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Role of Gender in the Presentation and Course of Antisocial Behavior for Alcohol and Drug-Disordered Youth

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy

in

Clinical Psychology

by

Katherine Patterson Lydecker

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2010

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ABSTRACT OF THE DISSERTATION

Role of Gender in the Presentation and Course of Antisocial Behavior for Alcohol and
Drug-Disordered Youth

by

Katherine Patterson Lydecker

Doctor of Philosophy in Clinical Psychology

University of California, San Diego, 2010
San Diego State University, 2010

Professor Sandra A. Brown, Chair

Adolescent delinquency is costly at both the individual-level and the societal-level. Many conduct-disordered (CD) adolescents meet criteria for antisocial personality disorder (ASPD) in adulthood, and adolescent alcohol/substance use disorders (ASUDs) are associated with increased risk for adult antisocial outcomes. CD research and treatments have historically targeted boys, but recent efforts have explored the phenomenon of antisocial behavior in girls. However, few studies have assessed male/female differences in presentation and course of CD/ASPD in

substance-disordered adolescents. In particular, no existing research has examined gender differences in antisocial behavior trajectories for substance-disordered youth through adolescence and into young adulthood.

This study investigated the role of gender in longitudinal patterns of antisocial behavior in 424 adolescents (intake M age=16.2 years) from an existing project examining clinical course for ASUD youth. The sample was 50% female, 62% Caucasian, and intake age range was 13-18 years. Gender differences in CD/ASPD and ASUD symptoms and prevalence rates were assessed during initial treatment and 2, 4, 6, and 8 years post-treatment. Antisocial behavior trajectory groupings were established using general growth mixture modeling, and gender differences in trajectory classes were assessed.

Conclusions are: (1) Gender differences in CD/ASPD symptoms and disorder prevalence rates were present during treatment and throughout the 8 years post-treatment. Boys had higher disorder prevalence, more total symptoms, more severe symptoms, and more symptoms independent of substance use; (2) ASUD prevalence was higher for boys at intake, 4, 6, and 8 years post-treatment. Gender differences in ASUD symptoms emerged in late-adolescence and early-adulthood, with female symptom levels higher at 2 years post-treatment then lower at 4, 6, and 8 years; (3) A five class solution ("late-escalating," "high-start desisting," "early-escalating," "gradual desisting," and "highest-start desisting" classes) was determined optimal based on model fit indices. Gender was related to CD/ASPD trajectory class membership with girls overrepresented in a "late-escalating" class and a "gradual-desisting" class. Boys were overrepresented in a "highest-start desisting class" and an "early-escalating" class. Overall, gender related findings indicate that despite lower rates of CD/ASPD

compared to their male counterparts, substance-abusing girls are at risk for particular

forms of antisocial psychopathology in late-adolescence and early-adulthood.

INTRODUCTION

Conduct disorder (CD) is common in alcohol and drug disordered adolescent populations. Youth with co-occurring substance use disorders (SUDs) and conduct disorder appear to have the most severe clinical presentation and poorest long-term outcomes (Lansford et al., 2008). Similarly, use of illegal drugs has been linked to the persistence of conduct disorder and progression to antisocial personality disorder (Myers et al., 1998). Little is known about the long-term associations between substance use and antisocial behavior as adolescents transition to adulthood, and even less is understood about how gender may be related to these processes. The present dissertation addresses important gaps in the understanding of gender-specific changes in antisocial behavior across this important developmental transition for substance abusing youth.

The model presented in Figure 1 combines theory from two distinct bodies of literature: (1) gender differences in antisocial behavior and (2) substance abuse as a risk factor for concurrent and long-term antisocial patterns. This theoretical model will form the basis of the following literature review. Findings from the present dissertation directly and indirectly address all relationships in the model. Aspects of the model that were directly tested in this study include: the relationship between gender and adolescent and adult antisocial behavior (1 and 2), the relationship between gender and adolescent and adult alcohol/drug problems (3 and 4), and gender differences in the progression of antisocial behavior from adolescence to adulthood (5). Additionally, secondary analyses (S) examine short and long-term associations between substance abuse and antisocial behavior. Overall, the present study seeks

to clarify the extent to which substance abuse in adolescence leads to future antisocial behavior for boys and girls, and whether pathways to adult antisocial behavior differ by gender for substance-disordered youth.

Background and Significance

Adolescent Delinquency

Adolescent substance abuse and conduct disorder are two distinct but theoretically and clinically related forms of externalizing psychopathology, and they both fall under the broad category of delinquent behavior. Some delinquent behaviors may be considered developmentally normative, with high base rates in the general population and not necessarily indicative of underlying psychopathology. Moffitt and colleagues (2001) describe the phenomenon of adolescence-limited antisocial behavior as normative during the "maturity gap" (dysphoric period of adolescence when biological maturation is completed before access to adult privileges and responsibilities are granted). This time-limited delinquent behavior serves to "… demonstrate autonomy from parents, win affiliation with peers, and hasten social maturation" (Moffitt et al., 2001, p. 356). Similarly, Jessor (1987) posited that certain behaviors that are considered deviant in youth but not adulthood (e.g., moderate alcohol consumption in a social context) may serve a critical function in psychosocial development, marking the transition from childhood to adulthood. By contrast, other antisocial behavior (e.g., heavy alcohol consumption as a means of coping with life stressors) may not serve an adaptive developmental purpose and can represent a clinically relevant psychiatric issue. The pervasiveness, severity, and consequences of the behavior determine clinical significance and inform diagnosis of

substance use disorder and conduct disorder. For some adolescents, delinquent behavior may be a precursor to continued, often more severe, forms of psychopathology. Thus, for many adolescents delinquency is time-limited and for others, it represents an early manifestation of underlying psychopathology that will persist into adulthood.

Adolescent delinquency, including substance abuse and antisocial behavior, is costly to both the individual and the public. Person-level consequences include negative repercussions across major life domains, including impaired relationships, decreased educational and occupational attainment, and health problems such as STDs and unplanned pregnancy (SAMHSA, 2007). Early researchers of conduct disorder incorrectly assumed that antisocial behavior results in fewer long-term negative outcomes for girls than boys (Cowie, 1968). In fact, CD may be associated with more severe personal consequences for girls. For example, antisocial adolescent girls have significantly higher rates of suicidality compared to their male counterparts (Joffe, Offord, & Boyle, 1988; Cairns, Peterson, & Neckeman, 1988). A review of the literature (Pajer, 1998) found that across multiple life domains, women with a history of conduct disorder have poorer outcomes than women with other forms of psychiatric illness. Specifically, conduct-disordered girls had higher mortality rates, violent deaths, and deficient parenting in adulthood compared to their non-antisocial peers. At the societal-level, costs of delinquency include threats to public safety as well as the monetary expense of legal proceedings and incarceration, welfare, drug treatment, medical care, and lost occupational productivity (Cartwright, 2008; Office of National Drug Control Policy, 2001). Economic costs associated with drug abuse in the United States were estimated at $143 billion in 1998, only $4.5 billion of which

was accounted for by intervention and prevention costs (Office on National Drug Control Policy, 2001). Thus, adolescent delinquency represents a risk factor for negative outcomes to the individual and a large societal burden.

Conduct disorder (CD) is defined as a repetitive and persistent pattern of behavior in which the basic rights of others or major age-appropriate societal norms or rules are violated. Although the diagnostic relationship between substance abuse and conduct disorder has changed with updates of the DSM, DSM-IV now lists alcohol and drug use as associated features of conduct disorder. In DSM-III (APA, 1980), "substance abuse" was named as a criterion behavior of conduct disorder, but was removed in subsequent versions of the manual. However, there is currently debate as to whether precocious substance use should be included as a criterion behavior for CD in DSM-V (Moffitt et al., 2008). Currently, DSM diagnoses of conduct disorder and ASPD do not require that antisocial behaviors occur independently of substance involvement.

Estimates of the prevalence of conduct disorder in the general population range from about 1% to 10% (APA, 2000). Results from the National Comorbidity Survey Replication (Nock, Kazdin, Hiripi, & Kessler, 2006) indicate that the lifetime prevalence of conduct disorder is 9.5%. In DSM-IV (APA, 1994; APA, 2000).

Male Gender as a Risk Factor for Conduct Disorder and ASPD

A large body of literature has found differential rates of antisocial psychopathology for males and females. In addition to higher rates of conduct disorder and ASPD for males compared to females, gender differences in developmental trajectories of antisocial behavior have been identified. The literature

reviewed in this section provides background for relationships 1, 2, and 5 in the proposed model (Figure 1).

Higher Prevalence Rates of CD/ASPD for Boys and Men

The sex ratio for conduct disorder has been estimated at 2 to 4 boys to each girl (Dodge, Coie, & Lynam, 2006; Loeber et al, 2000; Moffitt et al., 2001). This gender difference in prevalence rates decreases from preadolescence (Moffitt & Caspi, 2001; Zoccolillo, 1993) to adolescence (Hinshaw & Lee, 2003; Moffitt, Caspi, Harrington, & Milne, 2002). Gender differences in the prevalence of antisocial psychopathology are similarly found in adults. Higher rates of ASPD for men have been established in a wide range of epidemiological, criminal, and clinical populations. DSM-IV-TR (APA, 2000) reports that ASPD is found in 3% of men and 1% of women in the general population. This gender difference may be less pronounced in criminal populations (review, Cale & Lilienfeld, 2002). In summary, males have higher prevalence rates of antisocial disorders across the lifespan, and this difference is least pronounced during adolescence. When examined dimensionally rather than categorically, a similar pattern is found. Hicks and colleagues (2007) used an epidemiological twin sample to examine gender differences in the progression of externalizing disorders from age 17 to 24. Males had significantly more antisocial symptoms than females at both ages, and the gender gap increased from age 17 to age 24.

Predominant Taxonomy of Antisocial Trajectories: Adolescence-Limited and Life-Course-Persistent Pathways

Extensive work by Moffitt and colleagues using the male subsample of the longitudinal Dunedin Multidisciplinary Health and Development Study (Moffitt et al.,

1993; Caspi & Moffitt, 1995) has led to the distinction of two primary antisocial developmental pathways. The first, "life-course-persistent" (LCP) antisocial behavior, emerges in childhood and is associated with deficits in cognition, temperament, and parenting. This pathway is characterized by physical aggression and antisocial behavior that persists into mid-adulthood. The second, "adolescence-limited" (AL) antisocial behavior, is linked to the onset of puberty and desists with the onset of adult responsibilities unless "snares" (e.g., drug involvement) are encountered. As described by Moffitt and Caspi (2001), "…adolescence-limited antisocial are common, relatively temporary, and near normative. Life-course persistent antisocial are few, persistent, and pathological." These classes have been associated with differential long-term outcomes across several key domains in adulthood, including mental health, employment, financial stability, and criminal activity (Moffitt et al., 2002).

Gender Distribution across LCP and AL Pathways

Existence of an adolescence-limited (AL) pathway in girls has been well-documented in the literature. However, there has been some debate as to whether the life-course persistent (LCP) pathway is found across both genders or is specific to boys. It was initially assumed that the AL/LCP taxonomy would apply to females as well as males (Moffitt, 1994), but this assumption has been called into question by other researchers (Silverthorn & Frick, 1999). Further study of the Dunedin sample (Caspi, Lynam, Moffitt, & Silva, 1993; Moffitt and Caspi, 2001; Odgers et al., 2008), U.S. nationally representative samples (Schaeffer et al., 2006; Lahey et al., 2006), and multi-national epidemiological samples (Broidy et al., 2003) has confirmed the existence of a small subset of females with early onset of antisocial behavior.

Moffitt and Caspi (2001) used the Dunedin birth cohort sample to investigate gender differences in antisocial behavior from early childhood to age 18. Boys in this study were 10 times more likely to have the life-course-persistent form of conduct disorder but only 1.5 times more likely to have adolescent-onset antisocial behavior. Even in samples of detained youth, who are expected to include the most severely antisocial girls, there are significant gender differences in age of onset of conduct disorder. Silverthorn, Frick, & Reynolds (2001) similarly found that male adolescents incarcerated in a juvenile detention facility were much more likely to have childhood-onset conduct disorder than their female counterparts (46% versus 6%). In summary, although the LCP pathway has been identified for females as well as males, girls are far more likely to initiate antisocial behavior in adolescence and "outgrow" these behaviors by adulthood.

