Patterns of adolescent drug offending and their consequences in making the transition to adulthood

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PATTERNS OF ADOLESCENT DRUG OFFENDING AND THEIR
CONSEQUENCES IN MAKING THE TRANSITION TO ADULTHOOD

by

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ABSTRACT

The life course perspective in criminology acknowledges that as an individual moves through successive stages in life, a host of factors in various domains influence the individual’s developmental and behavioral patterns. The criminological literature is also replete with research that suggests an individual’s involvement in drug offending has negative repercussions in these domains of life. Further, specific drug offenses are thought to affect outcomes in differing ways. Drug offenders are far from a homogeneous group, and that heterogeneity can produce vastly different outcomes. From a life course perspective, adolescence then becomes a particularly important stage since this is the time when individuals exhibit the highest propensity for drug offending, and because the choices made in this stage impact the years to follow. This dissertation adopts a life course perspective to explore drug offending in adolescence and the consequences of such offending later in life. Using data from the Rochester Youth Development Study, factor analysis is employed to empirically develop patterns of adolescent drug offending. Those patterns are then used to predict life outcomes in the domains of employment, the family, and the criminal justice system in young and later adulthood. Results will provide a deeper understand of the divergent paths of drug-using adolescents, and the cascading implications of drug offending for the life course.
SECTION I

Introduction

Since their development, life course theories of crime have gained a reputation for offering powerful explanations of the individual criminal activity. The life course approach inherently recognizes that criminal participation is a dynamic phenomenon, changing as an individual moves from one stage in life to the next. Life course theories, like Interactional Theory (Thornberry, 1987; Thornberry and Krohn, 2001; 2005), also emphasize the multiple domains in a person’s life, such as the family, employment, education, and individual factors. Criminal choices thus have the potential to impact multiple domains of a person’s life simultaneously, and these impacts can have enduring effects as the person ages.

The proposed project will examine how participation in drug offending during adolescence can impact an individual’s transition to adulthood. The literature shows that both drug use and drug selling are associated with negative outcomes across multiple domains of life (Kinock, O’Grady, and Hanlon, 2003; Lizotte, Krohn, Howell, Tobin, and Howard, 2000; Baumer, 1994; Baumer, Lauritsen, Rosenfeld, and Wright, 1998; Easton, Mandel, and Babuscio, 2007; Morojele and Tandy, 2006; Cook and Laub, 1998; Thornberry, Krohn, Lizotte, Smith, and Tobin, 2003). It is important, therefore, to understand how an individual’s choice to engage in various drug offenses during adolescence (when criminal activity is likely to be quite high) influences these domains as he or she ages. It has also been shown that drug offenders are not a homogenous group (Shaffer, Nurco, and Kinlock, 1984; Nurco and Shaffer, 1982; Kubiak, Arfken, and Boyd, 2006; Preble and Casey, 1969; Lankenau and Clatts, 2008; Clatts, Welle,
Goldsamt, and Lankenau, 2008). Within this group exists a multitude of offending types and levels. That is, drug offenders can engage in very different crimes, and with quite different frequencies. Divergent patterns of offending therefore emerge.

This project will achieve several goals. First, to account for the heterogeneity of drug offenders, my project will create typologies of drug offenders based on their levels of both drug use and drug selling in adolescence using factor analysis. Typologies will be explored to study in depth the drug offending patterns of adolescents, and to better understand how prevalent and problematic particular patterns are. The typologies will subsequently be studied for their impact on three domains later in life; the criminal justice system, the family, and employment.

To accomplish this, the project will use data from the Rochester Youth Development Study (RYDS), an on-going longitudinal project studying youth at high-risk for delinquency and drug use. The RYDS is a large-sample prospective panel study that is well suited for the empirical assessment of the hypotheses generated from life course theories. It contains data not only self-reported by the core subjects, but also supplements these data with data from their parents, the schools, the courts, and the police. The longitudinal nature of the data set allows a researcher to follow each subject as he or she ages, and to see a relatively complete view of the subjects’ lives. RYDS is thus an ideal data set to accomplish the above goals of the proposed project. Below the typologies are discussed in further detail, and the domains and variables to be employed in this project are described.
Typologies of Drug Offenders

As stated above, the first goal of this dissertation will be the creation of a typology of drug offenders in the RYDS sample. Numerous extant studies in the literature categorize drug offenders based on various factors (Fagan and Chin, 1990; Baumer, 1994; Baumer et al., 1998). These include variables such as substance used, frequency of drug use, using drugs alone or in groups, substances sold, selling drugs in a group, and the like. However, most of these studies create categories of drug users separate from drug sellers. That is, studies tend to focus on only one family of drug offenses. Often this is due to data constraints. Robust data sets including measures on a broad spectrum of drug offenses are rare. A principal strength of the RYDS data is that it can bring to bear a host of drug offense variables for each individual sampled

The drug offense variables are included in the delinquency section of the RYDS survey. Collectively, these variables cover the range of possible drug use and drug selling activities. The measures ask the respondent about their behaviors since the date of the last interview. Since the interview waves were spaced approximately six months apart, the respondents are therefore reporting on their behavior in the previous six months. Unlike some other studies asking subjects to report on all prior behavior, the RYDS data are bounded temporally. Further, compared to the studies that do use multiple waves of data collection and temporal bounds, RYDS uses a shorter temporal bound than is often used. This makes the data less susceptible to the problems of

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1 It should be noted that while the RYDS interviews ask each subject a battery of questions regarding drug use and selling, the prevalence of such behaviors in the sample is still low. The overwhelming majority of drug use, for example, is the use of marijuana. Nearly all of the rest is cocaine use. Nonetheless, previous drugs and crime research using RYDS data has proven quite fruitful, despite not having extreme variation on the drug offending measures.
retrospective data collection found in the literature (Freedman, Thornton, Camburn, Alwin, and Young-DeMarco, 1998; Roberts, Mulvey, Horney, Lewis, and Arter, 2005).

Regarding drug use, the RYDS gathers the following measures; substances used at each wave (including marijuana, cocaine, as well as hallucinogens, inhalants, and the “harder drugs” such as heroin or PCP, although use of these harder drugs is reported infrequently), and the number of times each substance was used during each wave. Additional measures assess if the respondent sold drugs, and if so which drugs he or she sold (using the same list of substances in the drug use items). Respondents are asked how many times they sold each substance, and how much money they sold them for. Using these measures, the typologies will assess the totality of a person’s drug offending behavior.

Generating a typology of drug offenders according to their patterns of use and selling is important not only because there are multiple types of drug offenders, but also because substantial differences are likely to exist between the various types (Nurco and Shafer, 1982; Kinlock, O’Grady, and Hanlon, 2003; Fagan and Chin, 1990; Baumer, 1994). For example, the consequences of using marijuana once a month may differ greatly from those of using cocaine every day. Similarly, the effects of selling small amounts of drugs infrequently are likely not equivalent to the effects of heavy involvement in the retail drug markets. The current project will compare types of users to other types of users (and sellers to sellers). It is unique in that it will also be able to compare drug users to drug sellers, and to persons who do both. More completely, it will classify drug offenders according to where they fall along both the drug use and drug selling dimensions. Finally, it will develop novel typologies based on a method not
commonly used in the literature, although it is highly adept for this problem; factor analysis.

Transitions to Adulthood

Adolescence is a turbulent time in anyone’s life, and the decisions made in adolescence can have an impact later in life. Of the decisions made by adolescents that can impact their lives as they transition to adulthood, the decision to either participate in or abstain from drug offending is potentially one of the most influential. The secondary thrust of this project is to study how adolescent involvement in drug offending impacts individuals as they become young adults. Specifically, it will examine what effect an individual’s membership in a given typology of drug offending has on outcomes in young adulthood. These outcomes will span three domains.

Employment, the Family, and the Criminal Justice System

The first domain considered will be that of employment. A wealth of research exists to show that criminal involvement during adolescence has an impact on a person’s employment outcomes (Faupel, Horowitz, and Weaver, 2010; Kemp, Savitz, Thompson, and Zanis, 2004; Larson, Eyerman, Foster, and Groerer, 2007; Gleason, Venum, and Pergamit, 1991; SAMSHA, 2008). The RYDS data contain information on a subject’s employment status at each wave, along with how many hours they work per week, and changes in employment due to being fired, laid off, or unemployed. Using the drug offending typologies, the proposed project can assess how subjects’ membership in the

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2 It is the case that employment can be quite sporadic for some RYDS subjects, particularly during Phases 1 and 2.
typologies is related to their employment history. More persistent drug offenders may be less likely to be employed in young adulthood, and this lack of experience could hamper their employment later in life. Alternatively, frequent drug users may need steady employment to fund their habit. Thus there is potential for a positive association as well as a negative one. Subjects whose drug offending continues into adulthood may have even worse employment outcomes than peers who desisted in adolescence. Using typologies of drug offending created along both the use and selling dimensions will allow interesting comparisons of various sorts of offenders to be made with respect to their employment, and to show how adolescent offending influences movement through the life course into adulthood.

The second domain considered in this project will be that of the family. Specifically, the focus will be on determining how membership in drug offending typologies influences a respondent’s relationship with his or her family. Research has shown that a person’s relationship with family and children is attenuated by their drug involvement (Lyman, 2011; Faupel, Horowitz, and Weaver, 2010; Beschner and Thompson, 1981; Brady and Ashley, 2005; Hanke and Faupel, 1993). The RYDS data includes an array of measures reflecting how a subject relates to his or her parents, and if applicable, to his or her romantic partner and children. These measures ask respondents about the level of attachment between them and their parents, support given by parents, the amount of trust and reliance between the respondent and a romantic partner, and level of attachment to the respondent’s child. Being in a high drug offense typology could impact these family relationships in a number of ways. Chronic adolescent drug offenders may be less engaged with their parents, or leave the home earlier than their
peers. They may be less likely to develop romantic partnerships. As drug-involved subjects move into adulthood, the effect may become more pronounced. For instance, they may be less likely to have children, or less likely to have contact with their children. We know that when subjects have children, their parents are often a strong source of support (Krohn, Lizotte, Bushway, Schmidt, and Phillips, forthcoming). This avenue may be blocked because of prior drug offending and disengagement from the family of origin. In short, drug offending typologies may prove to be powerful predictors of problematic transitions to stable adulthood.

The final domain is the criminal justice system. Through their participation in drug use and drug selling, adolescents expose themselves to the risk of criminal sanctions. The potential exists for drug offenders to be arrested, convicted, and even incarcerated (Langan, 1991; Kuziemko and Levitt, 2004). Arguably, the risk of criminal sanctions such as arrest would increase as their degree of involvement in drug use and selling becomes more persistent. The proposed project will test this, demonstrating how the incidence of arrest may change for different typologies of drug offenders. Of course, this relationship may not be direct. That is, persons heavily involved in drug offending may have higher risks for criminal sanctions, but they could be arrested for non-drug related crimes. Rather, it could be that membership in high-offending typologies is an indicator criminal proclivity and high risk for arrest. Alternatively, such persons may be simultaneously involved in a variety of crime which exposes them to sanctioning (of course, this is not an exhaustive list, other possibilities certainly exist). Therefore, this project must be sensitive to these possibilities. Because the delinquency section in the RYDS is so thorough, it contains data that are more than adequate to account for all these
possibilities. Importantly, the project will also examine how various criminal sanctions related to membership in drug offending typologies influence the transition from adolescence to adulthood.

Continued Drug Offending in Young Adulthood

Finally, empirical models will be able to examine whether membership in a particular typology of drug offending during adolescence is predictive of drug offending in adulthood. Of course, one of the best predictors of future behavior is past behavior (Krohn et al., forthcoming; Bushway, Thornberry, and Krohn, 2003; Nagin, 2005; Nagin, Pagani, Tremblay, and Vitaro, 2003). This may be particularly true with respect to the drug offending behaviors considered here. There are a number of reasons to believe high-offending typology members may become entrenched in the drug lifestyle. Persistent drug offending in adolescence could harm one’s opportunities for legitimate employment later in life. The drug markets may then offer a viable (and often quite lucrative) alternative source of income (Freeman, 1996; Reuter, MacCoun, and Murphy, 1990). Moreover, it should not be forgotten that drug use carries the potential for physical and psychological addiction. Addiction is one more reason we might expect to see adolescent drug offending predict drug offending later in the life course.

However, it is also well established in our discipline that individuals tend to “age out” of crime (Blumstein, 1995; Blumstein and Cohen, 1987; Nagin and Land, 1993). That is, as an individual ages, he or she becomes less likely to engage in crime for a variety of reasons. Other aspects of life become more important, such as family life and employment. The incentives to abstain from criminal involvement become quite
powerful as the individual moves through the life course, as criminality could damage the bonds and individual has with conventional society (Laub and Sampson, 1993; 2001). This literature would suggest lower levels of criminal involvement, including drug offending, in early and middle adulthood than in adolescence.

There is inherent competition, therefore, between hypotheses at this stage. Evidence exists to support the notion that membership in high-offending typologies would be predictive of continued drug offending later in life, while other evidence would support the idea that the transition to adulthood would exhibit declining levels of participation in drug offenses. The ability of this project to examine the actual levels of adulthood drug offending for the various adolescent typologies is an important and unique contribution. It would be imprudent to ignore the continued drug offending of the subjects, and the current project will included the continued measures in conjunction with measures of outcomes in other life domains.

Conclusion

The emergence of life course theories of crime has given rise to a wide range of propositions regarding how criminal offending changes as individuals move from one stage in life to the next. However, the complexity of questions such theories would ask requires data that are equally nuanced. Cross-sectional data sets or data sets with retrospective data collection are ill-suited for addressing these multifaceted hypotheses. The advantage of the RYDS data is that its longitudinal, prospective nature offers a unique opportunity to empirically test life course propositions.
This project intends to exploit that data in an in-depth examination of drug offending in adolescence and adulthood. The research has long acknowledged that drug offending by individual is not a homogenous phenomenon, and that within-individual patterns of drug offending are dynamic rather than static. It is the intention of this project to be sensitive to these facts, accounting for both heterogeneity among drug offenders and changing processes through the life course.

Specifically, typologies of adolescent drug offending will be created using the diverse drug use and selling measures in the RYDS delinquency battery. These typologies will go beyond most other typologies in the extant literature because they can classify offenders according to behavior on both the drug use and drug selling dimensions. Once created, the typologies of drug offending in adolescence will then be explored for an understanding of the prevalence of divergent patterns and the forms they take. Having explored them, they will next be studied for their impact on the transitions into adulthood across three domains; the criminal justice system, the family, and employment. The robust data set will allow the empirical models to control for the inter-relationship between these domains as well, and follow the temporal chain between the adolescent typologies and the adulthood life domains. Finally, the typologies will be used to explore how varying types and levels of drug offending in adolescent translate to continued offending in adulthood.

Understanding how criminal offending changes through the life course and how these changes affect the rest of an individual’s life is an important challenge for criminology. This project is an examination of one particular category of crime and its role in the transition from adolescence to adulthood. Certainly, drug offending is not the
only category of crime that can negatively affect this transition, but it is an important power. The effects of adolescent drug offending may linger well into adulthood. Greater knowledge regarding how this process operates will be a valuable addition to the literature, but also to practitioners and policy-makers who are interested in curbing adolescent crime and facilitating healthy development of young adults.

The remainder of this prospectus is organized as follows. Section II presents a general discussion of the ways in which individual drug involvement negatively impacts one’s life. Section III more specifically reviews how drug offending impacts the three life domains of employment, the family, and experiences with the criminal justice system. A subsection is devoted to each of these domains. Section IV discusses life course theories generally, and interactional theory more specifically. This section also specifies how interactional theory will provide guidance to the project. Section V reviews the methods and data for the project. Finally, Section VI presents the results from the analyses, followed by a brief conclusion of the project in Section VII. At the end are presented the citations and figures referenced herein.
SECTION II

Drug offending continues to be a pressing concern for criminal justice professionals, policy makers, the media, and citizens in general in the US today. The staggering amount of time and resources spent to deter drug offending and to punish it when it occurs speaks to the issue’s centrality on the landscape of criminal justice policy. In addition to these broad domains of society, drug offending remains a heavily researched area in criminal justice and criminology. Research has been conducted on nearly every aspect of drug offending, including the use of drugs, drug selling, drug production, trafficking, and a host of other crimes that may be associated with drug use and drug selling, such as physical violence, domestic violence, property crimes, homicide, and terrorism. (Baumer, 1994; Easton, Mandel, and Babuscio, 2007; Goldstein, 1985; Hutchinson, 2002)

While empirical work exists discussing the full litany of drug offenses, perhaps the two most commonly encountered in the literature are drug use (or abuse) and drug selling. This should come as little surprise as they are the two most common drug offenses as well (Bureau of Justice Statistics, 2011). From this literature we have learned a great deal about the effects of drug use and drug selling and their associations with a variety of other forms of criminal and delinquent behavior.

Any discussion of the negative effects of drug use and abuse should begin with the harsh ramifications of drugs on the human body. The effects, however, vary greatly by the particular substance used. Marijuana, for example, contains roughly four times the carcinogens as tobacco, and is capable of producing lung cancer following prolonged use through one’s life (Nahas and Latour, 1992). The negative effects of marijuana for more
casual levels of use is less well documented and more contested. Long term use, for example, has negative effects on neurological functioning, but the relationship is not supported for short-term use (Carlin and Trupin, 1977). As the severity of the substance increases, the debate surrounding the health risks decreases. Substances commonly referred to as “hard drugs” such as cocaine, heroin, phencyclidine (PCP), and methamphetamines are tremendously damaging to the human body (Corner, Collins, Kleber, Nuwayser, Kerrigan, and Fischman, 2002; Greenberg and Segal, 2002; Grinspoon, 1975; Lyman and Potter, 2007; Miller and Kozel, 1991). Cocaine is characterized by powerful psychological addiction and compulsive cycles of use as the user attempts to regain the euphoric feeling cocaine initially brings. Heroin, by contrast is physically addictive to the body. PCP is a disassociative substance with pronounced hallucinogenic properties that are known to make users hostile or violent to themselves and to others. Methamphetamine is similarly dangerous, with use marked by paranoia, violence, hyperthermia, tachycardia, hallucinations, and psychosis. This is by no means an exhaustive list of harmful substances, merely examples of commonly used drugs and their effects.

It should be clear that drug use in and of itself can damage a person’s health and well being. But drug use can negatively impact a person’s life beyond their physical body. These negative impacts are felt throughout many domains of a person’s life. Educational outcomes have been shown to suffer as individual drug use increases (Hawkins, Catalano, and Miller, 1992; Johnson, O’Malley, and Bachman, 1997). This effect endures regardless of whether education is measured as grade point average,
highest grade completed, completed high school, or college achievement (Johnson, O’Malley, and Bachman, 1997; Mounts and Steinberg, 1995).

Drug use is also associated with having deviant peer groups (Hawkins, Catalano, and Miller, 1992; Mounts and Steinberg, 1995; Warr, 1993). Having a best friend condone substance use is a powerful predictor of one’s own substance use, as shown in Dishion, Capaldi, Spracklen, and Li (1995). Similarly, the drug use of individual high school students was predicted by the drug use of their friend in Mounts and Steinberg (1995). According to Oetting and Beauvais (1987), “the single dominant variable in adolescent drug use is the influence provided by the peers with whom an adolescent chooses to associate” (p. 206). Related to the association between drug use and deviant peers is the well-documented association between gang membership and drug use (Miller, 2001; Lyman and Potter, 2007; Thornberry, et al., 2003).

Because drug use is a criminal behavior, it is not surprising that it is associated with other forms of criminality. Most commonly, it is thought of for its relation to violent crime. For example, individual drug use is consistently associated with robbery and assault (Baumer, 1994; Baumer et al., 1998; Kinlock, O’Grady, and Hanlon, 2003; Reiss and Roth, 1993), and weapon-carrying (Lizotte et al., 2000) yielding the potential for severe violence and injury (see also Huizinga, Loeber, and Thornberry, 1995). A few studies suggest drug use may be related to homicide offending (Goldstein, 1985; Hagelstam and Hakkanen, 2006; Mclaughlin, Daniel, and Joost, 2000; Shaw, Hunt, and Flynn, 2006), but the relationship is not as clear or consistent as that between drug use and less serious violent offenses.
As mentioned above, the negative effect of drug use varies by the substance itself. This is true of drug use and violence as well. Research exists to suggest that violent behavior from drug use is nuanced among specific populations, such as gang members, methamphetamine or heroin addicts, or the mentally ill (Goldstein, 1979; Valdez, Kaplan, and Cepeda, 2006; Cartier, Farabee, and Pendergast, 2006; Digiusto, Shakeshaft, and Ritter, 2006; Mulvey, Odgers, and Skeem, 2006). Goldstein (1979) found that violence was more likely to result when withdrawing from heroin, rather than when under its influence. Methamphetamine use, on the other hand, is quite likely to result in violence (Cartier et al., 2006). The violence that results from drug using gang members can vary according to the level of involvement of both the member and the gang, according to Valdez and Sifaneck (2006). Others have linked drug use to engaging in domestic violence (Easton, Mandel, and Babuscio, 2007).

