance use. Table 40 shows the probability estimates of the dual trajectory model. Panel A in this table provides the probabilities of heavy substance use group membership conditional on arrest trajectory group membership. These probabilities suggest a fair degree of concordance between criminal and substance use behavior during the transition to adulthood. For instance, conformers have the greatest probability of belonging to the non-heavy/non-user group (.74), while persisters have the highest probability of membership in the heavy user (.26) and late riser groups (.24).

This pattern is also seen with the desister and late rising trajectory groups. Individuals classified as desisters from crime have a greater than .50 probability of belonging to either one of the substance use desister groups. However, there is also greater than a .30 probability of membership in either the late riser or heavy user group for individuals classified as desisters from crime. Thus, there still appears to be a relatively large probability of continued heavy substance use even though individuals may be desisting from crime.

Panel B in Table 40 provides the probabilities of arrest trajectory group membership conditional on heavy substance use group membership. This panel also indicates a strong degree of concordance between arrest and heavy substance use.

Non-heavy/non-users had the greatest probability of belonging to the conformer group (.93), while the heavy users had the greatest probability of belonging to the persister group (.13). Membership in either substance use desister group was also associated with relatively high probabilities of membership in the crime desister group. High desisters from heavy substance use have the greatest probability of membership in the crime desister group. It is also worth noting that heavy users had the highest probability of membership in the arrest desister group (.40) indicating continued heavy substance use despite desistance from crime.

Finally, panel C of Table 40 presents the joint probabilities of membership in the arrest and heavy substance use trajectory groups. This panel reveals a fair deal of heterogeneity in patterns of arrest and heavy substance use over the life course. Although more than half of the individuals are conformers and non-heavy/non substance users, none of the other joint probabilities are above .081. These joint probabilities also indicate a strong degree of concordance between arrest and substance use trajectories. Individuals classified as late risers in the model for arrest are also most likely to be classified as late risers in the heavy substance use model. Likewise, persisters in the arrest model have the greatest probability of being classified as heavy users in the substance use model. Individuals classified as desisters from crime are almost twice as likely to be classified as desisters from heavy substance use than to be classified as either late risers or heavy users (.092 vs. .053).

Summary

The main findings of this chapter may be summarized in five main points. First, the models for each of the outcomes examined include between three and five

trajectory groups. With few exceptions, each model contains trajectories of non-use/non-offending, desistance, and persistence. Many of the models also include a fourth trajectory group characterized by an increase in the behavior during the transition to adulthood.

Second, although the relative size of each trajectory group varies by outcome and across demographics, their relative proportion is consistent across each model. That is, a majority of individuals report never being arrested or heavy levels of substance use while a small (4-5%) proportion of individuals report the greatest likelihood of arrest or heavy substance use with the other trajectory groups falling somewhere in between these extremes. Third, both social and psychological factors are associated with a greater likelihood of membership in a desister trajectory group relative to a persister/heavy user group. These factors include marriage, employment, reduced strain, personality traits including conscientiousness and neuroticism, and the demographic characteristics of sex and race.

Fourth, the factors associated with desistance differ across behavior with social factors more often associated with desistance from crime and psychological factors more likely to distinguish desisters from heavy substance use from heavy users. Similarly, substance specific analyses indicate differences across substance type and subgroup analyses indicate differences across race and sex as well. Finally, the results of the dual trajectory model suggest a high degree of concordance in crime and substance use during the transition to adulthood such that desistance from crime is more often than not accompanied by desistance from heavy substance use and vice-versa. However, there was a sizable proportion of individuals who desisted from

crime, yet persisted in heavy substance use. The next chapter discusses (1) these results by placing them in context within the existing literature on desistance from crime and substance use, (2) the limitations of the current dissertation, and (3) potential future avenues for research.

Chapter 5: Discussion

Desistance from crime and substance use has been linked to changes in both the social context, such as the formation of adult social bonds and the experience of strain, and in psychological characteristics including risk perceptions and personality traits. Although the criminological and substance use literatures link desistance from these behaviors to similar changes, most of this literature has either (1) focused on these behaviors independent of one another or (2) treated one behavior as a risk factor for involvement in the other behavior rather than examining the joint development of both behaviors over time. Indeed, studies that examine both crime and substance use as outcomes often find change in offending but continuity in substance use. Despite this discrepancy, few studies have investigated the extent to which desistance is universal across criminal and substance use behavior.

This dissertation sought to explore the extent to which desistance from crime is similar to desistance from substance use. This was accomplished by asking (1) whether the factors associated with desistance from crime are similar to the factors associated with desistance from substance use and (2) to what extent are individuals desisting from crime also desisting from substance use. In addition to these two questions, additional analyses were performed to assess (1) whether similar factors are associated with desistance from the use of different substances and (2) whether the results differ across race and sex. These questions were explored using group based trajectory modeling with data from the National Longitudinal Survey of Youth 1997 cohort.

This chapter is divided into four main sections. The first section discusses the results of this dissertation and how they compare to the existing literature on desistance from crime and substance use. The second section discusses the implications of the results for theories of desistance from crime and substance use. The third section identifies the limitations of the current dissertation, while the final section suggests possible future avenues for research on desistance from crime and substance use.

Main Results

The results of this dissertation are largely consistent with those observed in prior research on desistance from crime and substance use as well as with prior studies that have applied group based trajectory modeling to study these behaviors. This section is divided into four subsections which discuss the results of (a) the trajectory models for each behavior in terms of the number of groups, trajectory shapes, and mixture probabilities, (b) the analyses for crime, (c) the analyses for substance use, and (d) the dual trajectory model.

Trajectory Models of Crime and Substance Use.

Each of the trajectory models examined in this dissertation contained between three and five trajectory groups. This is consistent with prior studies that have used group-based trajectory modeling to study offending (Piquero, 2008), marijuana use (Brook et al., 2011; Schulenberg et al., 2005; Windle and Wiesner, 2004), and binge drinking (Windle, Mun, and Windle, 2005). Prior research suggests that the type of data used (official vs. self-report) may result in differences in the number of trajectory

groups (Piquero, 2008). While all of the trajectory models in this dissertation are based on self-report data, the number of trajectory groups in each model reflects the prevalence of each behavior in the sample. For instance, the models for the normative behaviors of binge drinking and marijuana use contained no less than five groups, whereas the less common behaviors of arrest and hard drug use consisted of no more than four groups. This is also observed in the subgroup analyses as the models for whites and males always had the same number or a greater number of trajectory groups relative to the models for blacks and females.

Similar age patterns were observed across each of the trajectory models with the exception of the models for binge drinking among blacks and females which contained no desister trajectory group. All of the trajectory models examined in this dissertation include a trajectory group which reported no involvement in the behavior over the course of the observation period. This trajectory group was the modal group in each of the models, except for the models for binge drinking among whites and males in which the modal group reported low levels of binge drinking throughout the observation period.

Two other common age patterns in arrest and substance use identified in this dissertation are consistent with those predicted by Moffitt's (1993) dual taxonomy. Each of the models examined in this dissertation included a small trajectory group of persisters and a slightly larger group of adolescent-limited offenders (desisters) with the exception of the models for binge drinking among blacks and females which contained no adolescent-limited group. Many of these models also contained a late

onset trajectory group which is a common finding in trajectory studies (Piquero, 2008) although this pattern is not anticipated by Moffitt's (1993) taxonomy.

Desistance from Crime.

The results of the analyses for self-reported arrest indicate that the differences between persisters and desisters are primarily found in social bonds, particularly those related to marriage and employment. The strongest and most consistent association was observed for marriage. Individuals were more likely to be classified as desisters if they were involved in stable, durable marriages. This is consistent with a large body of literature which links marriage to desistance from crime (see Siennick and Osgood, 2008 for a review). Although marital duration and stability may not capture the quality of marital attachment, these marital qualities are consistent with Sampson and Laub's (1993) age-graded theory of informal social control.

The next strongest association was observed for employment. Both employment duration and job stability were associated with an increased probability of desistance from crime; however, job satisfaction was unrelated to desistance from offending except among males. Individuals were more likely to be classified as desisters if they reported having a longer and more stable history of employment. This finding is also consistent with the age-graded theory of informal social control and prior research on the relationship between employment and desistance (see Siennick and Osgood, 2008 for a review).

The subgroup analyses, however, indicated that the association between the social bonds of marriage and employment on the one hand and desistance from crime on the other may be moderated by race and sex. While the results of the models for

whites and males were similar to the results of the main model, the models for blacks

and females slightly differed. Employment duration and stability were the only

factors associated with desistance from crime among blacks, whereas marital duration

and stability were the only social bonds associated with desistance from crime among

females. Thus, while the results for marriage and employment are generally

consistent with the age-graded theory of informal social control, the results of the

subgroup analyses provide some support for criticism directed toward Sampson and

Laub's (1993) theory for being limited in generalizability to whites and males

(Giordano et al., 2002).

There was mixed support for the association between education and desistance

from crime. Enrollment duration was associated with an increased probability of

desistance from crime, although this effect was limited to whites and males only.

This is consistent with prior research that finds enrollment in an educational program

is associated with reduced offending (Blokland and Nieuwbeerta, 2005; Horney,

Osgood, and Marshall, 1995; O'Connell, 2003; Uggen and Kruttschnitt, 1998).

Educational achievement as measured by high school graduation status, however, was

unrelated to desistance from offending.

There was no support for the association between parenthood and desistance

from crime in the main model nor any of the subgroup models. Prior research has

also found parenthood is unrelated to offending (Blokland & Nieuwbeerta, 2005).

The null relationship between parenthood and desistance from crime may be due to

the fact that this study only examined parenthood duration rather than capturing other

dimensions of parenthood such as the level of attachment or time spent with one's children.

Other than social bonds, the only significant difference between desisters and persisters in offending was found for strain in adulthood. Desistance from crime was associated with fewer strains in young adulthood compared to those who persisted, although there were no differences in strain between desisters and persisters during the transition to adulthood. The association between reduced strain and desistance from crime is consistent with prior research (Eitle, 2010; Gunnison and Mazerolle, 2007). However, subgroup analyses suggest this association between strain and desistance from crime may be moderated by race and gender as strains were unrelated to desistance from crime among blacks and females.

Neither change in the perceived certainty or severity of punishment were associated with desistance from crime. Although this result is inconsistent with rational choice theory and other theories of desistance which incorporate changes in risk perceptions in its explanatory framework, the measurement of risk perceptions in this study is limited in several respects which may make it difficult to find an association. In this dissertation, risk perceptions were measured by asking about the change in perceived certainty and severity during the first five years of the observation period and only asked about one type of crime (auto theft). It is possible that the results would differ if change in risk perceptions is measured over a different time period or if questions pertained to a different crime type.

Desistance from crime was also unrelated to individual differences in personality in the main model. The subgroup analyses did find some significant

personality differences between persisters and desisters, although the results are somewhat inconsistent with prior research. Higher levels of agreeableness were associated with a decreased probability of desistance from crime among whites and males. Although agreeableness is one of the two traits of the Five Factor Model (FFM) that is most consistently linked to antisocial behavior, most prior research finds individuals who score higher on agreeableness are less likely to be involved in antisocial behavior (Miller and Lynam, 2001). Thus, it would be expected that higher levels of agreeableness are associated with a higher likelihood of desistance from crime. The results of this dissertation, however, indicate otherwise. There were no significant differences between persisters and desisters from crime in conscientiousness which is the other trait of the FFM most often linked to antisocial behavior.

Desistance from crime was associated with lower levels of neuroticism among females only. Prior research has also found an association between neuroticism and antisocial behavior, although this relationship has usually been found to be stronger among males than females (Miller and Lynam, 2001). There were no differences in openness to experience or extraversion between persisters and desisters in crime. The weak association and conflicting results observed between personality and criminal involvement may be due to the fact that personality was only assessed at one point in time and does not capture how personality may have changed over the observation period which may be more relevant in understanding the "maturing out" phenomenon (e.g. Littlefield, Sher and Wood, 2009). Nevertheless, the weak association between personality and criminal behavior provides little support for theories, such as

Gottfredson and Hirschi's (1990) general theory of crime, which attribute criminal behavior to differences in individual traits.

Desistance from Substance Use.

The factors associated with desistance from heavy substance use largely differ from those associated with desistance from crime. In contrast to the models for self-reported arrest, the results of the substance use models indicate few differences in social bonds between desisters and persisters. The only difference in social bonds between persisters and desisters from heavy substance use was found for marital duration. The association between marital duration and desistance from heavy substance use is consistent with prior studies which find a link between marriage and reduced levels of substance use (Chen et al., 2001; Kandel, 1980; Labouvie, 1996; Miller-Tutzauer et al., 1991; Nielsen, 1999). Marital stability, however, was unrelated to desistance from substance use.

The relationship between marriage and desistance from heavy substance use appears to be moderated by race and sex as this association was only observed in the models for whites and females. Further, the analyses by substance type indicate that marital duration was most strongly associated with desistance from binge drinking, although this relationship was observed among whites only. Although this dissertation did not examine change in marital status, this finding is consistent with Temple and colleagues (1991) finding that race and sex moderate the effect of marital transitions on alcohol consumption.

Employment duration was also associated with an increased probability of being classified as a desister from binge drinking, although the relationship between

employment duration and desistance from binge drinking is in the opposite direction from that observed for crime. Increased employment duration was associated with an increased probability of desistance from crime, whereas it is associated with a decreased probability of desistance from binge drinking. This finding is consistent with prior studies that find a direct association between alcohol use and employment (Hajema and Knibbe, 1998; Temple et al., 1991).

The positive association between employment duration and persistence in binge drinking may be explained by several mechanisms. Employment provides individuals with an income with which to support drinking behavior. Longer work histories may also result in greater amounts of work-related stress which individuals may cope with through binge drinking. The inverse relationship between employment duration and desistance from binge drinking may also be explained by a peer effect as employment provides individuals with peers who may also drink. Wright and Cullen (2000) find juveniles who associate with delinquent peers at work were more likely to offend at the workplace as well as in the community.

Although parenthood was unrelated to desistance from heavy substance use in the main model, the subgroup models indicate parenthood may be associated with desistance from heavy substance use among whites and females. The duration of parenthood was associated with an increased probability of being classified as a low level desister from marijuana use among females only. Kandel and Raveis (1989) also find parenthood is associated with desistance from marijuana use among females only. The duration of parenthood was also associated with an increased probability of

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desistance from hard drug use among whites only. This race specific effect may reflect the fact that few blacks in this sample were hard drug users.

The subgroup analyses also indicate a relationship between education and desistance from some forms of substance use although the direction of the relationship differed depending on how education is measured. Educational involvement was associated with an increased probability of desistance from heavy substance use and marijuana use among females only. This suggests enrollment in an educational program would increase the likelihood of desistance from substance use among females. However, educational attainment was inversely related to desistance from binge drinking among whites only and desistance from hard drug use among whites and females. The inverse relationship between educational attainment and binge drinking is consistent with survey research which finds heavy alcohol use is greater among individuals enrolled full time in college (SAMHSA, 2011). Thus, the relationship between education and desistance from substance use appears to be conditional on a number of factors including how education is operationalized, the substance type under consideration, and demographics such as race and sex.

In sum, there were few differences in social bonds between desisters and persisters in substance use although most of the differences between persisters and desisters in crime were found in social bonds. In addition, the direction of the relationship between some of the social bonds, such as employment duration, and substance use was opposite that observed for criminal offending. These conflicting results suggest age-graded informal social control theory (Sampson and Laub, 1993)

may not explain desistance from substance use as well as it explains desistance from crime.

Instead of social bonds, desistance from heavy substance use appears to be more strongly related to differences in strain. Desistance from heavy substance use was associated with greater strains during the transition to adulthood, although there were no differences in strains reported in adulthood. This suggests desistance from heavy substance use is associated with a decrease in strain over time. The strongest effect of strain was observed for marijuana use where desisters had significantly greater levels of strain during the transition to adulthood, but marginally fewer strains during adulthood compared to persisters. The observed relationship between strain and marijuana use is consistent with prior research which finds maturing out of marijuana use during the transition to adulthood is associated with an increased probability of experiencing symptoms of anxiety and reporting interpersonal difficulties such as an increased likelihood of argument with partners, reduced marital harmony, reduced satisfaction with their partners, and greater difficulties in the employment domain (Brook et al., 2011).

The subgroup analyses, however, indicated that the relationship between strain and desistance from substance use may be moderated by sex and depend on substance type as well. In addition to marijuana use, strains in adulthood were also associated with desistance from binge drinking and hard drug use among males. Similar to marijuana use, reduced strain in adulthood was associated with an increased probability of desistance from hard drug use; however, increased strains in adulthood increased the probability of desistance from binge drinking.

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These somewhat contradictory results concerning strains in adulthood and these three different forms of substance use suggests the desistance process may differ across substance type. The association between reduced strain in adulthood and desistance from marijuana and hard drug use suggests that individuals may be coping with strains and their resulting negative emotions through self-medication (Khantzian, 1997). Schulenberg and colleagues (2005) find individuals who increase their marijuana use during the transition to adulthood report the greatest increase in using marijuana to cope with strains. Qualitative research also indicates marijuana use is often used to self-medicate and cope with stressful life events such as parental death (Simpson, 2013). Reduced strains in adulthood would presumably eliminate the need to self-medicate and result in reduced substance use as a consequence.

In contrast, the direct relationship between strains in adulthood and desistance from binge drinking is consistent with the idea that strains themselves may prompt individuals into desistance from binge drinking. Individuals may recognize that many of their strains in life are a direct result of their drinking behavior and reduce their drinking accordingly. This explanation is consistent with the notion of "hitting bottom" in the recovery literature and the "crystallization of discontent" in Paternoster and Bushway's (2009) identity theory.

Risk perceptions regarding the certainty and severity of punishment were unrelated to desistance from substance use, although the subgroup analyses revealed two significant findings. First, blacks who reported an increase in punishment certainty were more likely to desist from marijuana use. The disproportionate representation of blacks in drug arrests, particularly those related to marijuana use

(American Civil Liberties Union, 2013), suggests blacks may desist from marijuana use because they fear receiving special police attention.

Second, an increase in the perceived severity of punishment was associated with a reduced probability of desistance from heavy substance use in general and marijuana use in particular among males. It is not clear why an increase in reported punishment severity would contribute to persistence in substance use. This contradictory result and the weak link between risk perceptions and desistance from substance use in general may reflect the fact that the risk perception measures ask about arrest and punishment risk in regards to criminal offending as opposed to assessing risks associated with substance use. Nonetheless, the results of this dissertation provide little support for rational choice theory in explaining desistance from substance use. However, these results are somewhat consistent with prior perceptual studies of deterrence which indicate perceived certainty has a stronger deterrent effect than perceived severity (Apel, 2013).

In addition to strain, desistance from heavy substance use was related to individual differences in personality. Individuals classified as low level desisters from heavy substance use reported higher levels of conscientiousness and lower levels of neuroticism relative to those who persisted in heavy use. Prior research has linked both excessive alcohol use and drug use to low levels of conscientiousness and high levels of neuroticism (Bogg and Roberts, 2004; Malouff et al., 2007; Terracciano et al., 2008; Turiano et al., 2012). The association between personality and desistance from substance use, however, should be interpreted with caution as each personality trait is measured using only two items and the reliability for each of

the five traits are weak as indicated by the low Cronbach's alpha. Nevertheless, low alpha levels would only weaken the strength of the results rather than bias their direction. As such, the observed association between desistance from heavy substance use and the traits of conscientiousness and neuroticism may be a conservative estimate.

Although conscientiousness and neuroticism were related to desistance from heavy substance use in general, the substance-specific models suggest the relationship between personality and desistance from substance use differs by substance type. Desistance from binge drinking was associated with lower levels of extraversion and neuroticism, whereas desistance from hard drug use was associated with lower levels of openness. Prior research has linked alcohol use with both extraversion and neuroticism. Littlefield and colleagues (2009) find higher levels of extraversion are associated with higher levels of initial problem alcohol use, although changes in this trait were unrelated to changes in problematic alcohol use. Costanzo and colleagues (2007) find persistence in heavy drinking is associated with increased levels of hostility, anxiety and depressive symptoms which are characteristic of individuals high in neuroticism. Unlike extraversion, however, changes in neuroticism over time have been linked to reductions in problem alcohol use (Littlefield et al., 2009).

Fewer studies have found a relationship between openness to experience and both substance use in general and hard drug use in particular. Turiano and colleagues (2012) found higher levels of openness were predictive of increased substance use in a general population sample of adults. Terracciano and colleagues (2008) find current marijuana users score higher on openness relative to former users and non-

users in a diverse community sample, although there were no differences in openness between current cocaine/heroin users and former/non-users. Benotsch and colleagues (2013) find openness to experience is predictive of the non-medical use of prescription drugs in a sample of undergraduate students.

Further, subgroup analyses indicate individual personality trait differences may be more strongly related to desistance from substance use and crime among females. The most consistent association between personality and desistance was found for neuroticism in females. Among females, lower levels of neuroticism were associated with an increased probability of desistance from each of the behaviors examined in this dissertation except for binge drinking in which no desister group was revealed. The personality trait of neuroticism thus appears to be strongly associated with females' involvement in criminal offending and substance use. Prior research also suggests gender may moderate the relationship between neuroticism and involvement in antisocial behavior, although neuroticism has been found to be more strongly associated with males' involvement in antisocial behavior (Miller and Lynam, 2001).

Is Desistance from Crime and Substance Use "Universal"?

Finally, although the factors associated with desistance form crime appear to differ from the factors associated with desistance from substance use, the results of the dual trajectory model indicate a high degree of concordance between trajectories of crime and substance use from adolescence to young adulthood. This result is consistent with Sullivan and Hamilton's (2007) joint latent class analysis of criminal behavior and substance use in a sample of serious youth offenders. Their analysis

indicated that substance use and crime tend to "ebb and flow together" although the persistence of substance use later in the life course suggested some independence between these behaviors.

While the results of the dual model indicate that individuals who are desisting from crime are also most likely desisting from substance use, there is still a relatively high probability that individuals desisting from crime either increase their substance use during the transition to adulthood or continue to be heavy substance users. This finding may reflect one of two possibilities. First, this could be a measurement artifact such that self-reported arrest is a poor indicator of criminal behavior and that these individuals are persisting in criminal behavior even though they report not getting arrested. This finding may also reflect behavioral displacement such that individuals are displacing criminal behavior with substance use. This is consistent with Massoglia's (2007) finding in the NYS that youth reduce their involvement in normative adolescent delinquency during the transition to adulthood with increased substance use.

In sum, the results of the dual trajectory model seem to contradict the findings from the first part of the analysis. Although the factors associated with desistance from crime appear to differ from those factors associated with desistance from substance use, the results of the dual trajectory model indicate that in most cases individuals who are desisting from crime are also desisting from heavy substance use. The question is then what might explain this apparent discrepancy and how it can be reconciled with prior research which suggests adult social bonds are associated with

desistance from both criminal behavior and substance use. This question is addressed in the following section.

Theorizing About Desistance

The results of this dissertation have important implications for theories of desistance from crime and substance use. As a whole, the results of this dissertation suggest desistance from crime is primarily associated with differences in social bonds, whereas desistance from substance use is associated with reduced strain and individual personality differences. These results seem to suggest different theories are needed to explain desistance from crime on one hand and desistance from substance use on the other. For instance, Sampson and Laub's (1993) age-graded theory of informal social control appears to provide a better explanation of why individuals desist from crime than why they desist from heavy substance use. In contrast, desistance from substance use may be better explained by strain and/or trait theories.