One study (Silverthorn et al., 2001), found that AL conduct-disordered girls had similar personality profiles to those of the childhood-onset boys. In contrast, results from the Dunedin community birth cohort (Moffitt & Caspi, 2001; Odgers et al., 2008) suggest that LCP females have similar high-risk backgrounds (e.g., deficient parenting, neurocognitive problems, and difficult temperament) to LCP males but that females with adolescent-onset CD do not share these risk profiles. Moffitt and colleagues have suggested that lower rates of LCP antisocial behavior are accounted for by gender differences in rates of the aforementioned risk factors. Thus, although a gender difference in rate of LCP antisocial behavior has been established in the majority of studies, debate still exists regarding the utility of this age-of-onset distinction for girls.

Gender Differences in Manifestation of Antisocial Behavior

There has been debate as to whether the aforementioned gender differences in the prevalence of CD/ASPD (relationships 1 and 2, Figure 1) are due to actual differences in male and female levels of antisocial psychopathology or are the result of gender biases in diagnostic definition and assessment. Specifically, some researchers (Zoccolillo, Tremblay, & Vitaro, 1996; Silverthorn & Frick, 1999) have posited that existing research has lacked sensitivity to female-specific forms of antisocial behavior. There has been suggestion that aggression may take a different, more indirect and interpersonal form in girls (Crick & Grotpeter, 1995; Crick, 1997). This "relational" aggression involves behaviors that may be considered equally antisocial as the overtly aggressive behaviors more typical of conduct-disordered boys. Examples of relational aggression include social exclusion as a means of exacting revenge on others and intentionally spreading false rumors about a peer. Girls are more likely than boys to exhibit antisocial behaviors in this domain (review, Crick et al., 1999). The authors of one review (Crick and Zahn-Waxler, 2003) concluded that the long-standing view of girls as "nonaggressive" is inaccurate and that targets of relational aggression experience significant distress and long-term psychological consequences. The authors also suggest that gender differences in manifestation of aggression (physical versus relational) are related to normative male and female goals (instrumentality/physical dominance versus social relationships). Thus, antisocial boys and girls are thought to adopt separate techniques for attacking peers "where it hurts the most." Given the increased interpersonal awareness of girls compared to boys, they may be more adept at expressing aggression in covert ways that are less likely to draw attention from authority figures (Zahn-Waxler, 1993).

Current DSM criteria for CD/ASPD are weighted more heavily toward overt forms of antisocial behavior. Using these existing potentially biased criteria, gender differences have been found in the symptom pattern of conduct disorder. According to the DSM-IV, girls are more likely to exhibit nonconfrontational antisocial behaviors such as running away and sexual deviance. Findings from a national probability sample of adolescents (National Longitudinal Youth Survey: Windle, 1990) suggest that the most frequently occurring antisocial behaviors are the same for boys and girls. However, the relative frequency and prevalence rates of each behavior differed by gender. For adolescent boys, the four most prevalent were: physical fight at school/work, consuming alcohol without parental permission, hitting or threatening to hit someone, and truancy. For adolescent girls, the order was: consuming alcohol without parental permission, truancy, hitting or threatening to hit someone, and physical fights at school/work. For all but one antisocial behavior (running away from home), prevalence rates of each CD symptom were higher for boys than girls. In general, boys are more likely than girls to exhibit antisocial behaviors that involve harm to others (Lahey et al., 1998; Windle, 1990).

Therefore, gender differences in symptom pattern have been found using standard DSM criteria as well as the previously discussed more recently identified forms of antisocial behavior. Although the present study did not assess relational aggression, qualitative gender differences in antisocial behavior symptom pattern were examined.

Gender Differences in Prevalence of SUD

Because the overarching aim of this study is to assess gender differences in long-term antisocial outcomes for substance-abusing youth, and level of substance involvement is expected to impact adult antisocial behavior (relationship 4, Figure 1), it is important to consider gender differences in the prevalence of substance use disorders.

Historically, adolescent boys and adult men have abused alcohol and drugs at a higher rate than their female peers. In recent decades, however, this gender gap has narrowed for adolescents but persisted for adults (Substance Abuse and Mental Health Services Administration, 2007), primarily as a result of decreases in male substance use rather than increases in female use. According to recent reports (SAMHSA, 2007), prevalence rates for current use of illicit drugs are nearly identical for adolescent boys (9.8%) and girls (9.7%). Similarly, prevalence rates for current alcohol use were comparable for adolescent boys (16.3%) and girls (17.0%). Gender equality was also found in prevalence of substance use disorder diagnoses, with 8.0% of adolescent boys and 8.1% of adolescent girls meeting criteria for substance abuse or dependence. As an illustration of the narrowing gender gap for adolescent substance involvement, recent marijuana use in adolescent males has gradually declined from 9.1% in 2002 to 6.8% in 2006 whereas marijuana use in female adolescents has stayed relatively stable (7.2% to 6.4%).

SUD as a Risk Factor for Longitudinal Antisocial Behavior Patterns

A large body of literature has established substance use disorders as a risk factor for concurrent and future antisocial behavior (relationships labeled S, Figure 1).

The following section will review research establishing comorbidity rates for these two forms of psychopathology and theoretical explanations for their co-occurrence.

Rates of SUD and CD/ASPD Comorbidity

According to recent literature reviews (Armstrong & Costello, 2002; Waldman & Slutske, 2000), substance use disorders and antisocial behavior disorders (CD and ASPD) have rates of co-occurrence that far exceed that expected by chance. An epidemiological study (Nock et al., 2006) found an odds ratio of 5.9 for the risk for substance use disorders for individuals with conduct disorder. As noted by Goldstein et al. (2007), rates of ASPD in drug-use disordered populations have ranged from slightly higher (8.9%) to strikingly higher (68%) than in the general population. The variability in diagnostic rates in these patients may be due to sample differences (e.g., substances of choice), diagnostic criteria used (different editions of the DSM), or other assessment issues (e.g., self-report versus collateral report).

Explanations for Comorbidity

Several explanations for this comorbidity have been proposed, following three basic conceptualizations: (1) substance use disorders and antisocial behavior share common etiological factors and processes; (2) antisocial behavior leads to substance abuse and dependence (e.g., individuals use substances to cope with the social isolation that results from their antisocial behavior); and (3) drug and alcohol use leads to antisocial behavior (e.g., prostitution or theft to obtain money for drugs). Compelling evidence exists in support for all three proposed pathways to comorbid SUD and CD/ASPD.

(1) Shared etiology hypothesis. Researchers have suggested that the high rates of co-occurrence of substance use disorders and antisocial behavior disorders

may reflect a general predisposition to externalizing psychopathology, with a common genetic basis. Krueger and colleagues have proposed an underlying factor- "a coherent liability dimension"- that underlies substance use disorders and disruptive behavior disorders (Krueger et al., 2007). Various forms of deviant youth behavior may also have shared motivational bases. Jessor's Problem-Behavior Theory (Jessor, 1987) suggests that different forms of adolescent deviant behavior may serve shared psychosocial functions. Jessor hypothesized that adolescent substance use and antisocial behaviors (e.g., cheating in school, precocious sexual activity) may reflect an attempt to attain autonomy, reject conventional values, manage negative emotions, and bond with peers. Thus, antisocial behavior and substance abuse may have common biological and psychosocial etiological contributions.

(2) Conduct disorder as a risk factor for later substance use disorders. A significant body of research has established the link between early antisocial behavior and later alcohol and drug use disorders. Early work by Pulkinnen (1983) found that aggressive behavior at age 8 was a significant predictor of alcohol use 12 years later. Conduct disorder in childhood (Fergusson, Horwood, & Ridder, 2007) and early adolescence (Monlina and Pelham, 2003; Boden et al., 2006) has been shown to predict later substance use, abuse, and dependence. In a large-scale study of retrospective self-reported antisocial behaviors (Robins and Price, 1991), conduct disorder status predicted alcohol and drug use disorder diagnoses in adulthood. Similarly, Windle (1990) found strong associations between conduct symptoms at ages 14 and 15 and alcohol and drug use 4 years later. Thus, conduct-disordered youth are at greater risk for the development of substance use disorders.

In addition to predicting later SUD diagnostic status, CD has also been shown to predict patterns of alcohol and drug use over time. Lansford and colleagues (2008) examined the role of psychiatric comorbidity in substance use trajectories from early adolescence to early adulthood. Individuals with CD or oppositional defiant disorder (with or without co-occurring internalizing disorders) had steep increases in use over adolescence, with highest levels in late adolescence and steep decline in young adulthood. In contrast, individuals with no psychiatric diagnosis or internalizing psychopathology only demonstrated lower and more stable substance use trajectories from early adolescence to early adulthood.

The majority of studies that have established the temporal sequencing of substance abuse and conduct problems have found that antisocial behavior generally precedes alcohol and drug use (e.g., Compton et al., 2000). For example, recent research with a nationally representative sample (Nock et al., 2006) found that conduct disorder occurred prior to the onset of a comorbid substance use disorder in 88.5% of cases.

(3) Role of alcohol and drug use in antisocial behavior patterns. Another body of research has explored the role of drug and alcohol abuse in the development and progression of antisocial behavior disorders. Substance use disorders are one form of co-occurring psychopathology that contributes to the progression of conduct problems over time. Research using a mixed-gender subset of the current sample found a high rate of progression from CD to ASPD for individuals treated for adolescent substance use disorders four years prior (Myers et al., 1998). In these substance-disordered youth, development of ASPD was predicted by early onset of deviant behavior (prior to age 10), greater diversity of antisocial behavior, and greater

pre-treatment drug use. Therefore, as with the effect of antisocial behavior on substance use outcomes, early drug use is a risk factor for poor conduct disorder prognosis. Rates of primary substance use and secondary antisocial behavior may be higher in drug-disordered populations than in the general population. One study found that more than half of drug-disordered participants with adult antisocial behavior (AASB; ASPD criteria without CD) initiated illegal drug use prior to the onset of antisocial behavior (Mikulich-Gilbertson et al., 2007).

Hussong et al. (2004) found support for two compatible hypotheses to explain how substance abuse may engage young men in persistent antisocial behavior during young adulthood, a time when antisocial behavior typically decreases. The "launch model" states that alcohol and drug abuse is both an indicator and an instigator of long-term antisocial behavior. The "snares model" involves a series of short-term influences of substance abuse on criminal activity. Hussong and colleagues' findings suggest that substance abuse in early adulthood is a significant predictor of elevated antisocial behavior trajectories, and the influence of drug and alcohol abuse on antisocial behavior is contemporaneous.

As noted by Brown et al. (1996), drug and alcohol abuse can lead to emotional dysregulation and impaired judgment that may enable or maintain antisocial behavior. In research with male juvenile offenders, Chassin and colleagues (2010) found that adolescent alcohol and marijuana involvement was associated with lower increases in psychosocial maturity from adolescence to young adulthood. The existing literature on the role of substance use in the progression of antisocial behavior is notably smaller than that on the role of antisocial behavior on later drug and alcohol involvement. Work in this area has tended to use all- or primarily-male samples and

thus the findings may not generalize to adolescent girls. Also, it is unclear whether conclusions made regarding the "launch" and "snares" models are applicable to the development of antisocial behavior during adolescence.

Gender and Longitudinal Influences of Substance Abuse on Antisocial Behavior

Several studies have assessed gender ratios of ASPD in alcohol and drug-disordered populations. Although one found similar rates across genders (Brown & Nixon, 1997), the majority has found notably higher rates (~ 2-3 times higher) in men than women (Flynn et al., 1996; Rutherford et al., 1995; Darke, Swift, & Hall, 1994; Hesselbrock, Meyer, & Keener, 1985).