In addition to violent crime, property crime is also related to drug use. Altschuler and Brounstein (1991) found that drug use was related to property crimes such as vandalism, burglary, and breaking and entering. Finally, drug use can be related to criminal victimization. This is for several reasons. Drug use can inhibit a person’s functioning and make them a more suitable target for criminal offenders. Alternatively, using drugs may bring a person into contact with more criminals, in a sense exposing them to risk of being victimized. Drug use preceding victimization is supported empirically (Chuang, Liebschutz, and Chang, 2007; Morojele and Tandy, 2006). A third potential is that following victimization (particularly traumatic or violent victimization), a person turns to drug use as a coping mechanism (Kubiak, Arfken, and Boyd, 2006; Vaddiparti, Bogetto, and Callahan, 2006).
We can see that individual drug use carries the potential to negatively impact a wide variety of the domains in one’s life. But so too does drug selling. Much as we see with drug use, drug selling shows a strong association to crime, particularly violent crime. Phillips (2012) demonstrated that drug selling was able to predict violence incidence, while drug use was only able to predict prevalence of violence. Lizotte and colleagues (2000) show that a high level of drug selling predicts carrying a gun. Violence and guns have reciprocal effects, especially in drug markets. Violence encourages the participants to turn to guns and gangs for protection, which in turn increases the levels of violence (see Cook and Laub, 1998). Drug selling was shown to be a remarkably common activity for gang members by Thornberry and colleagues (2003). Drug markets create reliably violent circumstances, a finding well established in the literature (Fleisher, 2006; Goldstein, 1985; Miller, 2001; Ousey and Lee, 2004; 2007; Valdez and Sifaneck, 2006;). Further, the violence can vary with the particular drugs being sold. Selling cocaine and crack cocaine, for example, is an especially violent enterprise (Fagan and Chin, 1990).

Altschuler and Brounstein (1991) found that juveniles who sold drugs were likely to be criminal “generalists,” committing both crimes against persons as well as property. The violent crimes in this study included carrying a weapon, using a weapon to threaten violence, robbery, and various forms of assault (including aggravated and sexual assault). The property crimes included vandalism, auto theft, burglary, breaking and entering, and buying or selling stolen goods. The conclusion that drug selling is related to the above list of crimes is quite consistent with conclusions presented in Goldstein (1985). Goldstein found that the crime and violence surrounding drug markets is most typically
“systemic” (meaning that it is intrinsic to drug markets, and used as an instrument of market regulation) or “economic-complusive” (meaning that it is used to obtain money for illegal substances).

Singularly, drug use and drug selling consistently show negative impacts on a wide range of individual outcomes. However, when an individual is involved with both of these behaviors the negative outcomes, most notably criminal activity, become much more pronounced. In the sample of adolescents studied by Altschuler and Brounstein (1991), subjects who used and sold drugs were the most likely to commit both crimes against persons (violent crimes) and against property, and at the greatest rate. Further, selling drugs is an often natural progression from using drugs for many individuals. Johnson, Golub, and Fagan (1995) for example reported that subjects who used crack cocaine were more likely than non-users to sell crack, to sell it more frequently, and to obtain higher incomes from crack sales (p. 281). Thornberry et al. (2003) found that gang membership facilitated the increase of drug use and drug selling, and that while drug use declined after leaving the gang, drug selling endured.

Clearly, the risks associated with drug use and drug selling are many. So why would adolescents become involved with either of these activities? Motivations for drug use and drug selling can vary from one individual to the next, but the literature nevertheless does show common themes. First is an economic motivation. Drug selling can be an effective way for youth to earn money, especially when considering the barriers to legal income. The jobs available to youth offer smaller wages than criminal activity (Freeman, 1996), particularly drug selling (Reuter, MacCoun, and Murphy, 1990). Freeman (1996) also notes that many individuals use illicit incomes from drug selling to
supplement their legal incomes. A second motivational theme is the camaraderie and social nature of drug use and drug selling. There is a wealth of research to show that using drugs is often done in social settings fostering a sense of community or belonging (Lyman and Potter, 2007; Pierce, 2008; Lankenau and Clatts, 2008). Drug use and drug selling is particularly socialized in the context of youth gangs (Curry, Decker, and Egley, 2006; Miller, 2001; Thornberry et al., 2003). In youth gangs, using and selling drugs as a group forges a sense of solidarity and commitment to the group (Valdez and Sifaneck, 2006).

The material presented above conveys the idea that while there are many potential risks associated with becoming involved with either drug use, drug selling, or both, there are many compelling incentives for adolescents to engage in such behavior as well. Having discussed both the motivations behind drug use and drug selling, and the negative effects of the behaviors in the individual’s life generally, the next chapters discuss how drug use and drug selling more specifically impact three domains of the life course. These domains are experiences with the criminal justice system, employment, and the family.
SECTION III

Employment

Following a period of steady increase of crime rates in the United States since the middle twentieth century, the crime rates began a declining trend in the mid- to late-1990s. For the fields of criminology and public policy an important question became “what explains the change in criminal behaviors?” A host of factors were subsequently explored to determine their ability to explain changing crime rates, but perhaps two of the more popular factors are illegal drug activity and employment conditions.

If illegal drug activity and employment conditions are each thought to affect criminal behavior, it is then logical to ask what effect illegal drug activity might have on employment at the individual level. Further, the effect of drug activity on employment is interesting net of any relationship to criminal activity. For example, if drug use does lead to unemployment, then drug use may place additional burden on limited economies with respect to receipt of public assistance. The dual state of being a drug user and being unemployed could pose significant challenges to a person’s welfare and potentially that of his or her family. If drug users are present in the workplace, they may place themselves and their coworkers in danger. For a variety of reasons therefore, it is important that we understand the ramifications of an individual’s drug activity on their employment.

An individual’s participation in drug activities (particularly drug abuse) has been shown to lead to adverse consequences in the individual’s life. These adverse consequences include difficulties in the labor market (Harwood, Fountain, and Livermore, 1998), such as unemployment or lower wages compared to persons not
involved in drug activity. A growing body of literature has examined the relationship between drug use and wages (Kaestner, 1991; Gill and Michaels, 1992), employment status (Register and Williams, 1992), and labor force participation (French, Roebuck, and Alexandre, 2001; Fairlie, 2002).

Nevertheless, the literature presents relationships that are both uncertain and complicated. Disagreement exists regarding appropriate analytic strategies for studying drug activity and employment at the individual level, and methodology is continually improving to allow for more precise causal inference. The current chapter is a review of the literature on the impact one’s drug offending behavior may have on various employment outcomes. Effects that are proximal and more distal in the life course are both discussed, considering the more immediate effects first. In addition, weaknesses in the literature are identified and considered for their role in shaping the conclusions the literature presents.

Drug Use and Employment

Conventional wisdom would lead one to assume that for an individual using drugs would lead to negative consequences in their employment, given the “potentially detrimental physical and psychological effects of drug use” (French, Zarkin, and Dunlap, 1998, p. 339). However, examining the literature closely shows that the association between illicit drugs and employment at the individual level is not necessarily as simple as conventional wisdom may suggest. The available literature suggests both the strength and the direction of this association may be dependent on a variety of factors, as will be elaborated upon below.
Considering the range of possibilities, an individual’s drug use could have a negative effect, a positive effect, or no effect at all on various employment outcomes. The literature shows support for all three possibilities. Conclusions vary as researchers study different samples, different time periods, and adopt different operationalizations of both drug use and employment. Understanding how these study design and methodological choices affect conclusions is therefore crucially important before designing a similar study of one’s own.

To begin reviewing the possible effects drug use on employment, let us first discuss a negative relationship. In such a scenario, an individual’s choice to use drugs hampers their employment. This may occur due to the pharmacological effects of drugs, the repercussions of addiction, or the undesirability of drug users as employees (Lyman and Potter, 2007, p. 25; p. 65-66, Freeman, 1987; Ginexi et al., 2003). Empirical support for a negative relationship such as this is readily found in the literature. DeSimone (2002) uses an instrumental variable analysis to show that for males both marijuana and cocaine use lowers the immediate likelihood of employment. Similarly, Register and Williams (1992) find that for males, wages are negatively related to drug use on the job and long-term use of marijuana and cocaine. French et al. (2001) distinguish between different types of drug users, and conclude that “chronic drug use” is negatively related to employment for both males and females, as it is negatively related to labor force participation for males.

At this point it is important to note that each of these studies made decisions to separate users by type, in one way or another. These separations may be according to type of drug(s) used, or the frequency of use. In other words, associations between drug
use and employment outcomes are inherently complicated. Further complicating the matter are a number of potential intervening factors. For example, drug users may be more prone to incarceration and the formerly incarcerated may face formidable hurdles in the labor market (Freeman, 1994; Nagin and Waldfogel, 1995; Grogger, 1995). These intervening factors will be expanded upon in greater detail.

Despite evidence claiming drug use harms employment outcomes, a positive association between drug use and employment has also been suggested, tested, and empirically supported. Although less intuitive than a negative association, such a scenario may occur as an individual supports their drug use through their employment (see Kaestner, 1991). Another general example might be an individual using various substances to increase or maintain a certain level of performance in their job (Lyman and Potter, 2007, p. 16; Miller, 2008). Using data from the National Longitudinal Survey of Youth, Kaestner (1994) presents models that show increased frequency of drug use has large positive effects on wages. However, this study sampled only subjects 18 years old and older. Ploeger (1997) used a juvenile sample and found a proximal positive effect of drug use on an adolescent’s employment status. This corroborates well with Register and Williams (1992) who find positive effects of marijuana use on wages in the short term.

In many studies that do evidence a positive relationship between drug use and employment, wages are often a focal outcome. Gill and Michaels (1992) find that drug users receive higher wages than non-users, and more importantly that the effect is stronger when only considering “hard drug” users. Studying heroin and cocaine users specifically, Uggen and Thompson (2003) conclude that the use of these two drugs creates a strong earnings imperative for users. In other words, sufficient wages must be
garnered to support a compulsive habit. In this study it is shown that wages from the legal labor market are typically insufficient for this purpose, and thus legal wages are supplemented with illegal income. Offenders in the authors’ sample earn more illegal when they are using heroin or cocaine compared to times when they are not using.

While one explanation for a positive association between drug use and employment is that high wages are used to support costly drug habits as outlined above, another common explanation is that there exists an a priori difference between drug users and non-users. This person-specific difference is called upon to explain why some individuals work or seek employment while others do not. As Kaestner (1994, p. 465) states, “the most commonly invoked explanation of that kind has been that important unobserved characteristics that are positively correlated with both wages and illicit drug use underlie the empirical relationship.” Fairlie’s (2002) study would agree. In an innovative and rather convincing study, Fairlie demonstrates that past experience as a drug dealer is positively associated with an individual being self-employed. Here, drug dealing is used as a proxy for risk-taking, entrepreneurial spirit, and a preference for autonomy. Regardless of the motivating influences behind the association, the point is that positive associations between drug use and employment are viable hypotheses as are negative ones.

With some studies finding negative relationships between drug use and employment outcomes and others finding the reverse, it should be no surprise that still other studies show mixed results or insignificant relationships between drug use and employment. French, Zarkin, and Dunlap (1998) study the drug use, wages, and levels of absenteeism of employees from six different worksites around the country. Regardless of
gender of the employee, the authors use models that do not control for current and life
time drug use but that do break the endogeneity between drug use and employment. The
final models show largely insignificant relationships between drug use, wages, and
absenteeism. Zarkin, Mroz, Bray, and French (1998) test adjacent cross-sections from
the National Household Survey on Drug Abuse (NHSDA) for a relationship between
hours worked and substance use. While the 1991 panel showed marijuana users worked
42 more hours in the past month than non-users, the 1992 showed that marijuana users
worked 41 fewer hours than non-users. That is, adjacent cross-sections show
relationships that are near perfect reverses of each other. The authors conclude that
results are not robust, and that strong evidence for a drug use-labor relationship does not
exist.

Up to this point, the studies discussed considered the relationship between drug
use and various employment outcomes in the short term. Though cognizant of issues of
temporal ordering and drawing upon panel data when available, these studies are not
primarily concerned with the effect of drug use on employment later in the life course.
Kandel, Chin, and Gill (1995), in contrast, adopt a life-course perspective and draw on
longitudinal data. This study makes an attempt to reconcile the inconsistent findings
reviewed above using a variety of drug use and employment measures. Specifically, the
authors find that among their male-only sample, illicit drug use was positively related to
labor force participation in the early twenties. However, by the mid-30s, this relationship
reverses direction as drug use is negatively related to earnings. Some of this effect was
indirect. When subjects are in their early 20s, drug users are more likely to experience
“non-voluntary” job mobility (i.e. terminations or firings) than are non-drug users. The
non-drug users are more likely to move jobs voluntarily, and this eventually translates into greater earnings. Most significantly, the study highlights the importance of looking at drug use and employment across the life course, as the relationships are inherently complex.

Drug Selling and Employment

The relationship between drug selling and employment is perhaps even more nuanced than the complicated relationship with drug use. This is in large part because drug selling is itself a form of employment, albeit an illegal one. Hagedorn (1994) for example, analyzes drug selling within gangs and finds that sellers approach the activity with remarkable rationality. The consequence of this fact is that researchers examining the potential relationship between the two must take great care in specifying not only what form drug selling takes (e.g. drug seller status, frequency of sales, substances sold, income earned from sales, etc.), but also in specifying how to measure employment (employment status or labor force participation, wages earned, and most importantly legal versus illegal forms of employment). Failing to consider these measurement issues can quickly result in imprecision and unreliable conclusions.

The reader should recall that it has already been shown that the selling of illegal drugs is an inherently dangerous activity (see Fagan and Chin, 1990; Fleisher, 2006; Goldstein, 1985; Miller, 2001; Ousey and Lee, 2004; 2007; Valdez and Sifaneck, 2006). A reasonable question, then, is why would someone choose this form of employment? Certainly, there has been no shortage of explanations, ranging from the psychological to the financial. Drawing data from qualitative interviews of young African-American
subjects in Washington, D.C. and Baltimore, Whitehead, Peterson, and Kaljee (1994) demonstrate that drug dealing offers participants psychological benefits, namely status, respect, and reputation among peers and within the community. Further, providing for one’s family enhances individual’s feelings of masculinity. Anderson (1996) concludes much the same. For those living in impoverished urban conditions, drug dealing is a vehicle to developing a “power base” (Whitehead et al., 1994).

But economic or financial motivations for drug selling exist as well as the psychological. In such impoverished and urban conditions where retail-level drug dealing is most prevalent, the prospects for legitimate employment are typically quite poor (Hagedorn, 1994; MacCoun and Reuter, 1992; Reuter et al., 1990; Whitehead et al., 1994). Even when legitimate employment opportunities can be found, the wages earned at these jobs tend to be low when compared to opportunities in less-urban areas. MacCoun and Reuter (1992) report that the typical wage for legal employment in the urban areas of Washington, D.C. were roughly $7.00 per hour. The income an individual can earn from drug selling are therefore particularly attractive, reaching as high as $30 an hour (MacCoun and Reuter, 1992).

In spite of these seemingly high wages, MacCoun and Reuter also found that drug selling was not likely to be a “full time” job. That is, most subjects in their sample used drug selling as a way to supplement their legal income, rather than replace it. More precisely, an overwhelming 82% of subjects who sold drugs did so in conjunction with legal employment. The likelihood of becoming wealthy from drug selling alone was quite slim. Levitt and Venkatesh (2000) support this notion. Examining the finances of drug selling gangs, the authors conclude that it is merely the prospect of future riches, not
current income, that is the economic motivator for drug selling gang members. The contemporaneous economic profits drug sellers received were not high enough to encourage continued individual involvement in the drug markets.

Moreover, evidence exists to show that even among those who participate in drug selling, legal employment is preferred to illegal employment. Matsueda, Gartner, Piliavin, and Polakowski (1992) surveyed a sample of unemployed drug addicts and ex-offenders regarding the prestige the believed certain legal and illegal occupations (including drug selling) held. Respondents who made more money illegally gave higher prestige scores to the criminal occupations. However, conventional or legal occupations were universally rated of higher prestige, regardless of criminal activity or illegal income. Illegal income was unrelated to the prestige ratings of conventional occupations. However, it is important to note that these were hypothetical occupations, not subjects’ own occupations.

Generally then, the literature shows that drug selling shows a positive relationship with employment in the short term, as drug selling is often done together with legal occupation. But what of the long term? Later in the life course, the relationship between drug dealing and employment outcomes becomes negative in direction, for many of the same reasons as drug use. Spending time and energy selling drugs means that less time is devoted to advancement in one’s legitimate career. Further, employers are usually reluctant to hire current or former drug sellers creating non-voluntary job mobility (Kandel et al., 1995), and the risk of incarceration for drug sellers is high when compared to other crimes (Freeman, 1996; Reuter et al., 1990). Therefore, the importance of considering the relationship between drug selling and employment through a life course
perspective is crucial. Unfortunately, many of the studies in this area rely on cross-sectional data and therefore lack the longitudinal perspective. Given the dynamic nature of drug use and drug selling and their impact on the life course, longitudinal data are preferred.

Drug Use Together With Drug Selling

To this point, drug use and drug selling have been discussed as exclusive, each having separate relationships with employment outcomes. It should not surprise the reader that drug use and drug selling are not exclusive. Many individuals who are involved in one of these are also involved in the other (see Adler, 1985; Valdez and Sifaneck, 2006). Steinman (2005) showed that among high school students, marijuana use was a key predictor of the prevalence of drug selling. Both drug use and drug sales were shown to be strongly related to youth gang membership by Thornberry et al. (2003). The co-occurrence of drug use and drug selling has been documented for adult samples as well. MacCoun and Reuter (1992), for example, report that in their sample of drug dealers, 79% of individuals used drugs during the time period they were selling. Even when excluding marijuana use, that figure was quite high, at 71%. Hagedorn’s (1994) subjects report that they didn’t get rich from drug sales because they were spending too much money on drugs for their own use. Lyman and Potter (2007) echo this sentiment, citing the support of drug habits as a chief reason why retail-level drug dealers are unlikely to become wealthy (p. 137).

Given the common co-occurrence of drug use and drug selling, and the independent effects each has on employment outcomes, it is then reasonable to ask if the
two combine to produce an interaction effect on employment. It may very well be that an individual who is both using and selling drugs would be predicted to have their employment affected in drastic fashion. Further, this effect on employment could be quite profound later in the life course, even after desisting from drug activities. Although several employment studies consider both drug use and drug sales (MacCoun and Reuter, 1992; Matsueda et al., 1992; Steinman, 2005; Uggen and Thompson, 2003), a study specifically testing for a combined or interactive effect of drug use and drug sales on employment outcomes could unfortunately not be found. This presents an opportunity for future research, once the tandem effect of drug use and selling can be effectively established. So few studies exist that consider both drug use and drug selling by the same individuals that a chief priority is to fill this gap in the literature. Their unique effects should be demonstrated before questioning their combined effects. However, the above discussion on drug use, sales, and employment should convey the importance of considering multiple forms of drug activity for effects on employment and labor market outcomes, particularly within the context of an individual’s life course.

Weaknesses in the Literature

The above discussion is a summary view of the state of the literature regarding individual drug offending and its impact on employment outcomes. However, the literature is not without its weaknesses. These weaknesses revolve around methodological features and design decisions. They may concern conceptualizations of drug use, drug selling, employment, or more general matters of causal inference. The consequences for conclusions and implications for the current research project are
presented below, following a more detailed description of limitations in each of these categories.

Considering drug use, a chief concern in many studies is the manner selected to operationalize the construct. Some researchers focus on chronic drug users (Harwood, Fountain, and Livermore, 1998), while others consider more casual or intermittent levels of drug use (French et al., 2001; DeSimone, 2002). The use of specific substances such as heroin, cocaine, or marijuana is examined by some (Kaestner, 1991; 1994; Uggen and Thompson, 2003), while others include the use of any illicit drug (French et al., 1998; Ploeger, 1997). These differences draw attention to the fact that when one is trying to operationalize drug use, two dimensions become important. First is the list of inclusive substances. Different substances have been shown above to have different effects on employment outcomes. The decision regarding which substances to include in one’s study is therefore an crucial one. The second dimension is frequency of use. Chronic drug use affects individuals in ways that more casual use does not. Unfortunately, not all studies have the ability to make the distinction between prevalence of drug use and incidence of drug use. This is typically an imposition created by the data drawn from sentinel drug studies such as the National Household Survey on Drug Abuse, or the National Longitudinal Survey of Youth. Regardless, it is a severe limitation that results in stymied measures of drug use and must improved upon for research to be further benefitted.

DeSimone (2002), for example, measured drug use with a pair of dichotomous measures indicating whether an individual had used marijuana or cocaine ever during the last year. This sort of measure is fairly common among studies using large-scale
(national) self-report studies (a nearly identical measure is used by Gill and Michaels, 1992). French et al. (1998) use prevalence measures indicating whether subjects ever used drugs in the past year, or ever in their lifetime. Drug use measures such as these are impotent. Drug use is remarkably nuanced, with some individuals using rarely, and others using multiple times per day. Sensitivity to these differences is a necessity. But, the above definition is not the only definition that can be found in the literature. Ginexi et al. (2003) for example, define drug use as the number of days in the past month in which an individual had used drugs. These authors benefited from not having to rely on a large-scale survey, however. French et al. (2001) distinguished between casual and chronic drug users, defining the former as individuals who used any illicit drug during the past year but not weekly, and the latter as individuals who used any illicit drug during the past year at least once per week. Kaestner (1994) uses a similar set of categorical drug use measures. These are improvements over dichotomous measures indicating past year use or not, but are a far cry from the ideal. The point is that drug use measures that offer greater variation and especially incidence measures are preferred to ensure construct validity, thus yielding greater confidence in results.

The operationalization of drug selling suffers from many of the same limitations as drug use. Here again, the dimension of substance and frequency are pivotal. That is, conclusions depend in part on which substances the focal subjects sold, and how often the subjects sold those substances. As with drug use, large scale studies often ask very basic questions regarding drug selling, and the measures of drug selling created from those items are accordingly limited. Steinman (2005) is prototypical of this limitation, defining drug selling as selling an illegal drug one or more times in the past year. As with drug
use above, this is an impotent operationalization of the construct, being far too inclusive. Fairlie (2002) is more conservative, defining drug dealers as persons in the sample who sold drugs six or more times during the past year. In each of these studies all illegal substances were included. Studies that consider the selling of specific drugs and effects on employment are rare, given the relative infrequency of drug selling. MacCoun and Reuter (1992) offer a refreshing exception to this rarity, including multiple measures of drug selling such as rate of participation, hours spent selling, number of sales, number of customers, and others. Further, these measures are broken down by type of drug sold, including crack, cocaine, marijuana, PCP, heroin, and all drugs. Having these multiple measures add robustness to the conclusions and a richness to studies using them. Accordingly, multiple measures of the drug selling construct spanning the dimensions of substance(s) and frequency are preferred when possible, as they offer results that we can put greater confidence in.