The results of the dual trajectory model, however, suggest a high degree of concordance between offending and substance use trajectories. When considered along prior research which finds adult social bonds are associated with desistance from both crime and substance use, the seemingly discrepant results of this dissertation suggest that although similar factors may promote change in multiple behaviors, the mechanism by which change is brought about differs across behavior. This suggests that desistance from externalizing behaviors such as crime and substance use may be best explained by an integrated theory which incorporates elements from social control, strain, learning, and trait theories.

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For instance, it is possible that adult social bonds promote desistance from crime through their influence on the social context, whereas adult social bonds promote desistance from heavy substance use through their impact on strain and personality development. Entry into adult social roles, such as marriage and employment, involve immediate changes in the social context which (1) "knife off" the past from the present, (2) provide supervision, monitoring, and opportunities for social support and growth as well as (3) bring change and structure to routine activities (Laub and Sampson, 2003). Such changes have immediate effects on opportunities to offend as individuals spend more time with their spouse or at work and less time with peers (Warr, 1998). This may only be true, however, for individuals with high quality social bonds as those who are weakly bonded may continue to associate with deviant peers.

However, entry into adult social roles may have less of an impact on opportunities to use substances as spouses and co-workers themselves may provide opportunities conducive to substance use. Prior research finds individual's substance use is highly correlated with their partner's substance use (see Rhule-Louie and McMahon, 2007 for a review). Thus, while we might expect married individuals to spend less time with deviant peers and be less likely to offend because of reduced opportunities, marriage may be less likely to effect changes in substance use behavior as individuals' substance use is highly correlated with their partners' substance use.

Although the results of this dissertation indicate substance use behavior is more strongly related to reduced strain and individual personality traits rather than social bonds, it is possible that adult social bonds promote desistance from substance

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use through their impact on (1) strains and individuals' abilities to cope with strains as well as (2) individual personality development. A lack of meaningful employment or satisfying relationships may itself be a source of strain for many individuals. Not only would entry into meaningful employment or satisfying relationships reduce these strains, but these bonds would also provide social support and social capital which individuals may use to cope with other strains.

Adult social bonds may also promote desistance from substance use through their impact on personality development. An emerging line of research suggests personality change is associated with "maturing out" of the use of various substances including alcohol (Littlefield et al., 2010) and tobacco (Littlefield and Sher, 2012; Welch and Poulton, 2009). Studies on personality development find that personality changes over the life course such that individuals become more socially dominant, conscientious and emotionally stable as they age (Roberts, Walton, and Viechtbauer, 2006). Further, while such development occurs throughout the life course, young adulthood is the period of the life course during which the greatest changes in personality occur and is also the period during which most individuals enter into adult social bonds such as marriage and employment.

It is possible that adult social bonds catalyze personality development such that individuals will more readily desist from substance use. Prior research finds major life events, such as marriage, contributes to personality change such that those who enter into social bonds experience greater personality change than those who experience no change in such bonds (Specht, Egloff, and Schmukle, 2011). However, it may be the quality of the social bond rather than the bond itself which acts as a

catalyst for personality change. Robins, Caspi, and Moffitt (2002) find individuals in bad relationships become more anxious, angry and alienated, whereas remaining in a good relationship over an extended period of time makes individuals "more cautious and restrained in his or her thoughts, feelings, and behaviors" (954). Thus, weak social bonds may promote persistence in substance use because individuals need to cope with the negative emotions that accompany such bonds.

Further, the traits that undergo the most change as a result of entry into such bonds are also those most closely linked to substance use, namely conscientiousness and neuroticism. Prior research indicates that individuals who become more involved in their work and those who remain in stable marriages increase on measures of conscientiousness (Roberts, Caspi, and Moffitt, 2003; Roberts and Bogg, 2004). Littlefield, Sher and Wood (2009) find marriage and parenthood are associated with steeper reductions in neuroticism during the transition to adulthood. They also find that the effect of marriage and parenthood on problem drinking disappears once controls are included for individual personality differences.

There is also some research on the influence of marriage on individual levels of self-control. Forrest and Hay (2011) find individuals in the NLSY 1979 cohort who became married reported greater increases in self-control than the mean improvement in self-control observed for the sample. Their analysis also finds marriage is associated with an increased probability of desistance from marijuana use and that this marriage effect is partially mediated through its impact on self-control. Increases in self-control accounted for 16% of the effect of marriage on desistance from marijuana use.

If different causal mechanisms are involved in desistance from crime and substance use, then this may explain why substance use usually persists later in the life course. Whereas changes to the social context, such as getting married or becoming employed, have an immediate effect on structuring opportunities for offending, normative changes in personality development during the transition to adulthood may take longer to manifest and affect substance use behavior. The sharp drop-off in criminal behavior during the transition to adulthood may reflect the immediate changes to individuals' routine activities and opportunities to offend following entry into adult social bonds. In contrast, the persistence of substance use beyond criminal offending may reflect the slower mechanism of personality development or change in propensity.

This explanation is also consistent with research that finds the marriage effect becomes stronger over time (Laub, Nagin, and Sampson, 1998). Whereas changes in the social environment due to marriage create immediate changes in opportunities to offend, the effect of marriage on personality may take longer to develop. Robins, Caspi, and Moffitt (2002) find relationship experiences predicted change in personality over a five year period, whereas Asendorpf and Wilpers (1998) find relationship experiences were unrelated to personality change over an 18-month period. The increase in the strength of the marriage effect over time may reflect the compounding of the initial changes to the social context which accompany adult bonds with changes in individual personality that accumulate over time.

Limitations

        This dissertation suffers from various limitations related to the sample used, the analytic method, and the measurement of independent and dependent variables. First, the use of a general population sample such as the NLSY97 to study desistance from crime and substance use is problematic for several reasons. Since it is a general population sample, there are few individuals in this sample who are heavily involved in crime or substance use. Thus, the results from this study may not generalize to more serious offending and substance using populations. This limitation would seem to be a greater problem for the outcomes of arrest and hard drug use which are relatively uncommon in a general population sample. In contrast, this may be less of a limitation for the outcomes of binge drinking and marijuana use which are normative behaviors in the general population.

        In addition, data in the NLSY97 only captures the developmental period from mid-adolescence to about age 30. This is problematic as the results of this dissertation may not generalize to individuals who desist beyond age thirty. As such, the factors associated with desistance after age thirty may differ from those associated with desistance during the transition to adulthood. Individuals who are still active offenders and substance users in their thirties are likely more serious offenders and substance users compared to those who cease their activities during the transition to adulthood.

        Further, it is not possible to assess whether the offending or substance use behavior of individuals changes beyond age thirty. As a result, individuals classified as desisters in this study may resume their offending or substance use after this age.

Thus, some individuals classified as desisters in this dissertation may not have actually desisted from the behavior in question.

Several limitations of this dissertation are associated with the use of group based trajectory modeling to study desistance. First, prior research indicates trajectory models are sensitive to sample size, follow-up length and the inclusion or exclusion of incarceration and mortality information (Eggleston, Laub, and Sampson, 2004). Additional data waves may affect substantial changes in trajectory shape, peak age and group membership. Changes in group membership may, in turn, affect the results of the analyses examining predictors of group membership. Although this is a limitation, the potential impact may be relatively minor in this dissertation as the groups that are most affected are those in which individuals are still offending by the end of the observation period (Eggleston, Laub, and Sampson, 2004), and most individuals in the NLSY97 appear to have desisted by the end of the observation period.

Another limitation to this study is the use of multinomial logistic regression to identify factors associated with trajectory group membership. This approach requires individuals to be hard classified into the trajectory group with which they have the greatest probability of membership. This is problematic as trajectory group membership is probabilistic and hard classification necessarily removes this uncertainty in group membership. Although this classification scheme fails to account for uncertainty in group membership, the results using hard classification will be similar to the results obtained from calculating group specific weighted averages as long as the average posterior probability of membership for each of the trajectory

groups is sufficiently high (> .70) (Nagin, 2005). Each of the models examined in this dissertation met this .70 threshold.

Several limitations of this dissertation pertain to the measurement of dependent and independent variables. First, the use of self-reported arrest as a measure of offending activity may be misleading as individuals may provide inaccurate information about their arrest history. The use of official arrest records or self-reported offending behavior may result in different trajectories and produce different results in regards to desistance from offending.

The measurement of substance use in the NLSY is also limited in many respects. Substance use measures in the NLSY are limited to the questions of whether an individual used the substance, the frequency of use and whether use occurred before or during school or work at each wave. There are no measures in the NLSY that designate whether individuals suffer from substance abuse or dependence or whether individuals are experiencing problems due to their substance use. As a result, this dissertation focused on change and continuity in the frequency of substance use rather than whether individuals recovered from a substance abuse or dependence problem. This is an important limitation as problems that are a result of substance use itself, such as health or financial problems, may motivate desistance from substance use.

Another limitation to this dissertation lies in the measurement of hard drug use. Hard drug use is a broad category and fails to capture whether there are any differences in (a) trajectories of use across different types of hard drugs or (b) the factors associated with desistance from the use of specific hard drugs. Further, this

categorization of hard drug use makes it impossible to determine whether these are individuals who are experimenting with a variety of different drugs or whether they are frequent users of a specific drug. It is important to capture this distinction as the desistance process may differ for those individuals who are frequent users of a particular hard drug, such as cocaine, and for polydrug users. Frequent users of a specific drug may be more likely to be addicted and thus may have more difficulty in desisting from hard drug use than polydrug users.

The measurement of risk perceptions is another limitation to this dissertation. Risk perceptions were measured by assessing change in the perceived risk of arrest and punishment for auto theft over time. These were measured relatively early in the observation period and there were no questions that assessed whether individuals experienced changes in risk perceptions in other domains. While measurement of perceived certainty and severity of punishment may be relevant for criminal offending, risk perceptions regarding punishment may be a poor measure of whether changes in risk perceptions contribute to changes in substance use behavior. Instead, a better measure may assess whether individuals report changes in the risks associated with the use of different drugs. For instance, individuals may desist from substance use because their perceptions about the dangerousness of a particular substance increase over time or because they believe they have an increased likelihood of doing something they would regret doing while under the influence and not because they think they have a higher probability of getting caught or being severely punished.

The measurement of personality in this study is problematic in that it was only measured at one wave – wave 12 – so it was not possible to assess whether, and to

what degree, personality may have changed during the observation period. Future investigations of desistance from substance use should continue to examine the role of personality change in the desistance process. Although personality differences were not associated with desistance from crime, future research on desistance should explore the extent to which personality changes may be associated with desistance from crime.

There are several factors not examined in this dissertation that may be associated with desistance from crime and substance use. For instance, this dissertation did not consider whether changes in peer relations may be associated with desistance from crime or substance use. Warr (1998) suggests desistance from crime during the transition to adulthood may be explained by changing peer relations including spending less time with peers and reduced exposure to delinquent peers. Reductions in the proportion of substance using peers has also been linked to desistance from the use of different substances including marijuana (Schulenberg et al., 2005). Since there were no controls for peers in this study, it was not possible to determine whether changes in the proportion of offending or substance using peers is associated with desistance.

In addition, this dissertation did not include a measure of Gottfredson and Hirschi's (1990) concept of self-control so it is not possible to assess whether self-control is associated with desistance from crime or substance use. However, the personality traits of Agreeableness and Conscientiousness capture many of the traits associated with self-control (Miller and Lynam, 2001). Finally, this dissertation did not consider whether any interventions, such as incarceration or substance use

treatment, may be associated with desistance. The NLSY97 contains no information on whether individuals received any treatment for a substance use problem. This is less of a concern in a general population sample which contains fewer individuals involved in heavy levels of substance use.

Future Directions

The results of this dissertation and its limitations suggest several possible avenues for future research. One future avenue for research is to assess the generalizability of the results by replicating this study using a sample of serious offenders or substance users. The prevalence of offending and hard drug use is relatively low in general population samples such as the NLSY97 and the use of a more serious offending or substance using sample, such as in the Pathways to Desistance study, may reveal differences between those who persist and those who desist. While the Pathways to Desistance data may be ideal for replication of the current study, the Pathways study only follows offenders till their mid-twenties and serious juvenile offenders are more likely than those in the general population to persist in crime and substance use beyond that age.

Second, future research on desistance from crime and substance use should use an observation period that extends beyond age thirty. The focus of this dissertation was on desistance during the transition to adulthood. Since the observation period did not extend past thirty years, it is not possible to assess whether the factors associated with desistance from these behaviors during the transition to adulthood are similar to those factors associated with desistance later in life. Further, a longer follow-up period will reduce the probability of individuals being falsely

classified as desisters as individuals may be intermittent offenders or relapse in their substance use beyond age thirty.

Third, the results of this exploratory study suggest desistance from crime and desistance from substance use may be best explained by different causal mechanisms. Future explanatory studies of desistance from crime and substance use would benefit from a closer examination of the causal mechanisms that link changes in individual traits and in the social context to behavioral change. Thus far, the criminological literature has largely focused on the causal effect of social bonds on desistance from crime while devoting less attention to the role of other possible factors such as strains or personality change. Although the results of this study suggest personality change may be more important in explaining desistance from heavy substance use than desistance from crime, it has been suggested that the age-crime curve reflects normative changes in personality traits such as disinhibition and negative emotionality over the life course (Blonigen, 2010).

Fourth, future studies should approach the study of desistance from crime and substance use with more detailed measures of substance use. The distinction between different types of hard drugs will allow researchers to investigate whether the factors associated with desistance differ across substance type. The use of substance specific measures also makes it possible to discern individuals who use one drug frequently from polydrug users who use a variety of hard drugs. In addition to more detailed categories of hard drugs, future studies on desistance from substance use should include measures that allow for the classification of whether individuals suffer from drug abuse or dependence as well as information on what types of problems

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individuals may be attributing to their substance use. Problems arising from substance use itself may serve as the initial motivators for desistance for many individuals.

Future research could more thoroughly explore the relationship between change in risk perceptions and change in offending and substance use. Although the results of this dissertation indicate no relationship between change in perceived certainty and severity of punishment, the measure of risk perceptions used in this study is limited in the sense that it only captured change in risk perceptions during a relatively small window relative to the total observation period and examined change in risk perceptions in the offending domain only. Future research should examine change in risk perceptions over a longer period of time and assess risk perceptions that are pertinent to the domain under study. For instance, change in risk perceptions regarding punishment certainty and severity may be unrelated to desistance from substance use, but increases in the perceived risks associated with the use of specific drugs, such as health problems, may promote desistance from substance use.

Fifth, future research should also consider the possible role of other factors in desistance from crime and substance use not examined in this dissertation. Perhaps the most important factor to be examined in future research on desistance is that of peers. It will be important that future research on the role of peers in desistance capture both peer associations as well as time spent with peers to assess whether desistance is associated with a change in the peers with which one associates and/or a change in the amount of time spent with peers.

Other important domains to examine for future research on desistance include religiosity, health, and emotions. Religiosity has been linked to desistance from both crime (Giordano et al., 2008) and substance use (Chu, 2007). Changes in health status may also have implications for desistance from crime and substance use, although such changes may be more strongly related to desistance from substance use than crime. Health problems resulting from substance use itself may serve as powerful motivators for behavioral change (e.g. Waldorf et al., 1991). Although health status may be more closely related to desistance from substance use, deteriorations in health and physical attributes, such as strength and agility, during the life course may affect individuals' decisions to offend. Desistance from crime has also been linked to changes in emotional processes that accompany aging such as the attenuation of negative emotions and an improved ability to regulate emotions (Giordano et al., 2007).

Future research should also continue to explore the extent to which desistance occurs across behaviors. Thus far, most research on desistance in the crime literature has focused on quantitative change in the frequency of offending rather than examining possible qualitative changes such as behavioral displacement. This dissertation focused on desistance from two externalizing behaviors: crime and substance use. Although the results of the dual trajectory model suggest desistance is universal in the sense that individuals classified as desisters from crime are most likely to be classified as desisters from heavy substance use, there was still a relatively high probability that individuals persist in heavy substance use despite desistance from crime. This finding suggests there may be differences among

individuals who are universal desisters in the sense that they experience change across multiple behaviors whereas partial desisters may display improvement in some behaviors but not others.

The distinction between universal desistance and partial desistance has particularly important implications for testing theories proposed to explain problem behaviors in general rather than crime in particular such as Gottfredson and Hirschi's (1990) self-control theory or Moffitt's (1993) dual taxonomy. The failure to consider change across multiple problem behaviors in testing theories proposed to explain problem behavior in general precludes any conclusions from being drawn regarding the veracity of such theories due to the possibility of behavioral displacement. Thus, future studies should explore (1) whether there are changes in other externalizing behaviors and (2) whether there are differences between "universal" desisters and individuals who desist from some externalizing behaviors but not others.

Future research should also consider the timing of desistance across crime and substance use. While this dissertation finds desistance from crime is more than likely associated with desistance from substance use, the results of this dissertation cannot speak to the timing of desistance from these behaviors. Although involvement in substance use tends to persist beyond involvement in crime, it may not always be the case that individuals desist from crime before cessation of substance use. It is possible that cessation of substance use behavior precedes desistance from crime if the main function of crime was to provide income with which to support substance use. Cessation of substance use may also precede desistance from crime by affecting individuals' decision making and restoring inhibitions against crime. Alternatively,

desistance from crime and substance use may occur simultaneously if these behaviors are being driven by the same factors. For instance, if involvement in both crime and substance use are being driven by peer associations, then changes in these associations may concurrently promote desistance from both behaviors.

Future research should continue to use group-based trajectory modeling to study desistance from crime and substance use. The approach taken in this dissertation illustrates just one way in which this method can be used to study desistance. The application of group-based trajectory modeling in this study did not account for uncertainty in group membership by controlling for involvement in marriage, education, and employment. Future studies using this method may account for this uncertainty by including involvement in these social bonds as time varying covariates.

Finally, future research on desistance from crime and substance use should continue to use a variety of methodological approaches. The analytic method used in this study, group based trajectory modeling, is just one statistical technique that may be used to study desistance. This method, like every other statistical method, has its limitations. As such, it is important that future research on desistance from crime and substance use utilize alternative methodologies to gain a better understanding of desistance from these behaviors. Multi-method studies that incorporate both quantitative and qualitative data may be especially important in improving our understanding of desistance. The supplementation of qualitative data with quantitative data can provide insight into the mechanisms promoting behavioral change including whether the mechanisms differ across behaviors. Such multi-

method designs may be especially suitable for addressing causal questions relating to desistance from crime and substance use.

Tables

Table 1. Descriptive Statistics for Analysis Sample (n=3379)

Variable	Mean	Std Dev	Minimum	Maximum
Age at Baseline	14.41	1.10	13	16
Ever Married	0.47	0.50	0	1
Age First Married	23.85	3.21	15.08	31.25
First Marriage Duration	4.99	3.10	0.03	16.22
Married Time	0.17	0.23	0	0.93
Marital Disruption	0.10	0.31	0	1
Ever Parent	0.53	0.50	0	1
Age First Parent	22.44	3.80	10.00^4	31.08
Parent Time	0.23	0.28	0	1
Job Satisfaction	2.19	0.58	1	5
Weeks Worked	362.79	134.94	0	601
Number of Jobs	5.73	3.37	0	35
HS Graduate	0.81	0.39	0	1
Education Time	0.40	0.21	0	1
Strains Wave 6	1.03	0.93	0	5
Strains Wave 11	0.92	0.85	0	5
Arrest Risk	0.38	0.49	0	1
Jail Risk	0.49	0.50	0	1
Openness	5.46	1.09	1	7
Conscientiousness	5.72	1.10	1	7
Extraversion	4.68	1.37	1	7
Agreeableness	4.97	1.12	1	7
Neuroticism	2.98	1.31	1	7
Male	0.49	0.50	0	1
Black	0.27	0.45	0	1
Hispanic	0.21	0.41	0	1
Total Arrests	1.00	2.78	0	62e
Ever Arrested	0.32	0.47	0	1
Ever Binge Drink	0.79	0.41	0	1
Ever Used Marijuana	0.49	0.50	0	1
Ever Used Hard Drugs	0.23	0.42	0	1

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[4] Four respondents reported becoming parents before fourteen years of age.