However, little research has examined gender and substance involvement in the initiation and progression of antisocial behavior (overall model, Figure 1). Most of the existing research on temporal sequencing has used primarily male samples or has not reported gender differences. Given that girls are more likely to have an adolescent onset of antisocial behavior (see p. 9), a time when initiation of substance abuse often occurs, it may be that antisocial behavior and substance abuse have shared psychosocial etiologies (e.g., association with deviant male peers) and that patterns of antisocial behavior serve to maintain their addiction (e.g., stealing or prostitution to get money for drugs). However, there is still likely a small subset of substance-disordered girls with life-course persistent CD for whom antisocial behavior is the primary form of psychopathology.

Substance Involvement and Antisocial Behavior in Non-clinical Populations

One longitudinal study (Measelle, Stice, & Hogansen, 2006) has provided information about the co-occurring development of substance abuse and antisocial

behavior in girls. For this community sample of female youth, antisocial behavior at intake predicted growth in substance abuse over the subsequent five years, and substance abuse at intake was associated with less rapid decreases in antisocial behaviors over time. Findings from this study improve understanding of the reciprocal relationship between substance abuse and antisocial behavior over time for girls, but given the study's all-female sample, do not answer questions of gender differences in these processes. Windle (1990) found that the relationships between early adolescent antisocial behavior and later alcohol and marijuana use were stronger for boys than girls, although there was no gender difference in the relationship between early antisocial behavior and later dependency symptoms.

Antisocial Behavior Histories in Male and Female Adult Drug Abusers

Using data from a recent large-scale epidemiological sample (the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions), Goldstein et al. (2007) found that drug-disordered men and women had prevalence rates of ASPD much higher than present in the general population (21% and 14%, respectively). Forty-four percent (44%) of drug-disordered men and 39% of drug-disordered women received the label of AASB (Adult Antisocial Behavior; ASPD criteria without history of CD), and a small proportion of drug-disordered men (1.9%) and women (2.1%) met criteria for conduct disorder but not ASPD (CD only). Notably, this study assessed antisocial diagnoses independent of substance involvement as well. For both male and female participants, rates of each antisocial behavior diagnosis (ASPD, AASB, CD-only) changed very little when antisocial symptoms that occurred in the context of substance use were excluded. Findings from this study support the conclusion that alcohol and drug addiction is often associated with a history of independent antisocial

behavior that begins or persists into adulthood. Male and female substance abusers are unlikely to be among the youth who "outgrow" conduct disorder.

Preliminary Findings from a Subset of the Current Sample

Previous research using a subset of the current sample investigated gender differences in conduct disorder incidence rates and symptoms during alcohol or drug treatment (Brown et al., 1996).   Boys had more total conduct disorder symptoms and more antisocial behaviors that were independent of drug or alcohol involvement. When the role of substance involvement was not taken into account, rates of conduct disorder were roughly equal across genders (96% males vs. 93% females). However, when conduct symptoms directly or indirectly related to substance use were excluded from consideration, a greater proportion of boys (53%) versus girls (39%) met criteria for conduct disorder.   Additionally, although there were a few differences in symptom occurrence ranking (girls more likely to report running away, boys more likely to report cruelty to animals), symptom rankings were generally similar across genders. Longitudinal research (Myers et al., 1998) from a subset of the current sample found that at 4 years following substance abuse treatment, males were more likely to have progressed to a diagnosis of ASPD than were females. In sum, early investigations using a subsample of the present dataset has found gender differences in the symptom pattern and progression of antisocial behavior up to four years post-treatment. The present study established antisocial behavior trajectories up to 8 years post-treatment for an expanded sample of substance-disordered youth.

Specific Aims and Hypotheses

Given the aforementioned gaps in knowledge regarding the development and expression of antisocial behavior in substance-disordered girls, the present dissertation has the following aims and hypotheses: (1) Assess gender differences in CD/ASPD symptoms and diagnostic rates among alcohol and drug-disordered youth during treatment and the following 8 years. It was hypothesized that boys would endorse more severe conduct symptoms and would endorse a larger number of total and substance-independent symptoms at each time point. Rates of CD/ASPD were also expected to be higher for boys than girls at each time point. (2) Assess gender differences in alcohol/drug dependence symptoms and diagnostic rates during treatment and the 8 years following treatment. It was hypothesized that gender differences in substance involvement would emerge at follow-up time points, with women showing higher rates of recovery from substance use disorders. Specifically, it was expected that the female subsample would have a lower mean number of dependence symptoms and lower prevalence rates of substance dependence at each follow-up time point. (3) Identify antisocial behavior trajectory classes for alcohol and drug-disordered adolescents over an 8 year time period. It was hypothesized that 3 trajectory classes would emerge: a group with escalating antisocial behavior, a group with desisting antisocial behavior, and a group whose antisocial behavior remains low throughout adolescence and adulthood. Gender was expected to be related to antisocial trajectory class membership with girls overrepresented in a desisting class and a no conduct disorder trajectory class, whereas boys were predicted to be overrepresented in an escalating symptoms class.

Theoretical and Clinical Significance

The present study has two key theoretical implications: (1) Provide a greater understanding of the symptom pattern and course of conduct disorder in girls, and (2) Describe the longitudinal patterns of deviant behavior in a sample of alcohol and drug-disordered youth over the transition from adolescence to young adulthood. Clinical implications include improvement of assessment and treatment of conduct disorder in substance-disordered boys and girls. In preparation for DSM-V, there has been a call for research identifying enduring individual factors that may be useful in differentiating conduct disorder subtypes (Moffitt et al., 2008). Male gender has been suggested as a potential subtype of CD, but more research is needed to determine whether gender differences in clinical presentation and course warrant subtyping based on gender. Additionally, the majority of prevention and intervention efforts for teen delinquency have been developed with mostly male populations and may not be optimal for girls. Although some work has attempted to tailor prevention (Palinkas et al., 1996; Freshman & Leinwand, 2001) and intervention (Najavits et al., 2006) efforts for teen girls, further work is still needed to ensure that efforts maximally address substance abuse and conduct disorder in girls. Findings from the present study will help guide treatment efforts by identifying antisocial behaviors most relevant to female substance abusers.

Method

Participants

The present dissertation included a sample of 424 participants ages 13-18 years, drawn from two compatible data sets. Intake demographic characteristics are presented for the total sample in Table 1. In Sample A, 169 adolescents (41% female,

mean age=16.4 years) were recruited from San Diego County alcohol and drug use treatment centers from 1988-1994, as part of a longitudinal treatment outcomes study. Participants in this sample had a primary alcohol or drug use disorder diagnosis, and CD was the only Axis I disorder permitted. In Sample B, 255 adolescents (57% female, mean age=16.0 years) were recruited from San Diego County inpatient psychiatric treatment centers, where they were treated for an alcohol or drug-use disorder and at least one other Axis I disorder including, but not limited to, conduct disorder. For Sample B, participant recruitment took place from 1992-2006. A comparison of sample sizes at each time point for the two samples is presented in Table 2. Despite a general compatibility between these two complementary samples (similar demographic profiles, identical assessment schedule and primary variables), two key differences must be considered. First, internalizing psychopathology (e.g., Axis I depression or anxiety diagnoses) were an exclusion criteria for Sample A but not Sample B. Second, there may be significant cohort effects across the two samples. Given the two aforementioned issues, the following measures were taken: (1) the samples were compared with regard to important demographic and substance use variables; (2) preliminary analyses compared intake rates of conduct disorder for the two samples. Because there was a significant group difference in prevalence of conduct disorder at intake (85% versus 91%), sample was included as a potential predictor of trajectory class membership. Additionally, Samples A and B were compared in terms of alcohol/drug dependence prevalence and CD/ASPD prevalence at each of the five time points. Sample B had higher rate of CD at intake (91% versus 85%, p=.041) and lower rate of alcohol/drug

dependence at the 6 year follow-up (40% versus 58%, p=.003). Prevalence rates did not statistically differ at any other time point.

Procedure

Recruitment and interview procedures for the larger longitudinal study have been previously published (Brown et al., 1989; Brown et al., 2001). Data specific to the present dissertation were collected at study intake and at 2, 4, 6, and 8 years post-intake. Index participants and a collateral resource person (typically a parent/caregiver in adolescence and a domestic partner in adulthood) were assessed separately by different interviewers.

Measures

Demographic Characteristics: At intake, a trained interviewer completed a 90-minute structured clinical interview (Brown et al., 1994) with each adolescent participant, and a second interviewer administered a complementary structured clinical interview to the resource person. Demographic and background information obtained through these two interviews were reviewed to clarify any inconsistencies.

Antisocial Behavior: The Conduct Disorder/Antisocial Personality Disorder Questionnaire (Brown et al., 1996) is a structured clinical interview that assesses DSM-III-R and DSM-IV criteria for conduct disorder and ASPD. The questionnaire was administered separately to the index participants and their resource persons. The questionnaire evaluates each antisocial behavior in relation to the participant's alcohol or drug use. Antisocial behavior that occurred exclusively during periods of alcohol or drug intoxication was classified as directly related to use, antisocial

behavior that occurred in an attempt to obtain substances was classified as indirectly related to use, and antisocial behavior that was completely unrelated to alcohol or drug involvement was classified as independent of substance use. Resource person and index participant reports were composited to increase accuracy of diagnoses. A composite antisocial score (hereafter called "antisocial domain composite score"; Odgers et al., 2008) calculated at each assessment represented the number of different types of antisocial behavior exhibited during the past two years. The antisocial domain composite score has a range of 0 to 5 and represents the number of antisocial behavior categories (physical fighting/aggression, property destruction, deceitfulness, truancy/irresponsibility, unlawful behaviors) endorsed. Each category could be "met" with relevant conduct disorder or ASPD behaviors. The antisocial domain composite score was chosen as the basis for trajectory analyses because it is a single variable that captures developmentally appropriate psychopathology across the lifespan.

  Substance Use: Customary Drinking and Drug Use Record (CDDR; Brown et al., 1998). CDDR was used to assess alcohol and drug involvement at intake, 2 years, 4 years, 6 years, and 8 years post-intake. At intake, the lifetime version of the CDDR was administered to assess lifetime alcohol and drug use (marijuana, amphetamines, barbiturates, hallucinogens, cocaine, inhalants, opiates, and other drugs). At each of the four follow-up time points, the current version of the CDDR was administered, which assessed average 30-day use in the previous 3 months. CDDR also assesses DSM-III-R and DSM-IV (APA, 1987 & 1994) substance dependence symptoms. For early time points (prior to DSM-IV), diagnostic classifications were recoded using DSM-IV diagnostic criteria. CDDR has good

internal consistency, test-retest, and interrater reliability; convergent and discriminant validity has also been demonstrated for CDDR in substance-disordered adolescents and young adults (Brown et al., 1998; Stewart & Brown, 1995).

For the present dissertation, CDDR data was used to assess gender differences in alcohol/drug use disorder symptoms and diagnostic rates during treatment and 8 years after treatment. Lifetime number of symptoms and diagnostic status were assessed at intake, and number of symptoms and diagnostic status for past two years were assessed at follow-up assessments. Additionally, CDDR data was used to calculate gender-specific correlations between alcohol/drug dependence symptoms at each time point and conduct symptoms at each time point.

Analytic Plan

Aims 1 and 2

Aims 1 and 2 were executed using cross-sectional and longitudinal analyses performed with SPSS software. Chi-square tests, ANOVAs, and ANCOVAs were completed to assess gender differences in mean number of total CD/ASPD symptoms, mean number of CD/ASPD symptoms independent of substance involvement, CD/ASPD diagnostic rates, and incidence of specific antisocial behaviors at each time point (Aim 1). Similarly, Chi-square tests, ANOVAs, and ANCOVAs were completed to assess gender differences in mean number of alcohol/drug dependence symptoms and diagnostic rates at each time point (Aim 2).