The drugs and employment literature contains not only multiple employment outcomes, but also varying definitions of those outcomes. As noted above, one very common outcome examined is a subject’s wages (French et al., 1998; Gill and Michaels, 1992; Kaestner, 1991; 1994; Kandel et al., 1995; MacCoun and Reuter, 1992; Register and Williams, 1991). However wages may differ according to the time period in which they were earned (e.g. wages per week, per month, or per year). The amount of time worked over a period of time is another common employment measure (French et al, 2001; Zarkin et al., 1998). Again, however this period of time varies from one study to the next.
Finally, employment status or participation in the labor force is yet another way to conceptualize employment (DeSimone, 2002; Fairlie, 2002; Ploeger, 1997). Employment status is a particularly “clear cut” measure, one that is easy to operationalize and define, and certainly most insulated from problems created by changes in the time period of interest. Even when defined as a continuous variable (e.g. percent time spent in the labor force), it offers a tighter range of possible values, and accordingly logging variables is less of an issue. In short, employment status is a concrete construct with desirable measurement properties. It is therefore a popular one in the literature. DeSimone’s (2002) measure of employment is a dichotomous indicator of whether the subject worked at least one hour in the last year. Ploeger (1997) uses a similar measure, treating subjects as workers if they indicated they worked in the community for pay during the last year. I argue that these are deficient measures of employment status. The obvious problem with these measures is that empirically persons who work only one hour per year are treated the same as persons who work 40 hours per week, every week of the year. There may be fundamental differences between such persons, and drug use or drug selling may be such a difference.

Finally, it is the case that differences exist in the methodological design choices made by researchers to strengthen causal inference. These differences are stark enough to give careful readers grounds on which to believe their emergent conclusions over the conclusions resulting from less-rigorous designs. In this way, it is possible to adjudicate between studies offering support for competing hypotheses. The use of an instrumental variables approach is a not uncommon technique use in this literature, given the high number of economists publishing in the area and the greater popularity of the technique.
among economists compared to criminologists. It is one approach that greatly boosts the ability for causal inference when used correctly. DeSimone (2002) used this technique to show marijuana and cocaine use negatively impacts the likelihood of employment. Instrumental variables was also used by French et al. (2001) to show a negative relationship between chronic drug use and employment status. While not using an instrumental variables approach, Register and Williams (1992) nonetheless put forth a stringent test, controlling for the probability of employment and endogeneity of drug use. A three equation structural model was used to estimate the effect of substance use (marijuana and cocaine) on wages, finding again a negative relationship. These studies are indicative of those that conscientiously seek to strengthen methodological design. Further, these studies all benefitted greatly from the use of longitudinal data sources.

The studies featuring these desirable design choices argue in favor of the more commonplace hypothesis that drug use and drug selling are negatively related to employment status, labor force participation, and wages, particularly in the short term. This argument endures despite the severely deficient measures used by DeSimone (2002). Fairlie (2002) offers one notable exception. Here again data are drawn from a longitudinal source, namely the NLSY. The author uses a reduced-form model controlling for unobserved latent individual traits to show that drug dealers are particularly inclined to seek legitimate forms of self-employment later in life. Thus we see the potential for a positive relationship between drug selling and employment under the right set of circumstances, particularly when considering many of those who sell drugs do so in tandem with legal employment (MacCoun and Reuter, 1992).

Together, the weaknesses detailed above carry potentially serious consequences.
for the conclusions one can glean from the literature regarding drug offending and employment. Often, the problem in the above studies is that the measures are too inclusive. A subject who used drugs one time in the past year is ostensibly different than a subject who used drugs every day, for example. Similarly, studies often use measures that fail to empirically recognize substantial differences between persons based on their levels of drug use, drug selling, or intensity of employment. What is needed then is the ability to create measures that result in more subtle differences between subjects. Doing so will allow a researcher to see a more fully exploit the variation between subjects with respect to drug offending and employment. It may also prove quite useful in examining whether various patterns of drug use and drug selling affect assorted employment outcomes in different ways. To determine these patterns, data should also be longitudinal in nature, thereby allowing the researcher to study how drug use and drug selling evolve over the life course, and how that evolution affects multiple operationalizations of employment.

**Family**

Research routinely documents the fact that drug use and drug selling has harmful effects on the life of the persons who engage in such actions. These harmful effects carry over into many domains of life, one of the most prominent being the family (Lyman, 2011, p. 8-9). The decision to use or sell drugs by an individual can affect their relationships with parents, with intimate or romantic partners, or their children. When drug offending occurs in multiple periods of the life course, relationships with all of these family members are easily burdened. Troubled family situations further have cascading
effects on the drug user (or seller), isolating them from key avenues of support and desistance (Lyman and Potter, 2007). Understanding more precisely how drug use and selling can impact family ties is a crucial task in minimizing the deleterious effects of drug use on society more generally.

Below are discussed the available literatures for how drug offending influences three key categories of the family; parents, partners, and children. It will be shown that both drug use and drug selling have powerful implications for each of these three categories. However, although much has been learned, much work remains to be done. To this end, weaknesses in the literature are also discussed, and ways to further scientific growth are presented.

Parents

Adolescence is a turbulent time in an individual’s life, often when newly found freedom and independence permit the development of delinquent behaviors including drug use and drug selling. Indeed, research has consistently shown adolescence to be the stage in the life course where drug offending is most prevalent in our society (Blumstein, 1995; Huizinga, Loeber, and Thornberry, 1993). Buffering this propensity for delinquency, a wealth of criminological theoretical and empirical work has reported that during adolescence a positive relationship with one’s parents and the family of origin inhibits antisocial behavior (Bushway, Krohn, Lizotte, Phillips, and Schmidt, forthcoming; Catalano, Morrison, Wells, Gillmore, Iratani, and Hawkins, 1992; Hawkins, Catalano, and Miller, 1992; Krohn et al., forthcoming; Thornberry, 1987). Accordingly, a variety of parent-child relationship measures, including affection, closeness, parental
supervision and monitoring, and two-parent households, have each been empirically linked to drug use among adolescents.

A great deal of research in this area has been conducted in a cross-sectional manner. Further, it has been approached from the angle of what effect parents can have on their child’s drug offending. While informative, this approach is the opposite of the current research’s goal of examining the effect of drug offending on the offender’s relationship with parents. The research is reviewed below in brief recognizing this difference of focus. The review is included for two reasons. First, a demonstrated association between drug offending and parental relations is salient regardless of the hypothesized direction of the relationship. If parents can impact drug offending, it makes perfect sense (both statistical and theoretical) that drug offending can impact parents. Second, there is surprisingly little research that places drug offending exogenous to parental relationship variables. The literature here represents what empirical evidence exists on the matter.

Having two parents in the household is a consistent factor shown to protect adolescents from drug use (Catalano et al., 1992; Ledoux, Miller, Choquet, and Plant, 2002; Farrell and White, 1998). Ostensibly, two parents would be more able to discourage drug use and delinquency among adolescent children than single-parent homes because there is another parent present to provide supervision, care, nurturing and guidance to the child (Krohn et al., forthcoming; Bushway et al., forthcoming). The literature seems to support this notion. Parental monitoring and/or parental supervision is reliably negatively associated with adolescent drug use (DeVore & Ginsburg, 2005; Ledoux et al., 2002; Little and Steinberg, 2006). However, agreement on this matter is
not universal. Sokol-Katz, Dunham, and Zimmerman (1997) find that family structure was unrelated to substance use in their sample. Closely tied to parental monitoring is the parenting style, a factor that also is related to drug use. In particular, authoritative parenting or family management practices\(^3\) insulates children from drug use (Catalano et al., 1992; DeVore and Ginsburg, 2005; Roche, Ensminger, and Cherlin, 2007; Vicary and Lerner, 1997). Correcting poor parenting practices also provides a benefit with regard to drug use (Schmidt, Liddle, and Dakof, 1996).

In addition, family situations that provide for closer monitoring of children are also likely to foster a stronger sense of closeness and attachment between the parent(s) and child. Farrington and Loeber (2000) support this idea empirically, showing that poor parental monitoring was associated with a child’s low attachment to their parent. Parental attachment or closeness between parent and child is also a reliable insulator against adolescent drug use. In fact, the cross-sectional relationship between parental attachment and drug use was the most consistent association found in the current review of the literature. Hawkins et al. (1992) for example report that a child’s low bonding to their family predicted initiation into drug use. DeVore and Ginsburg (2005), Brook, Whiteman, and Finch (1993), Ledoux et al. (2002), Farrell and White (1998), Sokol-Katz et al. (1997) and Catalano et al. (1992) echo this conclusion. In other words, a stronger bond to the family of origin inhibits drug involvement during adolescence. The review uncovered no literature that could empirically dispute this relationship. This relationship endures even in the sparse longitudinal research showing that poor relations with parents

\(^3\) Parents deciding who child’s friends are, parental agreement on punishment, parents not revoking privileges for misbehavior, parents not allowing child to misbehave, proactive family management, and restrained punishment.
or rejection by a parent (particularly a mother) was predictive of drug use later in adolescence (Kandel, Kessler, and Margulies, 1978; Vicary and Lerner, 1986).

A final category of parental factors contributing to adolescent drug use is the parent’s own drug use. This should not be surprising, as an adolescent would view his or her parent’s use of illegal drugs to be a de facto sanctioning of their own use of the same. Hawkins et al. (1992) provide a rather holistic treatment of this issue. In their sample, the authors find that parental drug use is positively related to adolescent drug user status and to the frequency of the child’s marijuana use. Further, a parent’s use of marijuana is positively associated with an adolescent’s use of harder drugs (e.g. cocaine, crack cocaine, heroin). To exploit an old cliché, parent’s marijuana use is sufficient to provide an adolescent a gateway to hard drugs. To complicate the situation for families with substance abuse issues, mothers who are more heavily involved in the use of drugs (through substance or frequency) are likely to have more control issues with their children, namely misbehavior and disobedience (Kandel, 1990). Such control issues can disrupt positive parenting practices and set in motion a sequence of events that culminate in a new generation of drug use.

Partners

But drug use does not just impact an individual’s family only through relationships with parents. Drug use also has the powerful potential to also impact an individual’s relationship with his or her romantic partner. While the angle of studies examining this phenomenon varies, the general direction of the association remains for the most part quite consistent. That is, although some studies look at a relationship’s
impact on drug use, and others focus on drug use’s impact on the relationship, the
association tends to be negative (see Laub and Sampson, 1993). Drug use inhibits the
quality of romantic relationships, and quality romantic relationships discourage drug use.
Of course beyond these general statements, empirical studies in this field have their own
unique methods and contributions, and the devil is in the details.

Beginning in adolescence, drug use is a salient factor as an individual transitions
away from his or her parents and moves to relationships with intimate or romantic
partners. Baumrind (1985) shows empirically that drug use is likely to promote an early
emancipation from the family relationship, as well as early or precocious sexual relations.
Rosenbaum and Kandel (1990) provide strong support for this finding. Using
longitudinal data from the National Longitudinal Survey of Youth, they show that the
prior use of marijuana and other illicit drugs greatly increases the risk of early sexual
activity for both males and females in their sample. More specifically, the higher the
drug involvement (as indicated by substances used and frequency of use), the early the
first sexual experience. However, this is mediated to a degree by race; the relationship
between early drug use and early sex was weakest for the Black subjects. Evidence also
exists to link the use of marijuana and other illicit drugs to an increased probability of
cohabitation for both males and females (Yamaguchi and Kandel, 1985). For females in
their sample, Yamaguchi and Kandel find that cohabitation decreases the probability of
eventual marriage to the same partner. In other words, past drug use indirectly reduces
the likelihood of marriage through cohabitation for women, according to these authors.
However, the association between cohabitation and drug use shows ample disagreement.
For example, Duncan, Wilkerson, and England (2006) find that cohabitation decreases
drug use, but with a much smaller effect compared to marriage. Bachman, O’Malley, and Johnston (1984) offer a competing conclusion, finding that while marriage decreases drug use after high school, cohabitation actually yields a small increase in drug use, similar to Yamaguchi and Kandel (1985).

As the careful reader will notice, there appears to be some temporal clustering of conclusions regarding cohabitation and its effect on drug use. That is, the studies showing a positive relationship came roughly two decades before those showing a negative relationship. This may be for several reasons. First, the statistical techniques used have changed considerably during this time period and could produce the varying results. Second, the data used to gather the variables employed have also changed, becoming more comprehensive and offering the research more statistical controls. Lastly an alternative, and perhaps simpler, mechanism could be at work. During the two decades in question, the nature of cohabitation may have changed in such a way that its status approached parity with marriage. The changing meaning of cohabitation and marriage is well beyond the scope of this chapter, of course, but it should suffice to say that it is a viable explanation.

Drug use influences intimate partner relations through channels other than marriage status and cohabitation. Sadly, drug use shows a pattern of encouraging intimate partner violence. Fals-Stewart, Kashdan, O’Farrell, and Birchler (2002) evaluate the efficacy of Behavioral Couples Therapy (BCT), and find that drug use mediates the treatment of BCT on the occurrence of male-initiated physical aggression and intimate partner violence. These results are similar to those found by Easton et al. (2007), who

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Data during this time period have also shown a general trend of moving from cross-sectional to longitudinal designs. However, the studies cited in the discussion of cohabitation here are each panel studies, and therefore this shift was not responsible for the differing results.
concluded alcohol and drug use were positively associated with male domestic violence. This literature seems to suggest that drug use becomes a coping mechanism for dealing with abuse, particularly physical or sexual abuse and sexual violence (Kellogg, Hoffman, and Taylor, 1999).

A third channel of influence, substantial evidence exists to support the notion that drug use also affects the quality of the relationship or marriage. Mudar, Leonard, and Soltysinski (2001) focus exclusively on newlyweds and their patterns of drug use. When one spouse is a heavy drug user, the quality of the marriage tends to be lower than in couples where neither spouse uses drugs or the level of use is more casual. Newcomb (1994) presents a rather comprehensive examination of marital quality and drug use patterns, chiefly polydrug use (here, the use of combinations of tobacco, alcohol, marijuana, cocaine, and other harder drugs). Disaggregating analyses by gender, he finds that for women, polydrug use is negatively related to marital satisfaction, and positively related to marital trouble and divorce. Marijuana use negatively impacts perceived support from their partner and marital satisfaction, and cocaine use damages marital cohesion. For men, polydrug use and cocaine use are both positively related to marital trouble, while marijuana use is negatively related to marital affection.

Finally, research also supports the notion that romantic relationships deflect further drug use (Froggio and Agnew, 2007; Laub and Sampson, 1993; Newcomb, 1994; Verbrugge, 1983). Again however, this direction of relationship is the opposite of the current research. Regardless, it is difficult to ignore the overall consistency in the literature on marriage and drug use. The negative relationship between the two endures, regardless of the methodological designs or the time period of the study. However, as the
above discussion on cohabitation should suggest, conclusions are still not universal, and researchers must be cognizant of the possibility that the meaning of marriage and intimate partner relationships is fluid. Sensitivity to that fluidity is not only warranted therefore, but necessary.

Children

A third and final prong on the family trident, drug use may affect an individual’s parenthood status and relationship with his or her children. Conventional wisdom would lead one to imagine that drug use would, as a general rule, adversely affect one’s relationship with a child. Anecdotes (if not stereotypes) abound that perpetuate the idea that parents who use drugs are less engaged with their children and are less concerned for the welfare of their child (see Lyman and Potter, 2007). Certainly these notions have contributed greatly to the laws punishing drug using parents, particularly mothers, and to cultural phenomena such as the “crack baby scare.”

But a holistic view of the intersection between drug use and parenthood is more nuanced. When exogenous to parenthood, for example, drug use may well influence parenthood status. That is, drug users may become parents at differential rates relative to non-drug users, or they may be likely to have children at different stages in the life course. When and if children do arrive, parenthood may itself discourage the continuation of drug use and act as a turning point much the same as marriage (see Laub and Sampson, 1993). Further, parenthood is itself entangled in the web of the larger family, which is also affected by drug use as detailed above. Grandparents and partners are primary social supports for parents, and the relationships with these individuals can
determine the level of support a parent receives. Therefore, prior drug use and its effect on the relationship an individual has with his or her parent(s) and partners must also be considered and examined. This is by no means an exhaustive list of the myriad ways in which drug use could influence the experience of parenthood, but it should suggest that the influence is not as straightforward as conventional wisdom posits.

Unfortunately, the literature regarding drug use and its effect(s) on parenthood and relationships with children is somewhat bare. The majority of the work considering how drug use influences parent-child relationships focuses on the drug use of the child. This work is reviewed in the Parents section above. The current section, by contrast, is focused on the drug use of the parent. The studies that remain after making this qualification consider parenthood status and not the specifics of the parent-child relationship. Conclusions from these studies are quite consistent but also quite limited in scope.

In particular, the literature maintains that drug use in adolescence and young adulthood is correlated with early sexual activity and early parenthood. Herrenkohl, Herrenkohl, Egolf, and Russell (1998) find a bivariate link between adolescent drug use and teenage parenthood among abused or neglected subjects. But this link exists in multivariate contexts and more generalized samples as well. Retrospective data on nearly 6,000 individuals were collected by Kessler, Berglund, Foster, Saunders, Stang, and Walters (1997) which showed that substance abuse disorders were correlated both with teenage sexual activity and teenage parenthood. Data from longitudinal studies in Pittsburgh, Rochester, and Denver were analyzed by Huizinga, Loeber, and Thornberry (1993). The authors found that drug use and early sexual intercourse often co-occur in
adolescence. Not surprisingly then, drug use also frequently co-occurs with teenage pregnancy. Measuring drug use more finely, Yamaguchi and Kandel (1987) show that the use of drugs other than marijuana is associated with two- to three-fold increase in the risk of premarital pregnancy.

Drug Selling and the Family

There has been much empirical work done focusing on individual drug use and its impact on the family and an individual’s relations with his or her parents, partner, and children. The available literature focusing on drug selling’s impact on the same, however, is not nearly as comprehensive. This is for several reasons. First, much of the research on drug selling and the family is subsumed under work on drug use and the family. Many of these studies have been cited above (Farrington and Loeber, 2000; DeVore and Ginsburg, 2005; Froggio and Agnew, 2007). Second, drug selling is often absorbed into more general indicators of delinquency (Smith and Thornberry, 1995; Thornberry et al., 2003). Third, studies regarding individual drug selling activities most often focus on violence (Ellickson, Saner, and McGuigan, 1997; Goldstein, 1985; Phillips, forthcoming; Hawkins, Herrenkohl, Farrington, Brewer, Catalano, Harachi, and Cothern, 2000). Finally, the focus of much of the extant work is on the family’s impact on drug selling, instead of the reverse. This mirrors the problem highlighted with drug use and the family above. This is not to suggest that the literature is silent on the intersection of drug selling and the family. As before, cross-sectional research still offers a window into the dyadic relationship between drug selling and family factors. However,
it is important to highlight the need for explicit focus on the two constructs and the potential for generation of knowledge.

In parallel manner to studies on drug use, research shows that parent-child factors are particularly salient for the prediction of drug selling. Generally, the stronger the bond between the parent and child, the less likely it is the child will engage in such behavior. Qualitative interviews of youth in urban public housing frequently note that parental monitoring and parent-child communication are critical in insulating youth from the draw of the drug markets (Black and Ricardo, 1994; Ricardo, 1994). Black and Ricardo (1994) supplement these conclusions with quantitative analysis that not only does parent-child communication predict involvement in drug selling, but so too does drug selling in the family. That is, when other family members are selling drugs, it becomes more likely that the child will sell drugs as well. The strong relationships between parental monitoring, parent-child communication, and parent-child connectedness are echoed by DeVore and Ginsburg (2005) and Farrington and Loeber (2000).

Little and Steinberg (2006) offer one of the rare studies focusing explicitly on drug selling and parent-child relations. Using quantitative data, these authors were able to show that low parental monitoring led to an increased opportunity for drug selling by the child. Interestingly, parental drug use also led to increased opportunity for drug selling. Drug using parents offer less supervision of their children and afford greater access to drugs. As one might think, that increased opportunity for drug selling translated into a higher frequency of drug selling. However, the effect on frequency of drug selling was mediated by commitment to school and the presence of conventional goals, such as employment, marriage, and parenthood.
The review of the literature uncovered only one study that focused on the interplay between individual drug selling and relationships with one’s intimate or romantic partner. Specifically, Froggio and Agnew (2007) found that break-ups with a romantic partner were predictive of persons becoming active in drug selling. However, the effect was not as strong as the effect for drug use. Having a romantic partner may discourage drug selling as it affords a vehicle of social control (Laub and Sampson, 1993). The review of the literature was unable to find a study which considered the interplay between individual drug selling and the relationships with one’s child, although Little and Steinberg (2006) show that drug selling exhibits a negative relationship with conventional goals such as parenthood. Parenthood status or strong relationships with one’s children therefore may be discouraging of drug selling. As we can see, considerably less is known about partner and child relationships than parent relationships. Despite the fact that the literature reviewed above focused chiefly on what impact the family has on drug selling, and this study is focused on the opposite direction of relationship, it was presented to give context to the present study. There is a noticeable gap in the literature regarding what effect drug selling during adolescence can have on an individual’s relationship with his or her family, particularly in the long term. Subsequently analyses will therefore be structured to extend the literature in these areas.

Weaknesses in the Literature

While substantial research exists examining how the individual’s drug use and drug selling actions affect his or her family relationships, much work remains to be done. As was the case with employment, the extant literature is replete with constrained,
inadequate, or incomplete measures of family outcomes. Of course, this is not to suggest that the available literature is not of any value. On the contrary, the work that has been done previously provides an invaluable knowledge base and a foundation that future research should build upon. Structuring that future research appropriately, however, depends on explicit awareness of the limitations of past studies, and ways to improve on those limitations. The current discussion is therefore not intended to disparage other work, but instead to the make explicit the potential for scientific growth.