Table 2. Ten Item Personality Inventory (TIPI)

Personality Dimension	Trait Pair	Cronbach's α
Agreeableness	Critical, quarrelsome (R) Sympathetic, warm	.09
Conscientiousness	Dependable, self-disciplined Disorganized, careless (R)	.45
Extraversion	Extraverted, enthusiastic Reserved, quiet (R)	.38
Neuroticism	Anxious, easily upset Calm, emotionally stable (R)	.49
Openness to experience	Open, complex Conventional, uncreative (R)	.17

(R) denotes items that were reverse coded

Table 3. BIC Scores and Size of Smallest Trajectory Group for Analysis Sample (n=3379)

	BIC	BIC	Size of Smallest Trajectory Group (%)
Arrest	(n=49863)	(n=3379)	
Two groups	-8036.24	-8024.13	15.96
Three groups	-7998.72	-7979.88	7.01
Four groups	-8005.50	-7979.93	3.60
Five groups	-8024.72	-7992.42	2.54
Six groups	-8039.18	-8000.15	1.43
Heavy Sub. Use	(n=50685)		
Two groups	-15869.19	-15857.00	25.62
Three groups	-15388.96	-15370.01	9.83
Four groups	-15177.30	-15151.58	8.77
Five groups	-15156.13	-15123.63	7.11
Six groups	-15117.75	-15078.48	5.01
Binge Drinking	(n=49565)		
Two groups	-47965.06	-47951.64	40.15
Three groups	-46726.28	-46706.14	15.41
Four groups	-46320.78	-46293.93	14.65
Five groups	-46111.15	-46077.58	8.55
Six groups	-45998.79	-45958.50	6.80
Marijuana Use	(n=49933)		
Two groups	-25214.84	-25201.37	19.73
Three groups	-24216.23	-24196.03	9.93
Four groups	-23878.58	-23851.65	5.52
Five groups	-23731.92	-23698.26	5.51
Six groups	-23572.27	-23531.87	3.83
Hard Drug Use	(n=46496)		
Two groups	-8947.13	-8934.02	12.40
Three groups	-8843.67	-8824.00	4.95
Four groups	-8739.30	-8713.08	1.89
Five groups	-8809.96	-8777.19	2.28
Six groups	-8924.27	-8884.94	0.00

Table 4. Arrest Trajectory Group Profiles for Analysis Sample

	Conformers n=2864	Late Risers n=110	Desisters n=316	Persisters n=89
	Mean	Mean	Mean	Mean
Posterior Probability	0.89	0.72	0.78	0.78
Ever Married	0.48	0.30	0.42	0.31
Age First Married	23.86	24.60	23.64	23.12
Marriage Duration	5.03	4.29	4.93	4.03
Married Time	0.17	0.07	0.14	0.08
Marital Disruption	0.10	0.13	0.14	0.19
Ever Parent	0.52	0.45	0.49	0.63
Age First Parent	22.69	21.97	21.50	20.10
Parent Time	0.23	0.18	0.26	0.21
Job Satisfaction	2.17	2.30	2.29	2.34
Number of Jobs	5.58	6.86	6.19	7.58
Weeks Worked	370.58	324.39	325.91	290.27
HS Graduate	0.86	0.68	0.55	0.43
Education Time	0.42	0.34	0.29	0.23
Strains Wave 6	0.99	1.16	1.26	1.43
Strains Wave 11	0.89	1.12	1.00	1.30
Arrest Risk	0.38	0.35	0.38	0.39
Jail Risk	0.49	0.49	0.53	0.52
Openness	5.45	5.47	5.45	5.45
Conscientiousness	5.77	5.25	5.53	5.35
Extraversion	4.71	4.65	4.50	4.60
Agreeableness	5.00	4.84	4.77	4.83
Neuroticism	2.93	3.37	3.18	3.29
Male	0.45	0.76	0.76	0.78
Black	0.27	0.33	0.28	0.34
Hispanic	0.21	0.21	0.22	0.17

Table 5. Heavy Substance Use Trajectory Group Profiles for Analysis Sample

	Non-Heavy/Non-Users n=2141	High Level Desisters n=181	Low Level Desisters n=359	Late Risers n=442	Heavy Users n=256
	Mean	Mean	Mean	Mean	Mean
Posterior Probability	0.90	0.78	0.77	0.81	0.89
Ever Married	0.49	0.46	0.49	0.41	0.31
Age First Married	23.62	24.80	23.85	24.18	25.19
Marriage Duration	5.15	4.26	5.04	4.65	4.23
Married Time	0.18	0.14	0.18	0.13	0.09
Marital Disruption	0.11	0.08	0.11	0.11	0.06
Ever Parent	0.57	0.48	0.57	0.43	0.35
Age First Parent	22.32	23.16	22.96	22.21	22.66
Parent Time	0.26	0.17	0.22	0.17	0.12
Job Satisfaction	2.19	2.20	2.19	2.16	2.22
Number of Jobs	5.49	6.29	5.93	6.06	6.52
Weeks Worked	358.25	382.28	351.70	372.10	386.44
HS Graduate	0.83	0.78	0.74	0.80	0.80
Education Time	0.41	0.37	0.38	0.39	0.39
Strains Wave 6	1.01	1.16	1.13	1.04	0.99
Strains Wave 11	0.91	0.87	0.91	0.97	0.96
Arrest Risk	0.37	0.38	0.40	0.39	0.41
Jail Risk	0.48	0.48	0.49	0.51	0.57
Openness	5.40	5.49	5.49	5.60	5.56
Conscientiousness	5.79	5.50	5.74	5.65	5.37
Extraversion	4.58	4.84	4.89	4.79	4.97
Agreeableness	5.04	4.93	4.93	4.87	4.66
Neuroticism	2.92	3.10	2.99	3.07	3.19
Male	0.40	0.66	0.56	0.64	0.79
Black	0.33	0.04	0.18	0.24	0.15
Hispanic	0.22	0.19	0.20	0.19	0.18

Table 6. Correlation Matrix (Pearson Correlation Coefficients) of Individual Characteristics

	Married Time	Marital Disruption	Parent Time	Job Satisfaction	Number of Jobs	Weeks Work	HS Graduate
Married Time		0.218	0.364	-0.130	-0.060	0.064	0.018
Marital Disruption	0.218		0.168	0.021	0.069	-0.041	-0.044
Parent Time	0.364	0.168		0.035	-0.069	-0.109	-0.240
Job Satisfaction	-0.130	0.021	0.035		0.065	-0.137	-0.088
Number of Jobs	-0.060	0.069	-0.069	0.065		0.187	0.004
Weeks Work	0.064	-0.041	-0.109	-0.137	0.187		0.218
HS Graduate	0.018	-0.044	-0.240	-0.088	0.004	0.218	
Educ. Time	-0.130	-0.093	-0.357	-0.090	-0.001	-0.019	0.451
Strains Wave 6	-0.054	0.033	0.042	0.065	0.081	-0.074	-0.106
Strains Wave 11	-0.022	0.000	0.024	0.081	0.060	-0.108	-0.076
Arrest Risk	0.028	0.010	-0.027	0.017	0.015	-0.009	0.001
Jail Risk	0.027	-0.039	-0.012	-0.002	-0.009	0.017	0.020
Openness	-0.065	-0.003	-0.069	-0.053	0.119	0.072	0.020
Conscientiousness	0.045	0.018	0.031	-0.098	-0.039	0.056	0.043
Extraversion	0.057	0.032	0.000	-0.207	0.055	0.096	0.090
Agreeableness	0.066	0.028	0.042	-0.068	0.053	0.018	0.039
Neuroticism	-0.013	0.061	0.111	0.149	0.015	-0.104	-0.113
Male	-0.104	-0.063	-0.344	-0.006	0.001	0.057	-0.038
Black	-0.210	-0.048	0.115	0.188	0.008	-0.155	-0.067
Hispanic	0.082	0.016	0.098	-0.031	-0.090	0.015	-0.054

Table 6. Correlation Matrix (Pearson Correlation Coefficients) of Individual Characteristics (cont.)

	Education Time	Strains W. 6	Strains W. 11	Arrest Risk	Jail Risk	Openness	Conscientiousness
Married Time	-0.130	-0.054	-0.022	0.028	0.027	-0.065	0.045
Marital Disruption	-0.093	0.033	0.000	0.010	-0.039	-0.003	0.018
Parent Time	-0.357	0.042	0.024	-0.027	-0.012	-0.069	0.031
Job Satisfaction	-0.090	0.065	0.081	0.017	-0.002	-0.053	-0.098
Number of Jobs	-0.001	0.081	0.060	0.015	-0.009	0.119	-0.039
Weeks Work	-0.019	-0.074	-0.108	-0.009	0.017	0.072	0.056
HS Graduate	0.451	-0.106	-0.076	0.001	0.020	0.020	0.043
Educ. Time		-0.078	-0.026	0.021	0.036	0.064	0.035
Strains W. 6	-0.078		0.171	0.002	0.002	0.038	-0.027
Strains W. 11	-0.026	0.171		-0.017	-0.025	0.030	-0.062
Arrest Risk	0.021	0.002	-0.017		0.230	-0.006	-0.016
Jail Risk	0.036	0.002	-0.025	0.230		0.009	-0.027
Openness	0.064	0.038	0.030	-0.006	0.009		0.156
Conscientiousness	0.035	-0.027	-0.062	-0.016	-0.027	0.156	
Extraversion	0.085	-0.004	-0.001	0.013	-0.026	0.239	0.104
Agreeableness	0.033	0.032	0.022	0.020	0.000	0.165	0.117
Neuroticism	-0.128	0.063	0.054	0.014	0.000	-0.184	-0.247
Male	-0.056	-0.028	-0.064	-0.014	0.058	0.008	-0.056
Black	-0.050	0.084	0.089	-0.011	-0.015	0.036	0.073
Hispanic	-0.090	-0.009	-0.021	-0.035	-0.021	-0.021	-0.023

Table 6. Correlation Matrix (Pearson Correlation Coefficients) of Individual Characteristics (cont.)

	Extraversion	Agreeableness	Neuroticism	Male	Black	Hispanic
Married Time	0.057	0.066	-0.013	-0.104	-0.210	0.082
Marital Disruption	0.032	0.028	0.061	-0.063	-0.048	0.016
Parent Time	0.000	0.042	0.111	-0.344	0.115	0.098
Job Satisfaction	-0.207	-0.068	0.149	-0.006	0.188	-0.031
Number of Jobs	0.055	0.053	0.015	0.001	0.008	-0.090
Weeks Worked	0.096	0.018	-0.104	0.057	-0.155	0.015
HS Graduate	0.090	0.039	-0.113	-0.038	-0.067	-0.054
Education Time	0.085	0.033	-0.128	-0.056	-0.050	-0.090
Strains Wave 6	-0.004	0.032	0.063	-0.028	0.084	-0.009
Strains Wave 11	-0.001	0.022	0.054	-0.064	0.089	-0.021
Arrest Risk	0.013	0.020	0.014	-0.014	-0.011	-0.035
Jail Risk	-0.026	0.000	0.000	0.058	-0.015	-0.021
Openness	0.239	0.165	-0.184	0.008	0.036	-0.021
Conscientiousness	0.104	0.117	-0.247	-0.056	0.073	-0.023
Extraversion		0.050	-0.134	-0.085	-0.095	-0.017
Agreeableness	0.050		-0.256	-0.205	0.005	-0.049
Neuroticism	-0.134	-0.256		-0.152	-0.013	0.026
Male	-0.085	-0.205	-0.152		-0.041	-0.012
Black	-0.095	0.005	-0.013	-0.041		-0.314
Hispanic	-0.017	-0.049	0.026	-0.012	-0.314	

Table 7. Multinomial Logit Model Predicting Arrest Trajectory Group Membership

	Conformers vs. Persisters		Late Risers vs. Persisters		Desisters vs. Persisters	
	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	3.744***	0.895	0.063	1.176	2.598**	0.923
Marital Disruption	-1.380***	0.356	-0.445	0.463	-0.939*	0.379
Parent Time	-0.089	0.562	0.172	0.721	0.795	0.599
Job Satisfaction	-0.003	0.204	0.015	0.257	0.088	0.217
Number of Jobs	-0.154***	0.029	-0.049	0.036	-0.091**	0.031
Weeks Worked	0.005***	0.001	0.002^	0.001	0.0023*	0.001
HS Graduate	0.812**	0.276	0.407	0.354	-0.007	0.294
Education Time	5.427***	0.938	3.637***	1.088	3.011**	0.986
Strains Wave 6	-0.207^	0.114	-0.156	0.146	-0.025	0.121
Strains Wave 11	-0.388**	0.121	-0.140	0.153	-0.283*	0.129
Arrest Risk	-0.083	0.246	-0.175	0.310	-0.086	0.261
Jail Risk	-0.324	0.242	-0.230	0.303	-0.124	0.257
Openness	-0.019	0.108	0.020	0.136	0.048	0.115
Conscientiousness	0.212*	0.099	-0.063	0.123	0.104	0.105
Extraversion	-0.163^	0.090	-0.019	0.112	-0.146	0.095
Agreeableness	-0.020	0.110	0.074	0.139	-0.053	0.117
Neuroticism	-0.047	0.093	0.162	0.115	0.044	0.098
Male	-1.942***	0.351	-0.195	0.434	-0.096	0.376
Black	0.269	0.280	0.279	0.352	-0.070	0.299
Hispanic	0.260	0.327	0.337	0.401	0.114	0.345
Intercept	2.272	1.365	-1.337	1.706	0.374	1.451

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 8. Multinomial Logit Model Predicting Heavy Substance Use Trajectory Group Membership

	Non-Heavy vs. Heavy Users		High Desisters vs. Heavy Users		Low Desisters vs. Heavy Users		Late Risers vs. Heavy Users	
	Logit	S.E.	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	2.424***	0.462	1.048^	0.604	2.139***	0.517	1.315*	0.517
Marital Disruption	0.226	0.290	-0.065	0.392	0.132	0.327	0.459	0.315
Parent Time	0.639	0.390	0.255	0.532	0.373	0.447	0.060	0.439
Job Satisfaction	-0.191	0.131	0.015	0.182	-0.051	0.155	-0.259^	0.148
Number of Jobs	-0.062**	0.020	-0.016	0.027	-0.025	0.024	-0.027	0.023
Weeks Worked	-0.001	0.001	-0.001	0.001	-0.002*	0.001	-0.001	0.001
HS Graduate	0.064	0.211	-0.134	0.287	-0.416^	0.243	-0.024	0.237
Education Time	1.258**	0.414	-0.213	0.585	0.561	0.496	0.373	0.468
Strains Wave 6	0.048	0.080	0.238*	0.106	0.182*	0.093	0.060	0.090
Strains Wave 11	-0.141	0.084	-0.165	0.118	-0.148	0.101	-0.018	0.095
Arrest Risk	-0.163	0.148	-0.117	0.207	-0.065	0.176	-0.095	0.167
Jail Risk	-0.333*	0.146	-0.342^	0.202	-0.305^	0.173	-0.242	0.165
Openness	-0.148*	0.072	-0.067	0.101	-0.098	0.085	0.026	0.082
Conscientiousness	0.221***	0.065	0.103	0.090	0.234**	0.078	0.144*	0.073
Extraversion	-0.330***	0.057	-0.130^	0.078	-0.115^	0.067	-0.176**	0.064
Agreeableness	0.121^	0.069	0.172^	0.098	0.087	0.082	0.086	0.078
Neuroticism	-0.239***	0.059	-0.060	0.083	-0.161*	0.071	-0.063	0.067
Male	-1.690***	0.182	-0.574*	0.246	-1.017***	0.211	-0.709***	0.204
Black	1.371***	0.204	-1.552***	0.437	0.236	0.245	0.747***	0.227
Hispanic	0.630***	0.190	-0.108	0.261	0.173	0.225	0.275	0.216
Intercept	4.465	0.877	0.495	1.220	1.695	1.039	1.359	0.994

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 9. Binge Drinking Trajectory Group Profiles for Analysis Sample

	Non-Bingers n=1326	Low Risers n=666	Desisters n=562	Late Risers n=565	Heavy Drinkers n=260
	Mean	Mean	Mean	Mean	Mean
Posterior Probability	0.93	0.81	0.83	0.84	0.91
Ever Married	0.49	0.44	0.54	0.38	0.41
Age First Married	23.14	24.05	23.96	24.88	25.17
Marriage Duration	5.56	4.67	4.93	4.26	4.07
Married Time	0.19	0.15	0.20	0.11	0.12
Marital Disruption	0.11	0.12	0.12	0.08	0.06
Ever Parent	0.62	0.49	0.61	0.35	0.40
Age First Parent	21.92	22.35	23.02	23.17	23.50
Parent Time	0.30	0.20	0.24	0.13	0.14
Job Satisfaction	2.20	2.19	2.16	2.17	2.18
Number of Jobs	5.33	5.92	5.93	5.95	6.43
Weeks Worked	343.67	371.70	360.15	384.67	395.60
HS Graduate	0.81	0.84	0.77	0.81	0.85
Education Time	0.41	0.42	0.37	0.41	0.41
Strains Wave 6	1.02	1.04	1.06	1.04	0.97
Strains Wave 11	0.92	0.96	0.93	0.89	0.81
Arrest Risk	0.36	0.37	0.38	0.40	0.42
Jail Risk	0.48	0.47	0.50	0.50	0.57
Openness	5.38	5.46	5.45	5.56	5.59
Conscientiousness	5.81	5.71	5.69	5.64	5.51
Extraversion	4.48	4.64	4.86	4.86	5.08
Agreeableness	5.10	4.93	4.96	4.78	4.87
Neuroticism	2.92	3.05	3.00	2.99	2.99
Male	0.35	0.53	0.47	0.69	0.77
Black	0.42	0.29	0.12	0.15	0.03
Hispanic	0.20	0.23	0.21	0.20	0.19

Table 10. Marijuana Trajectory Group Profiles for Analysis Sample

	Abstainers	Steady Risers	Desisters	Heavy Users	Experimenters
	n=1801	n=251	n=256	n=200	n=871
	Mean	Mean	Mean	Mean	Mean
Posterior Probability	0.93	0.86	0.86	0.94	0.85
Ever Married	0.49	0.44	0.54	0.38	0.41
Age First Married	23.57	24.64	24.67	24.50	24.02
Marriage Duration	5.31	4.11	3.97	4.62	4.76
Married Time	0.19	0.10	0.11	0.09	0.16
Marital Disruption	0.11	0.09	0.09	0.07	0.12
Ever Parent	0.62	0.49	0.61	0.35	0.40
Age First Parent	22.49	22.72	22.83	22.18	22.24
Parent Time	0.25	0.16	0.20	0.15	0.25
Job Satisfaction	2.15	2.18	2.26	2.30	2.22
Number of Jobs	5.29	6.70	6.98	6.83	5.76
Weeks Worked	368.99	369.06	351.41	370.34	349.77
HS Graduate	0.86	0.84	0.71	0.78	0.74
Education Time	0.42	0.41	0.38	0.37	0.38
Strains Wave 6	0.97	1.09	1.23	1.05	1.09
Strains Wave 11	0.85	0.98	0.99	1.10	0.97
Arrest Risk	0.36	0.34	0.43	0.42	0.41
Jail Risk	0.48	0.53	0.54	0.55	0.48
Openness	5.38	5.68	5.63	5.63	5.46
Conscientiousness	5.81	5.56	5.44	5.39	5.74
Extraversion	4.63	4.76	4.78	4.84	4.70
Agreeableness	4.99	5.04	4.91	4.72	4.99
Neuroticism	2.86	3.06	3.11	3.12	3.11
Male	0.45	0.58	0.58	0.69	0.49
Black	0.31	0.31	0.19	0.26	0.22
Hispanic	0.22	0.14	0.20	0.15	0.21

Table 11. Hard Drug Use Trajectory Group Profiles for Analysis Sample

	Abstainers	Desisters	Heavy Users
	n=2631	n=601	n=147
Posterior Probability	0.96	0.82	0.90
Ever Married	0.47	0.46	0.35
Age First Married	23.86	23.70	24.23
Marriage Duration	5.07	4.72	4.53
Married Time	0.17	0.15	0.11
Marital Disruption	0.09	0.15	0.10
Ever Parent	0.54	0.52	0.39
Age First Parent	22.47	22.32	22.41
Parent Time	0.24	0.22	0.14
Job Satisfaction	2.17	2.25	2.25
Number of Jobs	5.57	6.21	6.71
Weeks Worked	365.26	352.44	360.90
HS Graduate	0.83	0.73	0.79
Education Time	0.41	0.37	0.39
Strains Wave 6	0.99	1.16	1.22
Strains Wave 11	0.90	0.96	1.06
Arrest Risk	0.37	0.39	0.44
Jail Risk	0.48	0.50	0.59
Openness	5.44	5.47	5.70
Conscientiousness	5.79	5.50	5.32
Extraversion	4.65	4.74	4.96
Agreeableness	4.99	4.95	4.77
Neuroticism	2.91	3.16	3.38
Male	0.48	0.53	0.59
Black	0.32	0.13	0.07
Hispanic	0.20	0.23	0.20

Table 12. Multinomial Logit Model Predicting Binge Drinking Trajectory Group Membership

	Non-Bingers vs. Heavy Drinkers		Low Risers vs. Heavy Drinkers		Desisters vs. Heavy Drinkers		Late Risers vs. Heavy Drinkers	
	Logit	S.E.	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	2.359***	0.430	1.236**	0.448	1.690***	0.443	0.366	0.465
Marital Disruption	0.554^	0.305	0.744*	0.310	0.479	0.312	0.417	0.322
Parent Time	0.390	0.403	0.026	0.417	0.068	0.418	-0.776^	0.434
Job Satisfaction	-0.297*	0.140	-0.257^	0.144	-0.183	0.146	-0.177	0.144
Number of Jobs	-0.073***	0.022	-0.032	0.022	-0.021	0.022	-0.037^	0.022
Weeks Worked	-0.002*	0.001	0.000	0.001	-0.002*	0.001	0.000	0.001
HS Graduate	-0.173	0.236	-0.057	0.245	-0.332	0.241	-0.366	0.240
Education Time	0.976*	0.434	0.951*	0.444	-0.286	0.458	0.247	0.444
Strains Wave 6	-0.005	0.084	0.032	0.087	0.069	0.087	0.079	0.086
Strains Wave 11	0.055	0.094	0.160^	0.096	0.103	0.097	0.091	0.096
Arrest Risk	-0.197	0.156	-0.151	0.161	-0.130	0.163	0.012	0.159
Jail Risk	-0.317*	0.154	-0.362*	0.158	-0.225	0.161	-0.277^	0.157
Openness	-0.145^	0.077	-0.086	0.080	-0.088	0.081	-0.001	0.080
Conscientiousness	0.150*	0.070	0.119^	0.072	0.111	0.073	0.086	0.072
Extraversion	-0.447***	0.061	-0.317***	0.062	-0.207**	0.063	-0.165**	0.062
Agreeableness	0.037	0.074	-0.009	0.076	-0.054	0.077	-0.111	0.076
Neuroticism	-0.200**	0.065	-0.046	0.066	-0.133*	0.067	-0.047	0.066
Male	-1.962***	0.184	-1.135***	0.189	-1.400***	0.191	-0.583**	0.192
Black	3.510***	0.358	2.809***	0.362	1.511***	0.374	1.704***	0.368
Hispanic	0.706***	0.192	0.714***	0.196	0.176	0.201	0.237	0.198
Intercept	5.563	0.948	3.099	0.975	4.313	0.989	2.849	0.974

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 13. Multinomial Logit Model Predicting Marijuana Use Trajectory Group Membership

	Abstainers vs. Heavy Users		Steady Risers vs. Heavy Users		Desisters vs. Heavy Users		Experimenters vs. Heavy Users	
	Logit	S.E.	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	2.263***	0.496	0.295	0.627	0.149	0.608	1.246*	0.509
Marital Disruption	0.286	0.317	0.324	0.383	0.185	0.377	0.287	0.324
Parent Time	0.581	0.396	0.028	0.492	0.547	0.478	0.816*	0.406
Job Satisfaction	-0.341*	0.140	-0.382*	0.176	-0.081	0.172	-0.152	0.145
Number of Jobs	-0.113***	0.022	-0.007	0.026	0.017	0.025	-0.068**	0.022
Weeks Worked	0.000	0.001	0.000	0.001	-0.001	0.001	-0.001	0.001
HS Graduate	0.213	0.224	0.196	0.285	-0.368	0.265	-0.292	0.227
Education Time	1.522***	0.458	0.870	0.560	0.603	0.568	1.011*	0.476
Strains Wave 6	0.015	0.086	0.081	0.106	0.203*	0.101	0.094	0.088
Strains Wave 11	-0.308***	0.089	-0.162	0.111	-0.183^	0.109	-0.169^	0.091
Arrest Risk	-0.259	0.162	-0.367^	0.203	0.035	0.198	-0.028	0.167
Jail Risk	-0.246	0.160	0.004	0.198	-0.031	0.197	-0.246	0.166
Openness	-0.242**	0.079	-0.001	0.098	-0.011	0.097	-0.154^	0.081
Conscientiousness	0.246***	0.070	0.070	0.086	0.040	0.084	0.256***	0.072
Extraversion	-0.188**	0.061	-0.101	0.075	-0.066	0.074	-0.120	0.063
Agreeableness	0.114	0.074	0.228*	0.093	0.109	0.092	0.171*	0.077
Neuroticism	-0.129*	0.065	0.050	0.080	-0.028	0.079	0.015	0.067
Male	-0.831***	0.186	-0.305	0.227	-0.352	0.227	-0.543**	0.192
Black	0.732***	0.197	0.443^	0.239	-0.466^	0.253	-0.117	0.206
Hispanic	0.664**	0.223	0.112	0.284	0.214	0.266	0.329	0.229
Intercept	3.564	0.943	-0.288	1.178	0.628	1.155	1.575	0.974

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 14. Multinomial Logit Model Predicting Hard Drug Use Trajectory Group Membership