Aim 3

General Growth Mixture Modeling (GGMM; Muthen, 2004) was used to identify longitudinal patterns of antisocial behavior in the sample. GGMM, an

expansion of traditional growth curve modeling, identifies classes/profiles of individuals with common developmental trajectories rather than assuming that individuals are drawn from a single population. For each class, a unique set of parameter estimates describes the functional form of the expected developmental trajectory. Models were fitted in MPlus 4.2 (Muthen and Muthen, 2007) following an age-based developmental approach (Mehta & West, 2000). GGMM analyses were first conducted separately for males and females. Given the comparability of results across genders, male and female data was combined and trajectories for the total sample were identified as presented below.

Chi-square analyses were conducted in SPSS to determine if gender was a significant predictor of trajectory class membership. Trajectory classes were also compared in terms of intake characteristics and diagnostic outcomes at 8 years post-treatment.

Secondary Analyses.

A set of secondary analyses were included to further elucidate temporal relationships between antisocial behavior and substance dependence for male and female participants. Gender-specific correlations were calculated between alcohol/drug dependence symptoms at each time point and antisocial domain composite scores at each time point.

<p align="center">*Missing Data*</p>

More than half the sample (54%) had data for all five time points. Seventeen percent (17%) of the sample was missing data for 1 assessment, 9% was missing data for two, 6% was missing data for three, and 13% was missing data for 4 assessments. Mean number of missing data points did not statistically differ by

gender (p=.096), CD diagnostic status at intake (p=.123), alcohol/drug dependence diagnostic status at intake (p=.687), ethnicity (p=.118), or trajectory class (p=.683). Number of missing data points did differ by treatment cohort (p<.001). Sample A, on average, was missing .29 (SD=.72) assessments, and Sample B was missing an average of 1.55 (SD=1.55) assessments.

Results

Antisocial and substance dependence symptom counts and diagnostic rates were examined for the entire sample at intake and each follow-up time point (Table 3). Generally, decreases in symptom levels and prevalence rates were dramatic in the two years following treatment and gradual throughout the follow-up period.

Aim 1

Diversity and Severity of Antisocial Psychopathology

To evaluate gender differences in the diversity and severity of antisocial behaviors at each time point, male and female prevalence rates of the 5 categories of antisocial behavior (physical fighting/aggression, destruction of property, deceitfulness, truancy/irresponsibility, and unlawful behaviors) were compared. Male participants endorsed antisocial behaviors across more domains compared to female participants, and gender differences were found within each of the 5 antisocial domains (Table 4). The male rate of physical fighting/aggression at 4 years post-treatment was more than double that of females; property destruction rates for males were near-double at 2, 4, and 8 years; rates of unlawful behavior were near or more than double for males at 4, 6, and 8 years. Gender differences in rates of

deceitfulness and irresponsibility/truancy were less striking. The rate of deceitfulness was 15 percentage points higher for males at 6 years post-treatment. Rates of truancy/irresponsibility were higher for females than males at 2 and 4 years (by 3 and 10 percentage points, respectively) and higher for males at 6 and 8 years (by 15 and 10 percentage points, respectively). The prevalence rates of individual antisocial behaviors are presented in Tables 2-6 of the appendix. Overall, male participants were more likely to exhibit violent and illegal antisocial behaviors compared to their female counterparts during adolescence and adulthood (Table 4).

Number of Antisocial Behaviors and Rates of Conduct Disorder/ASPD

To examine the hypothesis that males in the sample would have a higher mean number of CD/ASPD symptoms and antisocial disorder prevalence, number of antisocial behaviors (total and substance-independent) and rates of CD/ASPD were compared for males and females at each of the five assessment points. Estimated marginal means adjusted for intake level of antisocial behavior are presented in Table 5. On average, male participants exhibited significantly more antisocial symptoms at each assessment. Similarly, the male subsample had significantly higher rates of CD/ASPD prevalence at each of the five time points (Table 6).

Aim 2

Number of Alcohol/Drug Dependence Symptoms and Diagnostic Rates

To examine the hypothesis that female participants would show higher rates of SUD recovery at follow-up assessments, the number of alcohol and drug dependence symptoms and rates of substance dependence were compared for males and females at each of the five time points (Table 7). At intake, mean number of alcohol and drug dependence symptoms did not significantly differ by gender. After

controlling for number of dependence symptoms at intake, female participants reported on average .41 more alcohol and .46 more drug dependence symptoms at 2 years post-intake. After controlling for intake dependence symptoms, male participants had an average of .82 more alcohol symptoms at 4 years, .75 more at 6 years, and .32 more at 8 years. Similarly, male participants had an average of .74 more drug dependence symptoms at 4 years, .63 more at 6 years, and .4 more at 8 years. This pattern of gender differences over time was partially consistent with study hypotheses. As anticipated, gender differences in severity of substance involvement emerged in the follow-up periods. However, the higher level of dependence symptoms for female participants at two years post-intake was not expected. A significantly larger proportion of the male subsample met criteria for alcohol or drug dependence at intake and three of the four follow-up periods (Table 8).

Aim 3

Empirical Evaluation of the GGMM Solutions

A series of models were fitted to the data, from a one-class up to a seven-class model. Determination of the "best-fitting" model (optimal within-group homogeneity and between-group heterogeneity) was made using recommended indices of model fit and classification accuracy (Roesch, Villodas, & Villodas, 2010). Fit indices included Akaike Information Criteria (AIC; Akaike, 1974), Bayesian Information Criterion (BIC; Schwartz, 1978), Sample Size-Adjusted Bayesian Information Criterion (SSABIC; Sclove, 1987), Lo-Mendell-Rubin Likelihood Ratio Test (LMR-LRT; Lo, Mendell, & Rubin, 2001), and entropy. AIC, BIC, and SSABIC each assess relative model fit by balancing complexity of the model versus goodness of fit with the sample data. Compared to AIC, BIC and SSABIC prefer models with

fewer parameters. When comparing two models, lower AIC, BIC, and SSABIC values indicate better relative fit. Entropy measures classification accuracy by averaging the posterior probabilities of all individuals to their assigned class. Entropy values range from 0 to 1, and those closer to 1 indicate greater precision of the model in assigning class membership. LMR-LRT estimates the difference between log-likelihood values for a model with k latent classes compared to one with k-1 classes. The more complex model is considered a "better fit" to the data if the LMR-LRT test is significant.

Based on the aforementioned guidelines, a five-class model was determined to be the best empirical fit to the data. AIC, BIC, and sample-size adjusted BIC values were notably lower for the 5-class model when compared to the 4-class and 6-class solutions (Table 9). Additionally, entropy values supported the five-class model over all but the 2-class solution. LMR-LRT test was non-significant for each of the multiple-class solutions. Given its superior AIC, BIC, and SSABIC values and relatively high entropy, the five-class solution was selected.

Evaluation of Model Based on Hypothesized Antisocial Patterns

The model that demonstrated the best empirical fit (5-class solution) did not contain the hypothesized number of trajectory classes (three were expected). For the selected model, trajectories partially correspond with the hypothesized developmental pathways. As hypothesized, there was a subset of the sample whose antisocial symptoms desisted over time. However, there were three separate classes that showed a pattern of desistence over time (Classes 2, 4, and 5). As hypothesized, there was a subset of participants whose antisocial behavior escalated over time. However, there were two escalating groups (Classes 1 and 3), rather than one. Class

1 showed an initial drop in symptoms which was not anticipated. The data did not support the existence of the hypothesized "consistently low" class.

Description of Trajectory Classes in the Best-Supported Solution

Developmental patterns of antisocial behavior for the total sample are presented in Figure 2. Trajectory Class 1 ("late-escalating class") started low, dropped slightly during adolescence, then increased in early 20s. Class 2 ("high-start desisting class") started high, dropped steeply in adolescence, then stayed consistently low in early 20s. Class 3 ("early-escalating class") started at a moderate level, increased slightly in adolescence, then decreased in adulthood. Class 4 ("gradual desisting class") started at a moderate level, dropped gradually during adolescence, then stayed consistently low in early 20s. Class 5 ("highest-start desisting class") started highest, dropped steeply in adolescence, then stayed relatively low in early 20s. Based on their highest posterior probabilities, 9% of the sample (n=39) were assigned class 1 membership, 15% (n=63) class 2, 2% (n=9) class 3, 8% (n=32) class 4, and 66% (n=281) class 5.

Characteristics of the Five Trajectory Classes

ANOVA and chi-square tests were used to evaluate trajectory class differences in intake characteristics and diagnostic outcomes at 8 years post-treatment. The following intake variables differed by class membership: age (F=32.8, p<.001), lifetime drug dependence symptoms (F=11.7, p<.001), substance dependence diagnosis (chi-square=41.8, p<.001), physical aggression (chi-square=47.5, p<.001), property destruction (chi-square=61.5, p<.001), deceitfulness (chi-square=36.0, p<.001), truancy/irresponsibility (chi-square=48.5, p<.001), and unlawful behaviors (chi-square=56.0, p<.001). Distribution of subsamples (Samples A

and B) did not differ significantly across trajectory classes (chi-square=1.27, p=.87). Lifetime alcohol dependence symptoms at intake did not differ by class membership (F=2.2, p=.063). Rates of substance dependence (chi-square=3.67, p=.45) and ASPD (chi-square=2.40, p=.66) at 8 years post-treatment did not significantly differ by trajectory class.

Class 1 ("late-escalating"). Participants with trajectories assigned to Class 1 were on average 14.8 years (SD=1.08) at intake with 2.9 lifetime alcohol dependence symptoms and 4.3 lifetime drug dependence symptoms. Seventy-four percent met DSM-IV criteria for alcohol or drug dependence. Thirty-nine percent exhibited physical fighting/aggressive behaviors at intake, 31% destruction of property, 87% deceitfulness, 77% truancy/irresponsibility, and 44% unlawful behaviors. Compared to the total sample, Class 1 membership was associated with younger age, fewer lifetime drug dependence symptoms at intake, and lower intake rates of physical aggression, property destruction, deceitfulness, truancy/irresponsibility, and unlawful behaviors.

Class 2 ("high-start desisting"). Participants with trajectories assigned to Class 2 were on average 15.6 years (SD=.92) at intake with 3.6 lifetime alcohol dependence symptoms and 5.7 lifetime drug dependence symptoms. Ninety-two percent met DSM-IV criteria for alcohol or drug dependence. Fifty-nine percent exhibited physical fighting/aggressive behaviors at intake, 64% destruction of property, 98% deceitfulness, 97% truancy/irresponsibility, and 76% unlawful behaviors. Compared to the total sample, Class 2 membership was associated with lower rates of physical aggression at intake.

Class 3 ("early-escalating"). Participants with trajectories assigned to Class 3 were on average 16.2 years (SD=1.55) at intake with 3.4 lifetime alcohol dependence symptoms and 6.1 lifetime drug dependence symptoms. All met DSM-IV criteria for alcohol or drug dependence. Eighty-nine percent exhibited physical fighting/aggressive behaviors at intake, 67% destruction of property, 100% deceitfulness, 89% truancy/irresponsibility, and 89% unlawful behaviors. Compared to the total sample, Class 3 membership was associated with higher rates of physical aggression at intake.

Class 4 ("gradual desisting"). Participants with trajectories assigned to Class 4 were on average 14.9 years (SD=.95) at intake with 3.1 lifetime alcohol dependence symptoms and 4.6 lifetime drug dependence symptoms. Eighty-eight percent met DSM-IV criteria for alcohol or drug dependence. Fifty percent exhibited physical fighting/aggressive behaviors at intake, 41% destruction of property, 91% deceitfulness, 91% truancy/irresponsibility, and 72% unlawful behaviors. Compared to the total sample, Class 4 membership was associated with younger age, fewer lifetime drug dependence symptoms at intake, and lower intake rates of physical aggression, property destruction, and unlawful behaviors.