One of the most pervasive limitations of studies focusing on drug offending and the family is one that is also present in the employment literature; categorical measures or indicators of drug offending. In many studies measuring either drug use or drug selling, individuals are grouped into categories labeling them either users or nonusers, sellers or nonsellers (Bachman et al., 1984; Duncan et al., 2006; Froggio and Agnew, 2007; Kandel et al., 1978). Other studies improve on these dichotomous measures by using scales of drug use or drug selling (Brook et al., 1993; Ledoux et al., 2002; Mudar et al., 2001) or by distinguishing between type of substances used (Hawkins et al., 1992; Newcomb, 1994; Rosenbaum and Kandel, 1990; Yamaguchi and Kandel, 1985). Ideally, data would allow a researcher to account for both frequency of offending (both use and selling) and the types of substances involved. Both dimensions of drug offending are important in assessing how life domains are affected, so having robust measures of each becomes even more important for furthering research in the area.

When we discussed drug offending and employment, it was the case that many of the employment measures were overly simple or incomplete. This is not the case with the drugs and family literature. Indeed, the literature covers a wide breadth of outcomes.
in the family domain, ranging from marriage and cohabitation, to parenthood status, and parenting practices including supervision, monitoring, and parent-child affection and closeness. Certainly, all of these are crucial for understanding how an individual’s drug use or drug selling may relate to his or her family. The potential for improvement comes in the synthesizing of these diverse outcomes. As stated above, drug offending has the potential not only to impact an individual’s relationship with parents, partners, and children, but to do all three, and at multiple stages of life. The review of the literature was unable to find a single study that included family outcomes from more than one family category (parents, partners, or children). The current research is therefore able to make noteworthy additions to the literature by assessing how a single individual’s drug use and drug selling creates consequences for all multiple family categories.

Experiences with the Criminal Justice System

When considering how crime can impact the many domains of an individual’s life, it’s appropriate to think of an individual’s experiences with the criminal justice system. The criminal justice system exists to respond to crime and individuals who commit them, and such individuals face a non-trivial risk of criminal sanction following their decision to engage in crime. Drug offenses, such as substance use and drug selling, are no exception. Offenders can be arrested, arrests can lead to convictions, and convictions can be punished with probation or incarceration. Such experiences are intensely disruptive to the normal evolution or progression of the life course. While the particular criminal charges may take many forms (e.g. possession, distribution,
possession with the intent to distribute), the broad family of drug offenses\(^5\) have the powerful potential to influence and individual’s life course by manufacturing these experiences with the criminal justice system.

However, it is not the case that all drug offenses carry the same risk of such experiences. Not only is the risk of arrest greater than the risk of conviction, the risk of which is in turn greater than that of incarceration (Stuntz, 2006), but these risks vary with the nature of the drug offense. Offenses carry different risks of arrests and therefore differing potential impacts on the life course. In other words, the effect of one drug offense on the life course may be substantially different than the effect of another offense. Therefore it is important to understand how various forms of drug offending influence arrest, conviction, and incarceration. The remainder of this section will discuss both drug use and drug selling (or distribution) offenses, and how such actions are understood to shape the risk of criminal justice sanctions. The section gives preeminence to drug offending’s potential impact on the threat of arrest. This is done for several reasons. First, because arrest is the initial stage of sanctioning in the criminal justice system. Second, the number of factors influencing subsequent movement through the system is vast, and the factors are often extra-legal. That is, many of the reasons why one offender is charged or convicted and an offender who committed the same offense is not has nothing to do with the actual offense. Third, arrest is the most well researched of the sanctions in the criminal justice system with respect to drug offending. However, as will be shown, much potential for improvement and additions to the literature remain.

\(^5\) Drug offenders may also be arrested for and charged with non-drug offenses. Indeed, many studies show that this also happens with great frequency (Blumstein, 1993; Harrison and Gfoerer, 1992; Langan and Levin, 2002). It is important to inform the reader that while many studies show that drug users and drug sellers are quite likely to be arrested on drug related charges, they are also more likely to be arrested for violent and property crimes than are non-drug users and sellers. This is reviewed at greater length below.
A source of limitation for the research in this area is the problem of endogenous stratification; selecting cases known to have experienced the dependent variable (i.e. arrest). Generally, it is ill practice to select a sample of arrestees and use that sample to estimate the effect of some variable on arrest. Doing so produces biased estimates. This is a crucial problem in the area given the high rate of use of so-called “captive samples” (Nurco, Kinlock, and Hanlon, 2008). These samples of known offenders in custodial settings (e.g. jail or prison) are preferred in drug offense research for their consistently high composition of variability on criminal activity, especially drug activity. But the use of a captive sample automatically introduces the potential for bias due to endogenous stratification. This is not to say that all studies using data drawn from samples of persons in custody are universally flawed. When arrest (or another custodial sanction) is not the dependent variable of interest, the bias to internal validity due to endogenous stratification is mitigated. Captive samples can be used reliably to provide estimates of recidivism, or estimate proportions of drug offenses (or offenders) within institutional samples, and the like (see Langan and Levin, 2002). However, when the goal is to estimate the effect of a particular endogenous variable on arrests, one’s estimates will not be reliable if the entire sample is populated with persons who have been arrested. Rhodes, Kling, and Johnson (2007) provide an excellent in-depth discussion of how this problem manifests itself, and solutions to the problem, given selection on the dependent variable. Solutions are complicated, both theoretically and mathematically. A more simple solution then would be to rely on data from a large sample containing subjects that

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6 Notable examples of this practice can be easily found (e.g. Belenko, Fagan, and Chin, 1991; Maden, Swinton, and Gunn, 1992).
were not all arrested. This requires a markedly large sample however, because arrest is a low probability event in the general population.

Drug Offending and the Threat of Arrest

The relationship between drug offending and arrest is the most widely researched of the criminal sanctions. This is with good reason, as arrest is also the most likely of the criminal sanctions for an offender to experience. Indeed, the criminal justice system is often thought of as a funnel, with fewer and fewer persons continuing from one level to the next (see Stuntz, 2006, p. 782-783). That is to say many individuals who are arrested will not be convicted. Nonetheless, an arrest can have a profound impact on a person’s life, either indirectly such as imparting negative stigma, or in more direct manners such as making it more difficult to get a job. Drug offenders risk such disruptions by exposing themselves to arrest, and the literature is remarkably consistent in agreeing that the risk is profound. Considering the number of crimes committed and the number of persons arrested, the overall risk of arrest is low. However, when compared to other crimes, the risk of arrest for drug offenses is quite high (Blumstein, 1993; Langan and Levin, 2002; Mosher, 2001). Exploring more specifically how particular drug offenses relate to arrest is the focus of the current section.

In nearly any study using samples drawn from arrestee populations, drug offenders are ubiquitously overrepresented (Bureau of Justice Statistics, 1992; Mosher, 2001; U.S. Department of Justice, 1997), and an incredible proportion of all arrestees have reported drug use at some point in their life (Langan and Levin, 2002; Lyman and Potter, 2007). Mosher (2001) notes that drug offenses represented the largest category of
arrests for the biggest cities in the United States as of the turn of the century. Over a third of inmates included in a Bureau of Justice Statistics sample were on drugs at the time of their offense (Blumstein, 1993; Bureau of Justice Statistics, 1992). The high proportion of drug users among arrestees exists not only in the United States, but in other cultures as well. According to Maden, Swinton, and Gunn (1992), 43% of an arrested sample in the United Kingdom had used an illicit drug prior to arrest, with the most common substances being marijuana, heroin, and methamphetamine. Eleven percent reported the use of an injectable drug.

Drug selling is also an extremely common offense in arrested samples. As an illustration of just how common it is, between 1985 and 1987 1 in every 6 African-American males between 18 and 20 years old were arrested and charged for drug selling offense in Washington, DC (MacCoun and Reuter, 1992). Langan and Levin (2002) followed persons released from custody and found that 64.2% were rearrested for a drug trafficking offense, compared to 67.2% being rearrested for a drug possession offense. In fact, the arrest rates for drug offending are so high that Warner and Coomer (2003) concluded that official drug arrest data is a valid indicator of the level of drug activity for small geographic locations such as neighborhoods. Rosenfeld and Decker (1999) echo this conclusion for city-level data, for cocaine and heroin use.

While the above research refers to adult arrestee populations, this trend also existed for juveniles. Between 1990 and 2000, juvenile (<18 years old) arrests for drug offenses increased 145% (Synder, 2000). It is notable that during this period both violent and property crimes were decreasing, as were their associated arrest rates. By the year 2000, drug arrests accounted for 13% of all juvenile arrests. For youth less than 15 years
old, drug arrests represented 17% of all arrests. Nearly all of these changes occurred before 1996, and drug arrest rates for juveniles were both high and stable after this point.

It may seem appropriate at this point to ask why drug offenders are so overrepresented in samples of arrested persons. The answer is tied to public opinion and responses by policy makers. Following the explosion of drug market activity in the mid-1980s, largely driven by expanding crack cocaine markets, society wanted an aggressive reaction to quell the violence it purportedly generated. This reaction manifested itself in the form of intensified law enforcement efforts directed at both drug possession and drug distribution offenses. Arrests were the most popular sanction (Reuter and Kleiman, 1986), and if convicted these were coupled with mandatory minimum sentences, longer prison terms, and high rates of conviction and incarceration following a drug arrest, particular for a distribution offense (Spencer, 1995).

The law enforcement response was hardest against crimes involving crack cocaine, a drug that had been demonized in the media since 1985 and blamed for the perceived epidemic of drugs and violence (Inciardi, Surrat, and Kurtz, 2008; Lyman and Potter, 2007, p.56-7). In an extremely intriguing study, Belenko, Fagan, and Chin (1991) compared crack arrests in 1986 to powdered cocaine arrests in 1983-84 in New York City. They found that crack arrests had higher probabilities of pretrial detention, felony indictment, and being sentenced to jail than cocaine arrests. Being indicted for a crack offense was even more damaging to a defendant’s case than having a prior police record. Johnson et al. (1995) further documented the intense law enforcement focus on crack cocaine. Not only were crack offenders more likely to receive a more severe disposition at each stage of the criminal justice system, but police departments were literally gunning
for crack offenders. The New York Police Department established special heavily armed Anti-Drug Squads, who were active during a two-thirds increase in the number of felony arrests between 1986 and 1989. By 1989, crack possession was the second most common felony arrest, behind armed robbery.

Clearly, we can see that the substances involved are salient in determining the risk of arrest. Drug offenders unilaterally face a substantial hazard of being arrested, and the more threatening drugs, like cocaine, or more recently, methamphetamine, carry higher arrest risks. But the frequency of offending is also highly relevant in understanding arrest rates. Harrison and Gfoerer (1992) analyze data from the 1991 National Household Survey on Drug Abuse and find that arrest rates are highest for persons most heavily involved in drug use, as measured by frequency of use. The lowest arrest rates were found in individuals who did not use alcohol or drugs in the year prior to the survey. Even after controlling for demographic characteristics such as age, race, gender, marital status, income, and education, the drug use measures (frequency of using marijuana and cocaine in the past year) were significantly related to arrest for criminal behavior. This was true not only for drug arrests, but also to arrests for both violent and property crime. Rhodes, Kling, and Johnston (2007) examined the drug use of arrestees and found that the arrest rate increases with the intensity of drug use7. Again, these arrests were not always for drug offenses. Compared to persons who do not use drugs (other than marijuana), low intensity drug users have arrest rates that are 18% higher; medium intensity users have 40% higher arrest rates, and high intensity users have 43% higher rates. Chronic drug users (those who used cocaine, heroin, or methamphetamine at least

7 Here, intensity is derived from frequency of use of crack cocaine, powder cocaine, heroin, and crystal methamphetamine, taken from data gathered in the Arrestee Drug Abuse Monitoring (ADAM) program.
four times in the month prior to arrest) had higher arrest rates than all other types of drug users.

It is fortunate that the literature is consistent with respect to the effect of drug offending on arrest. Uniformly, conclusions support the idea that drug users and drug sellers are quite likely to experience arrest, and that the risk of arrest (and arrest rate) increases with both the frequency of offending and the severity of the substances involved. But arrest is only an initial step, one that opens the gate to further experiences with the criminal justice system. Having reviewed how drug offenses relate to arrest, we will now move on to consider these other experiences.

Drug Offending and Charge and Conviction

Following an arrest by the police, persons can be formally charged with one or more offenses, and can subsequently be convicted of one or more of these offenses. Of course, it is far from the case that all persons arrested will be charged, or all persons charged will be convicted. Recall the imagery of the criminal justice system as a funnel, with fewer persons continuing to the next stage (Stuntz, 2006). Since there is not a 1-to-1 relationship, it is understandable that there are many factors influencing who gets charged and convicted. Drug offending is only one category of such factors. Although certainly not the only influencing factors, they remain powerful influences on decisions in the criminal justice system. As will be elaborated further, the focus of the current research is

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8 This is of course an oversimplification of the criminal justice process. Once an individual is charged, the charges could be dismissed, the then defendant can be acquitted, or could be convicted either through plea bargaining or a trial, and this is not an exhaustive list of possible outcomes. Because this project is not an examination of the legal system, an in-depth discussion of that system will not be included in the interest of space. It will suffice to say that the criminal justice system moves linearly. That is, charges follow arrest, convictions follow charges, and so on. A person must experience one event before experiencing the next.
on the effect of drug offending on the threat of arrest. As scholars of the criminal justice system will note, there are many factors influencing whether an individual suspected of a crime is formally arrested. It is argued here that committing a drug offense is one factor, but there are many others. The number of factors influencing subsequent justice system stages of being charged, convicted, and potentially incarcerated grows exponentially at each stage. For this reason, the current research will not formally test the effect of drug offending on the criminal justice system beyond arrest.

Weaknesses in the Literature

What is clear from the available literature on drug offending and experiences with the criminal justice system is that many drug behaviors or offenses are related to various criminal sanctions such as arrest, conviction, and incarceration. What is not clear is how the patterns of drug offending relate to an individual’s criminal justice history. That is, the literature at present cannot describe how individual variations in drug behaviors affect that individual’s movements into and through the criminal justice system, and how those movements translate into later life course outcomes. Use of a particular substance may carry an increased risk of arrest, or habitual drug selling may raise the likelihood of incarceration, but what of the totality of behaviors? It has already been argued that none of the drug behaviors in question are mutually exclusive, nor do they happen in isolation. Understanding how an individual’s complete drug offending history influences experiences with the criminal justice system is therefore a critical goal. The obstacles to that understanding are the focus of the current section.
An extremely common obstacle extant in the literature is that data adequate to assess the totality of behaviors are rare⁹. A majority of the studies reviewed above focus on a particular form of drug offending for which data are available, and are necessarily limited by the data. After all, one cannot examine the impact of a behavior the data does not measure. However, the consequence is that researchers are unable to examine the criminal justice outcomes dependent on those offenses. It bears mentioning that this limitation is not the fault of researchers. Drug offending is a rare phenomenon, and obtaining substantial variation to permit statistical analyses is a challenge.

To overcome this challenge, many data sets draw on what are referred to as “captive samples” (see Nurco, Kinlock, and Hanlon, 2008). Captive samples refer to samples of individuals held in custody, such as arrestees or jail or prison inmates. Inmates are then asked retrospective questions regarding their drug offending (as well as other forms of offending). Research shows that these persons are typically very forthcoming, honest, and willing to discuss their prior behaviors. The problem is rather one of external validity. Quite simply, persons arrested or incarcerated may be different a priori than persons not arrested or incarcerated. When looking at drug offending and arrest or incarceration, this creates a statistical problem known as endogenous stratification – the samples used in estimation are selected conditional on the value of the endogenous or dependent variable. Methods have been devised to correct for endogenous stratification (see Rhodes, Kling, and Johnston, 2007), but ideally one would want a prospective sample that is not selected conditional on having an arrest or being incarcerated (and that has substantial variation on the drug offending measures).

⁹ Even in the data set used in the current research, the list of drug offending behaviors assessed is more extensive than the majority of other data sets, but not exhaustive.
Ideally then, one would want a prospectively collected data set capturing information on individuals with multiple measures of drug use and drug selling (i.e. substances used and sold, the frequency of use and sales, etc.) and that captures every instance of arrest for each individual. Such a data set would allow for a robust exploration of how differing patterns of drug offending affects subsequent experiences with the criminal justice system, and how such the resulting arrests impact the later life course. The RYDS data provides exactly this type of information and can allow access to an answer that has long been blurred.
SECTION IV

Interactional Theory

It is the intention of this project to examine the patterns of drug use and drug selling in adolescence for a sample of high-risk youth, and to analyze how those patterns affect various domains of an individual’s life as he or she becomes an adult. In doing so this project adopts a life course perspective, focusing on the series of transitions from adolescence to adulthood. The life course perspective expects these transitions to occur along a “normative pattern” (Rindfuss, Swicegood, and Rosenfeld, 1987) as an individual leaves school, seeks employment, enters into romantic partnerships and marriage, and starts a family. Although this pattern may be the template, it is not universal. Often, the transitions are disorderly, complicated, and disrupted by a variety of influencing factors. To better understand the disruptive factors and the life course, this project will draw upon Interactional Theory (Thornberry, 1987) as a guide for the hypotheses and methods below. The current section provides a description of interactional theory, including its basic tenets and propositions, its empirical support, and its application to the present study.

Interactional theory draws from social control theory (Hirschi, 1969), social learning theory (Akers, 1977), and integrated theory (Elliott, Ageton, and Canter, 1979, Elliott, Huizinga, and Ageton, 1985). At its core, interactional theory asserts that the fundamental cause of delinquency is a weakening of the bonds to conventional society (Thornberry, 1996). However, goes well beyond the theories mentioned above in that it provides a more dynamic explanation of delinquency. Specifically, “interactional theory is more dynamic in two respects: (1) it explicitly recognizes the importance of
developmental change in accounting for delinquency, and (2) it views human behavior, including delinquent behavior, as a result of interactive and reciprocal causal influences that develop over time” (Thornberry, 1996, p. 199). The theory’s notions of developmental change and interactive, reciprocal causal influences are considered below.

Using this dynamic approach, interactional theory can explain both the change and the continuity in behavior. This explanation is grounded in three fundamental premises of the theory (see Thornberry and Krohn, 2005). These are: first, the life course perspective; second, bidirectional causality; and third, the proportionality of cause and effect.

Theoretical Premises

Life-Course Approach

In general terms, the life course has been defined as the “sequence of culturally defined age-graded roles and social transitions that are enacted over time” (Elder, 1997; Caspi, Elder, and Herbener, 1990). The sequences, as mentioned above, are not universal. That is, not every individual experiences the same transitions at the same ages. The multiple patterns of sequences, then, can be accurately described as behavioral trajectories (Thornberry, 1987). The original formulation of the theory described two extremes of such trajectories (Thornberry, 1987, p. 882-884). In the first, Thornberry considers an individual in early adolescence who have very weak social bonds. They are not attached to their parents, weakly committed to school, and do not adhere to conventional values (such as the value of employment and family). The weak social bonds place the individual at high risk for delinquent behavior. The manifestation of
delinquent behavior further weakens the social bonds, and the individual spirals into a delinquent trajectory. On the other hand, an individual may begin with strong social bonds. Such an individual would be at very low risk for delinquency. The abstinence from delinquent behavior strengthens social bonds, putting the individual on a long-term path free from delinquency. Intermediate trajectories of behavior exist between these two extremes.

This illustration highlights two key aspects of interactional theory. The first is the theoretical utility of behavioral trajectories. Understanding the patterns of change in behavior is crucial to explaining why abstain, initiate, continue, and desist from delinquency. Subsequent research has shown that not only are trajectories theoretically useful, they are empirically useful as well. An individual’s membership in a particular behavioral trajectory\textsuperscript{10} was a significant predictor not only of his or her own delinquency (Krohn, Lizotte, Bushway, Schmidt, and Phillips, 2011; Bushway, Krohn, Lizotte, Phillips, and Schmidt, 2011), but also of the behavior of his or her child (Lizotte, Phillips, Krohn, Thornberry, Bushway, and Schmidt, n.d.).

The second key aspect of interactional theory shown by this illustration is the importance of the initial values (Thornberry, 1987; 1996; Thornberry and Krohn, 2001; Thornberry, Lizotte, Krohn, Farnworth, and Jang, 1991). Adolescents with initially high social bonds are at low risk for delinquency and are likely to continue along prosocial careers. On the other hand, those with initially low social bonds are at great risk not only for beginning delinquency, but also continuing delinquent behavior. Furthermore, “the earlier the onset [in offending], the greater the continuity (Thornberry and Krohn, 2001,

\textsuperscript{10} In these examples, the trajectories were specific to violence.
p. 297, emphasis in original). Therefore, knowing where adolescents begin is a major portion of being able to predict where they will end.

A final outgrowth of interactional theory’s life course approach is that the factors salient in causing delinquency change from one stage in life to the next. The theory’s original formulation specified the factors salient for delinquency in three stages; early, middle, and late adolescence (approximately 11-13, 15-16, and 17-18 years old, respectively). For a complete discussion of these factors, see Thornberry (1987). In general terms, however, factors relating to the family are the most salient in early adolescence. Having a strong attachment to the parent and having parental supervision provide bonding and control in this stage. As the individual ages and activities transition outside of the family of origin, factors external to the family take on greater salience, and the effect of family factors diminish. In middle adolescence, for example, being committed to school and associating with delinquent peers are particularly salient. By late adolescence, delinquent behavior is most strongly affected by association with delinquent peers and weak commitment to conventional activities. As the individual transitions to young adulthood, the theory gives increasing salience to an individual’s own family (i.e. marriage, plans for marriage, and plans for childbearing).