	Abstainers vs. Heavy Users		Desisters vs. Heavy Users	
	Logit	S.E.	Logit	S.E.
Married Time	1.367**	0.531	0.430	0.560
Marital Disruption	-0.276	0.305	0.210	0.316
Parent Time	1.088*	0.468	0.915^	0.490
Job Satisfaction	-0.266^	0.160	0.000	0.169
Number of Jobs	-0.062*	0.024	-0.017	0.025
Weeks Worked	0.001^	0.001	0.000	0.001
HS Graduate	0.052	0.258	-0.377	0.269
Education Time	1.187*	0.513	0.447	0.548
Strains Wave 6	-0.200*	0.091	-0.045	0.095
Strains Wave 11	-0.175^	0.100	-0.128	0.106
Arrest Risk	-0.180	0.182	-0.129	0.194
Jail Risk	-0.405*	0.183	-0.300	0.194
Openness	-0.277**	0.094	-0.224*	0.099
Conscientiousness	0.233**	0.078	0.083	0.082
Extraversion	-0.188**	0.069	-0.110	0.073
Agreeableness	0.119	0.086	0.139	0.092
Neuroticism	-0.202**	0.072	-0.123	0.076
Male	-0.214	0.198	-0.073	0.212
Black	2.108***	0.334	0.644^	0.353
Hispanic	0.345	0.222	0.169	0.235
Intercept	4.048***	1.070	2.686*	1.131

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 15. BIC Scores and Size of Smallest Trajectory Group for Arrest

	BIC	BIC	Size of Smallest Trajectory Group (%)
Whites	(n=36244)	(n=2456)	
Two groups	-5660.06	-5647.95	15.56
Three groups	-5644.95	-5626.11	8.77
Four groups	-5650.88	-5625.31	3.85
Five groups	-5672.89	-5640.59	2.14
Six groups	-5691.07	-5652.04	2.09
Blacks	(n=13619)	(n=923)	
Two groups	-2403.81	-2391.69	16.03
Three groups	-2404.85	-2386.01	7.59
Four groups	-2424.27	-2398.70	6.47
Five groups	-2438.85	-2406.55	3.81
Six groups	-2458.10	-2419.07	3.52
Males	(n=24573)	(n=1670)	
Two groups	-5299.12	-5287.02	23.49
Three groups	-5276.66	-5257.84	11.34
Four groups	-5284.25	-5258.70	4.54
Five groups	-5302.80	-5270.53	2.89
Six groups	-5316.68	-5277.70	2.88
Females	(n=25290)	(n=1709)	
Two groups	-2653.12	-2641.00	7.18
Three groups	-2662.60	-2643.74	4.15
Four groups	-2673.43	-2647.83	1.07
Five groups	-2692.87	-2660.54	1.00
Six groups	-2720.14	-2681.07	0.00

Table 16. Multinomial Logit Model Predicting Arrest Trajectory Group Membership (Whites)

	Conformers vs. Persisters		Late Risers vs. Persisters		Desisters vs. Persisters	
	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	3.645***	0.709	-0.730	1.252	2.670***	0.718
Marital Disruption	-0.719*	0.338	0.596	0.497	-0.688*	0.347
Parent Time	-0.934^	0.532	-1.070	0.840	0.107	0.542
Job Satisfaction	-0.060	0.198	-0.314	0.300	0.088	0.202
Number of Jobs	-0.135***	0.028	-0.055	0.043	-0.074**	0.028
Weeks Worked	0.004***	0.001	0.002	0.001	0.003**	0.001
HS Graduate	0.796**	0.268	-0.256	0.407	-0.029	0.272
Education Time	4.787***	0.802	2.317*	1.118	3.653***	0.820
Strains Wave 6	-0.133	0.109	-0.105	0.165	0.029	0.110
Strains Wave 11	-0.345**	0.117	0.025	0.167	-0.313**	0.120
Arrest Risk	-0.203	0.232	0.081	0.343	-0.122	0.237
Jail Risk	-0.305	0.228	-0.483	0.340	-0.178	0.233
Openness	-0.128	0.111	-0.165	0.162	-0.039	0.114
Conscientiousness	0.144	0.095	-0.107	0.137	0.076	0.097
Extraversion	-0.110	0.083	0.028	0.124	-0.047	0.085
Agreeableness	-0.226*	0.111	-0.206	0.164	-0.273*	0.114
Neuroticism	-0.232**	0.089	-0.054	0.132	-0.134	0.091
Male	-2.165***	0.316	-0.437	0.466	-1.062***	0.323
Hispanic	0.068	0.243	-0.080	0.366	-0.051	0.249
Intercept	4.407	1.325	2.757	1.934	2.635	1.357

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 17. Multinomial Logit Model Predicting Arrest Trajectory Group Membership (Blacks)

	Conformers vs. Persisters		Desisters vs Persisters	
	Logit	S.E.	Logit	S.E.
Married Time	3.676*	1.665	2.693	1.672
Marital Disruption	-1.554**	0.600	-0.799	0.593
Parent Time	-0.454	0.833	0.085	0.838
Job Satisfaction	-0.005	0.270	-0.113	0.270
Number of Jobs	-0.214***	0.046	-0.172***	0.046
Weeks Worked	0.006***	0.001	0.003*	0.001
HS Graduate	0.876*	0.395	0.070	0.392
Education Time	2.175^	1.129	0.233	1.153
Strains Wave 6	-0.017	0.179	0.189	0.179
Strains Wave 11	-0.086	0.194	-0.074	0.195
Arrest Risk	-0.170	0.340	-0.121	0.341
Jail Risk	-0.393	0.342	-0.505	0.344
Openness	0.036	0.135	0.230^	0.137
Conscientiousness	-0.031	0.161	-0.164	0.160
Extraversion	-0.229^	0.127	-0.149	0.126
Agreeableness	0.089	0.147	0.004	0.147
Neuroticism	-0.277*	0.127	-0.148	0.126
Male	-2.514***	0.543	-1.140*	0.549
Intercept	4.154	1.958	3.798	1.961

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 18. Multinomial Logit Model Predicting Arrest Trajectory Group Membership (Males)

	Conformers vs. Persisters		Desisters vs. Persisters	
	Logit	S.E.	Logit	S.E.
Married Time	3.251***	0.611	2.035**	0.632
Marital Disruption	-1.076***	0.283	-0.755*	0.300
Parent Time	-0.908^	0.519	0.714	0.523
Job Satisfaction	0.127	0.153	0.371*	0.162
Number of Jobs	-0.118***	0.022	-0.093***	0.024
Weeks Worked	0.003***	0.001	0.002*	0.001
HS Graduate	1.139***	0.212	-0.030	0.215
Education Time	2.983***	0.546	1.348*	0.599
Strains Wave 6	-0.070	0.091	0.002	0.095
Strains Wave 11	-0.376***	0.097	-0.389***	0.103
Arrest Risk	0.077	0.177	0.034	0.189
Jail Risk	-0.351*	0.173	-0.298	0.184
Openness	-0.041	0.081	0.076	0.086
Conscientiousness	0.135^	0.077	0.069	0.081
Extraversion	-0.107^	0.064	-0.085	0.069
Agreeableness	-0.105	0.080	-0.184*	0.085
Neuroticism	-0.077	0.070	-0.026	0.073
Black	0.007	0.210	-0.124	0.224
Hispanic	-0.331	0.218	-0.300	0.233
Intercept	0.123	0.946	0.323	1.002

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 19. Multinomial Logit Model Predicting Arrest Trajectory Group Membership (Females)

	Conformers vs. Persisters		Desisters vs. Persisters	
	Logit	S.E.	Logit	S.E.
Married Time	4.222***	1.031	3.387**	1.062
Marital Disruption	-1.384***	0.396	-1.486***	0.434
Parent Time	-0.1755	0.525	0.689	0.568
Job Satisfaction	-0.3019	0.234	-0.341	0.253
Number of Jobs	-0.133***	0.041	-0.065	0.044
Weeks Worked	0.003**	0.001	0.002	0.001
HS Graduate	0.4396	0.352	-0.014	0.381
Education Time	2.902**	0.951	1.837^	1.019
Strains Wave 6	-0.262*	0.128	-0.001	0.137
Strains Wave 11	-0.0416	0.152	0.078	0.164
Arrest Risk	-0.3805	0.296	-0.153	0.320
Jail Risk	-0.2059	0.291	-0.193	0.314
Openness	0.00857	0.129	0.114	0.141
Conscientiousness	0.271*	0.119	0.178	0.129
Extraversion	-0.1035	0.105	0.020	0.114
Agreeableness	0.230^	0.134	0.220	0.145
Neuroticism	-0.461***	0.111	-0.320**	0.120
Black	0.985**	0.350	0.722^	0.377
Hispanic	0.982*	0.435	0.795^	0.461
Intercept	1.5951	1.512	-0.946	1.649

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 20. BIC Scores and Size of Smallest Trajectory Group for Heavy Substance Use

	BIC	BIC	Size of Smallest Trajectory Group (%)
Whites	(n=36840)	(n=2456)	
Two groups	-12729.55	-12717.37	27.88
Three groups	-12363.31	-12344.35	11.63
Four groups	-12357.58	-12331.85	9.16
Five groups	-12196.00	-12163.50	7.79
Six groups	-12164.54	-12125.27	5.41
Blacks	(n=13845)	(n=923)	
Two groups	-3011.90	-2999.71	18.34
Three groups	-2938.08	-2919.12	4.62
Four groups	-2916.01	-2890.28	4.66
Five groups	-2942.11	-2909.62	2.16
Six groups	-2951.37	-2912.10	1.58
Males	(n=25050)	(n=1670)	
Two groups	-9701.36	-9689.18	32.57
Three groups	-9440.64	-9421.68	14.00
Four groups	-9322.44	-9296.72	11.81
Five groups	-9322.04	-9289.54	10.21
Six groups	-9300.87	-9261.60	6.54
Females	(n=25635)	(n=1709)	
Two groups	-6009.50	-5997.31	18.87
Three groups	-5852.72	-5833.76	5.71
Four groups	-5772.16	-5746.44	4.46
Five groups	-5768.24	-5735.75	2.69
Six groups	-5779.71	-5740.44	2.84

Table 21. Multinomial Logit Model Predicting Heavy Substance Use Trajectory Group Membership (Whites)

	Non-Heavy vs. Heavy Users		Low Desisters vs. Heavy Users		Low Chronic vs. Heavy Users		High Desisters vs. Heavy Users	
	Logit	S.E.	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	2.373***	0.478	2.008***	0.535	1.242*	0.525	1.057^	0.601
Marital Disruption	0.281	0.304	0.004	0.349	0.465	0.324	-0.197	0.405
Parent Time	0.599	0.442	0.807	0.505	-0.066	0.490	0.358	0.556
Job Satisfaction	-0.215	0.148	-0.095	0.175	-0.153	0.162	0.100	0.190
Number of Jobs	-0.059**	0.022	-0.025	0.026	-0.033	0.024	-0.034	0.029
Weeks Worked	-0.001*	0.001	-0.002*	0.001	-0.001	0.001	-0.001	0.001
HS Graduate	0.003	0.240	-0.235	0.279	-0.010	0.261	-0.248	0.297
Education Time	1.440**	0.453	0.932^	0.543	0.294	0.498	-0.193	0.607
Strains Wave 6	0.052	0.089	0.175^	0.102	0.097	0.096	0.205^	0.110
Strains Wave 11	-0.102	0.094	-0.131	0.112	0.033	0.102	-0.103	0.122
Arrest Risk	-0.255	0.162	-0.189	0.193	-0.044	0.178	-0.215	0.214
Jail Risk	-0.378*	0.160	-0.373^	0.190	-0.371*	0.176	-0.366^	0.210
Openness	-0.208*	0.083	-0.168^	0.097	-0.064	0.091	-0.118	0.107
Conscientiousness	0.211**	0.072	0.225**	0.087	0.162*	0.079	0.055	0.092
Extraversion	-0.337***	0.063	-0.114	0.075	-0.173*	0.069	-0.067	0.082
Agreeableness	0.169*	0.077	0.121	0.091	0.171*	0.085	0.181^	0.101
Neuroticism	-0.217**	0.067	-0.120	0.079	-0.035	0.072	-0.050	0.086
Male	-1.672***	0.196	-1.168***	0.227	-0.588**	0.215	-0.692**	0.252
Hispanic	0.642***	0.189	0.075	0.228	0.230	0.209	-0.062	0.253
Intercept	4.708	0.979	1.749	1.162	1.328	1.076	1.050	1.264

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 22. Multinomial Logit Model Predicting Heavy Substance Use Trajectory Group Membership (Blacks)

	Non-Heavy vs. Heavy Users		Desisters vs. Heavy Users		Late Risers vs. Heavy Users	
	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	2.170	1.493	1.399	1.726	-0.153	1.738
Marital Disruption	-0.432	0.729	-0.090	0.848	0.217	0.809
Parent Time	0.186	0.806	-0.016	0.979	-0.283	0.908
Job Satisfaction	0.096	0.288	0.336	0.350	-0.005	0.326
Number of Jobs	-0.068	0.048	0.035	0.057	-0.007	0.054
Weeks Worked	-0.001	0.001	0.000	0.002	0.000	0.001
HS Graduate	0.693^	0.420	0.023	0.510	0.549	0.480
Education Time	0.471	1.065	0.013	1.303	-0.267	1.194
Strains Wave 6	-0.013	0.188	0.126	0.227	0.160	0.210
Strains Wave 11	-0.505**	0.195	-0.360	0.239	-0.475*	0.224
Arrest Risk	0.218	0.362	0.358	0.438	-0.036	0.409
Jail Risk	-0.267	0.350	-0.219	0.426	-0.029	0.395
Openness	-0.001	0.143	0.126	0.179	0.160	0.166
Conscientiousness	0.316*	0.150	0.313^	0.190	0.115	0.170
Extraversion	-0.308*	0.134	-0.185	0.162	-0.083	0.151
Agreeableness	-0.019	0.159	0.089	0.191	-0.126	0.178
Neuroticism	-0.299*	0.132	-0.316^	0.164	-0.104	0.148
Male	-1.977***	0.488	-0.646	0.589	-0.913^	0.542
Intercept	5.046	1.985	-1.160	2.484	1.596	2.261

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 23. Multinomial Logit Model Predicting Heavy Substance Use Trajectory Group Membership (Males)

	Non-Heavy/Non-Users vs. Heavy Users		Low Chronic vs. Heavy Users		Late Risers vs. Heavy Users		High Desisters vs. Heavy Users	
	Logit	S.E.	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	2.631***	0.610	2.005***	0.605	1.118	0.709	1.184	0.722
Marital Disruption	0.357	0.382	0.285	0.378	0.504	0.422	-0.530	0.524
Parent Time	-0.229	0.600	-0.134	0.588	-0.845	0.698	0.187	0.711
Job Satisfaction	-0.360*	0.170	-0.220	0.169	-0.351^	0.194	-0.343	0.211
Number of Jobs	-0.065*	0.026	-0.039	0.025	-0.048	0.030	-0.038	0.031
Weeks Worked	-0.001	0.001	-0.002**	0.001	-0.001	0.001	-0.001	0.001
HS Graduate	0.346	0.269	-0.096	0.258	0.159	0.301	-0.304	0.312
Education Time	1.549**	0.546	0.450	0.545	-0.094	0.626	-0.198	0.683
Strains Wave 6	-0.023	0.107	0.156	0.104	0.051	0.120	0.199	0.127
Strains Wave 11	-0.106	0.112	-0.063	0.110	-0.010	0.127	-0.178	0.139
Arrest Risk	-0.043	0.194	0.082	0.192	-0.080	0.221	-0.005	0.239
Jail Risk	-0.352^	0.190	-0.354^	0.188	-0.100	0.216	-0.468*	0.232
Openness	-0.244**	0.094	-0.112	0.094	-0.140	0.107	-0.132	0.116
Conscientiousness	0.172*	0.086	0.185*	0.085	0.091	0.098	0.114	0.105
Extraversion	-0.247***	0.073	-0.129^	0.072	-0.016	0.084	-0.132	0.090
Agreeableness	0.144	0.089	0.037	0.088	0.174^	0.102	0.192^	0.111
Neuroticism	-0.171*	0.080	-0.086	0.078	0.040	0.089	0.009	0.096
Black	1.883***	0.277	0.810**	0.279	1.003**	0.308	-0.523	0.397
Hispanic	0.759**	0.244	0.365	0.241	0.135	0.286	-0.003	0.295
Intercept	2.703*	1.082	2.491*	1.072	0.672	1.233	1.537	1.324

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 24. Multinomial Logit Model Predicting Heavy Substance Use Trajectory Group Membership (Females)

	Non-Heavy vs. Heavy Users		Desisters vs. Heavy Users		Late Risers vs. Heavy Users	
	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	1.966**	0.722	1.699*	0.774	0.363	0.837
Marital Disruption	-0.274	0.412	-0.419	0.453	0.281	0.465
Parent Time	1.551**	0.564	1.086^	0.621	1.083^	0.635
Job Satisfaction	-0.257	0.235	0.071	0.257	-0.331	0.272
Number of Jobs	-0.088*	0.036	-0.022	0.040	-0.044	0.042
Weeks Worked	0.000	0.001	-0.001	0.001	0.000	0.001
HS Graduate	-0.365	0.420	-0.590	0.456	-0.072	0.479
Education Time	2.295**	0.752	1.864*	0.833	1.084	0.860
Strains Wave 6	0.085	0.139	0.260^	0.149	0.128	0.158
Strains Wave 11	-0.087	0.145	-0.089	0.161	0.149	0.165
Arrest Risk	-0.206	0.264	-0.076	0.291	-0.241	0.307
Jail Risk	-0.355	0.261	-0.353	0.288	-0.061	0.302
Openness	-0.248^	0.132	-0.212	0.145	0.019	0.153
Conscientiousness	0.183	0.114	0.150	0.126	0.028	0.130
Extraversion	-0.436***	0.101	-0.084	0.112	-0.303**	0.116
Agreeableness	0.259*	0.123	0.257^	0.136	0.066	0.142
Neuroticism	-0.412***	0.101	-0.237*	0.111	-0.249*	0.117
Black	1.804***	0.412	0.251	0.465	1.135*	0.454
Hispanic	0.980**	0.371	0.408	0.405	0.650	0.420
Intercept	4.920**	1.557	0.817	1.714	2.214	1.803

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 25. BIC Scores and Size of Smallest Trajectory Group for Binge Drinking

	BIC	BIC	Size of Smallest Trajectory Group (%)
Whites	(n=36059)	(n=2456)	
Two groups	-38960.91	-38947.48	41.18
Three groups	-38021.74	-38001.59	18.93
Four groups	-37705.40	-37678.54	17.80
Five groups	-37518.00	-37484.42	10.70
Six groups	-37342.43	-37302.13	6.95
Blacks	(n=13506)	(n=923)	
Two groups	-8583.93	-8570.52	29.66
Three groups	-8532.80	-8512.68	23.65
Four groups	-8456.60	-8429.77	2.73
Five groups	-8426.14	-8392.60	2.47
Six groups	-8419.68	-8379.43	3.11
Males	(n=24378)	(n=1670)	
Two groups	-27726.39	-27712.98	46.67
Three groups	-26991.56	-26971.45	21.74
Four groups	-26752.25	-26725.45	14.39
Five groups	-26581.73	-26548.22	9.93
Six groups	-26486.93	-26446.72	8.67
Females	(n=25187)	(n=1709)	
Two groups	-19936.82	-19923.37	32.98
Three groups	-19562.28	-19542.10	11.23
Four groups	-19498.10	-19471.20	7.20
Five groups	-19523.44	-19489.81	1.83
Six groups	-19367.27	-19326.92	0.00

Table 26. Multinomial Logit Model Predicting Binge Drinking Trajectory Group Membership (Whites)

	Non-Bingers vs. Heavy Drinkers		Late Risers vs. Heavy Drinkers		Low Chronics vs. Heavy Drinkers		Desisters vs. Heavy Drinkers	
	Logit	S.E.	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	2.840***	0.446	1.042*	0.464	1.831***	0.432	1.523**	0.492
Marital Disruption	0.196	0.279	0.357	0.278	0.116	0.269	-0.349	0.330
Parent Time	0.915*	0.434	0.119	0.449	1.032*	0.416	0.892^	0.479
Job Satisfaction	-0.121	0.147	0.003	0.143	-0.060	0.138	-0.030	0.162
Number of Jobs	-0.068**	0.023	-0.028	0.022	-0.025	0.021	-0.001	0.024
Weeks Worked	-0.002**	0.001	-0.001	0.001	-0.002**	0.001	-0.002*	0.001
HS Graduate	-0.438^	0.251	-0.318	0.247	-0.146	0.237	-0.630*	0.264
Education Time	1.320**	0.445	0.795^	0.432	0.477	0.419	0.480	0.495
Strains Wave 6	-0.086	0.086	-0.063	0.084	-0.055	0.080	0.040	0.092
Strains Wave 11	0.059	0.097	0.147	0.094	0.110	0.091	0.150	0.105
Arrest Risk	-0.219	0.161	-0.073	0.157	-0.117	0.151	-0.099	0.177
Jail Risk	-0.186	0.157	-0.244	0.153	-0.117	0.148	0.072	0.174
Openness	-0.160*	0.081	0.013	0.080	-0.137^	0.076	-0.100	0.089
Conscientiousness	0.060	0.073	0.097	0.071	0.108	0.068	0.042	0.080
Extraversion	-0.398***	0.062	-0.199***	0.060	-0.263***	0.058	-0.062	0.069
Agreeableness	0.122	0.077	-0.007	0.074	0.016	0.071	-0.007	0.084
Neuroticism	-0.181**	0.068	0.008	0.065	-0.070	0.063	-0.080	0.074
Male	-1.848***	0.186	-0.648***	0.184	-1.578***	0.175	-0.804***	0.205
Hispanic	0.662***	0.183	0.324^	0.183	0.499**	0.175	0.022	0.211
Intercept	4.720	0.979	1.468	0.961	3.943	0.923	1.967	1.076

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 27. Multinomial Logit Model Predicting Binge Drinking Trajectory Group Membership (Blacks)

	Non-Bingers vs. Heavy Drinkers		Low Chronic vs. Heavy Drinkers	
	Logit	S.E.	Logit	S.E.
Married Time	4.648**	1.798	3.609*	1.809
Marital Disruption	0.902	1.124	1.274	1.120
Parent Time	-1.196	0.828	-1.840*	0.837
Job Satisfaction	-0.584*	0.270	-0.616*	0.273
Number of Jobs	-0.082^	0.047	-0.021	0.047
Weeks Worked	-0.003*	0.001	-0.002	0.001
HS Graduate	0.433	0.422	0.128	0.421
Education Time	0.139	1.036	-0.336	1.045
Strains Wave 6	-0.038	0.178	0.078	0.178
Strains Wave 11	-0.085	0.206	0.014	0.207
Arrest Risk	-0.229	0.343	-0.251	0.344
Jail Risk	-0.067	0.345	0.160	0.346
Openness	-0.463**	0.159	-0.377*	0.160
Conscientiousness	0.354*	0.152	0.189	0.152
Extraversion	-0.370**	0.135	-0.189	0.135
Agreeableness	0.109	0.150	-0.008	0.150
Neuroticism	-0.476***	0.129	-0.280*	0.129
Male	-3.309***	0.570	-2.352	0.572
Intercept	10.550	2.102	8.875	2.111

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 28. Multinomial Logit Model Predicting Binge Drinking Trajectory Group Membership (Males)