Class 5 ("highest-start desisting"). Participants with trajectories assigned to Class 5 were on average 16.6 years (SD=1.30) at intake with 4.1 lifetime alcohol dependence symptoms and 6.5 lifetime drug dependence symptoms. Ninety-nine percent met DSM-IV criteria for alcohol or drug dependence. Eighty-one percent exhibited physical fighting/aggressive behaviors at intake, 82% destruction of property, 100% deceitfulness, 99% truancy/irresponsibility, and 90% unlawful

behaviors. Compared to the total sample, Class 5 membership was associated with higher rates of physical aggression and property destruction at intake.

Class Membership by Gender

Distribution of participants across trajectory classes varied significantly by gender (chi-square=18.59, p=.001). See Figure 3. Women were overrepresented in the late-escalating (1) and gradual desisting (4) trajectory classes. Men were overrepresented in the early-escalating (3) and highest-start desisting (5) classes. Male and female participants were equally represented in the high-start desisting class (2). Distribution of female participants was as follows: 13.6% in Class 1, 15.5% in Class 2, 1.4% in Class 3, 10.7% in Class 4, and 59.8% in Class 5. Distribution of male participants was: 4.8% in Class 1, 15.2% in Class 2, 2.9% in Class 3, 4.3% in Class 4, and 72.9% in Class 5.

Within each trajectory class, gender differences in age were examined. In Class 1, boys were on average .75 years older; in Class 2, girls were .01 years older; in Class 3, boys were 1.28 years older; in Class 4, girls were .38 years older; in Class 5, boys were .40 years older.

Further Examination of Escalating Trajectories

In order to identify specific areas of risk for boys and girls, prevalence rates of antisocial behaviors in each of the five domains (physical fighting/aggression, property destruction, deceitfulness, truancy/irresponsibility, unlawful behaviors) were assessed for males and females in the two escalating classes.

Class 1 ("late-escalating"). For girls in Class 1, prevalence of property destruction and unlawful behavior increased throughout the follow-up period. Across time, girls in the late-escalating class had lower prevalence of behaviors within four of

the five antisocial domains (physical fighting/aggression, deceitfulness, truancy/irresponsibility, unlawful behaviors) compared to the total female subsample. Overall, increases in prevalence within each of the antisocial domains were less dramatic for females in Class 1 compared to their male counterparts. For boys in Class 1, prevalence of behaviors within each of the five antisocial domains nearly or at least doubled from the 4-year follow up to 8-year follow up. By the 8-year follow up, a majority of late-escalating males were exhibiting behaviors in the following domains: deceitfulness, truancy/irresponsibility, and unlawful behaviors. Compared to the total subsample of boys, Class 1 boys had lower prevalence of all 5 types of antisocial behavior at intake, 2, and 4 year. However, prevalence of physical fighting/aggression, property destruction, and deceitfulness was higher for this subset of boys at 6 and 8 years. Truancy/irresponsibility was higher at 8 years for Class 1 boys compared to the total male subsample.

　　　Class 3 ("early-escalating"). For the total male subsample, prevalence of antisocial behavior in 3 of the 5 domains consistently dropped over time (see Table 4). For boys in Class 3, prevalence of behaviors within all 5 antisocial domains were equivalent or increased from the 2-year follow up to the 4-year follow up. By 4 years post-treatment, 100% of boys in Class 3 exhibited antisocial behavior in the deceitfulness, truancy/irresponsibility, and unlawful behavior domains. These rates are notably higher than those found in the total male subsample (70%, 52%, and 41%, respectively). Given the low number of girls in Class 3 (n=3), change in prevalence rates within each antisocial domain are not reported.

Secondary Analyses

Longitudinal Correlations between Alcohol/Drug Dependence Symptoms and

Antisocial Behavior

To further explore the longitudinal relationships between antisocial behavior and substance involvement, Pearson correlations were established between antisocial domain composite score at each assessment point and number of substance dependence symptoms at each assessment point (Table 11). For males and females, there were significant cross-sectional and longitudinal associations between alcohol/drug dependence symptom level and antisocial symptom level. These associations became more consistent at later follow-up time points. For both genders, 4, 6, and 8 year antisocial symptom level was significantly correlated with 4, 6, and 8 year dependence symptom level. Additionally, higher levels of antisocial behavior at 2 years post-intake were associated with higher dependence symptoms two years later. For both genders, all significant correlations were positive, indicating that increased symptomatology in one domain is associated with increased symptoms in the other.

For female participants only, antisocial behavior and concurrent substance dependence were correlated at 2 years post-intake. For male participants, intake dependence levels were associated with 6 year antisocial behaviors, and 2 year dependence levels were associated with 6 and 8 year antisocial behavior. For males, intake antisocial behavior was correlated with severity of dependence 4 years later. Antisocial behavior at 2 years post-intake was associated with 6 and 8 year dependence levels for males. Thus, increased symptoms in one domain may be a better predictor of future dysfunction in the other domain for males versus females.

Discussion

The primary objective of this dissertation was to describe gender differences in the symptom pattern and course of antisocial psychopathology for substance-abusing youth. This is the first study in which this issue was examined using a large gender-balanced sample followed over the transition from adolescence to adulthood. In this sample, a large percentage of individuals continued to demonstrate pathological levels of antisocial behavior into adulthood. At 8 years post-treatment, 52% of male participants and 34% of female participants met DSM-IV criteria for ASPD. These prevalence rates are strikingly high compared with those of the general population (APA, 2000). This finding is consistent with previous research suggesting that substance-abusing youth are less likely to "outgrow" antisocial behavior than their non-abusing deviant peers (Mikulich-Gilbertson et al., 2007; Myers et al., 1998; Hussong et al., 2004). Findings from the present study support the conclusion that alcohol/drug addiction is frequently associated with independent antisocial psychopathology that persists beyond adolescence (Goldstein et al., 2007).

Do Women Exhibit Less Antisocial Behavior across Adolescence and Adulthood Compared to Men?

Differential rates of antisocial behavior symptoms and diagnoses were expected based on the literature and hypothesized model (relationships 1 and 2, Figure 1). As hypothesized, women exhibited fewer antisocial behaviors during substance abuse treatment and throughout the 8 year follow-up period. This is consistent with previous report that males in a subset of the present sample displayed a larger number of conduct disorder symptoms compared to females (Brown et al.,

1996). This gender gap in number of antisocial symptoms during adolescence and adulthood has also been demonstrated in epidemiological samples (Hicks et al., 2007).

The clinical significance of these findings is supported by examination of prevalence rates of antisocial disorders in the sample. Men were more likely to meet DSM-IV criteria for conduct disorder or ASPD throughout adolescence and early adulthood. This increased rate of antisocial behavior disorders for male substance abusers has been previously demonstrated using a small subset of the current data (Myers et al., 1998) and by other research groups (Dodge et al., 2006; Loeber et al., 2000; Moffitt et al., 2001). Notably, at each time point at least half of the men in the present study met criteria for conduct disorder or ASPD. Prevalence rates for women were lower than for men, but high compared to men or women in the general population. Thus, despite elevated rates of antisocial psychopathology for this substance-disordered sample, gender differences in prevalence rates parallel those in the general population (Nock et al., 2006). This finding is important, given that much of the existing research on gender ratios of ASPD in substance-disordered populations has employed outdated diagnostic criteria which included "substance abuse" as a criterion. Additionally, gender differences in level of antisocial psychopathology became more pronounced as individuals progressed from adolescence to adulthood. This is consistent with research by Hicks et al. (2007) using an epidemiological sample suggesting that the gender gap in antisocial behavior widens from age 17 to 24.

Men in the sample also exhibited greater diversity of antisocial behaviors. At each assessment period, men displayed symptoms across a larger number of

antisocial domains. This is notable given the evidence that greater diversity of antisocial behavior in adolescence is a significant predictor of development of ASPD in adulthood (Myers et al., 1998). Men in the present study were also more likely to participate in violent and illegal acts during adolescence and adulthood compared to their female counterparts. This is consistent with existing literature that suggests boys are more likely to engage in behaviors that involve harm to others (Lahey et al., 1998; Windle et al., 1990).

When examined separately, rates of change for some categories of antisocial behavior differed by gender. For men and women, prevalence of aggressive behavior (e.g., often initiates physical fights, fought using a weapon) dropped considerably over the follow-up period. However, this decrease happened later for men than women. Similarly, the rate of property destruction dropped dramatically after intake for women but decreased gradually for men. Rates of deceitfulness (e.g., "cons" others) and truancy/irresponsibility (e.g., missed school/work on a regular basis) decreased gradually over time for both genders. For both men and women, change in rates of unlawful behavior (e.g., broken into a house, building, or car) over time was non-linear.

The present study assessed current CD/ASPD diagnostic criteria, which may not adequately identify antisocial psychopathology in females (review, Delligatti, Akin-Little, & Little, 2003). Therefore, it remains unclear whether antisocial behavior for female participants was actually lower or simply different than that of males during adolescence and young adulthood. For example, the finding that aggression decreases earlier for women than men may be due to a shift in form of aggressive behavior for women. During adolescence, an important period for social development,

girls may learn that relational aggression (e.g., spreading rumors, excluding others) is more effective and socially acceptable compared to physical aggression (Crick, 1997). Findings from the present study suggest that there are certain domains of deviant activity (e.g., truancy/irresponsibility) and specific antisocial behaviors (e.g., staying out late without permission) that are particularly problematic for females with a history of substance use disorder. These behaviors should be specifically targeted in prevention and intervention efforts for female and mixed-gender populations.

Are Rates of Recovery from Substance Dependence Higher in Late Adolescence and

Early Adulthood for Women?

Fewer symptoms and lower prevalence rates of alcohol/drug dependence were expected for females during the follow-up period (early adulthood) but not at intake (relationship 3, Figure 1). The pattern of gender differences in substance dependence over time was partially consistent with hypotheses. When examined categorically, girls had lower rates of alcohol/drug dependence at intake compared to boys. However, this gender difference was not supported when the data was examined dimensionally. The Substance Abuse and Mental Health Services Administration (2007) reported equal rates of substance use disorders for adolescent boys and girls. Findings for the present study may differ due to assessment of substance dependence alone, rather than dependence or abuse. Prevalence rates at intake may have been similar across genders had substance abuse (a clinically relevant but less severe form of SUD) been included. Treatment enrollment may be prompted by differential levels of substance-related problems for boys and girls. Compared to similar levels of involvement by their male peers, substance abuse by

adolescent girls may be perceived as less normative and more problematic by parents and other authority figures.

In the present study, gender differences in substance dependence continued in late adolescence and early adulthood. Inconsistent with hypotheses, girls displayed a larger number of alcohol/drug dependence symptoms compared to boys at two years post-treatment. A significant correlation between 2 year dependence symptoms and 2 year antisocial domain composite score suggests that this elevated level of female substance involvement is related to concurrent antisocial psychopathology. During early adulthood, women had higher rates of recovery from alcohol and drug dependence compared to men. This is consistent with reports that the gender gap in substance involvement widens from adolescence to adulthood (SAMHSA, 2007). This may be partially due to female-specific developmental milestones (i.e., pregnancy) that occur during early adulthood.

Can Substance Involvement Help to Explain Gender Differences in Antisocial Behavior?

Secondary analyses examined potential concurrent and long-term influences of substance use on antisocial behavior (relationships labeled S, Figure 1). Substance involvement was expected to "ensnare" and "launch" individuals into patterns of continued antisocial behavior (Moffitt, 1993; Hussong et al.,2004). Investigation of gender differences in these processes was exploratory.