By having these dynamic models explain delinquency in multiple stages of life, the developmental model of the theory offers repeated chances for desistance. Milestones can be met, goals can be achieved, and new networks evolve as an individual ages and gives increasing importance to new domains in life. As the social bonds strengthen, pathways to prosocial careers are forged (Thornberry and Krohn, 2001).
Bidirectional Causality

According to interactional theory, weak social bonds are the cause of delinquency. However, delinquency is not purely an outcome in the theoretical causal models. Delinquency also becomes an input whose effects resonate further down the system (Thornberry, 1996). This premise moves interactional theory beyond many contemporary theories of delinquency as they only consider unidirectional or recursive processes. Unidirectional systems treat delinquency as a purely endogenous phenomenon, and thus fail to account for the mutually causal nature between delinquency and its influences in the long term.

Thornberry (1987, p. 878) shows an example of this process in a causal model proposing that delinquent behavior is caused by low commitment to school, weak belief in conventional values, and the association with delinquent peers. What is important is the delinquent behavior is also a cause of weak attachment to parents, low commitment to school, weak belief in conventional values, and the association with delinquent peers subsequent to the commission of the delinquency. Reciprocal relationships exist between delinquency and the factors that cause it. They are entangled in mutually reinforcing causal loops as delinquent careers evolve (Thornberry and Krohn, 2005; see also Thornberry, Lizotte, Krohn, Farnworth, and Jang, 1991). Similarly, Thornberry et al. (1991, p. 21) show the reciprocal relationships of social bonds and delinquency in a three-wave panel model. These examples illustrate the concept of bidirectional causality. As in Farrington and Hawkins (1991, p. 7), “the level of antisocial behaviour in one developmental phase influences the social development process in subsequent phases.” Interactional theory posits that the initial values of the social bonds influence the
subsequent incidence of delinquency, and the incidence of delinquency influences later values of the social bonds (Thornberry and Krohn, 2001).

The Proportionality of Cause and Effect

Interactional theory includes multiple factors that can weaken one’s social bonds and produce delinquent behavior. The theory holds that it is not the case that all of the multiple causes must be present in an individual’s life to produce the outcome. For some individuals, a few of the causes may be sufficient to yield delinquency. Others may have assets in their life to offset the causes of delinquency, and therefore many causes are necessary to elicit delinquency\textsuperscript{11}. As described in Thornberry and Krohn (2005, p. 189), the “causal force” varies across individuals. That is, a causal factor (or combination of factors) can have different influencing power for one individual than for another. The causal force, in this case for delinquency, is at its peak when there are many causal factors present, when those factors are at their extreme values, and when there are few if any offsetting assets.

Interactional theory uses the concept of the proportionality of cause and effect, that states as the magnitude of the causal force (i.e. the number and strength of causal factors) increases, so too does the likelihood of the effect (i.e. delinquency), and the magnitude of the effect. In other words, the more causal factors present and the stronger they are, the greater the likelihood of delinquency and the greater the severity of that delinquency (Thornberry and Krohn, 2005). The severity of delinquency can be

\textsuperscript{11} This is consistent with a risk and protective factor approach (Luthar, Cicchetti, and Becker, 2000; Luthar, Cushing, Merikangas, and Rounsaville, 1998), where the causes of delinquency are risks, and offsetting assets offer protection that buffer or moderate the risks.
operationalized in several ways, including the age at onset, frequency, seriousness of offense, and duration.

Empirical Support for Interactional Theory

The propositions of interactional theory have been tested with empirical research multiple times, and it has proved to be a remarkably reliable theory for explaining delinquency in the life course. Thornberry (1996) reviewed the existing literature for the multiple components of the theory put forth in the original formulation. By and large, this review supported the tenets of the theory. Thornberry concluded that the importance of strong belief in conventional values was actually underestimated in the original formulation, and is particularly salient in middle adolescence. Attachment to a parent was weaker in importance than originally supposed. In fact, subsequent research shows that strong bonding with a delinquent parent can actually encourage delinquency (Krohn et al., n.d.). The salience of commitment to conventional values received the strongest support, becoming particularly important in late adolescence.

Interactional theory has also been directly tested using data from the Rochester Youth Development Study. For example, Thornberry et al. (1991) not only show that the hypothesized causal factors of attachment to parent and commitment to school accurately predict delinquency, but also show that delinquency is a salient input into the developmental models. That is, delinquency is a significant predictor of both of these factors later in the life course. More specifically, delinquent behavior is predictive of lower attachment to parents at later points in time, and delinquency and commitment to school are involved in a mutually reinforcing causal loop. Thornberry, Lizotte, Krohn,
Farnworth, and Jang (1994) provide empirical support for the reciprocal models and reinforcing nature of delinquency and the peer network. Incidence of delinquency is promotive of association with delinquent peers, who reinforce continued delinquent behaviors. Finally, Jang and Smith (1997) support interactional theory in exploring how parent-child relationship changes over time, and how that change affects delinquency. Jang and Smith conclude that parental supervision is provides greater social control for adolescents than does attachment to parent. Delinquency diminishes the later attachment to a parent, but having weak attachment to parent does not predict later delinquency. On the other hand, delinquency and parental supervision are negatively related to each other and are involved in a reciprocal reinforcing process.

Even empirical research that draws on interactional theory but does not directly test its propositions support the theory (e.g. Bushway, Thornberry, and Krohn, 2003; Bushway et al., 2011; Krohn et al., 2011; Krohn et al., n.d.; Pogarsky, Lizotte, and Thornberry, 2003; Thornberry et al., 2003). Overall then, interactional theory is a widely tested and widely supported theory of delinquency that shows great utility in explaining a variety of delinquent behaviors and its causes.

Application of Interactional Theory to the Present Study

The above discussion of interactional theory and its propositions should provide ample justification for its use as the theoretical guide for the current project. The goal of the project is to examine the patterns of drug use and drug selling during adolescence and use those patterns to explain outcomes later in the life course in multiple domains. In accordance with that goal, the project is grounded in interactional theory’s assertion that
the level of delinquency in one developmental stage (here, adolescence) influences the social development and social bonds in subsequent phases of life (here, young adulthood). Further, the literature review previously discussed presented a wealth of information that is congruent with interactional theory. Simply put, persistent and serious involvement in drug use and drug selling has powerful negative ramifications in multiple life domains, including the family, employment, and experiences with the criminal justice system. What is more, the outcomes in those domains interact with one another, and the outcomes at one stage can influence the outcomes at later stages.

Although the theory provides explanation of delinquency generally speaking, it is well supported when explaining drug use as well (Krohn, Lizotte, Thornberry, Smith, and McDowall, 1996)\textsuperscript{12}. Here, the authors showed that drug use and peer drug use are involved in a reciprocal causal process, and that the effects of beliefs on the acceptability of drug use (a more specific conceptualization of belief in conventional activity) are much smaller than peer influences. Additional evidence for the applicability of interactional theory to drug use is found in Krohn, Lizotte, and Perez (1997). Early adolescent use of alcohol and drugs were predictive of dropping out of school, becoming a teen parent, and living independently from one’s parents. These outcomes, in turn, weakened conventional social bonds and encouraged the continued use of alcohol and drugs. We can be confident then that interactional theory is as applicable to drug offending as it is to general delinquency.

Interactional theory will provide specific guidance to the project in several ways. First and foremost, the project adopts a life-course perspective examining the impact of

\textsuperscript{12} In reviewing the literature, I was unable to find a study that tested interactional theory using drug selling as the core measure of delinquency, although it was included in Thornberry et al. (2003).
delinquent behavior in one life stage on subsequent life stages. As will be seen in the methods discussion to follow, this life-course perspective also informs the empirical models that are designed to account for bidirectional causality. The outcomes at one phase will become inputs at later phases. Third, the project is grounded in the theory’s foundation on the proportionality of cause and effect. In identifying patterns of adolescent drug offending, it is hypothesized that the more persistent patterns will have the largest negative effects on the life domains of the family, employment, and experiences with the criminal justice system. The theory will shape the hypotheses tested by coupling theoretical propositions with knowledge garnered from the literature. Predictions and statistical tests will be structured as tests of these hypotheses to determine if the patterns of offending influence life course outcomes in theoretically expected ways. Thus, while not intended to be a strict test of interactional theory, the theory will nonetheless play a major role in shaping the empirical analyses to follow.
SECTION V

Methods
Data

The review of the literature discussed at great length the weaknesses in previous research, highlighting the need for a more robust data set. To properly explore multiple patterns of drug use and drug selling over the course of adolescence, and to then use those patterns to explain multiple outcomes in three domains of life in young adulthood places several requirements on the necessary data. First, it must be longitudinal in nature. Only longitudinal data collecting information on individuals at repeated points in time, and at multiple developmental stages, will be adequate for the life course analyses consistent with the goals of this project. Second, the data must contain numerous measures on drug offending across several dimensions. These include the frequency of drug use, the substances used, the duration of use, whether the substances were used alone or in group settings, the frequency of drug selling, the substances sold and for how much money, the duration of the drug selling “career,” and whether the individual sold alone or with others. Third, the data must also contain indicators of life outcomes in the three domains of employment, family, and criminal justice experiences. Not only are these domains starkly unique to each other, they are also each quite complex as the literature review conveys. Being able to operationalize outcomes in each domain is a necessity for meeting this project’s goal.

To meet these requirements, the project will draw data from the Rochester Youth Development Study (RYDS), an on-going longitudinal study of a panel of youth at high risk for violence and delinquency. The RYDS project began in 1988, and selected 1000
seventh and eighth graders in the Rochester (New York) Public School System to be interviewed, along with a parent or guardian. We refer to our original subject as “G2” (Generation 2) and his or her parent as “G1” (Generation 1). To date, RYDS has completed fourteen interviews for the panel, reaching subject ages in the early 30s.

Data collection for the RYDS was completed in several phases. Phase 1 includes the first 9 waves of data collection, and collectively captures the period of adolescence. From Wave 1 to Wave 9, subjects (G2) were interviewed every six months from the spring of 1988 to the fall of 1996. In addition, one of their parents (G1) was also interviewed from Waves 1 to 8. RYDS contains information gathered from school records and social services records covering the entirety of Phase 1. By Wave 9, our subjects’ average age was 18 years old. Following a two-year gap in data collection, Phase 2 began in 1994. Phase 2, covering the stage of young adulthood, included annual interviews for three waves (Waves 10, 11, and 12). Subject ages at these waves averaged 21, 22, and 23, respectively. Parent interviews continued during Phase 2, although school and social services records did not. The final phase of data collection focusing on the G2 subjects, Phase 3, contains two waves (13 and 14), completed in 2003 and 2005. Phase 3 contains data during adulthood, when subjects are 29 and 31 years old, on average. At all waves of Phases 1, 2, and 3, data were gathered from police records for our G2 subjects. Figure 1 shows the overall design of the RYDS project for Phase 1, 2, and 3.

The original RYDS sample was stratified on two dimensions in order to select subjects who were at high risk for violence and delinquency. First, males were oversampled (75% versus 25%) as they are more likely than females to engage in serious

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13 Both from Rochester Police Department (RPD) and the New York State Department of Criminal Justice Services (DCJS). Including both of these agencies assures that events occurring outside of Rochester will be included. Unfortunately, but data outside New York State are not available.
and violent offenses (Blumstein et al., 1986; Huizinga, Morse, and Elliott, 1992). Second, students living in areas of the city with high residential arrest rates were also oversampled. This was based on the assumption that adolescents who live in such areas are at greater risk for offending than students living in areas with lower residential arrest rates. High residential arrest areas were identified by assigning each census tract in Rochester a resident arrest rate which reflected the proportion of the tract’s total adult population arrested by the Rochester Police Department in 1986.

The subject panel is 68% African-American, 17% Hispanic, and 15% White. These proportions are quite close to what was expected given the population characteristics of Rochester schools and the decision to oversample high-risk youth. Subject attrition in the RYDS is quite low when compared to other longitudinal studies. From Waves 2 to 12, we experienced only about 1% attrition per year. At Wave 12, 85% (846) of the original 1000 subjects were reinterviewed. Attrition increased slightly during Phase 3, which included roughly 785 subjects. A formal test of subject attrition within RYDS revealed that the subjects retained did not significantly differ from those not retained on multiple dimensions, including gender, social class, family structure, drug use, delinquency, property crime, and violent crime (see Krohn and Thornberry, 1999).

Typologies of Drug Offenders

To explore the patterns of drug use and drug selling during adolescence, typologies of drug offending will be created using data from Phase 1 of RYDS. Using typologies as heuristic and empirical constructs in drug offense research is quite common and particularly useful. It has long been recognized that drug offenders are not a
homogenous group (see Nurco, Kinlock, and Hanlon, 2008). The offenses particular to individuals vary widely, and typologies therefore are useful devices to separate the heterogenous group of drug offenders into categories that more accurately group offenders similar to one another.

There are several examples of empirical research using simple drug offending typologies. When both drug use and drug selling are considered together, these typically take the form of categories such as no drug involvement, drug use only, drug selling only, and both drug use and drug selling (Altschuler and Brownstein, 1991; Black and Ricardo, 1994; Ricardo, 1994). Even when studies examine only drug use or only drug selling, typologies can still be useful. Newcomb (1994), for example, grouped drug users into marijuana users only, cocaine users only, and polydrug users. French, Roebuck, and Alexander (2001) distinguished between chronic and non-chronic drug users in their analysis. Kandel, Kessler, and Marguilies (1978) conceptualized drug use into stages, ranging from initiation to chronic use. Typologies of drug selling also exist. Caulkins, Johnson, Taylor and Taylor (1998) broke sellers into various types, according to the substances they sold. Fagan and Chin (1990) examined only sellers of cocaine, but grouped them according to whether they sold powdered cocaine, crack cocaine, or both, and whether they sold alone or in groups.

The creation of typologies of drug offenders, then, is not an entirely novel concept. However, the work reviewed above created typologies of drug offenders, with categories populated by individuals. The current work will take a different approach, instead creating typologies of drug offending. That is, the typologies are classes of behaviors, not classes of actors. This idea will be elaborated upon below. One key
advancement made by the current project is the ability to create typologies of drug offending that seeks to capture the totality of drug involvement during adolescence. Previous research has been limited in that data were available for only one or few dimensions of drug involvement. The typologies that could be created based on those data were simplistic and constrained. Even when both drug use and drug selling are considered together, the typologies were rudimentary (as above, including use only, selling only, or both). Finally, because there were mostly based on cross-sectional data, the typologies cannot account for changes in behaviors over time. The evolution of the drug offending career remains hidden in the typologies that exist in the literature up to this point. The drug offending typologies that will be created in this project will be more nuanced, and able to include the complete spectrum of drug behaviors. They will be based on longitudinal data, and therefore will be able to account for patterns of change for individuals.

A second key advancement in this research is a notable departure from traditional drug offending research employing typologies. The typologies created here are patterns of drug offending instead of drug offenders. The difference is subtle, but quite important. Traditional typologies group offenders into categories based on various behavioral traits and predilections. The typologies used here do not reflect groups of offenders or individuals. Rather, they capture the underlying or latent dimensions of drug offending that are present to greater or lesser extents in every individual. For example, a person will not be categorized as a “marijuana user,” but would instead be measured on the degree to which he or she uses marijuana, in addition to being measured on all of the
other latent dimensions. For the sake of convenience these underlying latent dimensions are referred to as typologies.

*Factor Analysis*

To create the typologies based on the drug use and drug selling data in RYDS, factor analysis will be used. Factor analysis is a mathematical procedure that searches for and uncovers systematic dependencies and correlations, synthesizing thousands of measurements and resolving them into distinct patterns of occurrence (Rummel, 1967). Factor analysis has many applications, and can be used to explore a content area, structure domains, classify or reduce data, define relationships, test hypotheses, formulate theories, make inferences, and more. For the purposes of the current project, factor analysis will be used for classifying data. More specifically, it will be used to develop an empirical typology of drug offending. Factor analysis is well suited to this purpose as it groups interdependent variables into descriptive categories and shows how individuals cluster (Rummel, 1967, p. 450).

The patterns or factors that emerge from this technique represent groups of variables, not groups of individual subjects. This is why it is therefore important to conceptualize the factors as dimensions of drug offending, rather than descriptions or categories of drug offenders (i.e. individuals). As above, while traditional typology research was interested in placing individuals into various categories based on their behavior, the current research uses their behavior to describe individuals along multiple dimensions of drug offending via factor analysis. The factors represent latent traits of individuals with respect to one form of criminality, namely drug offending. The ability to
capture and describe these latent patterns is a crucial contribution to the literature made by this project.

Factor analysis is not without its costs. It is mathematically quite complicated, relying on matrix algebra. Most analysis in the social sciences plot cases in variable-space. Factor analysis does just the opposite, plotting variables in case-space. Geometrically, it can be thought of as this. Suppose there are \( m \) variables for \( n \) cases. These variables are plotted as a swarm of data points that are plotted on \( n \) case axes (one axis per case). The \( n \) axes are orthogonal to each other. That is, the axes are uncorrelated, and form an \( n \) dimensional space. A graphical representation is shown in Figure 2 for illustration. Figure 2 considers a 3-variable case, where the axes \( n_1, n_2, \) and \( n_3 \) represent the cases, and the thin blue lines represent the variables, \( m \). The bold orange arrows in Figure 2 represent vectors, labeled \( F \). Although not possible to show graphically here, it is possible to move beyond three dimensions.

Factor analysis plots vectors extending from the origin through these cases. Axes are then rotated until the variables tightly cluster around these vectors\(^{14}\). There are a variety of procedures for rotation, the most common being orthogonal rotation. This project intends to use an extension of that, known as oblique rotation\(^{15}\). With correct rotation, factor analysis arrives at a solution that is mathematically unique. To say the solution is unique is to say that different researchers using the same research design will arrive at the same result. The emergent vectors, the solution, are the factors, which describe what variables cluster with each other. As stated in Rummel (1970, p. 21),

\(^{14}\) Again, factor analysis plots variables in case-space. It searches for clusters of variables, not clusters of cases.

\(^{15}\) Oblique rotation defines a pattern and structure matrix for primary and reference axes. It is more complicated but more consistent with the goals of the project.
“factors can be considered a typology, classifying or categorizing phenomena according to their inter-relationships.”

**Variables To Be Factor Analyzed**

The results obtained from factor analysis depend heavily on the variables the researcher includes. Careful selection of those variables is thus a crucial step in the process. Here, the goal is to use factor analysis to uncover common patterns of drug use and drug selling. The current project will consider variables in three categories; drug use variables, drug selling variables, and other variables known to be salient in the drugs milieu. Since the typologies are intended to be patterns of drug offending in adolescence, these variables will be gathered from the Phase 1 data in RYDS (Waves 1 to 9).

The drug use variables\(^{16}\) to be included in the typologies are; age of onset of drug use (age at initiation), number of substances used, number of times used\(^{17}\) marijuana, number of times used hard drugs\(^{18}\), number of waves drugs were used (duration of drug use), number of waves was marijuana used, and number of waves hard drugs were used.

The drug selling variables will include age of onset of drug selling, number of substances

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\(^{16}\) More correctly, these represent concept areas, rather than specific variables. Each of these concepts are measured for each subject for each wave of data collection from Waves 1 to 9. When estimating the factor analysis, it will be fruitful to include both wave-specific and cross-wave variables, and to measure each of these concepts or constructs in multiple ways. This is because factor analysis requires there to be more cases than variables, and more variables than factors. Factor analysis does not extract the total possible factors that exist in the data. It instead stops when no additional significant or meaningful variance remains to be extracted (Rummel, 1970, p. 169). To yield a sufficient number of factors for these purposes then, multiple measures of many constructs are necessary to include meaningful variation. The variables discussed in this section are intended to give the reader an understanding of the concept areas that will be included, rather than a precise list of variables and their construction. This caveat applies equally to the drug selling variables, and variables known to be salient.

\(^{17}\) Count variables such as this will be measured both across Phase 1 and specific to waves. Alternatively, these could be converted in frequencies per a given unit of time such as week or month (\(\lambda\)). As above, the goal is to provide sufficient variation to yield multiple factors describing adolescent drug offending patterns.

\(^{18}\) Id est, drugs other than marijuana.
sold, number of times sold marijuana, number of times sold hard drugs, number of waves
drugs were sold (duration of drug selling), number of waves marijuana was sold, number
of waves hard drugs were sold, and highest amount of drugs sold\textsuperscript{19}. This is not an
exhaustive list, but should give the reader a good feel for the variety of variables that will
be used in the factor analysis.

\textit{Factor Analysis and Factor Scores}

Factor analysis uses known data on variables to define common patterns of
variation in those data using linear functions. That is, it assumes that the known variables
\((X)\) are related to a number of functions, \(S\), that operate linearly. A factor model would
then take the form

\[ X_j = \alpha_{j1}S_1 + \alpha_{j2}S_2 + \ldots + \alpha_{jm}S_m + \alpha_{ju}S_u \]

where \(X\) represents the known variables and \(S\) represent the functions. It is important to
understand that the functions, \(S\), represent functions of unknown variables, not variables.
Letting \(W\) represent the unknown variables, then hypothetically \(S_1 = f(W) = (W^2-1)^2\)
and \(S_2 = f(W) = (W-1)/W^{1/2}\). These unknown variables, \(W\), are related in unknown ways to the
functions, \(S\), though they themselves are linear. The equation for \(X_j\) above could then be
rewritten as

\[ X_j = \alpha_{j1}f_1(W_1, W_2, \ldots, W_i) + \alpha_{j2}f_2(W_1, W_2, \ldots, W_i) + \ldots + \alpha_{jp}f_p(W_1, W_2, \ldots, W_i) + \alpha_{ju}f_u(W_1, W_2, \ldots, W_i) \]

Using the known data on these variables, factor analysis defines the hypothetical
unknown functions, \(S\), related to the common variance components of the variables, \(X\).