	Non-Bingers vs. Heavy Drinkers		Low Chronics vs. Heavy Drinkers		Late Risers vs. Heavy Drinkers		Desisters vs. Heavy Drinkers	
	Logit	S.E.	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	1.981***	0.571	1.591**	0.492	0.517	0.495	0.599	0.558
Marital Disruption	0.285	0.377	0.581^	0.314	0.374	0.317	0.371	0.359
Parent Time	-0.104	0.627	-0.001	0.529	0.062	0.524	0.897	0.588
Job Satisfaction	-0.188	0.170	-0.203	0.148	-0.135	0.145	-0.166	0.174
Number of Jobs	-0.038	0.029	-0.031	0.024	-0.008	0.023	0.024	0.026
Weeks Worked	-0.001	0.001	-0.002*	0.001	-0.001	0.001	-0.002^	0.001
HS Graduate	-0.004	0.283	0.046	0.238	0.005	0.234	-0.447^	0.263
Education Time	1.462**	0.528	-0.088	0.465	0.302	0.451	-0.259	0.551
Strains Wave 6	-0.233*	0.111	-0.069	0.092	-0.011	0.089	0.004	0.104
Strains Wave 11	0.161	0.119	0.111	0.103	0.260**	0.099	0.230*	0.116
Arrest Risk	-0.200	0.194	-0.115	0.167	-0.012	0.162	0.008	0.194
Jail Risk	-0.189	0.188	-0.197	0.162	-0.264^	0.159	-0.218	0.189
Openness	-0.199*	0.090	-0.126	0.080	0.016	0.080	-0.075	0.095
Conscientiousness	0.119	0.089	0.061	0.076	0.136^	0.075	-0.002	0.087
Extraversion	-0.366***	0.073	-0.282***	0.063	-0.146*	0.062	-0.048	0.075
Agreeableness	0.165^	0.090	0.004	0.077	-0.018	0.076	-0.038	0.090
Neuroticism	-0.101	0.082	-0.148*	0.070	0.030	0.067	-0.079	0.081
Black	2.622***	0.292	2.092***	0.272	1.593***	0.271	0.086	0.356
Hispanic	0.238	0.251	0.437*	0.200	0.278	0.195	-0.126	0.234
Intercept	1.115	1.083	3.175***	0.940	0.470	0.925	1.704	1.095

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 29. Multinomial Logit Model Predicting Binge Drinking Trajectory Group Membership (Females)

	Non-Bingers vs. Heavy Users		Light Drinkers vs. Heavy Users		Low Chronics vs. Heavy Users	
	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	2.646***	0.606	1.946***	0.582	0.753	0.596
Marital Disruption	0.326	0.435	0.429	0.416	0.674	0.418
Parent Time	1.234*	0.519	1.670***	0.497	0.890^	0.502
Job Satisfaction	-0.317	0.219	-0.387^	0.210	-0.118	0.210
Number of Jobs	-0.095**	0.035	-0.043	0.032	-0.036	0.032
Weeks Worked	-0.002^	0.001	-0.002^	0.001	0.000	0.001
HS Graduate	-0.493	0.406	-0.516	0.386	-0.263	0.392
Education Time	2.032**	0.674	1.595*	0.641	1.207^	0.639
Strains Wave 6	-0.152	0.119	-0.144	0.111	-0.130	0.111
Strains Wave 11	-0.153	0.140	0.110	0.131	0.126	0.131
Arrest Risk	-0.088	0.240	-0.023	0.227	0.027	0.227
Jail Risk	-0.271	0.235	-0.249	0.223	-0.090	0.223
Openness	-0.106	0.119	-0.005	0.113	0.002	0.113
Conscientiousness	0.215*	0.106	0.212*	0.100	0.082	0.099
Extraversion	-0.586***	0.095	-0.494***	0.090	-0.333***	0.090
Agreeableness	0.324**	0.112	0.274**	0.106	0.275**	0.107
Neuroticism	-0.239*	0.097	-0.078	0.091	-0.024	0.090
Black	4.107***	0.614	3.262***	0.608	2.192***	0.614
Hispanic	0.863**	0.314	1.035***	0.293	0.665*	0.297
Intercept	3.016*	1.420	2.281^	1.351	0.939	1.354

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 30. BIC Scores and Size of Smallest Trajectory Group for Marijuana Use

	BIC	BIC	Size of Smallest Trajectory Group (%)
Whites	(n=36300)	(n=2456)	
Two groups	-19326.76	-19313.30	19.96
Three groups	-18539.07	-18518.87	9.91
Four groups	-18272.03	-18245.10	4.81
Five groups	-18182.65	-18148.98	4.82
Six groups	-18099.51	-18059.11	4.23
Blacks	(n=13633)	(n=923)	
Two groups	-5836.31	-5822.84	18.63
Three groups	-5700.39	-5680.19	12.46
Four groups	-5724.19	-5697.26	10.05
Five groups	-5674.31	-5640.65	0.00
Six groups	-5577.92	-5537.53	0.00
Males	(n=24608)	(n=1670)	
Two groups	-14039.83	-14026.38	22.90
Three groups	-13553.59	-13533.41	12.20
Four groups	-13408.45	-13381.55	6.49
Five groups	-13277.87	-13244.24	7.28
Six groups	-13296.82	-13256.47	7.03
Females	(n=25325)	(n=1709)	
Two groups	-11109.94	-11096.46	17.48
Three groups	-10648.90	-10628.68	6.74
Four groups	-10580.38	-10553.42	4.54
Five groups	-10482.49	-10448.79	4.44
Six groups	-10507.39	-10466.95	2.64

Table 31. Multinomial Logit Model Predicting Marijuana Use Trajectory Group Membership (Whites)

	Abstainers vs. Heavy Users		Late Risers vs. Heavy Users		Low Desisters vs. Heavy Users		Desisters vs. Heavy Users	
	Logit	S.E.	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	2.524***	0.600	-0.185	0.752	1.205*	0.610	0.710	0.675
Marital Disruption	0.703	0.449	0.761	0.511	0.735	0.452	0.522	0.490
Parent Time	0.345	0.537	0.301	0.649	0.494	0.541	0.437	0.597
Job Satisfaction	-0.436*	0.188	-0.303	0.225	-0.248	0.189	-0.086	0.211
Number of Jobs	-0.113***	0.028	-0.003	0.032	-0.057*	0.028	-0.012	0.030
Weeks Worked	0.000	0.001	-0.001	0.001	-0.001	0.001	-0.001	0.001
HS Graduate	0.305	0.294	0.460	0.363	-0.154	0.293	-0.406	0.323
Education Time	1.660**	0.598	0.837	0.711	1.510*	0.607	1.079	0.681
Strains Wave 6	0.087	0.114	0.224^	0.133	0.177	0.115	0.240^	0.125
Strains Wave 11	-0.183	0.118	0.050	0.140	-0.005	0.119	-0.053	0.133
Arrest Risk	-0.298	0.210	-0.066	0.252	-0.051	0.212	-0.036	0.238
Jail Risk	-0.278	0.206	-0.126	0.248	-0.299	0.209	-0.104	0.234
Openness	-0.395***	0.108	0.060	0.132	-0.240*	0.109	-0.185	0.122
Conscientiousness	0.227*	0.091	0.078	0.109	0.268**	0.092	0.045	0.102
Extraversion	-0.196*	0.079	-0.197*	0.093	-0.147^	0.080	-0.077	0.089
Agreeableness	0.249*	0.099	0.326**	0.120	0.245*	0.100	0.203^	0.113
Neuroticism	-0.181*	0.084	-0.028	0.101	-0.057	0.085	-0.092	0.095
Male	-0.712**	0.237	-0.106	0.283	-0.618**	0.240	-0.468^	0.268
Hispanic	0.595*	0.243	0.187	0.293	0.285	0.247	0.038	0.279
Intercept	4.401***	1.246	-0.614	1.505	2.315^	1.260	1.732	1.402

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 32. Multinomial Logit Model Predicting Marijuana Use Trajectory Group
Membership (Blacks)

	Abstainers vs. Heavy Users		Late Risers vs. Heavy Users		Low Desisters vs. Heavy Users		Desisters vs. Heavy Users	
	Logit	S.E.	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	3.302*	1.373	1.801	1.698	3.557**	1.405	2.841^	1.669
Marital Disruption	-0.377	0.583	-1.167	0.927	-0.160	0.601	-0.830	0.833
Parent Time	0.308	0.605	-0.427	0.797	0.285	0.644	0.025	0.853
Job Satisfaction	-0.128	0.222	-0.166	0.294	-0.027	0.237	-0.047	0.323
Number of Jobs	-0.086*	0.040	0.010	0.050	-0.036	0.042	0.094^	0.052
Weeks Worked	0.000	0.001	0.000	0.001	-0.001	0.001	-0.001	0.002
HS Graduate	0.306	0.356	0.156	0.469	0.005	0.373	-0.568	0.476
Education Time	0.650	0.791	0.257	1.021	-0.143	0.857	-1.579	1.243
Strains Wave 6	-0.111	0.149	0.090	0.191	-0.021	0.159	0.107	0.208
Strains Wave 11	-0.335*	0.157	-0.280	0.210	-0.212	0.168	-0.107	0.220
Arrest Risk	0.328	0.295	0.324	0.375	0.409	0.313	0.819*	0.414
Jail Risk	-0.141	0.275	0.369	0.362	0.096	0.294	-0.448	0.400
Openness	-0.015	0.116	0.121	0.156	-0.034	0.123	0.151	0.172
Conscientiousness	0.424***	0.120	0.171	0.157	0.391**	0.129	0.062	0.168
Extraversion	-0.309**	0.106	-0.175	0.139	-0.282*	0.113	-0.110	0.149
Agreeableness	-0.031	0.124	-0.066	0.161	-0.035	0.132	0.089	0.175
Neuroticism	-0.151	0.109	0.065	0.141	0.078	0.115	-0.115	0.155
Male	-1.363***	0.352	-0.694	0.450	-0.868*	0.376	-0.471	0.504
Intercept	2.801^	1.560	-0.180	2.072	1.202	1.659	-0.305	2.213

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 33. Multinomial Logit Model Predicting Marijuana Use Trajectory Group Membership (Males)

	Abstainers vs. Heavy Users		Steady Risers vs. Heavy Users		Desisters vs. Heavy Users		Low Desisters vs. Heavy Users	
	Logit	S.E.	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	2.827***	0.736	0.101	0.980	-0.298	0.971	1.745*	0.759
Marital Disruption	0.258	0.462	-0.006	0.598	0.202	0.574	0.325	0.473
Parent Time	-0.568	0.672	-0.777	0.893	0.250	0.844	0.250	0.689
Job Satisfaction	-0.271	0.191	-0.312	0.237	-0.150	0.244	-0.065	0.199
Number of Jobs	-0.112***	0.028	-0.014	0.034	-0.007	0.034	-0.075*	0.029
Weeks Worked	0.000	0.001	-0.001	0.001	-0.001	0.001	-0.001	0.001
HS Graduate	0.581*	0.285	0.544	0.368	-0.020	0.351	-0.103	0.291
Education Time	0.607	0.619	0.314	0.755	-0.405	0.805	0.130	0.651
Strains Wave 6	0.125	0.119	0.125	0.147	0.337*	0.145	0.114	0.124
Strains Wave 11	-0.279*	0.120	-0.181	0.152	-0.253	0.155	-0.217^	0.125
Arrest Risk	-0.065	0.218	-0.342	0.275	0.261	0.277	0.034	0.228
Jail Risk	-0.534*	0.218	-0.149	0.269	-0.581*	0.276	-0.357	0.227
Openness	-0.245*	0.105	0.010	0.131	0.114	0.137	-0.088	0.109
Conscientiousness	0.260**	0.095	0.104	0.118	0.049	0.119	0.283**	0.099
Extraversion	-0.085	0.081	0.011	0.100	-0.187^	0.102	-0.091	0.085
Agreeableness	0.116	0.099	0.188	0.123	0.095	0.127	0.211*	0.104
Neuroticism	-0.071	0.088	0.037	0.109	-0.067	0.111	0.047	0.091
Black	0.389	0.265	0.426	0.319	-0.644^	0.357	-0.227	0.279
Hispanic	0.327	0.286	-0.065	0.374	0.022	0.355	0.097	0.297
Intercept	2.606	1.196	-0.612	1.494	1.057	1.519	0.738	1.248

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 34. Multinomial Logit Model Predicting Marijuana Use Trajectory Group Membership (Females)

	Abstainers vs. Heavy Users		Low Risers vs. Heavy Users		Low Desisters vs. Heavy Users		Desisters vs. Heavy Users	
	Logit	S.E.	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	2.018**	0.684	0.592	0.819	0.856	0.705	0.038	0.851
Marital Disruption	0.213	0.445	0.648	0.500	-0.021	0.460	0.381	0.519
Parent Time	0.638	0.502	-0.170	0.597	1.051*	0.521	0.908	0.628
Job Satisfaction	-0.487*	0.219	-0.331	0.262	-0.302	0.227	-0.052	0.273
Number of Jobs	-0.111**	0.036	0.024	0.041	-0.073	0.038	0.023	0.044
Weeks Worked	0.000	0.001	-0.001	0.001	-0.001	0.001	-0.002	0.001
HS Graduate	-0.333	0.396	0.071	0.473	-0.596	0.405	-0.700	0.476
Education Time	2.484***	0.733	0.756	0.861	1.934	0.763	2.506**	0.912
Strains Wave 6	-0.178	0.126	-0.013	0.148	-0.021	0.129	-0.066	0.154
Strains Wave 11	-0.116	0.146	0.275^	0.167	0.032	0.150	0.021	0.177
Arrest Risk	-0.411	0.259	-0.267	0.309	0.029	0.269	-0.153	0.322
Jail Risk	-0.151	0.256	-0.260	0.303	-0.381	0.266	0.014	0.317
Openness	-0.300*	0.130	-0.143	0.153	-0.306*	0.134	-0.138	0.161
Conscientiousness	0.182	0.111	-0.056	0.130	0.189	0.116	-0.070	0.135
Extraversion	-0.230*	0.095	-0.154	0.112	-0.095	0.099	0.102	0.120
Agreeableness	0.067	0.121	-0.057	0.143	0.091	0.126	0.066	0.152
Neuroticism	-0.340***	0.099	-0.278*	0.118	-0.200^	0.103	-0.212^	0.124
Black	1.080***	0.323	0.570	0.374	0.015	0.338	-0.665	0.439
Hispanic	0.940*	0.373	0.241	0.444	0.344	0.385	0.517	0.436
Intercept	5.860***	1.527	3.891*	1.798	3.880*	1.579	1.513	1.877

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 35. BIC Scores and Size of Smallest Trajectory Group for Hard Drug Use

	BIC	BIC	Size of Smallest Trajectory Group (%)
Whites	(n=33769)	(n=2456)	
Two groups	-8162.36	-8149.26	29.99
Three groups	-7804.69	-7785.03	6.22
Four groups	-7791.27	-7765.06	0.00
Five groups	-7710.46	-7677.70	2.14
Six groups	-7799.11	-7759.80	0.00
Blacks	(n=12727)	(n=923)	
Two groups	-801.23	-789.42	6.06
Three groups	-823.50	-805.13	4.03
Four groups	-830.83	-805.90	1.24
Five groups	-844.16	-812.67	0.62
Six groups	-873.17	-835.12	0.14
Males	(n=22915)	(n=1670)	
Two groups	-5005.95	-4992.86	27.29
Three groups	-4782.09	-4762.45	2.52
Four groups	-4832.08	-4805.89	3.18
Five groups	-4857.40	-4824.66	5.50
Six groups	-4844.96	-4805.68	0.00
Females	(n=23581)	(n=1709)	
Two groups	-4238.10	-4224.98	22.92
Three groups	-4154.62	-4134.94	0.00
Four groups	-4055.64	-4029.39	2.84
Five groups	-4102.57	-4069.77	0.43
Six groups	-4091.78	-4052.42	0.00

Table 36. Multinomial Logit Model Predicting Hard Drug Use Trajectory Group Membership (Whites)

	Abstainers vs. Heavy Users		Low Desisters vs. Heavy Users		High Desisters vs. Heavy Users	
	Logit	S.E.	Logit	S.E.	Logit	S.E.
Married Time	1.591**	0.604	0.460	0.639	0.813	0.755
Marital Disruption	-0.322	0.341	0.271	0.354	-0.106	0.442
Parent Time	1.131*	0.551	1.350*	0.578	0.666	0.697
Job Satisfaction	-0.300^	0.180	-0.065	0.192	0.322	0.235
Number of Jobs	-0.062*	0.027	-0.022	0.029	-0.005	0.035
Weeks Worked	0.002^	0.001	0.001	0.001	0.002^	0.001
HS Graduate	-0.283	0.301	-0.738*	0.315	-0.485	0.390
Education Time	1.439*	0.568	0.861	0.614	0.969	0.751
Strains Wave 6	-0.147	0.103	-0.032	0.109	0.105	0.131
Strains Wave 11	-0.105	0.113	-0.100	0.121	0.053	0.147
Arrest Risk	-0.267	0.203	-0.184	0.218	-0.402	0.270
Jail Risk	-0.444*	0.204	-0.406^	0.219	-0.070	0.268
Openness	-0.379***	0.107	-0.316**	0.114	-0.234^	0.139
Conscientiousness	0.286***	0.087	0.142	0.093	0.031	0.114
Extraversion	-0.186*	0.076	-0.121	0.081	-0.091	0.100
Agreeableness	0.126	0.098	0.175^	0.105	0.114	0.129
Neuroticism	-0.252**	0.080	-0.136	0.085	-0.304**	0.109
Male	-0.358	0.221	-0.171	0.238	-0.592*	0.290
Hispanic	0.172	0.228	-0.035	0.245	-0.185	0.307
Intercept	4.753***	1.197	2.959*	1.279	0.829	1.581

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 37. Multinomial Logit Model Predicting Hard Drug Use Trajectory Group Membership (Blacks)

	Abstainers vs. Heavy Users		Desisters vs. Heavy Users	
	Logit	S.E.	Logit	S.E.
Married Time	1.059	1.319	0.708	1.644
Marital Disruption	-0.526	0.577	-1.326	0.937
Parent Time	1.333^	0.737	0.898	0.946
Job Satisfaction	0.105	0.270	0.054	0.350
Number of Jobs	-0.095*	0.044	-0.074	0.061
Weeks Worked	0.001	0.001	-0.002	0.002
HS Graduate	0.382	0.398	-0.016	0.516
Education Time	1.772^	1.019	0.673	1.344
Strains Wave 6	-0.234	0.172	-0.053	0.226
Strains Wave 11	-0.133	0.189	0.281	0.241
Arrest Risk	0.267	0.349	0.371	0.454
Jail Risk	-0.123	0.332	-0.206	0.441
Openness	-0.046	0.142	0.029	0.186
Conscientiousness	0.235^	0.141	0.291	0.192
Extraversion	-0.222^	0.123	-0.228	0.164
Agreeableness	-0.137	0.149	-0.277	0.193
Neuroticism	-0.175	0.126	-0.077	0.164
Male	-0.515	0.406	-0.237	0.539
Intercept	3.450^	1.884	1.220	2.460

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 38. Multinomial Logit Model Predicting Hard Drug Use Trajectory Group
Membership (Males)

	Abstainers vs. Heavy Users		Desisters vs. Heavy Users	
	Logit	S.E.	Logit	S.E.
Married Time	1.489^	0.822	0.410	0.864
Marital Disruption	-0.351	0.445	0.345	0.458
Parent Time	1.159	0.866	1.701^	0.899
Job Satisfaction	-0.188	0.216	-0.030	0.227
Number of Jobs	-0.050	0.032	-0.015	0.033
Weeks Worked	0.002^	0.001	0.001	0.001
HS Graduate	0.353	0.323	-0.127	0.336
Education Time	1.344^	0.691	0.938	0.736
Strains Wave 6	-0.164	0.127	-0.058	0.133
Strains Wave 11	-0.338**	0.131	-0.291*	0.138
Arrest Risk	-0.042	0.245	-0.144	0.259
Jail Risk	-0.527*	0.245	-0.436^	0.258
Openness	-0.353**	0.129	-0.219	0.135
Conscientiousness	0.175	0.108	-0.052	0.113
Extraversion	-0.101	0.090	-0.088	0.095
Agreeableness	0.073	0.115	0.119	0.121
Neuroticism	-0.064	0.097	-0.059	0.103
Black	2.673***	0.540	1.541**	0.557
Hispanic	0.255	0.287	0.023	0.305
Intercept	3.409*	1.360	2.787^	1.430

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 39. Multinomial Logit Model Predicting Hard Drug Use Trajectory Group Membership (Females)

	Abstainers vs. Heavy Users		Desisters vs. Heavy Users	
	Logit	S.E.	Logit	S.E.
Married Time	1.167^	0.698	-0.013	0.735
Marital Disruption	-0.461	0.397	-0.189	0.416
Parent Time	1.029^	0.580	0.675	0.607
Job Satisfaction	-0.435^	0.240	-0.145	0.251
Number of Jobs	-0.096*	0.037	-0.033	0.039
Weeks Worked	0.001	0.001	0.000	0.001
HS Graduate	-0.832^	0.482	-1.154*	0.492
Education Time	1.255^	0.760	0.029	0.807
Strains Wave 6	-0.266*	0.128	-0.084	0.133
Strains Wave 11	-0.032	0.151	0.040	0.158
Arrest Risk	-0.333	0.277	-0.124	0.292
Jail Risk	-0.123	0.275	-0.018	0.290
Openness	-0.191	0.137	-0.158	0.144
Conscientiousness	0.385***	0.115	0.306*	0.121
Extraversion	-0.276**	0.103	-0.129	0.108
Agreeableness	0.114	0.132	0.125	0.139
Neuroticism	-0.428***	0.108	-0.248*	0.113
Black	2.149***	0.502	0.371	0.531
Hispanic	0.105	0.320	-0.146	0.339
Intercept	5.386***	1.622	3.280^	1.701

^p <= .10   *p < .05   **p < .01   ***p < .001

Table 40. Probability Estimates for Dual Trajectory Model

| | | Heavy Substance Use Group | | | | |
Arrest Group	Non-Heavy/ Non-User	Low Desisters	Late Risers	High Desisters	Heavy Users
A. Probability of heavy substance use group conditional on arrest group					
Conformers	0.742	0.113	0.092	0.023	0.030
Late Risers	0.177	0.195	0.385	0.101	0.142
Desisters	0.118	0.330	0.146	0.232	0.173
Persisters	0.145	0.197	0.244	0.154	0.260
B. Probability of arrest group conditional on heavy substance use group					
Conformers	0.931	0.512	0.508	0.241	0.302
Late Risers	0.026	0.101	0.244	0.122	0.166
Desisters	0.034	0.343	0.184	0.559	0.404
Persisters	0.009	0.043	0.065	0.078	0.128
C. Joint probability of arrest and heavy substance use trajectory groups					
Conformers	0.533	0.081	0.066	0.017	0.021
Late Risers	0.015	0.016	0.032	0.008	0.012
Desisters	0.020	0.054	0.024	0.038	0.029
Persisters	0.005	0.007	0.008	0.005	0.009