Substance involvement and antisocial behavior were associated cross-sectionally and longitudinally for men and women in the sample, and the link between these two forms of psychopathology was more consistent in adulthood than

adolescence. Present findings are consistent with the work of Hussong and colleagues (2004) which provided support for both the "launch" and "snares" hypotheses in young men from the Dunedin Multidisciplinary Health and Development Study. They found that greater alcohol/drug abuse in late adolescence was associated with increased levels of antisocial behavior across early adulthood. Several mechanisms by which substance use may "ensnare" individuals into continued antisocial behavior during a period of typical desistance have been proposed. As reviewed by Hussong and colleagues (2004), these include the following: difficulty with conventional adult roles that serve a protective function, incomplete education and incarceration, engagement in antisocial behavior necessary to obtain substance of dependence, deviant peer associations, and substance-induced disinhibition,

Interestingly, increased psychopathology in one domain (antisocial behavior or substance dependence) was a better predictor of future dysfunction in the other domain for males versus females. This finding is partially consistent with existing research (Windle, 1990) suggesting that the association between earlier conduct disorder and later substance involvement (but not dependence symptoms) is stronger for boys than girls. The long-term influence of substance involvement on antisocial behavior – and antisocial behavior on substance involvement- has also been demonstrated in an all-female sample (Measelle et al., 2006). The present study is unique in its examination of these short and long-term associations for a mixed-gender sample of substance-disordered youth.

As previously mentioned, males in this study exhibited more antisocial behavior throughout adolescence and early adulthood. When deviant behaviors either

directly or indirectly related to substance involvement were excluded, the gender difference in antisocial psychopathology remained. Therefore, gender differences in antisocial behavior over the 8-year follow-up cannot simply be explained by short-term influences of continued substance dependence for men.

In summary, present findings suggest that although substance involvement is associated with concurrent and future antisocial behavior for both genders, higher rates of continued alcohol/drug abuse do not completely account for gender differences in adolescent and adult antisocial behavior.

What are the Developmental Patterns of Antisocial Behavior for Youth Treated for

Substance Abuse?

Most of the research identifying longitudinal patterns of antisocial behavior has used data from non-clinical populations. The present study examined antisocial trajectories spanning the period from adolescence to early adulthood for a large treatment sample of male and female youth. The five identified developmental trajectories reflect the diverse deviance starting points and long-term antisocial patterns of substance-abusing adolescents (Goldstein et al., 2007). Consistent with the existing research, the majority of individuals showed decreases in antisocial behavior from early adolescence to adulthood. Also consistent with current literature (Mikulich-Gilbertson et al., 2007; Myers et al., 1998; Hussong et al., 2004) a subset of the substance-disordered youth did not "outgrow" their antisocial behavior.

Inconsistent with hypotheses, five trajectory classes best characterized the developmental patterns of antisocial behavior in the sample. Three of the identified trajectory classes were consistent with the hypothesized "desisting" pattern.

Participants assigned to the three desisting groups ("highest-start desisting," "high-start desisting," and "gradual desisting") differed in terms of starting level of deviance, age, and symptom pattern of antisocial behavior at intake.

Two of the classes were consistent with the hypothesized "escalating" pattern. Individuals assigned to the "late-escalating" class were younger and had fewer drug dependence symptoms and antisocial behaviors at intake compared to those in assigned to the "early-escalating class." The pattern of delayed onset of antisocial behavior found in the "late-escalating class" is consistent with the classification AASB (Adult Antisocial Behavior; ASPD criteria without CD in childhood). Other research has suggested that more than half of drug-abusing individuals with AASB began using drugs prior to the onset of antisocial behavior (Mikulich-Gilbertson et al., 2007). Identification of individuals who may be predisposed to follow an "early-escalating" or "late-escalating" course is important given that substance abusers with long-term patterns of antisocial behavior are at greater risk for negative outcomes and typically require additional services.

Most of the existing literature identifying antisocial behavior trajectories has focused on patterns beginning in childhood (Moffitt et al., 1993; Caspi & Moffitt, 1995; Broidy et al., 2003; Schaeffer et al., 2006). The present study modeled antisocial trajectories beginning in adolescence and during treatment. This limits comparability of present findings to existing research on developmental patterns of antisocial behavior in two ways. First, the predominant taxonomy tested in the literature is adolescence-limited (adolescent onset) versus life-course persistent (childhood onset) antisocial behavior trajectories. Because participant in the present study were between the ages of 13 and 18 at intake, it was not possible to model trajectories

beginning in childhood. Second, trajectories in this study begin at what is expected to be a peak deviance period from a general developmental perspective and at the individual level (participants were in treatment at study entry). This elevated starting point affects the shape of the trajectories, and those labeled "desisters" in this study continue to exhibit more antisocial psychopathology than is found in the general population.

Do Long-term Patterns of Antisocial Behavior Differ by Gender?

A primary goal of this study was to examine the impact of gender on the progression of antisocial behavior from adolescence to adulthood for substance-abusing youth (relationship 5, Figure 1). Overall, identified gender distributions indicate that there are some gender-specific antisocial developmental patterns and some that are common across genders (Schaeffer, 2006). As hypothesized, when participants were assigned to classes with the highest probability of membership, men and women were distributed differentially across trajectories. However, distribution of male and female participants across classes was partially inconsistent with hypotheses. A pattern of desistance from antisocial behavior was common for both men and women, but gender distribution varied across the three unique trajectory classes. Women were more likely to follow the desisting pathway with the lowest starting point, and men were more likely to follow the desisting pathway with the highest starting point.

Predominantly female and predominantly male patterns of escalation were also observed. Contrary to hypotheses, females were more likely than males to follow a "late-escalating" pattern of antisocial behavior over time. The younger age of late-

escalating girls may partially explain their delayed peak in antisocial behavior. It is important to note that although late-escalating girls exhibited increases in property destruction and unlawful behaviors in early adulthood, their psychopathology across all antisocial domains was consistently lower than other substance-abusing girls. Mikulich-Gilbertson et al. (2007) found that women substance abusers are more likely than their male counterparts to exhibit adult-limited antisocial behavior. Therefore, a subset of substance abusing girls may continue alcohol/drug involvement that results in adult-limited antisocial behaviors. Those who follow the "late-escalating" pattern may adopt antisocial behaviors necessary to support their addiction in adulthood, when they no longer have access to parents' financial resources. The identification of a predominantly female escalating pattern suggests that there may be a second high-risk period for some women with substance abuse histories.

Males were more likely than females to follow an "early-escalating" pathway. Boys with this developmental pattern were most likely to be physically aggressive at intake and were at increased risk for other, non-violent forms of antisocial behavior in the four years post-treatment. Therefore, the combination of male gender and physical aggression may be a marker for poor early antisocial outcomes for substance-disordered youth.

Study Strengths

The data used for the present dissertation has several unique strengths that make it appropriate to address the study aims. First, analyses were completed using a large, gender-balanced treatment sample of substance abusing adolescents. Compared to boys, relatively little is known about the progression from adolescent to

adult antisocial behavior in girls. Few samples have had the equal proportions of male and female participants necessary to address questions of gender equivalence in symptom pattern and course of conduct disorder. Second, the present study examined dimensional as well as categorical gender differences in the occurrence of antisocial behavior. This is significant, given questions regarding the appropriateness of current diagnostic cutoffs for antisocial girls (Moffitt et al., 2008). Third, this research included several data points spanning the transition from adolescence to young adulthood, allowing important longitudinal research questions to be answered. Finally, multiple informants provided information on substance involvement and antisocial behaviors, thus improving the reliability of diagnoses and symptom profiles.

Limitations and Future Directions

Study findings must be considered in light of several limitations. First, the age range for participants was relatively large at study entry. Thus, time-based analyses (aims 1 and 2) are not entirely compatible with developmental hypotheses and trajectory analysis results (aim 3). Second, there is no established cutoff to evaluate the clinical relevance of the antisocial domain composite score which formed the basis of the trajectories. Additionally, only lifetime antisocial and substance dependence symptoms were assessed at intake (not past two years as at other time points). This poses a challenge for interpreting change in symptom level from intake to follow-up points. This shift in assessment timeframes is also responsible for elevated trajectory starting points and impacts the shape of the trajectories. Finally, the existing literature suggests that there may be female-specific forms of antisocial behavior (e.g., relational aggression) that were not assessed in this study. Thus,

conclusions drawn from this research regarding gender differences in level of antisocial psychopathology and rates of CD/ASPD may be confounded by gender biases in the assessment of antisocial behavior (Zoccolillo et al., 1996; Silverthorn & Frick, 1999).

Future research in this area should include female-specific antisocial behaviors identified by clinicians and through exploratory research as well as established DSM-IV conduct disorder and ASPD symptoms. Additionally, antisocial behavior trajectories modeled separately for male and female substance abusers would provide further understanding of developmental patterns unique to women. Finally, research modeling substance involvement and antisocial behavior simultaneously would further elucidate the long-term bidirectional influences of these two forms of psychopathology for male and female substance abusers.

<div style="text-align:center">Conclusion</div>

In sum, the goal of this dissertation study was to investigate gender differences in the symptom pattern and course of antisocial behavior for a large sample of substance-disordered youth. The following are the primary conclusions drawn from this research:

1. Cross-sectional findings support the hypothesis that females treated for substance abuse in adolescence exhibit fewer and less severe antisocial behaviors and lower rates of CD/ASPD in adolescence and adulthood than their male counterparts (relationships 1 and 2, Figure 1).

2. Cross-sectional findings also support the hypothesis that gender differences in rates of alcohol/drug dependence emerge in late-adolescence and early

adulthood. As expected, women in the sample showed higher rates of recovery at 4, 6, and 8 years post-treatment. However, contrary to hypotheses, female participants exhibited a higher number of alcohol and drug dependence symptoms 2 years post-treatment (relationships 3 and 4, Figure 1).

3. Five developmental patterns of antisocial behavior were identified for this sample of substance-disordered boys and girls. These trajectory classes were partially consistent with hypothesized patterns. Three of the identified groups were characterized by desistance in antisocial behavior over time and were distinguished from each other by intake level of psychopathology. Two groups can be considered "escalating" classes- one with increases in adolescence and the other with increases in early adulthood. The hypothesized "consistently low" group was not identified in the data.

4. Hypotheses related to gender differences in class membership were partially supported by the present findings. As expected, gender was a significant predictor of class membership. Men and women were overrepresented in distinct "escalating" classes and "desisting" classes (relationship 5, Figure 1).
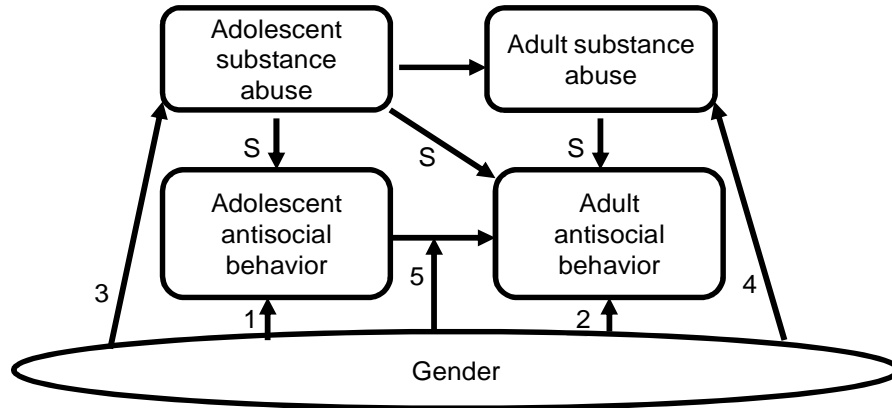
Figure 1: Model of the Role of Gender in Concurrent and Long-term Influences of Substance Involvement on Antisocial Behavior

Table 1: Intake Demographics and Treatment History for a Sample of Drug-Disordered Youth

	Total sample (N=424)	Female (n=213)	Male (n=211)
Age (M, SD)	16.2 (1.5)	15.9 (1.5)	16.4 (1.4)
Ethnicity (% Caucasian)	62%	63%	61%
Parents' marital status (% married)	50%	44%	55%
Religious background	28% none 28% Catholic 17 % Other Protestant	20% none 35% Catholic 16 % Other Protestant	34% none 23% Catholic 17 % Other Protestant
Living arrangements			
With parental figures	88.1%	83.3%	92.8%
With other relatives	2.9%	3.8%	1.9%
Foster home	7%	1.4%	0%
Group home	.5%	.5%	.5%
Institution	1.9%	1.9%	1.9%
Transient	3.3%	5.2%	1.4%
Other	2.6%	3.8%	1.4%
Ever seen by a professional for substance abuse issues	45.8%	38.9%	52.9%
Ever in inpatient program for substance abuse	16.7%	20.9%	12.5%
Ever seen a professional for psych/emotional problems	80.3%	87.1%	73.6%
Ever hospitalized for psych/emotional problems	19.6%	22.7%	16.3%