\textsuperscript{19} Dollar amount, either during a wave or across the Phase.
Emergent from this process are factor loadings, the $\alpha$ constants. The size of the loadings measure how strongly the specific function is related to the known variables. Factor scores can then be derived for each case in the data. Each variable is weighted proportionally to its contribution to the variance in a given pattern through the loadings. So, variables not related to a pattern would be weighted near zero. Factor analysis proceeds by way of matrix algebra. $X$ and $S$ then are not variables, they are vectors. The factor model for vector $X_j$ can be shown for $n$ cases as
The factors are not mutually exclusive\textsuperscript{20}; each subject receives a score on each factor. This represents another advancement made by the current research. Previous typology research was capable of classifying drug offenders chiefly on their participation in at most a few behaviors. The current project has argued that this method is an insufficient way to measure the spectrum of an individual’s drug behavior.

As an analogy, think of the process of grading a diamond. Diamonds are graded along four dimensions; cut, color, clarity, and carat (the “four Cs”). Within each dimension, diamonds can be given scores along a fairly descriptive range. That is, many potential scores exist for each dimension. For example, within the dimension of color, more options exist than “colorless” and “not colorless.” In fact, having such a limited response would render that dimension much less useful. But when research classifies drug offenders as sellers or non-sellers, the same error has occurred. A trait with enormous inherent complexity has been reduced to artificially small and non-useful categories.

Factor analysis is used here to avoid making this mistake. Gemologists use four dimensions to grade diamonds ostensibly because three dimensions would not be sufficient, and five would be unnecessary\textsuperscript{21}. The argument here is that factor analysis can accomplish for drug offending research what the four Cs accomplish for diamonds. More precisely, it can first identify the correct number of dimensions along which drug offending should be described, and second it can provide a score on every dimension for each subject in the data set. Just as diamonds receive scores across multiple dimensions,
so too will the subjects in the current research. Further, those scores will not be
artificially reduced into stunted categories.

The first main thrust of this project will be a thorough examination of the factors
by means of these factor scores. They will be studied to determine the various patterns of
adolescent drug offending that are present in the RYDS sample. Describing these
patterns, the various sorts of drug offenders, and their respective prevalences is a useful
exercise that will move the literature beyond its current state.

Outcomes and Analysis

Having created and explored the typologies of adolescent drug offending using
factor analysis, the project will then move on to its second main thrust. The typologies
will be used to predict life outcomes in the three domains of employment, the family, and
experiences with the criminal justice system. Of course, typologies are only patterns of
behavior. They are templates, and not every subject will fit cleanly into a particular
typology. To account for this, the central exogenous variables will be the factor scores
for membership in the typologies for each subject, emergent from the factor analysis
process. As discussed above, factor analysis yields a factor score for each case for each
factor. To put it differently, each subject will have a unique factor score for each
typology. Using factor scores essentially creates a unique descriptive pattern of
offending for each subject. This also avoids the concern of treating all members of a
typology as a homogenous group (Raudenbush, 2005).

The factor scores, representing patterns of drug offending, will then be used as
exogenous variables in models predicting particular outcomes in three life domains, along
with relevant controls\textsuperscript{22}. The typologies are created from subject information gathered in Phase 1 of the RYDS project and outcomes are measured at Phase 2 (young adulthood) and Phase 3 (adulthood)\textsuperscript{23}. In this way, analyses will maintain correct temporal order.

The reader should notice that the model measures outcomes at multiple phases. This means that the models will test for the effect of the change of outcomes in one phase on the change of outcome in the next phase. Measuring the effect of change, as opposed to the level, is consistent with the aim of this project, namely to understand how adolescent drug offending impacts the transition to adulthood. That is, interactional theory supports the idea that the movement from adolescence to adulthood is dynamic rather than static. Designing the models to predict outcomes base on change is congruent with this dynamic orientation.

Empirical analyses will be decomposed into the three domains. The specific outcomes included in the models were chosen for several reasons. First, these outcomes show the strongest and most consistent relationships with drug use and drug selling in the extant literature, as reviewed above. Second, these outcomes have been previously validated and used in prior RYDS work. Finally, the outcomes represent “baselines” for the domains. They are somewhat general indicators of healthy (or unhealthy) transitions in each domain, whose relationship to drug offending is supported both by literature and theory.

\textsuperscript{22} The models below include controls for subject’s race (indicated by dummy variables for African-American and Hispanic subjects), education (having completed high school or a GED), and poverty (receipt of welfare). Additional controls were also tested running the gamut of life domains, such as college aspirations, growing up in a two-parent household, self-esteem, depression, and gang membership. However, none of these controls mitigated the effects of the factor scores, and were themselves never significant. For these reasons the models below only include controls for race, education, and poverty. \textsuperscript{23} Some outcomes may take longer to manifest for some subjects, and including Phase 3 data will capture these manifestations.
Within the domain of employment, the outcome chosen is the percent of time the subject was unemployed, both at Phase 2 and Phase 3. This measure was created by counting the number of weeks the subject reported being unemployed and dividing by the total number of weeks in period. Employment in the RYDS sample can be somewhat sporadic\textsuperscript{24}. This may be particularly true of subjects who were heavily involved in drug offending. Using a numerical indicator of how much time a subject spends without a job is thus a useful indicator of the employment domain. Both the literature and interactional theory support the expectation that the more heavily involved in drugs a subject was in adolescence, the worse his or her employment outcomes will be in young adulthood. That is, adolescents in the most problematic patterns of drug offending should have the most time spent unemployed in young adulthood. Hypothesis tests will be structured to reflect this expectation. It is also hypothesized that the drug offending patterns will impact (un)employment at Phase 3.

In the family domain, attachment to parent is the focal outcome at Phase 1 and Phase 2. The literature suggests that temporally proximate drug offending damages one’s relationship with parents. However, it is also hypothesized here that the effect will also be present more distally. That is, persistent drug offending during adolescence should not only harm attachment to parent at Phase 1, but also at Phase 2. Interactional theory and empirical works in the literature suggest that by later adulthood, one’s own family takes on greater importance than the family of origin. Therefore, the focal outcome at Phase 3 in the family domain is partner status (whether the subject has a romantic partner). This is measured as a dichotomous indicator of having a partner at either Wave

\textsuperscript{24} For a variety of reasons. It is argued here that adolescent drug offending is one of these reasons.
13 or 14. The expectation is that the more heavily a subject was involved in drug offending in adolescence, the less likely the subject will be to have a partner.

The final domain, criminal justice system experiences, includes an outcome measured at Phase 1, 2, and 3. Whereas the first two domains will rely on data self-reported by the G2 subjects, data in this domain contain official measures from the police record portions of RYDS. Here, the focal outcome will be the number of arrests accrued by a subject during the phase. By far, the most well-documented, well-researched, and well-supported criminal justice sanction (with respect to drug offending) is arrest. Conviction and incarceration show less consistent relationships, and are much less prevalent in the RYDS sample. Arrest is therefore the natural outcome. Because agreement between self-reported and official arrests in RYDS has been shown to be quite high (Krohn, Lizotte, Phillips, Thornberry, and Bell, 2011), and using official data here presents no bias. Based on empirical research and theoretical principles, the more heavily drug involved subjects are hypothesized to have more arrests than those less involved at each phase.

Functionally, the models are estimated using ordinary least squares regression (OLS). OLS is appropriate for dependent variables with normal distributions thought to be linearly related to the predictors, as is the case here. Partner status, however, is a dichotomous outcome and will be modeled using logistic regression. A final note, in as much as past behavior is predictive of future behavior, it is expected that the more heavily involved drug offending adolescents to have some continuity in this behavior. Analyses include drug use and drug selling at Phases 2 and 3 as controls in light of this
expectation. Because drug use and drug selling is markedly rare at this stage in the RYDS sample, it is expected that simple counts of instances should suffice.
SECTION VI

Factor Analysis

Factor Analysis Procedures

Before a factor analysis could be estimated it was first necessary to assemble the most extensive possible list of variables pertaining to drug offenses captured in the RYDS interviews during Phase 1 of the project. These variables were then studied through correlation matrices and entered into a series of factor analytic models to begin the process of isolating the communality and patterns in the data. This process let two themes emerge. First, that the across-phase variables were more powerful descriptors of behaviors than within-wave variables. This came as little surprise. After all, the goal was to describe as complete as possible a picture of drug offending during adolescence. Measuring behaviors in only one wave is ineffective as the behaviors, and their occurrence, change rapidly. This variation is precisely what the current project is after.

The second emergent theme was that the data contain less variation on the substances involved than would be preferred. That is, variables that were specific to drugs involved (e.g. cocaine, crack, heroin, etc.) were typically less useful than variables that collapsed drugs into two categories; marijuana and hard drugs. Admittedly, this is unfortunate. However, the simple fact is that in this data set, insufficient numbers of subjects used or sold each of the hard drugs to have statistical variation to exploit on their own\(^{25}\). For this reason, the reader will notice the final factor analysis included “hard drug” variables instead of variables pertaining to individual drugs in this category\(^{26}\).

\(^{25}\) Marijuana, by contrast, provided ample variation.
\(^{26}\) With 3 exceptions, detailed and discussed below.
All told, the factor analysis model included a total of 33 variables. From these variables factor analysis extracts a large set of factors. In fact, it extracts as many factors as there are variables. The factors are ordered according to proportion of the variance each factor explains in the variables, with the first factor explaining the most variance. However, only a small subset of factors are kept for further consideration. These original factors are known as the unrotated factors, or factor patterns.

The purpose of the unrotated factor analysis was to determine the correct number of factors. The first unrotated factor pattern identifies the largest pattern of relationships in the data. The second unrotated factor pattern identifies the next largest pattern of relationship in the data, independent of the first pattern. The third unrotated factor pattern identifies the next largest pattern, independent of the first and second patterns, and so on. Thus the amount of variation in the data explained each successive pattern decreases (Rummel, 1967).

Eigen values were also calculated for the factors. Eigen values express the number of variables explained by each factor, and are not dependent on the factors being rotated. Eigen values are commonly displayed in Scree plots, with the factor number along the bottom axis and the eigen values along the vertical axis. A rule of thumb in examining Scree plots is to look for an “elbow,” or a point where the curve bends. The elbow is used to determine how many unique factors are contributing to the explained variance of the factor analysis. Further, factors are considered to not add to the model when their eigen values fall much below 2.0. At this point, the factor is not explaining any more variance than the original variables. Recall that the goal of factor analysis is to collapse variables into more parsimonious descriptions. Factors with eigen values less
than 2 defeat this purpose, and can be discarded as either irrelevant or nonexistent (that is, they can be assumed to reflect measurement error, Abdi, 2003).

The Scree plot in Figure 3 shows the results from this process. As identified in the plot, the first factor has an eigen value of 11.35. Thus it explains the variance of a little more than 11 variables. Similar, with its eigen value of 4.41, the second factor explains the variance of about 4 and half variables. The eigen values for the third and fourth factors are 3.40 and 2.72, respectively. At the fifth factor, we notice the “elbow.” The fifth factor has an eigen value of only 1.82. It explains the variance of less than two variables. Accordingly, the remainder of the factor analysis relies on four factors.27

Having estimated an unrotated factor analysis and recognized four to be the correct number of factors for this data set, the next step is to estimate a rotation on the factors that were retained. In geometric terms, rotation means that the axes (representing the factors) are rotated (around the origin) to more closely fit the vectors (the clusters of interrelated variables). Rotating the factors in no way changes the vectors, it only changes our perspective on them. Therefore rotation is used to make interpretation of the factors easier and more reliable.28

The first rotation estimated is an orthogonal rotation. The $n$ axes in Figure 2 are representative of the factors that are themselves highly correlated with clusters of the $m$ vectors. When vectors are highly positively related, the angular distance29 between them will be very small (i.e. close to 0 degrees), and when they are highly negatively related,

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27 For completeness, the subsequent analyses were estimated with 5 factors. The fifth factor added practically nothing to the analysis, and results were unchanged. Using four factors is therefore the more parsimonious choice.

28 Reliable here means that the results can be replicated with different data sets (Abdi, 2003).

29 Strictly speaking, these are the cosines of the angles. The raw angles are left in the discussion to make it more transparent.
the angular distance will be near the other extreme (i.e. near 180 degrees). When vectors are unrelated to one another, the angular distance between them is 90 degrees. There are several methods of orthogonal rotation, the most popular of which is VARIMAX rotation\(^30\). A VARIMAX solution gives each factor a small number of large factor loadings, and a large number of small factor loadings. This is a simple solution because each original variable is correlated with one factor, so each factor represents a small number of variables.

As its name would imply, in orthogonal rotation, the factors remain at right angles to each other. But just as vectors can be correlated with one another, so too can the factors. Orthogonal rotation allows the factors to rotate in space around the origin, on the condition that the factors maintain orthogonal relationships to each other. This imposes the assumption that factors are uncorrelated with one another, typically an unrealistic assumption. Oblique rotation, by contrast, not only allows the factors to rotate around the origin, but also to change their angular distance to each other to account for correlations among factors. In other words, the factors are free to take any position in the factor space. This is a more accurate reflection of real-world relationships. Using oblique rotation means that the best definition of the uncorrelated and correlated patterns of interrelated variables is sought (Rummel, 1967). In principle, the results of oblique rotations could be presented graphically, but this becomes difficult beyond the two factor case. However, they can be easily interpreted by looking at the correlations between the rotated axis and the original variables. These correlations are the factor loadings (Abdi, 2003). In obliquely rotated factors, the factor loadings are near zero when a variable is

\(^30\) Other methods include the VARMIN, QUARTIMAX, and EQUIMAX. Because orthogonal rotation is not the focal rotation, these will not be discussed.
not involved in the pattern, and close to 1.0 when a variable is almost perfectly involved in a pattern.

As there are several methods of orthogonal rotation, so too are there several methods of oblique rotation. One of the most common, and the method used here, is the PROMAX rotation. This method proceeds in two steps. In the first step, a target matrix is identified using orthogonal rotation whose entries (values) are raised to a power between 2 and 4. Here, the first step rotation method is the VARIMAX rotation, and the entries are raised to the third power. The second step is to compute a least squares fit to the VARIMAX solution. The PROMAX factor loadings solution is shown in Table 1.

Patterns of Drug Offending

As shown in Table 1, there are four distinct factors emergent from the factor analysis process. These factors represent the underlying dimensions or latent patterns of drug offending in adolescence that were the target of this project. Once developed, the factors can be given symbolic labels according to the variables they each capture. The labels do not change the content of the factors or what portion of variance they describe. They only serve to facilitate communication and ease of discussion. They could be labeled A, B, C, and D, just as they could be labeled 1, 2, 3, and 4. Naming them descriptively, however, gives meaning to their content and more important gives clues to factor content found in other studies (Rummel, 1967, p. 471).

Factor 1 can then be descriptively named “Drug Selling.” The variables that load strongly on the Drug Selling factor each pertain to the various aspects of drug selling measured by the original variables. For example, the average number of times a subject

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31 This forces the values to become bi-polar. That is, values become either very large or very small.
sold drugs in a given wave, the most number of times a subject sold hard drugs in a wave, and the most times a subject sold marijuana in a given wave are all found in this factor or dimension. These three variables have very high factor loadings, meaning the correlation between the rotated factor axis and the variables is quite high (alternatively, the cosine of the angle between them is small). However, it is equally important to note the variables with large negative factor loadings. These variables were the age of initiation for marijuana selling and the age of initiation for hard drug selling. The negative sign indicates that subjects who sold drugs the most actually tended to get involved in drug selling early in adolescence (i.e. they had very low scores on the age of initiation variables, which is to say they were younger). What is interesting about this factor is that both marijuana and hard drug variables loaded equally strongly. The interpretation of this artifact is that, at least in the RYDS sample, the selling of marijuana clustered with the selling of hard drugs and the two were empirically identical in this dimension.

The second factor can be descriptively named “Use of Marijuana.” As the name suggests, and as seen in the table, the variables that loaded on the second factor all describe the subject’s use of marijuana during adolescence. Facets of this dimension include the average number of times marijuana was used in a wave, the most number of times marijuana was used in a wave, and the total number of times marijuana was used during Phase 1. Also found in this factor is the most number of times a subject used any drug. This is not surprising, since this variable was driven by the use of marijuana. In other words, marijuana was the overwhelming favorite for drug use in the RYDS sample.

32 Also included in this factor were two dummy variables for age of initiation for marijuana selling and age of initiation for hard drug selling. The factor analysis process discards cases listwise if a case is missing on any variable. This means that if a subject never sold hard drugs or marijuana, they would be deleted from the sample. To correct for this, subjects who never initiated were recoded on these variables to their current age. The dummy variables remove this correction, and their factor loadings can be ignored.
It is important to note that this dimension only describes marijuana use, not hard drug use. Whereas the drug selling variables clustered regardless of whether marijuana or hard drugs were being sold, this is not the case for drug use. Separate dimensions emerged for marijuana use and hard drug use.

The hard drug use dimension is encompassed by Factor 3. We will thus name the factor “Use of Hard Drugs.” Examples of variables that loaded on this factor include the average number of times hard drugs were used in a wave, the total number of times hard drugs were used in Phase 1, the most number of times hard drugs were used in a wave, and the number of times cocaine, crack cocaine, and heroin were used in Phase 1. Especially interesting is that these drugs had significant variation to load individually, despite the small number of users in the RYDS sample. This suggests that use of the three drugs are quite distinct phenomena. As in Factor 1, the age of initiation of hard drug use loaded with a negative factor loading. Subjects with high marks on hard drug use tended to start use early in adolescence.

The fourth and final factor can be descriptively labeled “Age of Initiation.” The clustered variables comprising this dimension are the age of initiation to drug use (any drug use), the age of initiation to marijuana use, and to a lesser extent the age of initiation to hard drug use. The weaker factor loading for hard drug use implies that the age of initiation for hard drug use was less highly correlated with the factor. This means that the users most typically initiated drug use with marijuana, a finding that is in no way surprising.
Who Do The Factors Describe?

Identifying the factors is an important piece of this research, but the central idea is to use these factors to describe the patterns of drug offending during adolescence. An appropriate question then is, “who do the factors describe?” That is, how can the factor scores be used to explore real samples of individuals? To begin this discussion, a few points should be articulated. First, a factor score of zero does not indicate that a subject does not participate in the factor, or that the pattern does not describe the subject. Factor scores are standardized scores with a mean of zero and standard deviations of 1. Thus, a subject with a score of zero on a particular factor falls on the average of the factor. Second, extremes of factor scores can serve as useful comparisons for counterfactuals. Suppose two subjects each had high factor scores on Factor 1, Factor 2, and Factor 4 (Drug Selling, Use of Marijuana, and Age of Initiation). Now suppose the first subject had a high factor score on Factor 3 (Use of Hard Drugs), while the second individual had a low score on this factor. The second subject can then serve as a counterfactual comparison to the first, as the two are in effect equals in all dimensions save hard drug use. This point will be especially useful when the factor scores are used to predict later life outcomes.

It is also possible to quickly look at the factor patterns to identify roughly how many subjects in the sample can be described as either high or low on the factors. In factor analysis, it is common convention to use a factor score of 0.30 or more to identify scores as being high (or -0.30 or less as low). Due to the overwhelming number of males in the sample\(^{33}\), males and females will be presented separately and in terms of percentages. There are 94 males and 15 females who have high factor scores for the

\(^{33}\) Recall that the original RYDS sample is 75% male.
Drug Selling factor (14% and 6%, respectively). Many more subjects were low on their Drug Selling factor scores, with 224 males (35%) and 105 females (43%). In the Use of Marijuana factor (Factor 2), there are 70 (10%) males and 13 (6%) females with high factor scores, and 30 (5%) males and 9 (4%) females with low factor scores. In other words, marijuana use is more common than not in the RYDS sample. Looking at the Use of Hard Drugs factor, there are 45 males and 9 females (7% and 4%) with high factor scores, but 19 males and 4 females with low factor scores (3% and 2%). With such low percentages of subjects who are low on this dimension, we can assert that at least some use of hard drugs was the norm in the RYDS sample, even though persistent hard drug use was not common.\(^{34}\)

The final factor operates in the reverse direction. Low scores on the factor indicate the subjects initiated drug use early. Thus a low score on the factor actually is the indicator of problematic behavior. There were 230 males (36%) and 103 females (42%) with low scores in this dimension. 401 males (63%) and 140 females (57%) had high scores on the dimension, and initiated drug use late in adolescence.\(^{35}\) It is notable that nearly all of the subjects, both male and female, fell into one of the extremes, initiation drug use early in adolescence or much later. Table 2 presents the numbers and percentages of subjects with high and low factor scores on each of the four factors for easy reference.

As subjects can be described based on their factor scores on one factor or dimension, they can also be described based on their scores for multiple dimensions at

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\(^{34}\) This finding adds to the understanding of the RYDS subjects, long known to be prone to the use of marijuana. This research indicates that at least sporadic use of hard drugs is not as uncommon as previously thought.

\(^{35}\) Or, not at all. Dummy variables account and control for this possibility.
once. This is after all the goal. For example, a simple descriptive exercise would be to see how many subjects had high factor scores on Factor 1, but low factor scores on Factors 2 and 3. These individuals would be particularly active in selling drugs, but would not use drugs themselves. In fact, there are 14 such subjects, 11 males and 3 females. Or, if one were to select subjects with high factor scores on Factor 3, but low factor scores on Factor 2, these would be subjects who were committed hard drug users, but who eschewed the use of marijuana. There were only 3 of these subjects, all of whom were male.