Figures

Figure 1. Four Group Trajectory Model of Arrest Probability for Analysis Sample
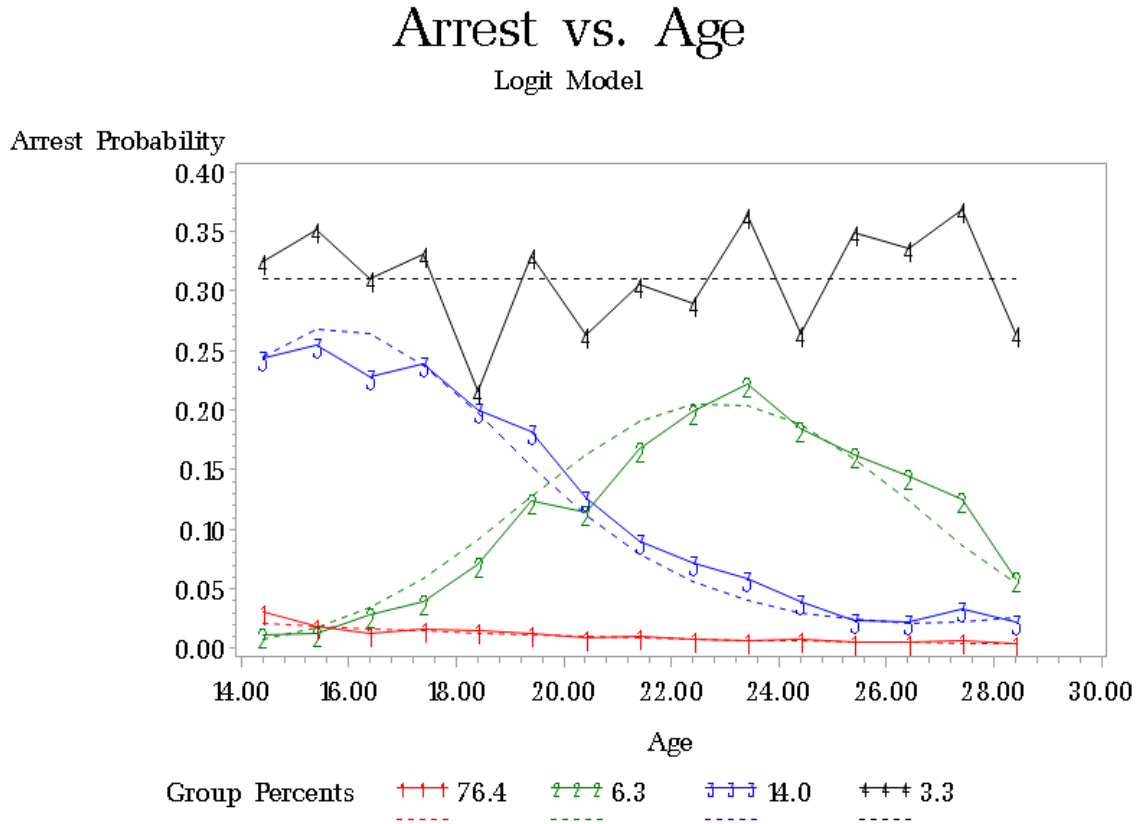
Figure 2. Five Group Trajectory Model for Heavy Substance Use for Analysis
Sample

Heavy Substance Use vs. Age

Logit Model
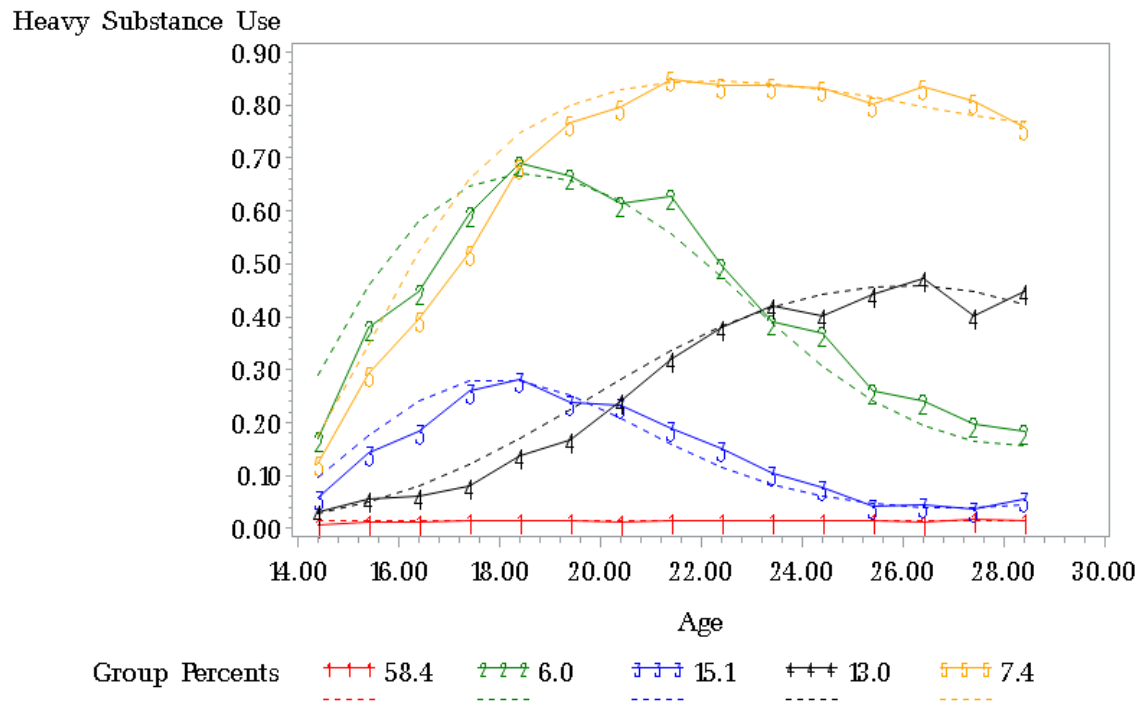
Binge Drinking vs. Age
CNORM Model
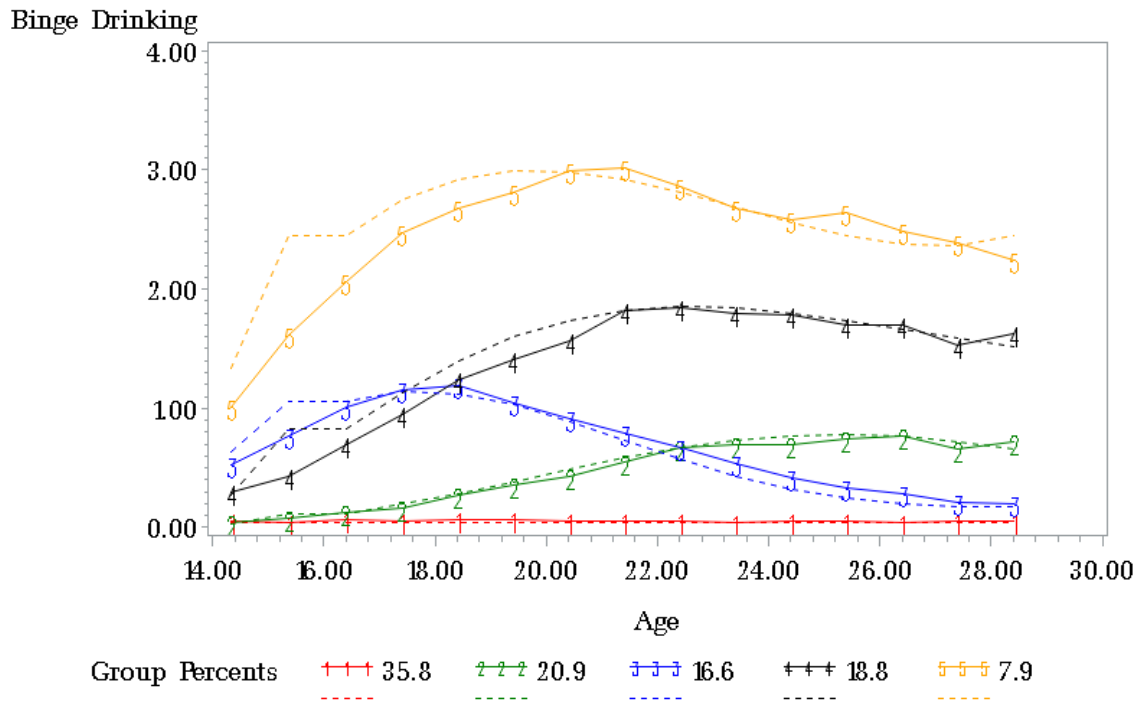
Figure 4. Five Group Trajectory Model for Marijuana Use for Analysis Sample

Marijuana Use vs. Age
CNORM Model
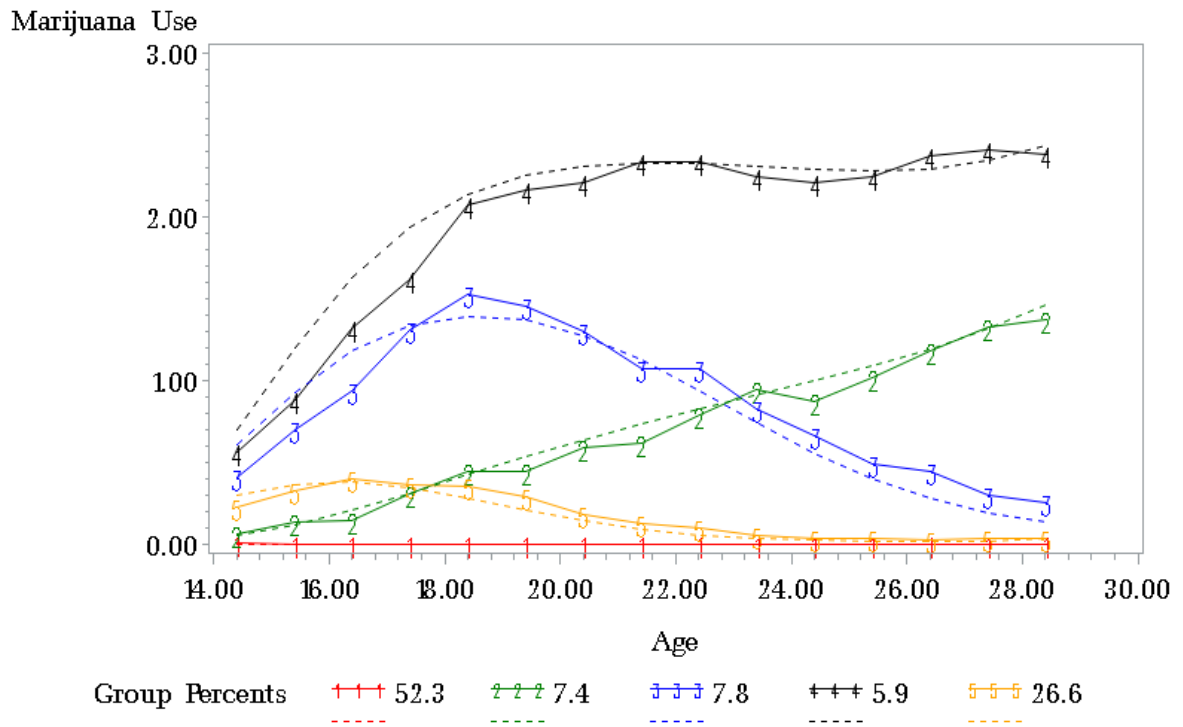
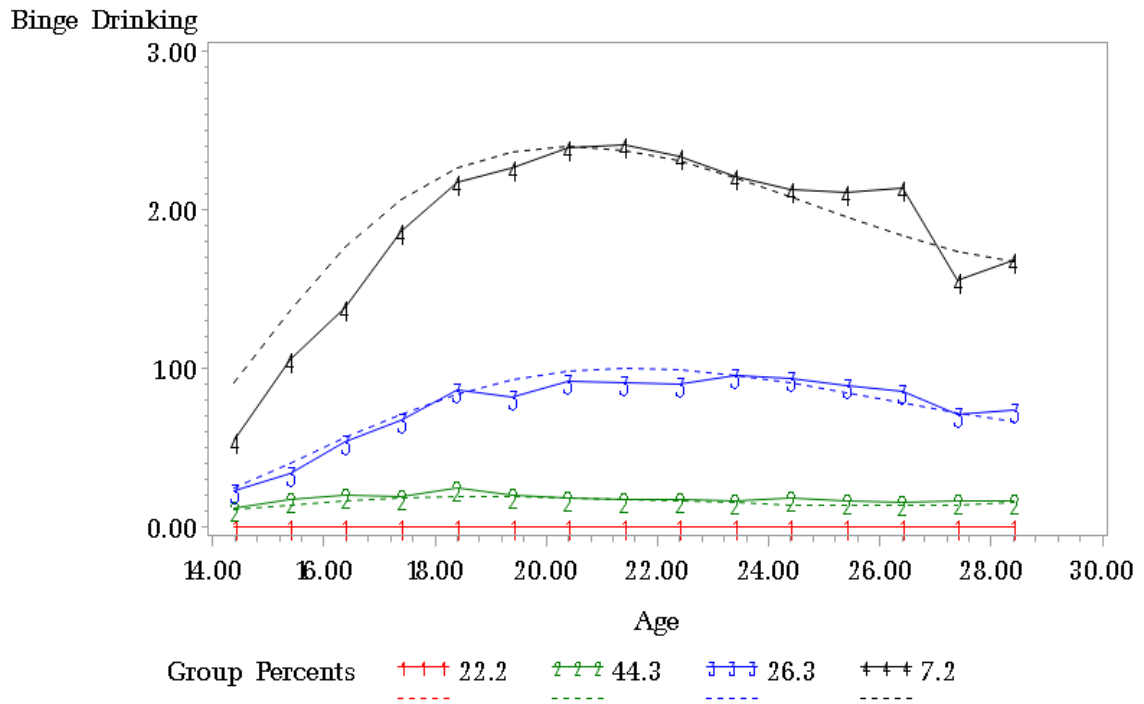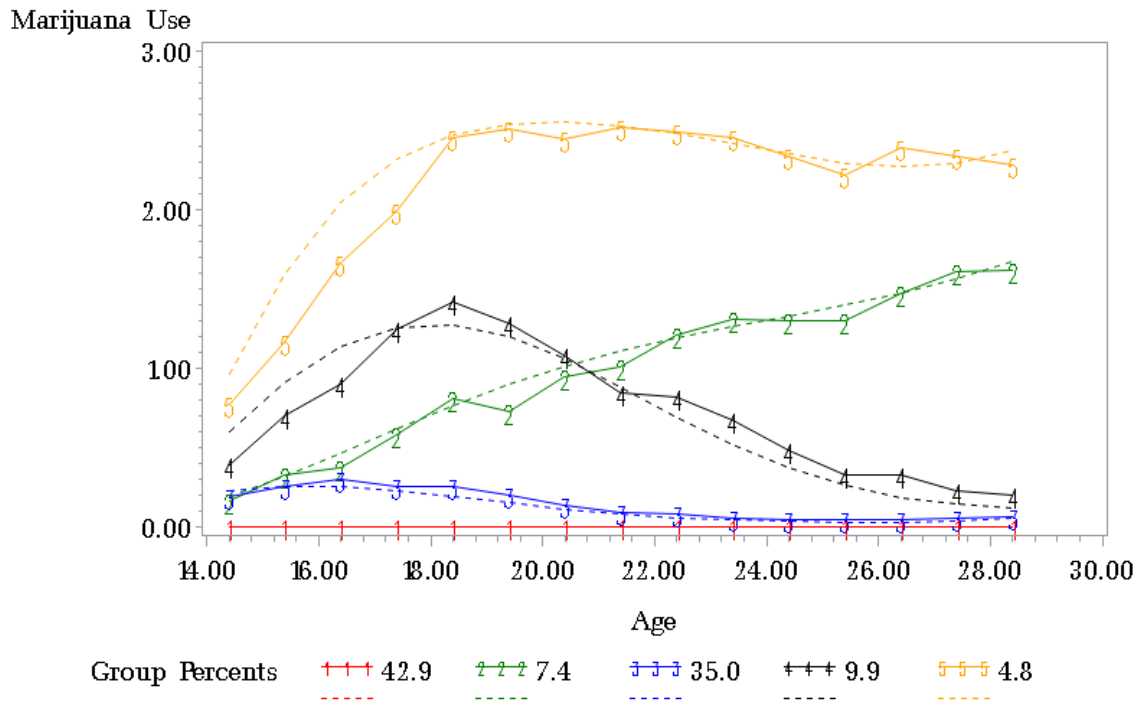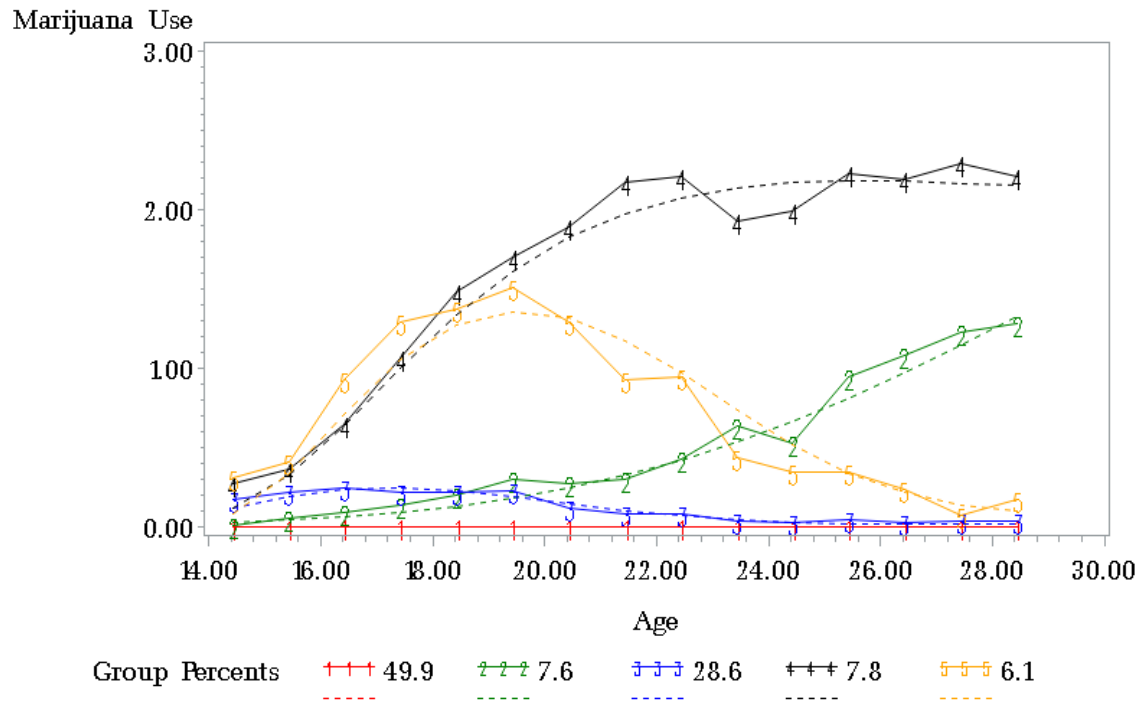Figure 5. Three Group Trajectory Model for Hard Drug Use for Analysis Sample

Hard Drug Use vs. Age
CNORM Model
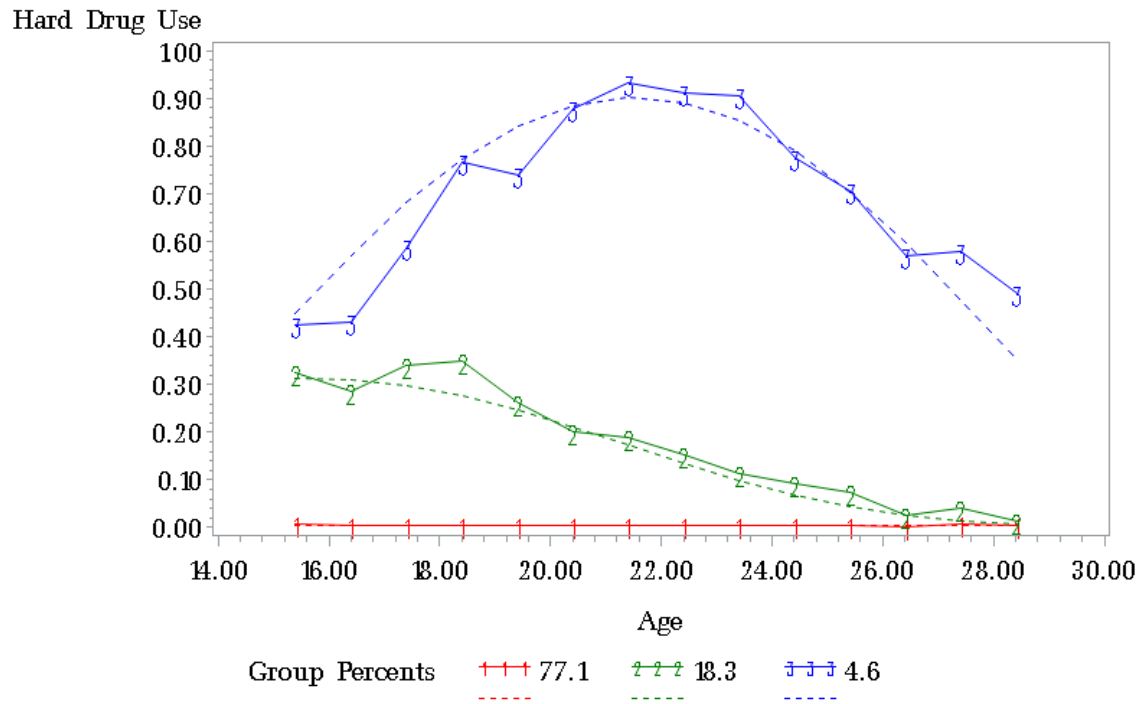
Figure 6. Four Group Trajectory Model of Arrest Probability for Whites

Arrest vs. Age (Whites)
Logit Model
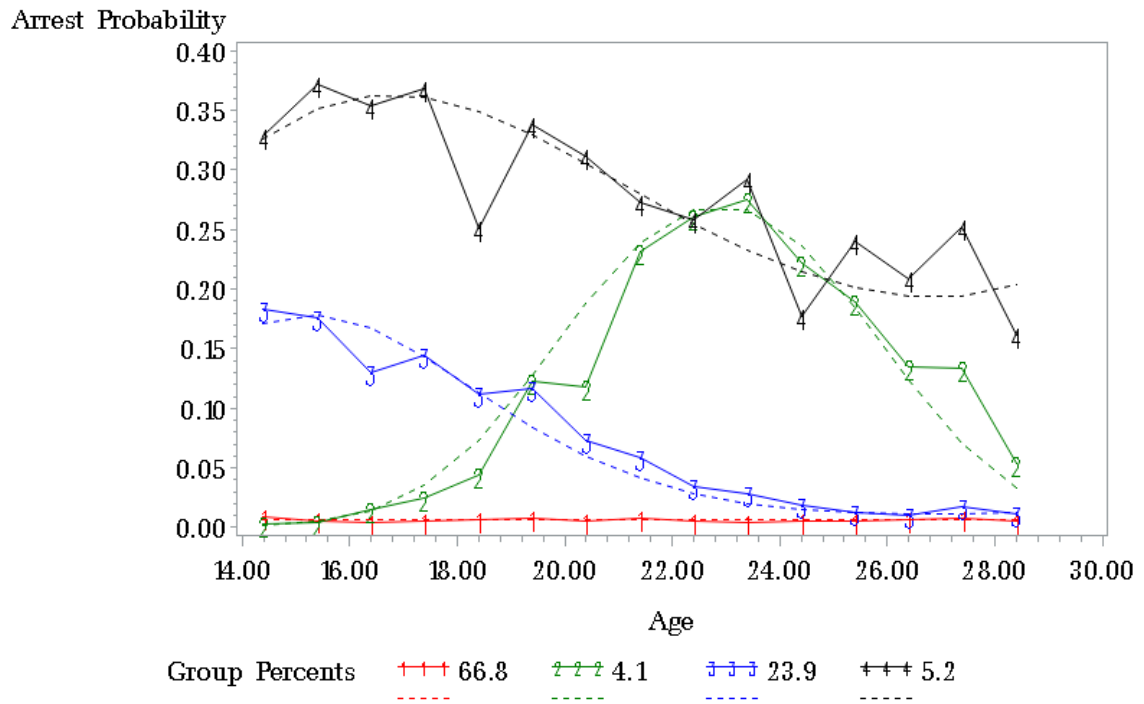
Figure 7. Three Group Trajectory Model of Arrest Probability for Blacks