Table 2: Sample Sizes for Subsamples A and B at 5 Assessment Points

Sample Size	Sample A	Sample B	Total
N at intake	169	255	424
N at 2 year FU	161	181	342
N at 4 year FU	162	138	300
N at 6 year FU	160	163	323
N at 8 year FU	144	150	294

Table 3: Antisocial and Alcohol/Drug Dependence Characteristics for Substance-Disordered Youth over an Eight Year Period

	Intake	2-yr	4-yr	6-yr	8-yr
Antisocial sx count (M, SD)	6.7 (3.1)	2.6 (2.4)	2.1 (2.1)	2.3 (2.0)	2.4 (2.2)
CD/ASPD prevalence (%)	89	55	54	41	44
# Alcohol dependence sx (M, SD)	3.8 (2.8)	1.7 (2.1)	1.6 (2.0)	1.4 (2.0)	1.5 (2.1)
# Drug dependence sx (M, SD)	6.1 (2.4)	2.4 (2.7)	2.4 (2.6)	1.9 (2.6)	1.8 (2.5)
Prevalence of alcohol or drug dependence (%)	95	57	55	49	47

Note: Sx=symptoms. Lifetime symptom counts and prevalence rates at intake; past two years symptom counts and prevalence rates at follow-up periods

Table 4: DSM Antisocial (CD/ASPD) Symptom Domain Scores and Domain
Composite Score over 8 Years for Substance-Abusing Youth: Gender Differences

Symptom Domain	Female (n=213)	Male (n=211)	p-value
% Physical Fighting/Aggression			
Intake (LIFETIME)	65	79	.001
2-year FU	24	39	.001
4-year FU	22	48	<.001
6-year FU	11	16	.111
8-year FU	11	17	.112
% Property Destruction			
Intake (LIFETIME)	58	83	<.001
2-year FU	16	29	.002
4-year FU	10	26	<.001
6-year FU	11	17	.066
8-year FU	9	17	.036
% Deceitfulness			
Intake (LIFETIME)	98	98	.506
2-year FU	65	76	.019
4-year FU	58	70	.020
6-year FU	32	47	.004
8-year FU	32	41	.064
% Truancy/Irresponsibility			
Intake (LIFETIME)	95	97	.318
2-year FU	65	62	.338
4-year FU	62	52	.053
6-year FU	33	48	.005
8-year FU	29	39	.056

Table 4: DSM Antisocial (CD/ASPD) Symptom Domain Scores and Domain Composite Score over 8 Years for Substance-Abusing Youth: Gender Differences, Continued

Symptom Domain	Female (n=213)	Male (n=211)	p-value
% Unlawful Behaviors			
Intake (LIFETIME)	76	89	<.001
2-year FU	26	36	.034
4-year FU	22	41	<.001
6-year FU	16	45	<.001
8-year FU	24	49	<.001
DOMAIN COMPOSITE (mean, SD)*			
Intake (LIFETIME)	3.92 (1.13)	4.46 (.82)	<.001
2-year FU	1.96 (1.47)	2.43 (1.38)	.003
4-year FU	1.73 (1.36)	2.36 (1.50)	<.001
6-year FU	1.03 (1.34)	1.74 (1.61)	<.001
8-year FU	1.06 (1.40)	1.63 (1.57)	.001

* Domain composite is the sum of antisocial domains for which a symptom was endorsed (Range=0-5)

Table 5: Antisocial Symptoms over 8 Years for Substance-Disordered Youth:
Gender Difference

	Female (n=213)	Male (n=211)	Gender X Intake Sx F	Gender X Intake Sx p-value	Gender F	Gender p-value	Intake Sx F	Intake Sx p-value
Intake (LIFETIME)*								
# total CD[1]	6.03 (.22)	7.41(.20)						
# independent sx	4.96 (.20)	5.91(.21)						
2-year follow-up								
# total CD sx	2.54 (.18)	2.69 (.18)	0	1.0	4.6	.010	42.9	<.001
# independent sx	1.86 (.14)	1.92 (.14)	.02	.903	6.2	.002	47.8	<.001
4-year follow-up								
# total CD sx	1.76 (.17)	2.25 (.16)	7.3	.007	8.5	<.001	21.0	<.001
# independent sx	1.36 (.14)	1.41 (.13)	2.2	.140	8.4	<.001	15.6	<.001
6-year follow-up								
# total ASPD sx	1.98 (.16)	2.55 (.15)	.02	.884	10.4	<.001	15.0	<.001
# independent sx	.40 (.12)	1.66 (.12)	.002	.961	15.1	<.001	15.6	<.001
8-year follow-up								
# total ASPD sx	2.09 (.18)	2.80 (.17)	.26	.614	11.7	<.001	24.7	<.001
# independent sx	1.39 (.14)	1.94 (.13)	.73	.393	23.6	<.001	4.0	.046

[1]p<.001,[2] p=.001; Sx= symptoms. Observed means (SE) at intake. Estimated marginal means (SE) at follow-up time points, adjusted based on intake symptom count.

Table 6: Conduct Disorder/Antisocial Personality Disorder Rates over 8 Years for
Substance-Disordered Youth: Gender Differences

	Female (n=213)	Male (n=211)	p-value
Intake (LIFETIME, % CD)	84	94	.001
2-year follow-up (% CD)	48	62	.007
4-year follow-up (% CD)	41	65	<.001
6-year follow-up (% ASPD)	28	53	<.001
8-year follow-up (% ASPD)	34	52	.001

Table 7: Alcohol/Drug Dependence Symptoms over 8 Years for Substance-
Disordered Youth: Gender Differences

	Female (n=213)	Male (n=211)	Gender X Intake Sx F	Gender X Intake SX p-value	Gender F	Gender p-value	Intake Sx F	Intake Sx p-value
Intake (lifetime)								
# alcohol dependence sx [1]	3.98 (.20)	3.60 (.19)						
# drug dependence sx [2]	6.10 (.18)	6.04 (.16)						
2-year follow up								
# alcohol dependence sx	1.88 (.22)	1.47 (.25)	.05	.824	5.6	.004	11.5	.001
# drug dependence sx	2.64 (.28)	2.18 (.34)	.82	.367	4.7	.010	3.7	.056
4-year follow up (past 2 years)								
# alcohol dependence sx	1.16 (.17)	1.98 (.17)	.32	.575	19.0	<.001	7.9	.005
# drug dependence sx	2.08 (.23)	2.82 (.22)	1.19	.276	11.5	<.001	.72	.398
6-year follow-up (past 2 years)								
# alcohol dependence sx	1.10 (.17)	1.85 (.17)	.89	.347	20.5	<.001	3.1	.080
# drug dependence sx	1.63 (.21)	2.26 (.22)	.06	.805	6.2	.002	1.7	.194
8-year follow-up (past 2 years)								
# alcohol dependence sx	1.33 (.18)	1.65 (.18)	1.05	.306	23.8	<.001	.07	.787
# drug dependence sx	1.61 (.22)	2.01 (.21)	.03	.858	5.9	.003	.95	.332

Note: Sx= symptoms. Observed means (SE) at intake. Estimated marginal means (SE) at follow-up time points, adjusted based on intake sx count.

Table 8: Alcohol/Drug Dependence Rates over 8 Years for Substance-Disordered
Youth: Gender Differences

	Female (n=213)	Male (n=211)	p-value
Intake (LIFETIME)	92%	97%	.019
2-year follow up (past 2 years)	59%	55%	.401
4-year follow up (past 2 years)	47%	63%	.009
6-year follow up (past 2 years)	40%	57%	.002
8-year follow up (past 2 years)	39%	55%	.005

Table 9: Decision Criteria by Antisocial Symptom Class Solutions for Growth Mixture Modeling for Youth Followed 8 Years after Substance Abuse Treatment

	AIC	BIC	SSABIC	Entropy	LMR-LRT
1-class	4933.5	4998.3	4947.6		
2-class	4898.5	4979.5	4916.1	.721	p=.07
3-class	4874.6	4971.8	4895.6	.559	p=.39
4-class	4860.6	4974.0	4885.1	.621	p=.12
5-class	4627.9	4757.4	4655.9	.692	p=.39
6-class	4853.1	4998.9	4884.7	.622	p=.52
7-class	4840.2	5002.2	4875.3	.637	p=.48

Note: AIC= Akaike Information Criteria; BIC= Bayesian Information Criterion; SSABIC= Sample Size-Adjusted Bayesian Information Criterion; LMR-LRT= Lo-Mendell-Rubin Likelihood Ratio Test

Table 10: The 8-Year Latent Class Growth Model Characteristics for Antisocial
Behavior: 5 Class Model

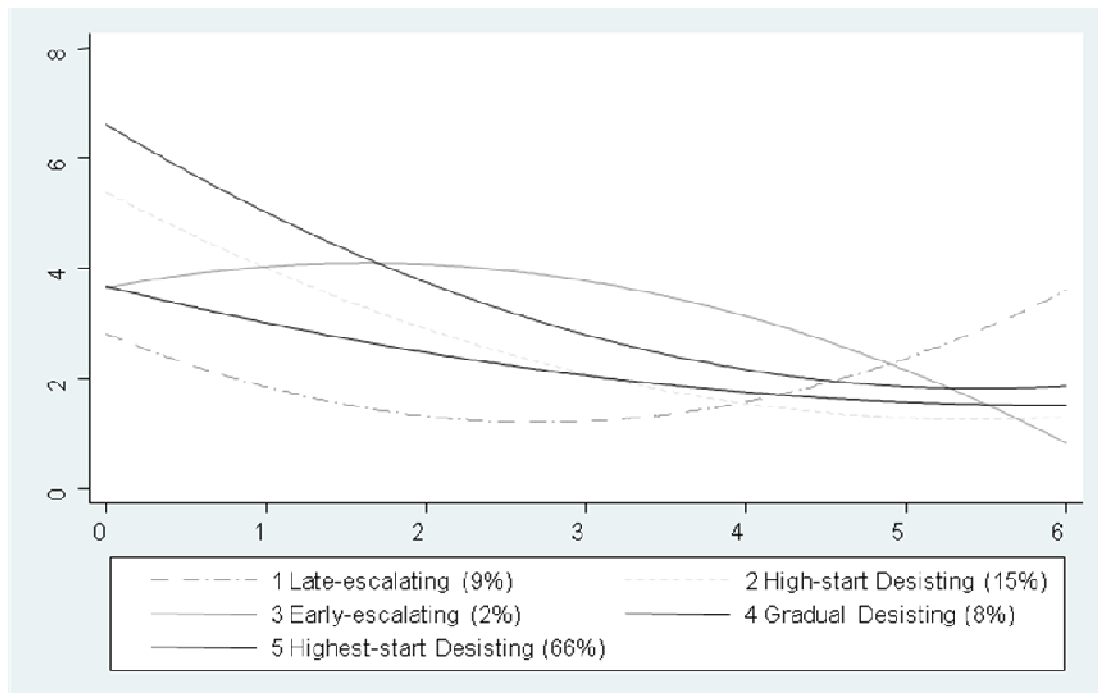| Latent class	Intercept (SE)	Slope (SE)	Quadratic (SE)
1. Late-escalating	2.81 (.26)	-1.19 (.34)	.22 (.07)
2. Highest-start desisting	5.38 (.28)	-1.52 (.34)	.14 (.06)
3. Early-escalating	3.64 (.32)	.55 (.38)	-.17 (.06)
4. Gradual desisting	3.67 (.23)	-.72 (.27)	.06 (.05)
5. Highest-start desisting	6.61 (.10)	-1.75 (.12)	.16 (.02)