The pitfall with this exercise is that when one selects subjects for high or low scores on a few factors or patterns, one is effectively categorizing individuals according to one’s own preference. It is has been argued here, quite forcefully, that this is an incomplete method of measuring drug offending. Instead, the more complete method advocated here is to use the precise factor scores on all factors simultaneously. To illustrate this, I have selected subjects with high factor scores on Factors 1, 2, and 3, and low factor scores on Factor 4. These subjects can be thought of the most “hardcore” of the drug offenders in the RYDS sample. In keeping with the analogy used above to describe the scoring process, these subjects can be referred to as “diamonds.” There are only 8 diamonds in the sample; 7 males and 1 female. The factor scores for each dimension for each of the 8 diamonds are shown in Table 3. Examining the factor scores directly allows the subjects to be compared to each other. For example, Diamond 7 has remarkably high scores in the Drug Selling and Use of Marijuana dimensions, with quite high of a score on the Use of Hard Drugs dimension. The lone female, Diamond 1, has
high factor scores in absolute terms, but her scores are not near as severe relative to her male diamond counterparts.\(^36\)

At this point the reader will hopefully see the utility of the factor score method of measuring drug offending during adolescence. It identifies four succinct and concrete dimensions of drug offending, including common and unique aspects of behaviors. It also provided an empirical basis for the number of factors. Three factors would have been insufficient to describe the variation the data, but there was not enough variation to warrant five. Finally, it provides each subject with a precise score on all four factors or patterns. These factor scores can be used to quickly compare subjects to one another on the basis of their unique patterns of drug offending behavior. The next section will test how well the factor scores can predict later life outcomes.

**Predicting Outcomes in Three Life Domains**

Having created and explored the factor scores as dimensions of adolescent drug offending, the next step of this project is to determine the utility of those factor scores in predicting outcomes across three domains in multiple life stages. As the reader will recall, the original RYDS sample was stratified based on gender. There are roughly 3 males for each female in the sample. Further, gender was a highly salient variable in the review of the literature presented above. That is, various drug offending behaviors do not impact males in the same way as they impact females. For both of these reasons, subsequent analyses were performed separating the male sample from the female sample.

\(^{36}\) For reasons of anonymity and non-identifiability, much more cannot be said about this subject.
Predicting Outcome for Male Subjects

To begin, the factor scores were entered into an OLS regression model predicting the G2’s level of attachment to parent for males at Phase 1 (roughly age 18). Also included in this model were several control variables\(^{37}\); namely dummy variables to indicate whether the G2 was black or Hispanic, a dichotomous indicator of whether the subject completed high school or a GED (coded 1 = yes and 0 = no), and finally a dichotomous indicator of whether the subject was receiving welfare at the end of Phase 1 (coded 1 = yes and 0 = no). The results from this model are shown in the first column of Table 4.

The joint test of significance statistic presented in the table is a value indicating the statistical significance of the 4 factor scores together in predicting the outcome, attachment to parent. This is a statistical test to determine if the four factor scores together have a significant (that is, non-zero) association with the dependent variable\(^{38}\). In other words, the joint significance test is an indicator of whether the factor score dimensions together are significant predictors of the outcome. With a value of 2.14, the test indicates that the factor scores are jointly significant predictors of attachment to

\(^{37}\) For completeness, models identical to those presented below were also estimated including measures for drug use and drug selling at Phase 2 and Phase 3. These measures were created by counting the number of use and selling incidents for each subject across the phases. The rationale for their inclusion was that if past drug offending is predicted to be related to these outcomes, then it is reasonable to ask if contemporaneous drug use and drug selling could have a direct impact on the same outcomes. Surprisingly, these measures were never significant in any model, with one exception. Drug use was a significant predictor of arrests at Phase 2 for males. In all cases, the sizes of the coefficients were miniscule in comparison, all less than 0.002. Further, including these measures did not mediate the significance of the adolescent drug offending factor scores in any case. The likely reason is that by Phase 2 and Phase 3, there are so few subjects who continued to use and sell drugs that the variables did not have statistical power. For these reasons, the measures were dropped from the final models presented herein. At the introduction to the project, the competing hypotheses of offenders becoming entrenched in drugs versus aging out were discussed. The results here support the idea that the vast majority of the RYDS subjects aged out of crime by the time they reached adulthood.

\(^{38}\) This test amounts to an analysis of variance, distributed as F, with n-k degrees of freedom where n equals the sample size and k equals the number of independent variables. The null hypothesis for the test is one of no relationship.
parent at Phase 1 for males. Looking at the table more closely, the early initiation
dimension (Factor 4) is independently significant. The positive coefficient of 0.05 tells
us that subjects who have lower values on the factor score for early initiation (i.e.
subjects who initiated drug use early in adolescence) had lower attachment to parent than
their counterparts who did not. However, the $R^2$ for this model is admittedly low, at only
0.04. This means that the model explains roughly 4% of the variance. While the factor
scores and the control variables are significant predictors of the outcome, they explain a
small amount of the variance in Phase 1 attachment to parent for males.

The second column of Table 4 presents the results of an OLS regression model
predicting the number of arrests\textsuperscript{39} accumulated in Phase 1 for males, using the same
predictors as in the first column of the table. Again, the joint significance test at the
bottom of the table indicates that the jointly the factor scores are significantly related to
the outcome, here the number of arrests. Compared to the first model, the joint
significance test value is quite large, and is significant at a higher (more restrictive level).
Consistent with this, we can see that three of the four factor scores are independently
statistically significant predictors of arrest (Factors 1, 2, and 4). The Factor 1 coefficient
of 0.086 indicates that subjects with high factor scores on the drug selling dimension are
predicted to have more arrests than their peers with lower factor scores. Similarly, the
Factor 2 coefficient of 0.008 indicates that subjects with high factor scores on the
marijuana use dimension are also predicted to have more arrests. Finally, the Factor 4

\textsuperscript{39} Arrests in this data set are highly skewed to the right end of the distribution. There are several
corrections for this non-normal distribution, including Poisson or negative binomial regression. Poisson
regression assumes the conditional variance of the outcome variable be equal to the conditional mean. In
all of the arrest outcomes in this project, this assumption is violated. Specifically, the variances were much
larger than the mean. The simplest correction proposed in situations like these is to take the natural log of
the dependent variable, and this correction was used here. All arrests are in logged units. Because the
remainder of the continuous outcome variables exhibit approximately normal distributions, ordinary least
squares regression is appropriate.
coefficient of -0.147 indicates that subjects who initiated drug use early are predicted to have more arrests than peers who initiated later. The $R^2$ for this model tells us the model explains just under 20% of the variance in Phase 1 arrests for males. In other words, the factor scores do a much better job predicting the number of Phase 1 arrests than in predicting the level of attachment to parent for males RYDS subjects.

Table 5 presents the results for OLS regression models predicting outcomes at Phase 2, when subjects are roughly 21 to 23 years old. The first column of the table shows the coefficients for the model predicting attachment to parent. Contrary to what was seen in the Phase 1 models, the joint significance test indicates that the factor scores are not jointly significant predictors of attachment to parent at Phase 2. This means that the factor scores as a whole are not significantly related to the attachment to parent for males at Phase 2. Substantively, this implies that for males, adolescent drug offending is not related to attachment to parent in young adulthood. Further, only one factor score (Factor 4) was even moderately significant independently. The coefficient of 0.043 indicates that subjects with lower factor scores on the early initiation dimension were predicted to have lower attachment to their parent. No other coefficient was significantly related to the outcome, a fact supported by the low $R^2$ of 0.015. Comparing this model to the Phase 1 attachment to parent model leads us to conclude that adolescent drug offending as measured by the factor scores is a better predictor Phase 1 attachment than Phase 2 attachment. This is not entirely surprising. After all, by Phase 2 most subjects have left their parents home and other aspects of their life become more important in accordance with interactional theory.
The middle column of Table 5 uses the factor scores and control variables to predict a new outcome at this Phase, the percent of time spent unemployed. The factor scores here are jointly significant as predictors of this outcome. Further, Factors 1 and 4 (drug selling and early initiation) are independently significant. The Factor 1 coefficient of 0.022 indicates that subjects with higher factor scores on this dimension (i.e. the more involved drug sellers in adolescence) are predicted to spend more time unemployed in Phase 2. The Factor 4 coefficient of -0.030 means that male subjects who initiated drug use at young ages are also predicted to spend more time unemployed in Phase 2. Both of these results are in line with theoretical expectations. The model R^2 of 0.142 indicates that the model explains a sizable proportion of the variance in unemployment, at about 14%.

The third column of the table uses the factor scores for drug offending dimensions to predict the number of arrests incurred at Phase 2. These arrests do not include any arrests incurred during Phase 1. Here again, the factor scores are jointly significant as predictors of arrests at Phase 2 for male subjects. Factors 1 and 4 (drug selling and early initiation) are independently significant predictors of arrests, in the theoretically expected directions. The Factor 1 coefficient of 0.063 indicates that subjects with higher drug selling dimension scores are predicted to have more Phase 2 arrests. The Factor 4 coefficient of -0.106 again means that subjects with lower ages of initiation are predicted to have more arrests than subject who initiated later in adolescence. The R^2 of this model, 0.11, indicates that the regressors explain roughly 11% of the variance in Phase 2 arrests. This is a notable proportion since adolescent drug offending dimensions are capable of predicting arrests 5 years in the future.
Moving on to Phase 3 (ages 29-31) outcomes for the males, the outcome for the family domain has been changed. Namely, attachment to parent has been replaced by a dichotomous indicator of partner status. This was done because of interactional theory’s supposition that as the individual moves into adulthood, the family of origin decreases in importance as one’s own family takes on greater centrality. Because this outcome is dichotomous, Phase 3 models (both male and female) predicting partner status are estimated using logistic regression. The first column of Table 6 shows the results of the logistic regression model predicting Phase 3 partner status for males. Jointly, the factor scores are not significant predictors of partner status. Further, no factor score is independently a significant predictor of partner status. We can conclude from this model that adolescent drug offending dimensions have no direct relationship with partner status at Phase 3.

Estimates of the OLS regression model predicting the percent of time spent unemployed in Phase 3 for males is much the same story. Independent factor scores are not significant predictors of the outcome, and the factor scores are not jointly significant. The low $R^2$ for the model, 0.01, demonstrate the difficulty in predicting Phase 3 outcomes using adolescent drug offending measures. In other words, the factor scores have no direct impact on Phase 3 unemployment. Although adolescent drug offending appears to be significantly related unemployment at Phase 2, it is no longer significant by Phase 3. This is an important finding. While drug offending has a proximal impact on unemployment in young adulthood, it does not have distal impact on unemployment in later adulthood. Its impact has faded.
The results for arrests at Phase 3 represent a departure from the other Phase 3 outcome models. The factor scores are jointly significant in predicting Phase 3 arrests\textsuperscript{40}. Factor 4 also has a significant independent relationship to Phase 3 arrests. The coefficient of -0.061 indicates again that subjects who initiated drug use early in adolescence are predicted to have more arrests at Phase 3, as low factor scores (indicative of early initiation to drug use) are associated with higher numbers of arrests at this phase. The results suggest early initiation to drug use in adolescence has far-reaching implications for arrests well into adulthood. This is consistent with all other coefficients for Factor 4, and is also a notable finding. That early initiation to drug use has such cascading effects through the life course by influencing arrests even through adulthood is an important addition to the literature. However, the small $R^2$ of 0.058 suggests that while the factor scores have this distal effect, they are by no means the most salient influence.

Predicting Outcomes for Female Subjects

The models predicting the domain outcomes for the female subjects are identical to those predicting outcomes for male subjects. As above, two outcomes are predicted at Phase 1; the level of the G2 subject’s attachment to her parent and the number of arrests accrued by end of Phase 1. These two OLS regression models are presented in Table 7. The factor scores for the drug offending dimensions are jointly significant as predictors of Phase 1 attachment to parent, as indicated by the test value of 3.66 and associated $p$ value of 0.01. Further, three of the factor scores are independently significant predictors of attachment to parent; Factors 2, 3, and 4. The Factor 2 (marijuana use) coefficient of

\textsuperscript{40} Again, these are only arrests incurred during Phase 3.
0.378 indicates that female subjects with higher factor scores on the marijuana use dimension actually have higher attachment to parent scores than subjects with lower scores on this factor. This finding is contrary to theoretical expectations, and may be due to the fact that there were more female marijuana users proportionally compared to males. The Factor 3 coefficient of -0.238 by contrast is in line with theoretical expectations, indicating that female subjects with higher scores on the hard drug use dimension are predicted to have lower attachment to parent. Lastly, the Factor 4 coefficient, 0.081, indicates that female subjects with lower scores on the early initiation dimension (i.e. those who initiated at earlier ages) are predicted to have lower attachment to parent, consistent with the models for male subjects. As was the case with the Phase 1 attachment to parent model for males, the $R^2$ reveals a small proportion of explained variance.

Continuing with the Phase 1 results, the model predicting Phase 1 arrests for females is shown in the second column of Table 7. Again we see the factor scores are jointly significant in predicting arrests. Independently, only Factor 2 (marijuana use) is a significant predictor of arrests. This is not surprising given the relatively small proportion of female subjects involved in either drug selling or hard drug use. The coefficient of 0.331 indicates that subjects with higher factor scores on this dimension are predicted to have incurred more arrests during Phase 1 than their counterparts with lower factor scores. Parallel to what was seen with the male arrest model, the $R^2$ is much more sizable, as the model explains nearly 15% of the variance in Phase 1 arrests.

Attachment to parent at Phase 2 for females is presented in the first column of Table 8. Whereas the factor scores were jointly insignificant predicting this outcome for
male subjects, it is jointly significant in predicting attachment to parent for the females at Phase 2. Moreover, two factor scores are independently significant predictors of the females’ attachment to parent. A coefficient of -0.279 for Factor 2 (marijuana use) indicates that subjects with lower factor scores are predicted to have higher attachment to parent at Phase 2, consistent with theoretical expectations. This also represents a departure from the results at Phase 1. The Factor 4 coefficient of 0.084 indicates that subjects with lower factor scores on this dimension (those who initiated drug use earlier in adolescence) are predicted to have lower attachment to parent in early adulthood. The R² of the model is 0.063, so the model explains about 6% of the variance in Phase 2 attachment to parent. Together, these results support the conclusion that adolescent drug offending has more far-reaching impact on the family domain for females than for males.

The second model at Phase 2 predicts the number of arrests incurred during this phase. The factor scores for drug offending are jointly significant in predicting these arrests. Factors 1 and 2 are independently significant as well. The respective coefficients of 0.168 and 0.410 indicate that female subjects with higher factor scores on the drug selling and marijuana use dimensions are predicted to have experienced more arrests in Phase 2. Both of these are in line with theoretical expectations. Approximately 18% of the variance in Phase 2 arrests is explained by this model, a reasonably high figure. As with the males, the drug offending dimensions have distal relationships with the arrests in early adulthood for females.

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41 At Phase 2 in the RYDS sample, the data is unable to distinguish between female subjects who were unemployed from female subjects who were stay-at-home mothers. There of course is a crucial difference between the two conditions, and for this reason unemployment was not predicted for female subjects at Phase 2. The anomaly was corrected in the RYDS data by Phase 3.
Although the factor scores were significant predictors of several outcomes for females in both Phase 1 and 2, the Phase 3 models tell a different story. The full model results are shown in Table 9. As the reader can see, the factor scores were never jointly significant for any outcome, nor were any factor scores independently significant. From this we can infer that females are relatively insulated from their adolescent drug offending by the time they reach their 30s. The drug offending dimensions have no direct relationship with the life domain outcomes at this stage in life for female subjects. In fact, this is the only case in which the factor scores were not significant predictors of an arrest outcome for either gender at any phase.

**Gender Differences**

To further explore how the factor scores for adolescent drug offending dimensions operate differently for males than for females, we can compare the coefficients of the factor scores for the parallel models. That is, the coefficient for Factor 1 for males in the Phase 1 model predicting attachment to parent can be compared to that coefficient for the females, the male Factor 2 coefficient can be compared to the female Factor 2 coefficient, and so on. More precisely, we can test for significant differences in the effect sizes. The test used to accomplish this is that advocated by Paternoster, Brame, Piquero, and Mazerole (1998). It amounts to a Z test, calculated as follows
test statistic is distributed normally as $Z$, if the test statistic is larger than 1.96 we can conclude the difference in effect size is significant. If it is less, then we must conclude there is no statistical difference between the coefficients.

For easier interpretation, the results of this process are presented in Table 10. This table presents the pairs of coefficients for the male and female counterpart models. When the difference is statistically significant, the pair is presented in bold font. As can be seen in the table, at Phase 1 there are significant differences for males and females regarding the association between factor scores and attachment to parent and arrests. At Phase 2, there are significant differences between males and females for both outcomes. At Phase 3 however, we see there are no significant differences between males and females regarding how factor scores are related to the outcomes. In all likelihood, there were no significant differences between males and females in this phase because the factor scores were unable to predict the outcomes in a meaningful way.

It is remarkable is that when differences are significant, they are larger (in absolute value) for the females in every case. In other words, the drug offending dimension, as measured by the factor scores, had a stronger effect for female subjects than for males. More pointedly, drug offending was more disruptive for the females as they transitioned to adulthood. This finding is crucial, and one that was previously unknown in the literature. These results are particularly useful in that they can demonstrate the utility of separating males and females when researching drug offending. It is clear that drug offending affects males in different ways than for females, and that when it comes to involvement in drug offending it seems the females are hit harder.

\[\text{Recall that unemployment was not predicted for the females at Phase 2.}\]
Implications of the Results

Considering the results as a whole, it becomes clear that dimensions of adolescent drug offending have direct associations with outcomes at multiple phases in life, but that these associations are highly contingent on the gender of the subject and the outcome under consideration.

By far the outcome with the most consistent relationship to the factor scores was that of arrest. The factor scores were jointly significant predictors of arrests at all phases for the male subjects, and all but Phase 3 arrests for female subjects. However, looking at the individual factor scores suggests that the mechanisms operate through different dimensions for males than for females. For example, the Factor 4 (early initiation) coefficient was always significant in predicting male arrests, but never significant in predicting female arrests. Instead, female arrests were predicted by factor scores on the marijuana use dimension at Phases 1 and 2. The drug selling dimension was salient for males at Phases 1 and 2, but only for females at Phase 2. This is likely because females involved in drug selling during adolescence were the more problematic offenders, and this behavior had lasting salience.

With respect to outcomes in the other two domains, further gender differences emerged. The factor scores were significant predictors of the percent of time spent unemployed for males at Phase 2, but this was not true for females. Attachment to parent exhibited the reverse trend, with the factor scores being significant predictors for females at Phase 2, but not for males. It is possible that this is suggestive of the family of origin retaining greater significance for females than for males, which is supported in the literature. Because the coefficient for completion of high school was comparably quite
large and highly significant for females in predicting percent time spent unemployed at Phase 2 (while insignificant in the parallel male model), it is possible that female subjects can fall back on their educations more easily than the males, but this is only speculation.

A final matter to address is the collective difficulty in using the factor scores to predict outcomes at Phase 3. In fact, the adolescent drug offending dimensions were significantly related to only one Phase 3 outcome for either gender, namely male arrests. Because the factor scores were able to predict other outcomes quite consistently, this suggests that any direct consequences of adolescent drug offending dimensions have evaporated by the time the subject reaches the late 20s and early 30s. This makes sense conceptually. After all, the Phase 3 is a full decade in time after the end of Phase 1. By this time, the subjects (even the most problematic) offenders have reconciled themselves from their teenage offending. The consequences of adolescent drug offending, then, manifest in early adulthood, but experience subsequent decay.
SECTION VII

The literature regarding drug use, drug selling, and the influences these behaviors have on the domains of life is rich and well-developed. However, substantial gaps in that literature remain. The overwhelming majority of conclusions from empirical studies must be viewed through the prism of limited data and threats to the validity of the studies.

The current project is offered in an attempt to begin bridging the gap between empirical knowledge and expectation. It had two main aims. First, to explore, define, and describe common patterns of drug offending during adolescence. Second, to take an initial step to understand how these patterns of behavior influence outcomes later in life. In doing so, the project adopted a life course perspective, and brought to bear a robust data set that is uniquely suited to answering the unanswered questions in the literature through methodological designs conducive to internal and external validity.

The development and exploration of common patterns of drug offending during adolescence was accomplished through factor analysis. The overwhelming majority of prior work was built on simple categorization of drug offenders, and this categorization ignored the rich variation that exists among drug offenders. While common patterns among drug offenders exist, the results here suggest there are markedly more subtleties than are usually sought in research. Treating offenders this way empirically yields stilted results. To improve on this method, factor analysis was used to develop a more robust typology of drug offending. Four factors emerged, representing four latent or underlying dimensions of drug offending. These dimensions were then explored to give reader an idea of how prevalent the various patterns are. However, the project was cautious not to
advocate categorization of offenders. Rather, it was argued here that scoring each subject on each dimension is an important advancement made here.

These factor scores or measures of the dimensions were then tested for their utility in predicting outcomes in three life domains. Attachment to parent and partner status were chosen from the family domain, the percent of time spent unemployed was chosen from the employment domain, and arrests were selected from the criminal justice domain. Results were compelling for both the literature and for the methodology. With respect to the methods, the results from the regression models demonstrated that the factor scores were able to predict the outcomes in consistent ways. They also showed the benefit of using measures as encompassing as the factor scores. Simple categorizations would miss the remarkable variation that exists. For example, if one measured only drug use, and ignored drug selling, one would miss the contribution of that important dimension. The early age of initiation is rarely considered in the literature, but emerged as one of the most consistent predictors. If a drug use category collapsed marijuana use with hard drug use, their unique contributions would be entirely masked. It also argues that measures should be tailored to the data set at hand.

With regard to the literature, the results are quite interesting indeed. Most notable is the fact that adolescent drug offending carries consequences well into young adulthood, and that the severity of the consequences are contingent on how problematic the drug offending was during adolescence. Equally important is the fact that the consequences decay within a decade. The results here strongly support the idea that drug offending is highly related to arrests for males and females. Employment seems to be more strongly related to drug offending for females, but the family is more strongly
related to drug offending for females. This should highlight the importance of carefully considering whether males and females should be grouped together in drug offending research. This research joins the several examples in the literature suggesting separating the genders is often useful.