Arrest vs. Age (Blacks)

Logit Model
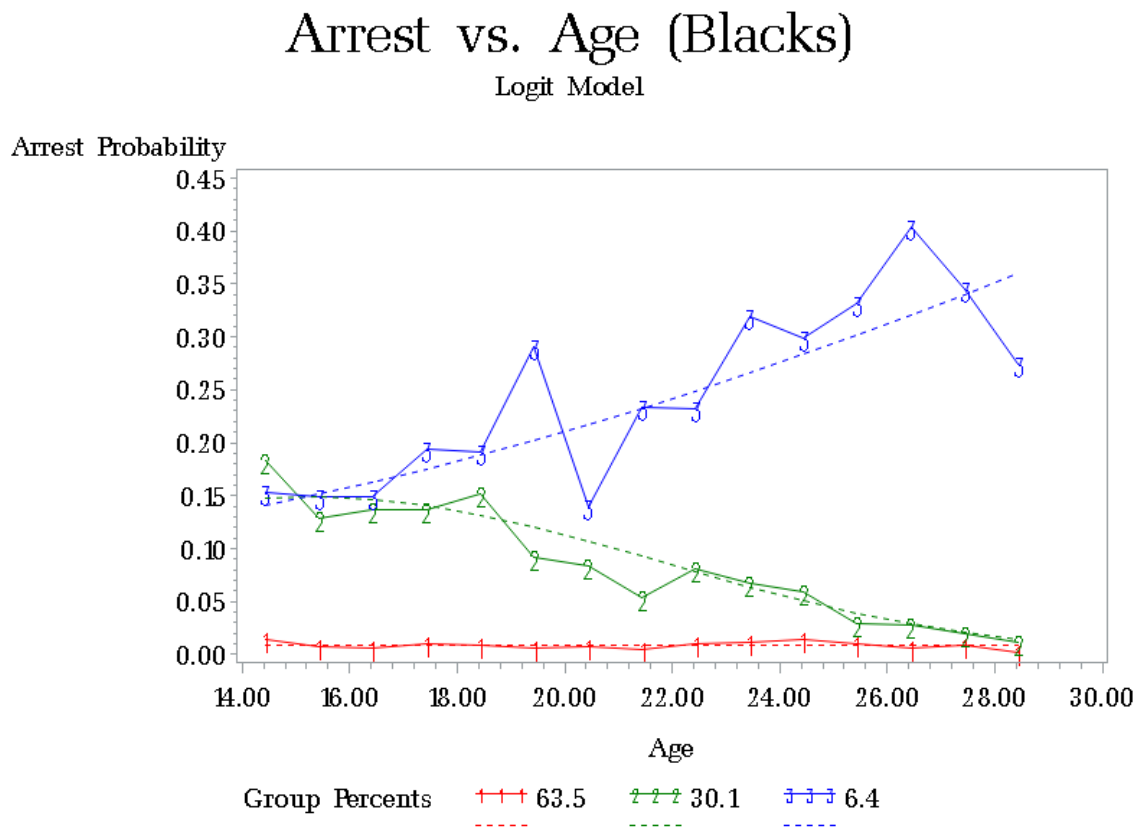
Figure 8. Three Group Trajectory Model of Arrest Probability for Males

Arrest vs. Age (Males)
Logit Model
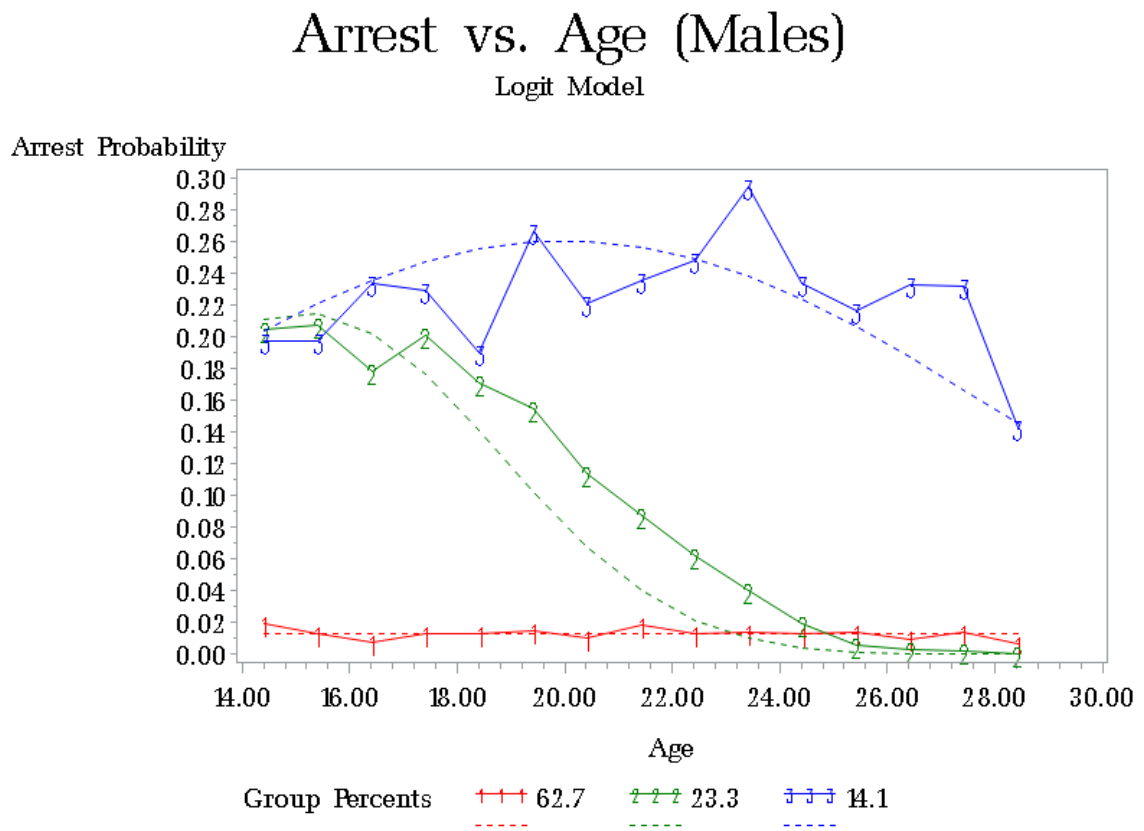
Figure 9. Three Group Trajectory Model of Arrest Probability for Females
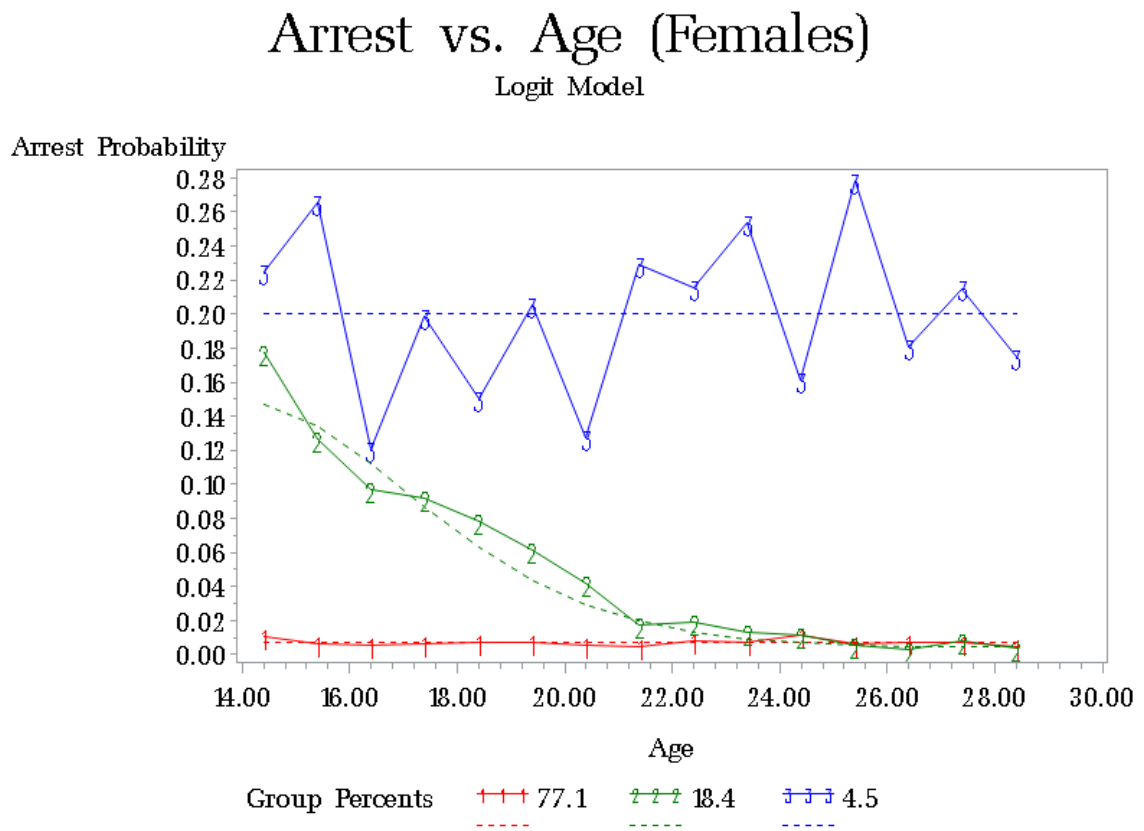
Figure 10. Five Group Trajectory Model for Heavy Substance Use for Whites

Heavy Substance Use vs. Age (Whites)
Logit Model
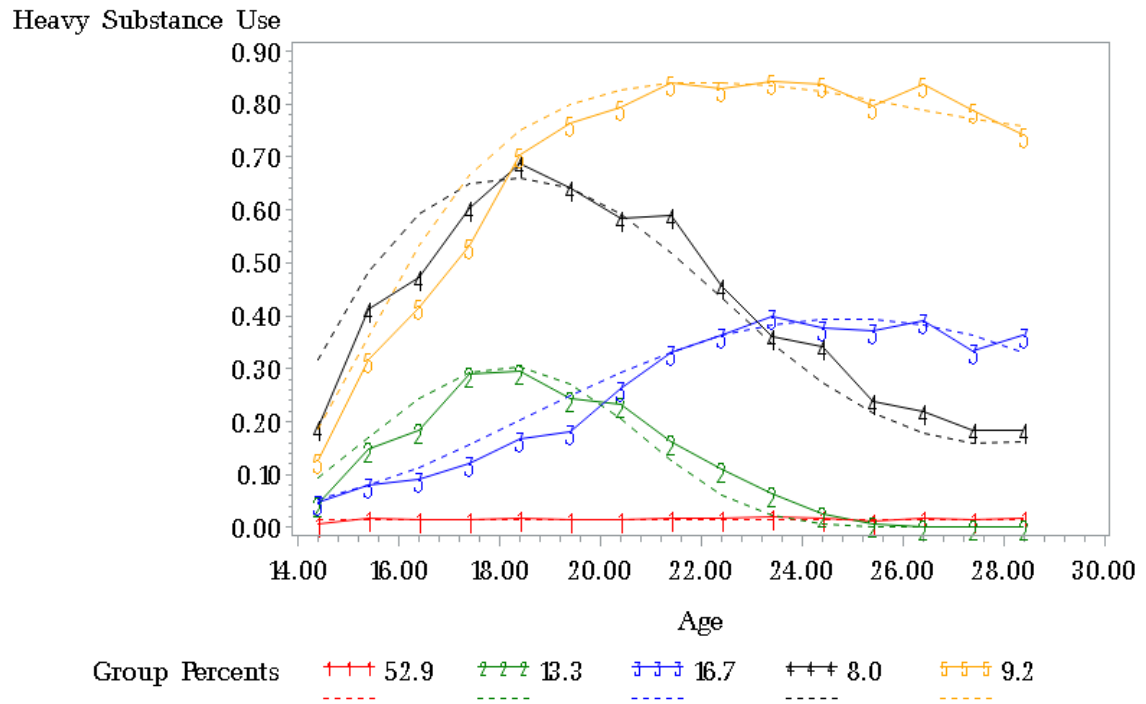
Figure 11. Four Group Trajectory Model for Heavy Substance Use for Blacks

Heavy Substance Use vs. Age (Blacks)
Logit Model
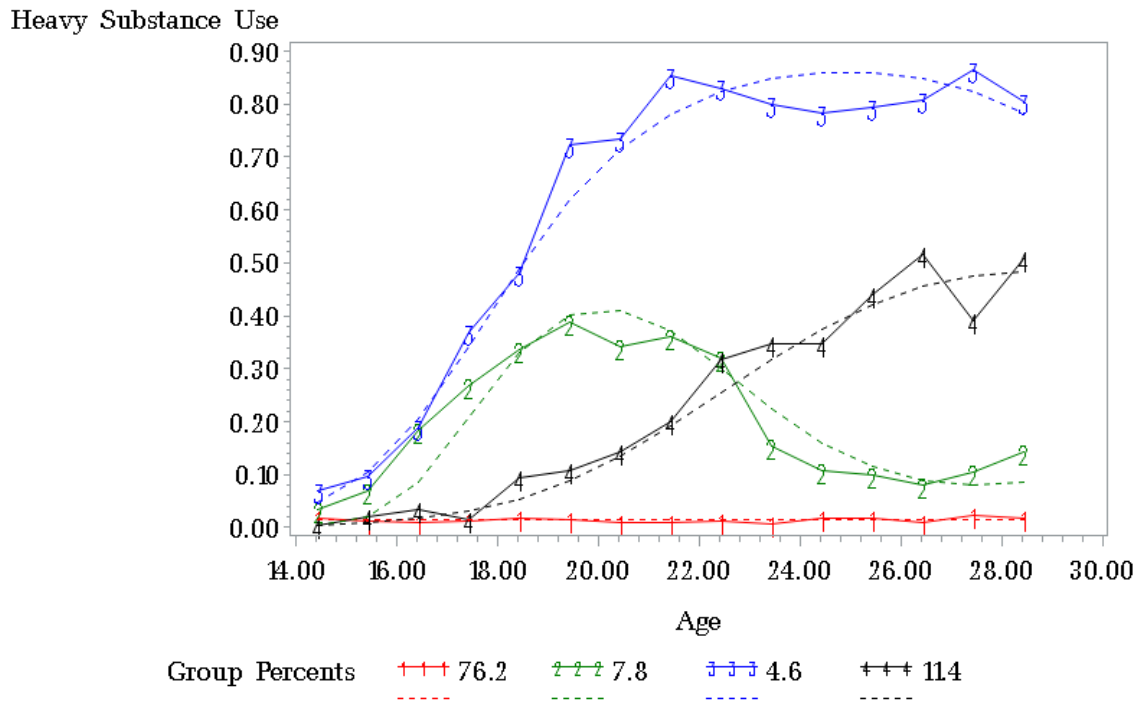
Figure 12. Five Group Trajectory Model for Heavy Substance Use for Males

Heavy Substance Use vs. Age (Males)

Logit Model
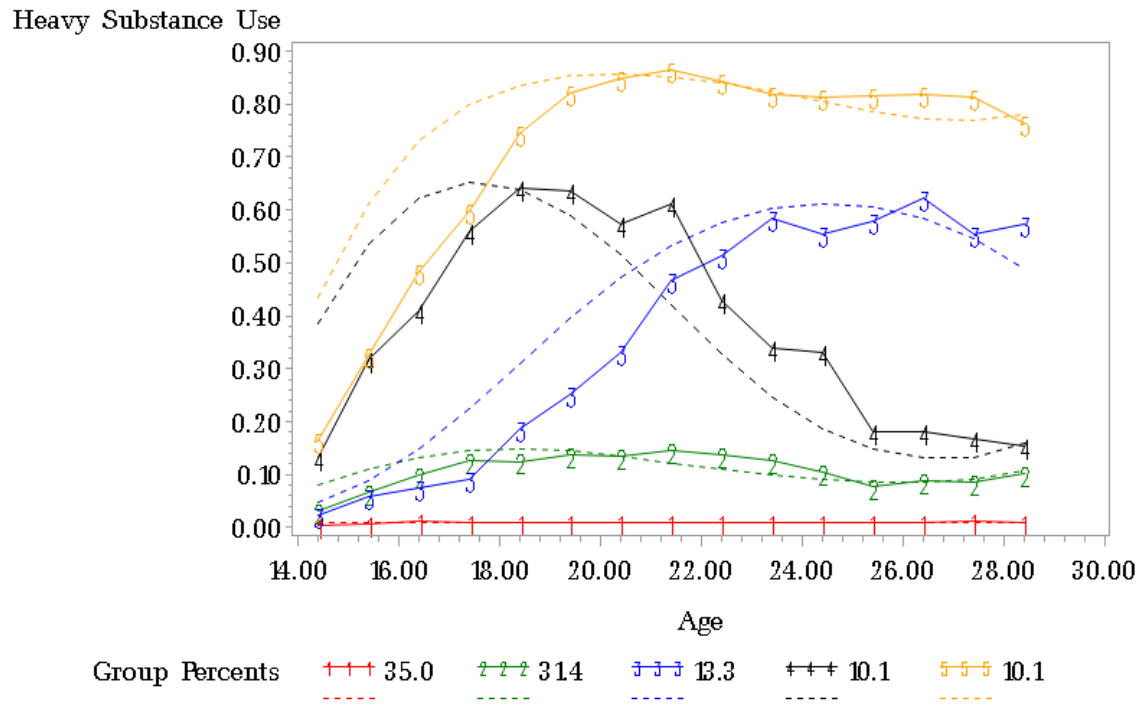
Figure 13. Four Group Trajectory Model for Heavy Substance Use for Females

Heavy Substance Use vs. Age (Females)
Logit Model
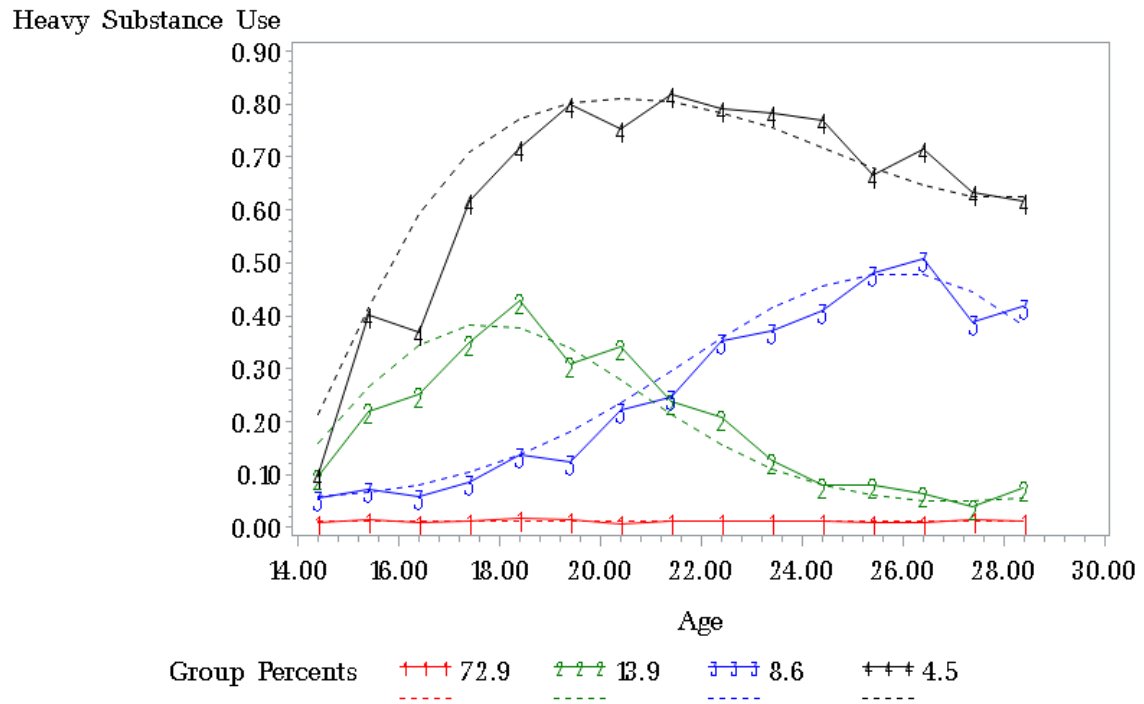
Figure 14. Five Group Trajectory Model for Binge Drinking for Whites

Binge Drinking vs. Age (Whites)

CNORM Model
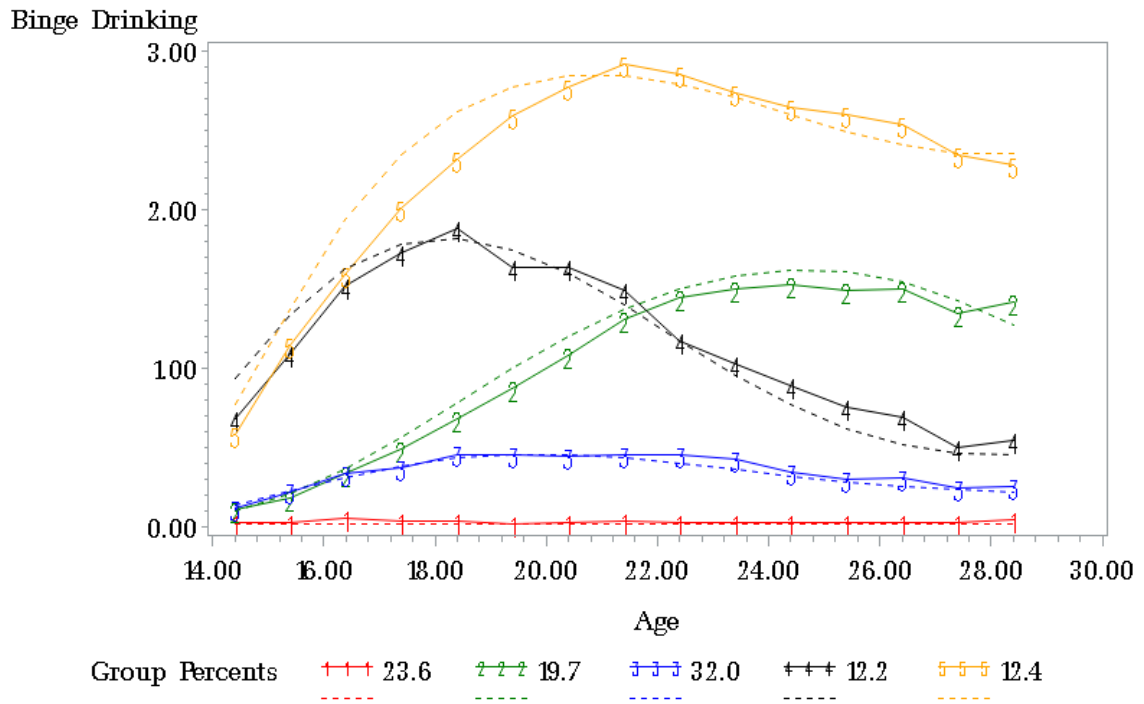
Figure 15. Three Group Trajectory Model for Binge Drinking for Blacks

Binge Drinking vs. Age (Blacks)

CNORM Model
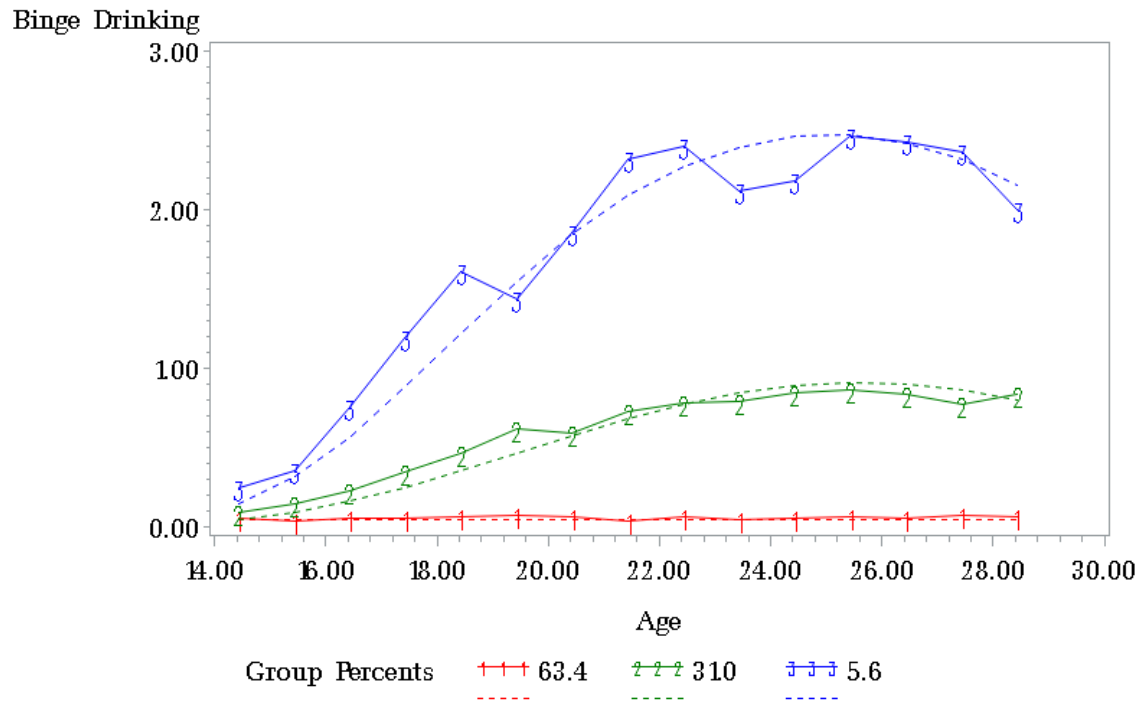
Figure 16. Five Group Trajectory Model for Binge Drinking for Males

Binge Drinking vs. Age (Males)

CNORM Model
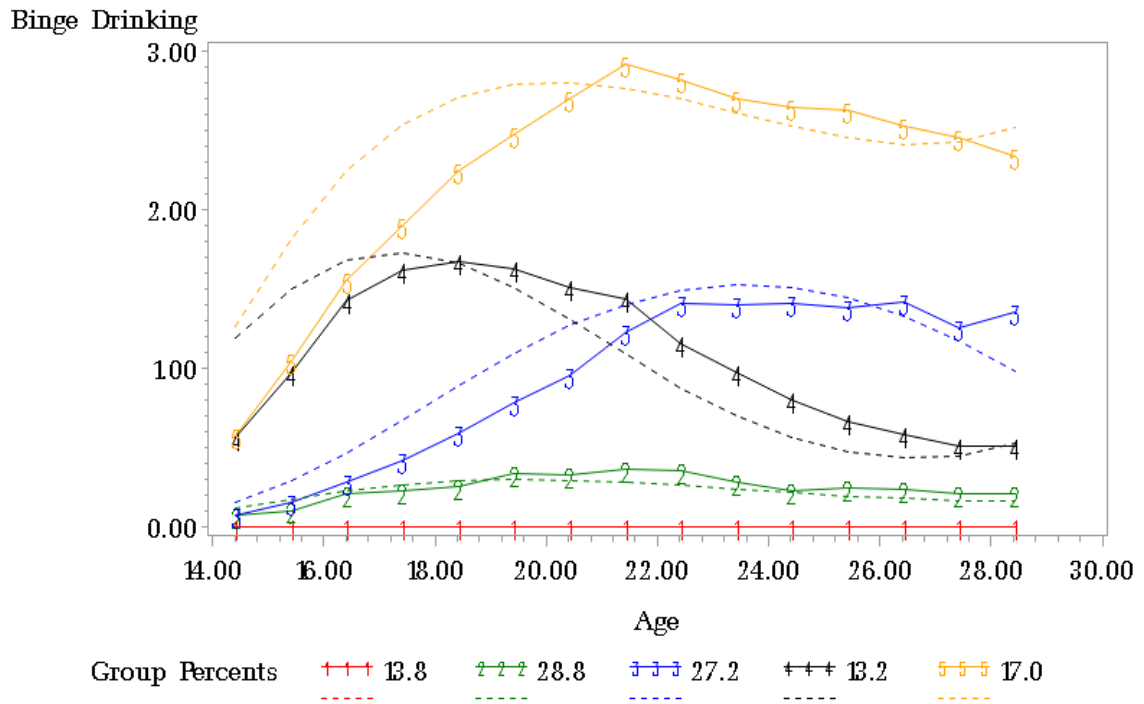
Figure 17. Four Group Trajectory Model for Binge Drinking for Females

Binge Drinking vs. Age (Females)
CNORM Model

Figure 18. Five Group Trajectory Model for Marijuana Use for Whites

Marijuana Use vs. Age (Whites)
CNORM Model

Figure 19. Five Group Trajectory Model for Marijuana Use for Blacks

Marijuana Use vs. Age (Blacks)
CNORM Model

Figure 20. Five Group Trajectory Model for Marijuana Use for Males

Marijuana Use vs. Age (Males)
CNORM Model
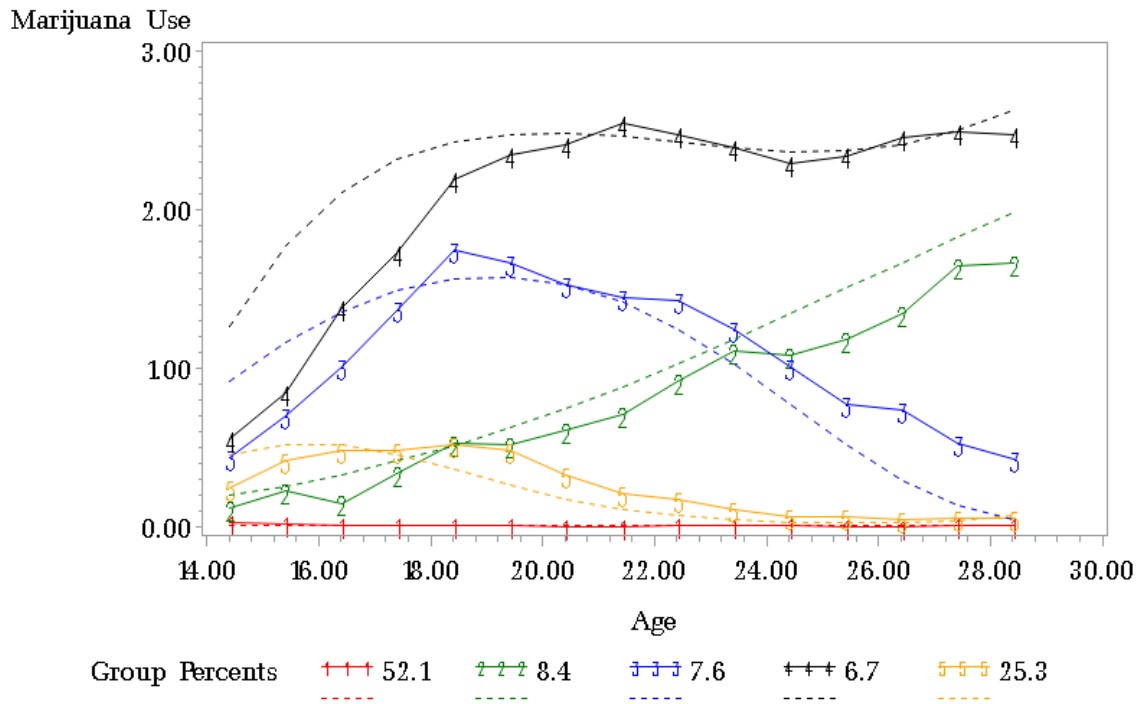
Figure 21. Five Group Trajectory Model for Marijuana Use for Females

Marijuana Use vs. Age (Females)
CNORM Model
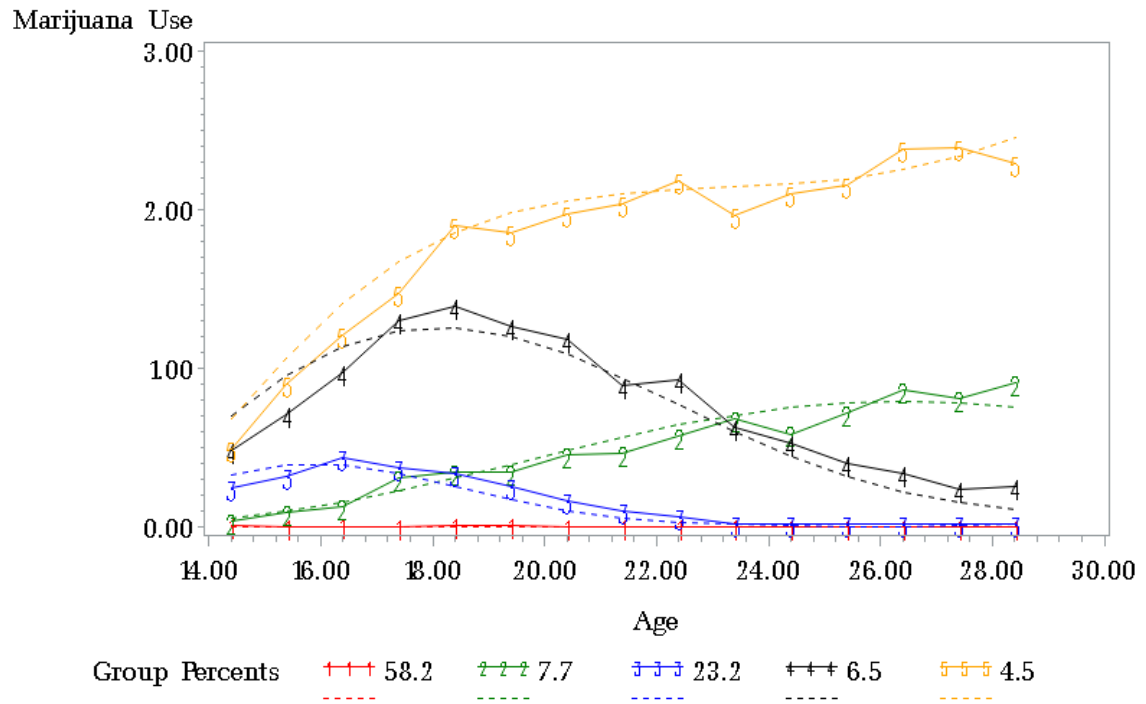
Figure 22. Four Group Trajectory Model for Hard Drug Use for Whites

Hard Drug Use vs. Age (Whites)
CNORM Model
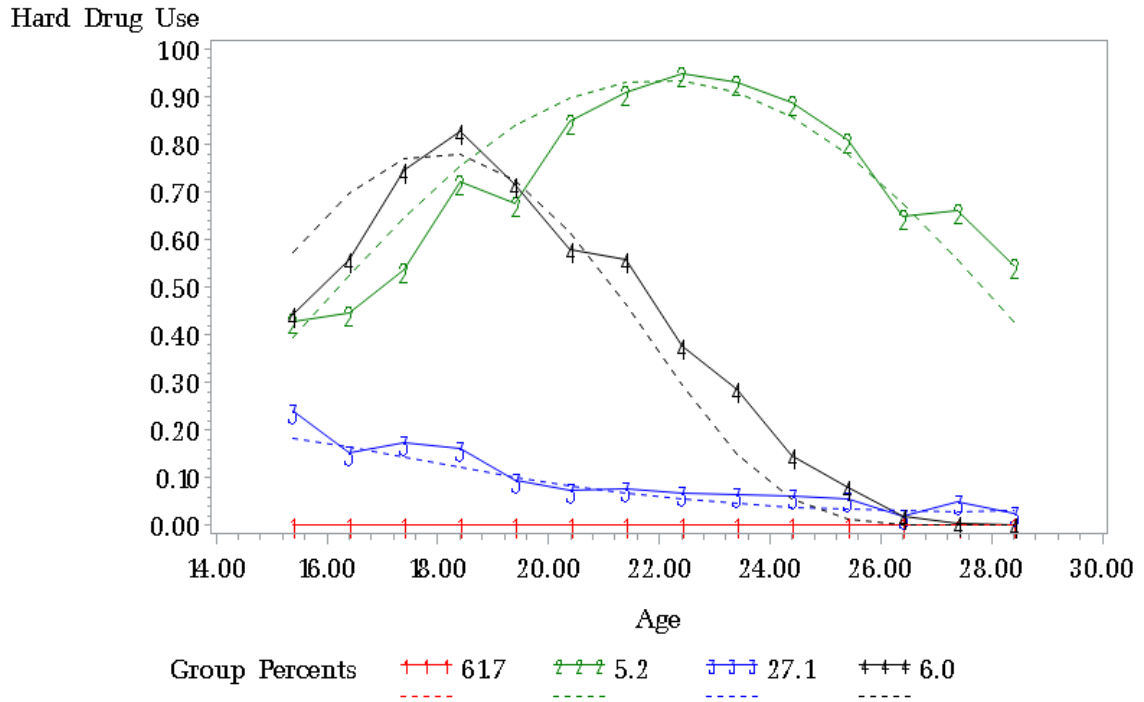
Figure 23. Three Group Trajectory Model for Hard Drug Use for Blacks

Hard Drug Use vs. Age (Blacks)
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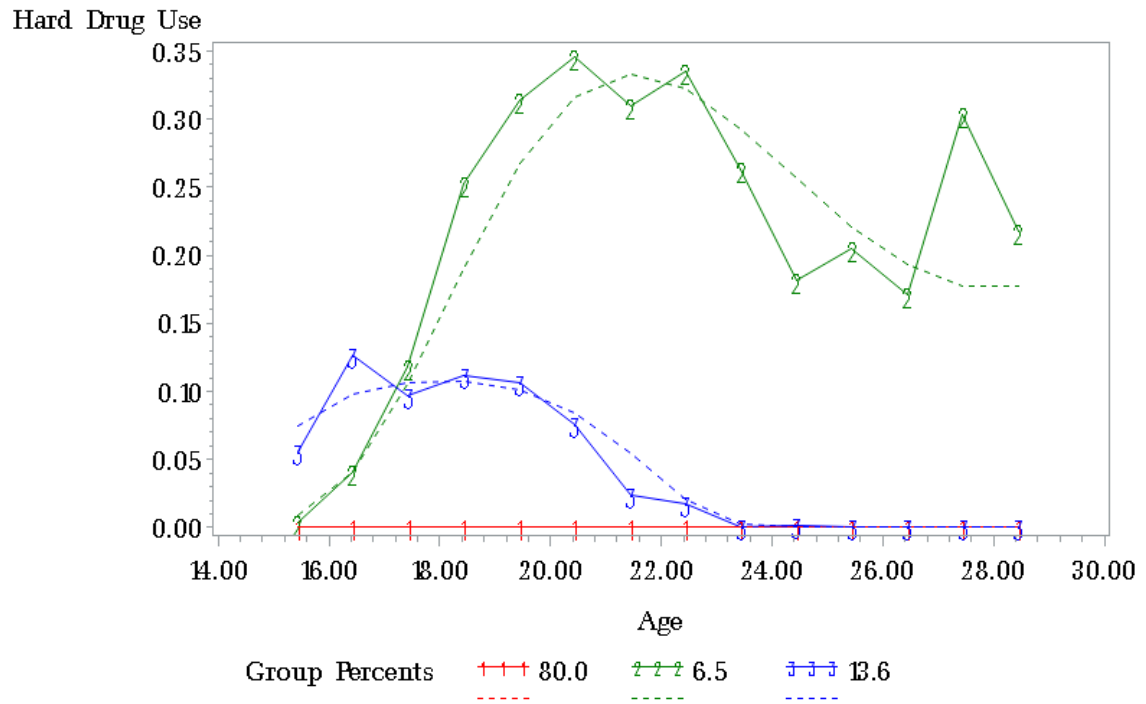
Figure 24. Three Group Trajectory Model for Hard Drug Use for Males

Hard Drug Use vs. Age (Males)
CNORM Model
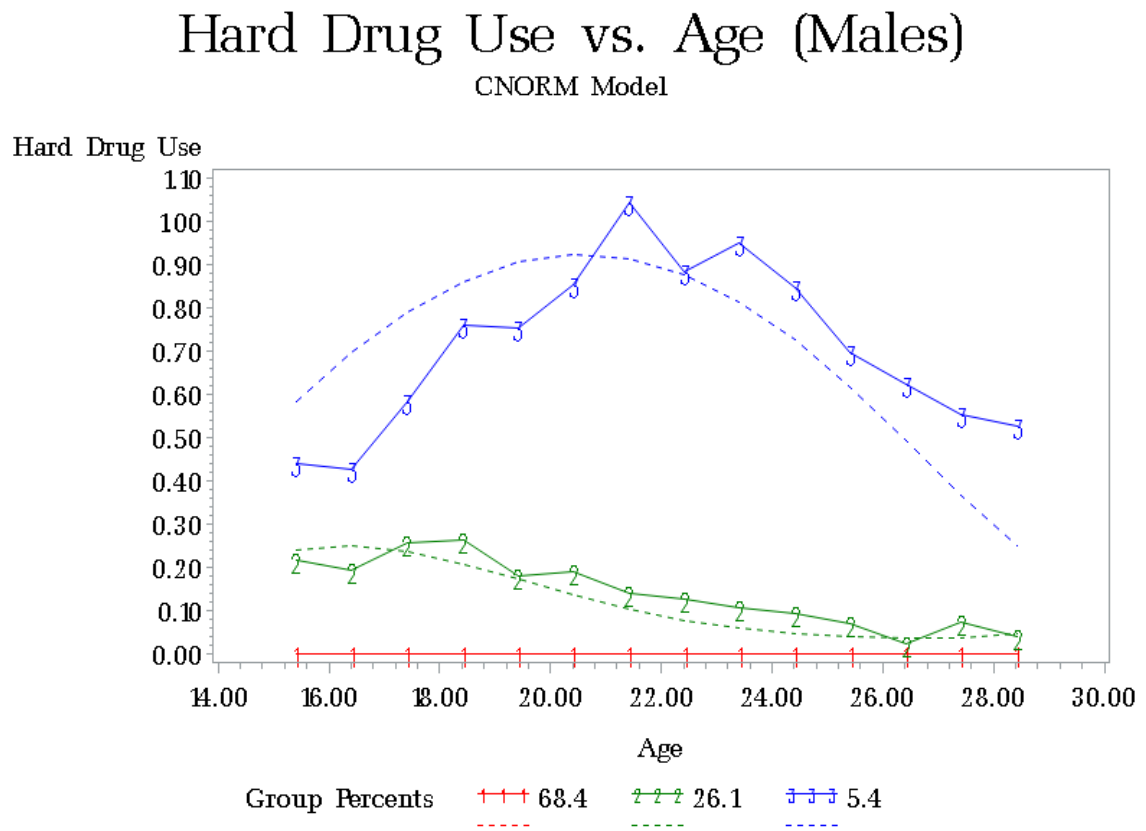
Figure 25. Three Group Trajectory Model for Hard Drug Use for Females

Hard Drug Use vs. Age (Females)
CNORM Model
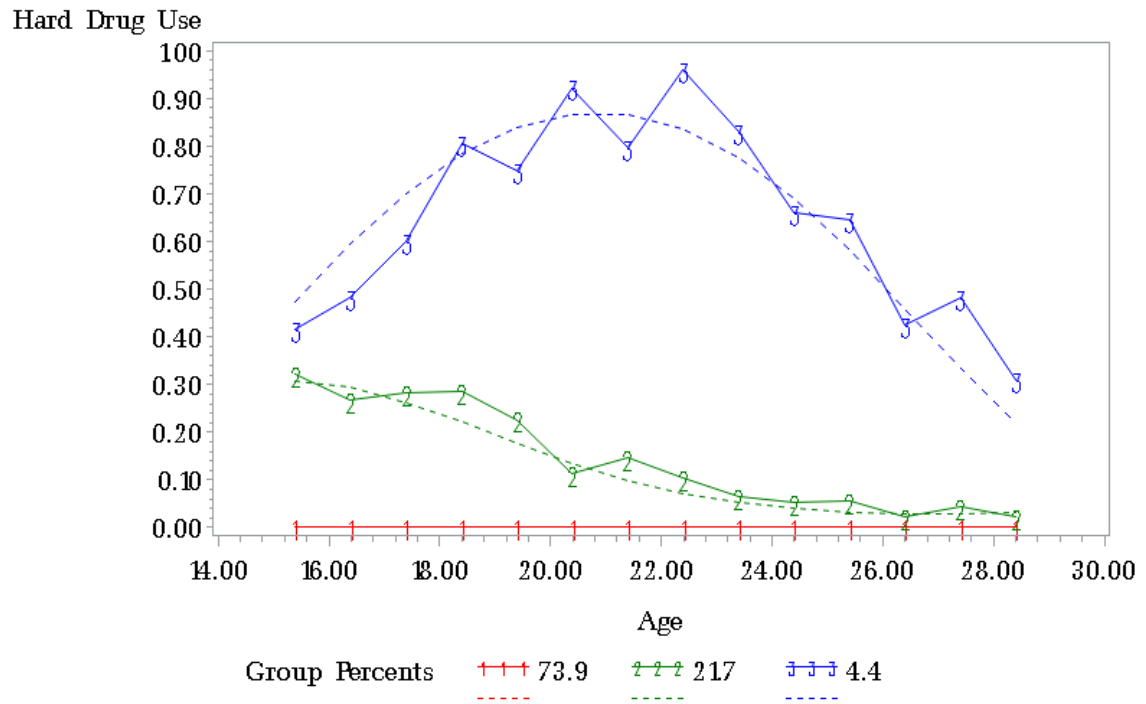
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