Implications for Theory

Although this project was not designed as a direct test of Interactional Theory, it did draw heavily from the theory in creating its hypotheses and tests. The results were quite supportive of the theory. Drug offending, characterized as latent dimensions and measured by factor scores, showed consistent direct relationships with the outcomes in three life domains; employment, the family, and the criminal justice system. This is consistent with prior interactional theory research that concluding drug use and drug selling had implications across multiple domains.

Adopting the life course approach, the research also supports interactional theory’s supposition that the drivers of delinquency change from one stage of life to the next. Indeed, we saw here that while drug offending factor scores were capable of predicting outcomes at Phases 1 and 2, they were not capable of the same at Phase 3. In fact, that the factor scores did not predict Phase 3 outcomes is quite consistent with theory. As the individual ages, the past declines in importance as the individual makes transitions to new stages. As the subjects approached the approximate age of 30, their adolescent drug offending histories had little importance.

Finally, the results supported the theory with respect to the factor scores themselves. First, interactional theory places great importance on the initial values and
the onset of offending. As mentioned in the theory section above, the theory holds that the earlier the onset in offending, the greater the continuity. The consistency in the predictive capability of the fourth factor score (early initiation) is directly in line with this part of the theory. Second, the proportionality of cause and effect is central to the theory. This concept posits as the magnitude of the causal force increases (in strength and in number) so too does the magnitude of the effect. The measurement of the drug offending using factor scores was designed in line with this premise, and provides a useful test of the premise as well. Cutting across four dimensions of behavior, the factor scores were able to measure both the number of driving factors as well as their magnitude. The reader will recall the “diamonds” discussed in the factor analysis section. These individuals had both high numbers and high magnitudes. When the factor scores were used to predict later life domain outcomes, the results directly supported interactional theory. Those subjects with the most severe scores in the most dimensions had the most problematic outcomes. They were predicted to have low attachment to parent, spend more time unemployed, and accrue more arrests in late adolescence and young adulthood.

Thus, while not a direct test of the theory, the current project is nonetheless indebted to the theory for providing guidance, and the results provided further example of interactional theory’s utility in explaining delinquent behavior and its consequences in the life course.

*Implications for Future Research*

The current study was intended as an initial effort to determine the ability of factor scores to measure adolescent drug offending, and to determine how well those
factor scores could predict later life outcomes. Both of the project’s thrusts have implications for future research.

Regarding the factor scores, the current project argues that factor scores offer a more complete and holistic way to capture the depth and breadth of drug offending than the more traditional typology approach. The factor analysis technique is an empirically driven tool to identify commonalities and disparities in the behaviors encompassed by drug offending. Without first identifying these dimensions in the data, the researcher who categorizes individual subjects is doing so in a somewhat arbitrary way, and may be missing key dimensions of behavior. Further, the factor scores can map out precise patterns of drug offending that are uniquely descriptive of individual subjects. The scores are rich descriptors of each dimension, and represent marked improvements over the limited or stilted values more commonly encountered in the literature. In sum, the factor score method used here should serve as a benchmark, offering future research a powerful tool to study drug offending.

The results from the multivariate models predicting life domain outcomes also have implications for future research. First, future research would do well to extend the outcomes included in each domain. Second, research should also extend the number of domains considered. The results presented herein suggest that there are many more outcomes in these and other domains that likely have a relationship to adolescent drug offending, even into adulthood. Additionally, it was emphasized that only direct effects were studied in this project, although it is quite possible that indirect effects also exist. Because this study was an initial step, indirect effects were not the focus. After all, it is reasonable to first examine whether direct effects exist before turning attention to the
indirect effects. However, researching these indirect effects is a quite laudable goal. The results here imply that future research would provide much knowledge to the literature by testing for indirect effects.

Finally, the results with respect to gender have direct implications for future research. It was clearly demonstrated here that drug offending was related to later outcomes for males in different ways than for females. The significant differences argue that future research should be careful when including both male and female subjects in drug offending research. While it cannot be stated conclusively that all samples will exhibit the stark gender differences seen here, it is the case that being attentive to the potential for such differences is prudent.

*Implications for Policy*

Drug policy in this country has been a long standing concern, with a wealth of research devoted to it. Criminal justice policies addressing drug offending are among the most controversial, because these offenses typically carry steep penalties in most jurisdictions. Because the danger posed by drug offending (and drug offenders) is the most cited reason for the penalties, it makes good sense to ask whether drug offending actually poses a danger. While the research presented here is not arguing for or against drug offenders posing a danger to society, the research can argue that drug offending poses a danger to the offender. In other words, the results show that drug offending carries substantial negative consequences for the individual, and that these consequences are felt into adulthood.
Policy would be well served by being attentive to these results. That is, once identified as drug offenders, policies should exist that recognize the harmful implications the offending has for the individual later in life. For example, because early initiation was a consistent predictor of negative outcome, policies to identify early initiates and to protect them from future offending would likely have great benefit. Drug selling was a consistent predictor of arrests for both males and females, with comparably large effect sizes. Thus policies designed to break the cycle of drug selling may well have benefits by reducing the number of arrests adolescents experience.

Finally, policies should recognize the gender differences highlighted by this research. Drug offending affects males and females differently, and policies must therefore be attentive to this fact, tailoring interventions to the genders. For example, policies to strengthen the job prospects of drug offenders might be better suited for males, while policies intended to strengthen family relations may better serve females. Certainly, as the research in this area progresses, policies can be better informed on how to implement programs designed to mitigate the negative influence of adolescent offending in comprehensive ways.

**Closing Remarks**

Of course, the project here has its own weaknesses. The project in limited in that it only focuses on three domains of life. Of course, many more domains exist. It therefore is not intended to describe how adolescent drug offending patterns affect the entirety of an individual’s life. The three domains included here were chosen because they are strongly related to drug offending in the extant literature. Further only four
outcomes were used here to represent the domains. Again, many more outcomes exist for each domain.

Additionally, this study considered only the direct effects of the drug offending factor scores on the various outcomes. It is quite possible that indirect effects also exist, as discussed above. For example, the factor scores could have an indirect effect on employment through arrests. This study intended to develop a new methodology for measuring drug offending, and was therefore necessarily limited in scope. Estimating the direct effects was an initial step, although future research would certainly benefit from estimating indirect effects.

Because the data were limited to a single study in the US, external validity is hampered. Replications of this work in other cities where data is available would prove quite interesting. If results were replicated, one could argue the results shown here are widespread. If not, then drug offending’s impact on the life course may exhibit regional variations. Similarly, the study used only adolescent drug offending, and did not use factor scores to model adult drug offending. Whether the results are applicable to only young offenders or to offenders of all ages remains to be seen.

For all these reasons, the current research is by no means intended to be a final word on the subject. Rather, it is hoped that it will be used as part of the foundation on which build a stronger and more well developed literature. Having shown the benefit of measuring drug offending in precise ways across multiple dimensions of offending, can build on the efforts here to continue scientific research on drug offending in all of its forms. A more complete view of drug offending and the life course will require
additional research. The current project is offered as the next step in science reflecting this small corner of human behavior.
REFERENCES


Ledoux, Sylvie, Patrick Miller, Marie Choquet, and Martin Plant. 2002. “Family Structure, Parent-Child Relationships, and Alcohol and Other Drug Use Among


Roche, Kathleen M., Margaret E. Ensminger, and Andrew J. Cherlin. 2007. “Variations in Parenting and Adolescent Outcomes Among African American and Latino


Figure 1. Research Design of the Rochester Youth Development Study
Figure 2. Graphical Representation of Factor Analysis in Three Dimensions
Figure 3. Scree Plot Showing Eigen Values by Factors
Table 1. Obliquely Rotated Factor Patterns (Promax Rotation)

<table>
<thead>
<tr>
<th>Metric</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average No. of Times Sold Hard Drugs Per Wave</td>
<td>0.835</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most No. of Times Sold Hard Drugs Per Wave</td>
<td>0.781</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most No. of Times Sold Marijuana Per Wave</td>
<td>0.758</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total No. of Times Sold Hard Drugs, Phase 1</td>
<td>0.730</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average No. of Times Sold Marijuana Per Wave</td>
<td>0.727</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total No. of Times Sold Marijuana, Phase 1</td>
<td>0.721</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Largest Hard Drug Selling Group</td>
<td>0.687</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Average Size of Hard Drug Selling Group</td>
<td>0.671</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Most Money Made Selling Marijuana</td>
<td>0.438</td>
<td></td>
<td></td>
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<td>Largest Marijuana Selling Group</td>
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<td>Average Size of Marijuana Selling Group</td>
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<tr>
<td>Most Money Made Selling Hard Drugs</td>
<td>0.348</td>
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<tr>
<td>Age of Initiation to Marijuana Selling</td>
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<tr>
<td>Marijuana Selling Dummy Variable</td>
<td>-0.781</td>
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<td></td>
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<tr>
<td>Age of Initiation to Hard Drug Selling</td>
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<td>Hard Drug Selling Dummy Variable</td>
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<tr>
<td>Most No. of Times Used Marijuana Per Wave</td>
<td>0.953</td>
<td></td>
<td></td>
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<tr>
<td>Most No. of Times Used All Drugs Per Wave</td>
<td>0.947</td>
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<td></td>
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<tr>
<td>Total No. of Times Used Marijuana, Phase 1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Average No. of Times Used Marijuana Per Wave</td>
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<tr>
<td>Average No. of Times Used All Drugs Per Wave</td>
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<tr>
<td>Average No. of Times Used Hard Drugs Per Wave</td>
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<td>Total No. of Times Used Hard Drugs, Phase 1</td>
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<tr>
<td>Most No. of Times Used Hard Drugs Per Wave</td>
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<td></td>
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<td>Total No. of Times Used Cocaine, Phase 1</td>
<td>0.804</td>
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<tr>
<td>Total No. of Times Used Crack, Phase 1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total No. of Times Used Heroin, Phase 1</td>
<td>0.564</td>
<td></td>
<td></td>
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<tr>
<td>Age of Initiation to Hard Drug Use</td>
<td>-0.616</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hard Drug Use Dummy Variable</td>
<td>-0.614</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Age of Initiation to Drug Use</td>
<td></td>
<td>0.943</td>
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</tr>
<tr>
<td>Drug Use Dummy Variable</td>
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</tr>
<tr>
<td>Age of Initiation to Marijuana Use</td>
<td></td>
<td>0.940</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marijuana Use Dummy Variable</td>
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<td>0.938</td>
<td></td>
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<td>Table 2. Number of Males and Females With High and Low Factor Scores</td>
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</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td><strong>High Scores</strong></td>
<td><strong>Males</strong></td>
<td>94</td>
<td>70</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>(14%)</td>
<td>(10%)</td>
<td>(7%)</td>
<td>(36%)</td>
</tr>
<tr>
<td></td>
<td><strong>Females</strong></td>
<td>15</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>(6%)</td>
<td>(6%)</td>
<td>(4%)</td>
<td>(42%)</td>
</tr>
<tr>
<td><strong>Low Scores</strong></td>
<td><strong>Males</strong></td>
<td>224</td>
<td>30</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>(35%)</td>
<td>(5%)</td>
<td>(3%)</td>
<td>(63%)</td>
</tr>
<tr>
<td></td>
<td><strong>Females</strong></td>
<td>105</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>(43%)</td>
<td>(4%)</td>
<td>(2%)</td>
<td>(57%)</td>
</tr>
</tbody>
</table>

N (males) = 638  N (females) = 243

<table>
<thead>
<tr>
<th>Table 3. Factor Scores for Subjects with High Scores on All Factors, “Diamonds”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diamond</strong></td>
</tr>
<tr>
<td>1*</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
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</table>

* Diamond 1 is the lone female.
<table>
<thead>
<tr>
<th></th>
<th>Attachment to Parent</th>
<th>Arrests</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 (Drug Selling)</td>
<td>0.013 (0.017)</td>
<td>0.086*** (0.024)</td>
</tr>
<tr>
<td>F2 (Marijuana Use)</td>
<td>-0.011 (0.016)</td>
<td>0.008*** (0.023)</td>
</tr>
<tr>
<td>F3 (Hard Drug Use)</td>
<td>0.013 (0.014)</td>
<td>0.057 (0.021)</td>
</tr>
<tr>
<td>F4 (Early Initiation)</td>
<td>0.050** (0.017)</td>
<td>-0.147** (0.024)</td>
</tr>
<tr>
<td>Black</td>
<td>0.117** (0.042)</td>
<td>0.290 (0.062)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.014* (0.052)</td>
<td>0.190 (0.077)</td>
</tr>
<tr>
<td>Completed HS/GED</td>
<td>-0.112** (0.042)</td>
<td>-0.171 (0.061)</td>
</tr>
<tr>
<td>Welfare Receipt</td>
<td>-0.007 (0.058)</td>
<td>0.122 (0.082)</td>
</tr>
<tr>
<td>(Intercept)</td>
<td>3.466*** (0.050)</td>
<td>0.276 (0.073)</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>N</td>
<td>599</td>
</tr>
<tr>
<td>R²</td>
<td>0.040</td>
</tr>
<tr>
<td>Joint Test of Significance (F value)</td>
<td>2.14*</td>
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</table>

Standard Errors In Parentheses
* p < 0.05    ** p < 0.01    *** p < 0.001
<table>
<thead>
<tr>
<th>Table 5. OLS Regression Models Using Factor Scores to Predict Outcomes at Phase 2, Male Subjects Only</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attachment to Parent</strong></td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>F1 (Drug Selling)</td>
</tr>
<tr>
<td>F2 (Marijuana Use)</td>
</tr>
<tr>
<td>F3 (Hard Drug Use)</td>
</tr>
<tr>
<td>F4 (Early Initiation)</td>
</tr>
<tr>
<td>Black</td>
</tr>
<tr>
<td>Hispanic</td>
</tr>
<tr>
<td>Completed HS/GED</td>
</tr>
<tr>
<td>Welfare Receipt</td>
</tr>
<tr>
<td>(Intercept)</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td>R²</td>
</tr>
<tr>
<td>Joint Test of F value</td>
</tr>
</tbody>
</table>

* Standard Errors In Parentheses

* p < 0.05   ** p < 0.01   *** p < 0.001
<table>
<thead>
<tr>
<th></th>
<th>Partner Status</th>
<th>Percent of Time Unemployed</th>
<th>Arrests</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 (Drug Selling)</td>
<td>-0.087</td>
<td>(0.101)</td>
<td>0.006</td>
</tr>
<tr>
<td>F2 (Marijuana Use)</td>
<td>0.067</td>
<td>(0.096)</td>
<td>0.011</td>
</tr>
<tr>
<td>F3 (Hard Drug Use)</td>
<td>-0.112</td>
<td>(0.122)</td>
<td>0.009</td>
</tr>
<tr>
<td>F4 (Early Initiation)</td>
<td>0.060</td>
<td>(0.097)</td>
<td>-0.061*** (0.016)</td>
</tr>
<tr>
<td>Black</td>
<td>0.267</td>
<td>(0.244)</td>
<td>0.070</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-0.287</td>
<td>(0.319)</td>
<td>0.043</td>
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<tr>
<td>Completed HS/GED</td>
<td>0.103</td>
<td>(0.245)</td>
<td>-0.052</td>
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<tr>
<td>Welfare Receipt</td>
<td>0.619*</td>
<td>(0.301)</td>
<td>0.023</td>
</tr>
<tr>
<td>(Intercept)</td>
<td>-1.143***</td>
<td>(0.294)</td>
<td>0.145</td>
</tr>
</tbody>
</table>

N = 606
$\chi^2 = 13.183$

Logistic Regression used to predict Phase 3 Partner Status

Standard Errors in Parentheses

* $p < 0.05$  ** $p < 0.01$  *** $p < 0.001$
<table>
<thead>
<tr>
<th>Table 7. OLS Models Using Factor Scores to Predict Outcomes at Phase 1, Females Subjects Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>F1 (Drug Selling)</td>
</tr>
<tr>
<td>F2 (Marijuana Use)</td>
</tr>
<tr>
<td>F3 (Hard Drug Use)</td>
</tr>
<tr>
<td>F4 (Early Initiation)</td>
</tr>
<tr>
<td>Black</td>
</tr>
<tr>
<td>Hispanic</td>
</tr>
<tr>
<td>Completed HS/GED</td>
</tr>
<tr>
<td>Welfare Receipt</td>
</tr>
<tr>
<td>(Intercept)</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td>R²</td>
</tr>
<tr>
<td>Joint Test of Significance (F value)</td>
</tr>
</tbody>
</table>

Standard Errors In Parentheses

* p < 0.05  ** p < 0.01  *** p < 0.001
Table 8. OLS Regression Models Using Factor Scores to Predict Outcomes at Phase 2, Female Subjects Only

<table>
<thead>
<tr>
<th></th>
<th>Attachment to Parent</th>
<th>Arrests</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 (Drug Selling)</td>
<td>-0.026</td>
<td>0.168**</td>
</tr>
<tr>
<td>F2 (Marijuana Use)</td>
<td>-0.279*</td>
<td>0.410**</td>
</tr>
<tr>
<td>F3 (Hard Drug Use)</td>
<td>0.173</td>
<td>-0.021</td>
</tr>
<tr>
<td>F4 (Early Initiation)</td>
<td>0.084*</td>
<td>-0.046</td>
</tr>
<tr>
<td>Black</td>
<td>0.140</td>
<td>0.114</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.207</td>
<td>0.156</td>
</tr>
<tr>
<td>Completed HS/GED</td>
<td>-0.039</td>
<td>-0.157*</td>
</tr>
<tr>
<td>Welfare Receipt</td>
<td>-0.013</td>
<td>0.079</td>
</tr>
<tr>
<td>(Intercept)</td>
<td>3.396***</td>
<td>0.247</td>
</tr>
</tbody>
</table>

N                          | 236                  | 221             |
R²                         | 0.063                | 0.181           |
Joint Test of Significance (F value) | 3.42**       | 8.97***         |

Standard Errors In Parentheses
* p < 0.05      ** p < 0.01       *** p < 0.001
<table>
<thead>
<tr>
<th></th>
<th>Partner Status</th>
<th>Percent of Time Unemployed</th>
<th>Arrests</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 (Drug Selling)</td>
<td>0.072</td>
<td>-0.008</td>
<td>-0.026</td>
</tr>
<tr>
<td>F2 (Marijuana Use)</td>
<td>-0.821</td>
<td>-0.010</td>
<td>-0.005</td>
</tr>
<tr>
<td>F3 (Hard Drug Use)</td>
<td>-0.693</td>
<td>-0.005</td>
<td>0.006</td>
</tr>
<tr>
<td>F4 (Early Initiation)</td>
<td>-0.117</td>
<td>0.001</td>
<td>-0.015</td>
</tr>
<tr>
<td>Black</td>
<td>12.257</td>
<td>0.001</td>
<td>0.015</td>
</tr>
<tr>
<td>Hispanic</td>
<td>11.999</td>
<td>0.022</td>
<td>-0.030</td>
</tr>
<tr>
<td>Completed HS/GED</td>
<td>-0.227</td>
<td>0.014</td>
<td>-0.024</td>
</tr>
<tr>
<td>Welfare Receipt</td>
<td>-0.155</td>
<td>0.012</td>
<td>0.025</td>
</tr>
<tr>
<td>(Intercept)</td>
<td>-13.348</td>
<td>0.001</td>
<td>0.049</td>
</tr>
</tbody>
</table>

| N                                  | 239            | 239                       | 225       |
| $R^2$                              | $\chi^2 = 11.210$ | 0.026                    | 0.018     |
| Joint Test of Significance (F value) | 5.06          | 0.23                      | 0.28      |

Logistic Regression used to predict Phase 3 Partner Status

* $p < 0.05$  ** $p < 0.01$  *** $p < 0.001$
### Table 10. Comparing the Effect Sizes of Male and Female Multivariate Models

<table>
<thead>
<tr>
<th></th>
<th>Phase 1</th>
<th></th>
<th>Phase 2</th>
<th></th>
<th>Phase 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attachment to Parent</td>
<td>Arrests</td>
<td>Attachment to Parent</td>
<td>Arrests</td>
<td>Attachment to Partner Status</td>
<td>Arrests</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Factor 1</td>
<td>0.013</td>
<td>0.03</td>
<td>0.086</td>
<td>0.029</td>
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<td></td>
</tr>
<tr>
<td>Factor 2</td>
<td>-0.011</td>
<td>0.378</td>
<td>0.008</td>
<td>0.331</td>
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<td></td>
</tr>
<tr>
<td>Factor 3</td>
<td>0.013</td>
<td>-0.238</td>
<td>0.057</td>
<td>-0.048</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 4</td>
<td>0.05</td>
<td>0.081</td>
<td>-0.147</td>
<td>-0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 1</td>
<td>-0.004</td>
<td>-0.026</td>
<td>0.063</td>
<td>0.168</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 2</td>
<td>0.011</td>
<td>-0.279</td>
<td>0.034</td>
<td>0.410</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 3</td>
<td>0.004</td>
<td>0.173</td>
<td>0.022</td>
<td>-0.021</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 4</td>
<td>0.043</td>
<td>0.084</td>
<td>-0.106</td>
<td>-0.046</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 1</td>
<td>-0.087</td>
<td>0.072</td>
<td>-0.003</td>
<td>-0.008</td>
<td>0.006</td>
<td>-0.026</td>
</tr>
<tr>
<td>Factor 2</td>
<td>0.067</td>
<td>-0.821</td>
<td>0.000</td>
<td>-0.01</td>
<td>0.011</td>
<td>-0.005</td>
</tr>
<tr>
<td>Factor 3</td>
<td>-0.112</td>
<td>-0.693</td>
<td>-0.001</td>
<td>-0.005</td>
<td>0.009</td>
<td>0.006</td>
</tr>
<tr>
<td>Factor 4</td>
<td>0.06</td>
<td>-0.117</td>
<td>-0.003</td>
<td>0.001</td>
<td>-0.061</td>
<td>-0.003</td>
</tr>
</tbody>
</table>

Bold indicates the difference between coefficients to be significant at the p < 0.05 level.