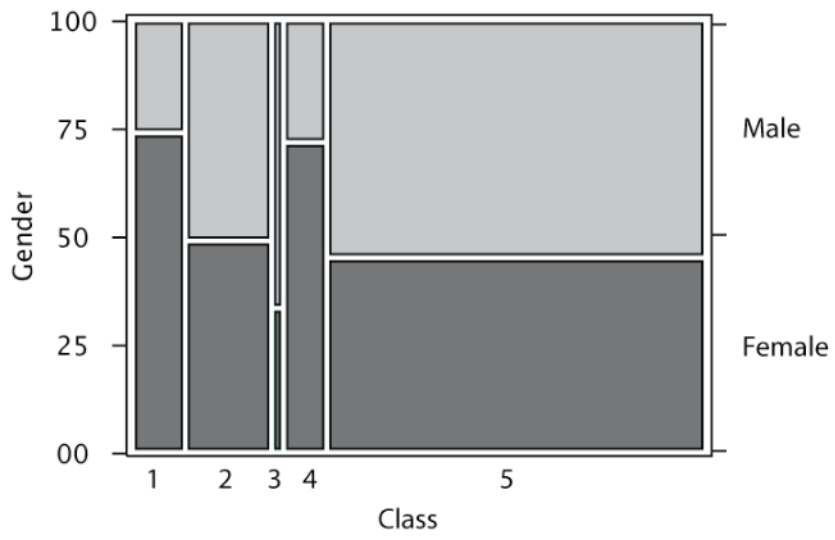**Figure 2:** Trajectories of Antisocial Behavior over an 8-Year Period for Substance-Disordered Youth

Figure 3: Gender Distribution in 8-Year Antisocial Trajectory Classes for Substance-Disordered Youth

Table 11: Correlations between Antisocial Symptoms and Substance Dependence Symptoms over 8 Years for Substance-Disordered Youth by Gender (Female/Male)

	Intake AB	2-yr AB	4 –yr AB	6-yr AB	8-yr AB
Intake SD	.250**/.271**	.110/.062	-.029/.054	-.006/.169*	.000/.108
2-yr SD	.154/-.078	.591**/.158	-.018/.167	.141/.358*	.198/.317*
4-yr SD	-.052/.189*	.202*/.223*	.493**/.470**	.193*/.309**	.249**/.228*
6-yr SD	.099/.084	.135/.235**	.346**/.317**	.521**/.476**	.515**/.346**
8-yr SD	.145/.050	.147/.221*	.341**/.247**	.547**/.374**	.591**/.536**

Note: AB= antisocial behavior domain composite score, SD=number of substance dependence symptoms. Lifetime symptoms at intake and past two years symptoms at follow-up points

APPENDIX TABLES:

Table A1: Constrained environment information: Gender differences

	Female (n=213)	Male (n=211)	significance
Intake			
Currently in group home or institution	2.4%	2.4%	1.0
Max days incarcerated in time period	3.4 (16.7)	9.4 (65.1)	.198
2 year follow-up			
Currently in group home or institution	4.3%	6.0%	.758
# medical hospitalizations in time period	0.18 (.74)	0.17 (.65)	.968
Psychiatric or substance abuse hospitalization	11.0%	11.4%	1.0
Max days incarcerated in time period	0.76 (5.4)	17.33 (63.2)	.015
Juvenile detention/jail overnight	3.3%	18.1%	.001
4 year follow-up			
Currently in group home or institution	1.0%	6.4%	.081
# medical hospitalizations in time period	.33 (.80)	.11 (.34)	.005
Psychiatric or substance abuse hospitalization	6.1%	8.9%	.613
Max days incarcerated in time period	9.1 (74.2)	30.7 (96.0)	.066
Juvenile detention/jail overnight	8.1%	36.2%	<.001
6 year follow-up			
Currently in group home or institution	0.9%	9.6%	.002
# medical hospitalizations in time period	.40 (1.0)	.15 (.4)	.010
Psychiatric or substance abuse hospitalization	4.3%	6.1%	.580
Max days incarcerated in time period	4.6 (35.9)	49.8 (140.3)	<.001
Juvenile detention/jail overnight	9.9%	33.9%	<.001
8 year follow-up			
Currently in group home or institution	3.1%	12.9%	.012
# medical hospitalizations in time period	.52 (1.2)	.30 (1.1)	.161
Psychiatric or substance abuse hospitalization	4.1%	3.4%	1.0
Max days incarcerated in time period	8.6 (53.3)	48.1 (139.7)	.002
Juvenile detention/jail overnight	17.3%	43.3%	<.001

Table A2: Prevalence of individual antisocial behaviors at intake for youth in treatment for alcohol/drug abuse

		Female % yes	Male % yes	p-value
		(% yes Independent of substance use)	(% yes Independent of substance use)	
Aggression to people and animals	Often bullies, threatens, or intimidates others	*55 (52)*	*49 (48)*	.428
	Often initiates physical fights	56 (51)	67 (62)	.061
	Fought using a weapon	28 (16)	42 (23)	.011
	Physically cruel to people	39 (30)	60 (46)	<.001
	Physically cruel to animals	10 (8)	32 (27)	<.001
	Theft with confrontation	10 (4)	22 (8)	.005
	Forced sexual activity	2 (1)	2 (1)	1.0
Property destruction	Fire setting	21 (17)	49 (44)	<.001
	Deliberate property destruction	58 (43)	84 (67)	<.001
Deceitfulness/ theft	Broken into house, building, car	36 (21)	65 (42)	<.001
	Taken things without permission	71 (60)	83 (65)	.005
	"Cons" others	93 (89)	97 (94)	.411
	Theft without confrontation	73 (68)	86 (73)	<.001
Serious rule violation	Stays out late at night	70 (61)	63 (53)	.542
	Run away from home	52 (38)	50 (31)	.267
	Ditched/played hookey	95 (85)	97 (86)	.438
	Missed school/work #+ days/mo	68 (48)	69 (45)	.573

Table A3: Prevalence of individual antisocial behaviors at 2 year follow-up for youth in treatment for alcohol/drug abuse

		Female % yes	Male % yes	p-value
		(% yes Independent of substance use)	(% yes Independent of substance use)	
Aggression to people and animals	Often bullies, threatens, or intimidates others	13 (12)	20 (17)	.502
	Often initiates physical fights	20 (14)	28 (22)	.151
	Fought using a weapon	5 (2)	19 (13)	<.001
	Physically cruel to people	12 (9)	24 (17)	.016
	Physically cruel to animals	2 (2)	6 (4)	.091
	Theft with confrontation	2 (1)	6 (3)	.183
	Forced sexual activity	1 (1)	1 (0)	.221
Property destruction	Fire setting	2 (2)	2 (2)	.658
	Deliberate property destruction	16 (8)	30 (17)	.011
Deceitfulness/ theft	Broken into house, building, car	11 (5)	19 (10)	.124
	Taken things without permission	34 (24)	38 (29)	.606
	"cons" others	53 (45)	63 (55)	.372
	Theft without confrontation	23 (17)	34 (20)	.047
Serious rule violation	Stays out late at night	47 (37)	46 (36)	.981
	Run away from home	19 (11)	19 (8)	.392
	Ditched/played hooky	54 (48)	48 (43)	.600
	Missed school/work 3+ days/mo	37 (30)	37 (29)	.977

Table A4: Prevalence of individual antisocial behaviors at 4 year follow-up for youth in treatment for alcohol/drug abuse

		Female % yes (% yes Independent of substance use)	Male % yes (% yes Independent of substance use)	p-value
Aggression to people and animals	Often bullies, threatens, or intimidates others	8 (5)	15 (12)	.410
	Often initiates physical fights	16 (10)	33 (20)	.005
	Fought using a weapon	6 (3)	17 (8)	.008
	Physically cruel to people	9 (7)	22 (14)	.007
	Physically cruel to animals	1 (1)	3 (3)	.219
	Theft with confrontation	1 (1)	10 (4)	.002
	Forced sexual activity	0 (0)	0 (0)	
Property destruction	Fire setting	1 (1)	1 (1)	.129
	Deliberate property destruction	10 (9)	26 (16)	<.001
Deceitfulness/theft	Broken into house, building, car	6 (4)	24 (11)	<.001
	Taken things without permission	24 (20)	40 (25)	.004
	"cons" others	37 (33)	47 (39)	.376
	Theft without confrontation	22 (15)	35 (16)	.009
Serious rule violation	Stays out late at night	38 (27)	18 (18)	.008
	Run away from home	14 (8)	10 (3)	.196
	Ditched/played hookey	44 (41)	35 (30)	.101
	Missed school/work #+ days/mo	24 (17)	24 (19)	.585

Table A5: Prevalence of individual antisocial behaviors at 6 year follow-up for youth in treatment for alcohol/drug abuse

		Female % yes	Male % yes	p-value
		(% yes Independent of substance use)	(% yes Independent of substance use)	
Aggression to people and animals	Often initiates physical fights	19 (13)	31 (15)	.016
	Fought using a weapon	6 (5)	10 (4)	.050
	Physically cruel to people	8 (7)	17 (6)	.000
	Theft with confrontation	1 (0)	8 (2)	.018
	Forced sexual activity	0 (0)	0 (0)	
Property destruction	Deliberate property destruction	11 (7)	18 (6)	.051
Deceitfulness/ theft	Broken into house, building, car	4 (1)	14 (5)	.006
	"cons" others	38 (26)	51 (34)	.054
	Theft without confrontation	13 (6)	30 (14)	.001
Irresponsibility	Left job/school without a plan	34 (28)	42 (34)	.328
	Out of work/school >= 1 month	30 (16)	43 (26)	.035
	Missed school/work 3+ days/mo	22 (11)	24 (13)	.914
Adult-specific items	Sex w/ partner didn't know well	38 (24)	54 (29)	.010
	Cheated on romantic partner	30 (23)	33 (21)	.392
	Unprotected or risky sex	49 (35)	45 (27)	.499
	Trouble w/ law b/c of driving	30 (26)	46 (35)	.002
	Driven recklessly	17 (10)	33 (18)	.060
	Trouble keeping up with debts	49 (42)	56 (44)	.238
	Frequent unplanned moves	24 (17)	27 (19)	.801
	Arrested in past 2 yrs	14 (3)	38 (13)	.000
	Kept in jail overnight	10 (2)	33 (12)	.000

Table A5: Prevalence of individual antisocial behaviors at 6 year follow-up for youth in treatment for alcohol/drug abuse, Continued

	Female % yes	Male % yes	p-value
	(% yes Independent of substance use)	(% yes Independent of substance use)	
Convicted of felony in past 2 yrs	5 (1)	14 (6)	.010
Involved in illegal occupations	15 (4)	32 (11)	.002
Fired from job or demoted	22 (15)	29 (18)	.349
Child gone hungry at any time	3	1	.268
Sick child not taken to a doctor	3	1	.433
Child stay with neighbors for meal/sleep	5	3	.244
Spent grocery money on non-necessities	7	3	.062
Children removed from the home	4	2	.630

Table A6: Prevalence of individual antisocial behaviors at 8 year follow-up for youth in treatment for alcohol/drug abuse

		Female % yes	Male % yes	p-value
		(% yes Independent of substance use)	(% yes Independent of substance use)	
Aggression to people and animals	Often initiates physical fights	19 (10)	30 (13)	.101
	Fought using a weapon	4 (2)	8 (5)	.276
	Physically cruel to people	6 (4)	23 (8)	.000
	Theft with confrontation	1 (0)	9 (2)	.020
	Forced sexual activity	0 (0)	0 (0)	
Property destruction	Deliberate property destruction	9 (4)	17 (7)	.130
Deceitfulness/ theft	Broken into house, building, car	4 (1)	15 (5)	.003
	"cons" others	35 (25)	47 (33)	.126
	Theft without confrontation	16 (7)	23 (10)	.340
Irresponsibility	Left job/school without a plan	26 (26)	27 (27)	.944
	Out of work/school >= 1 month	25 (14)	31 (20)	.412
	Missed school/work 3+ days/mo	17 (9)	29 (16)	.056
Adult-specific items	Sex w/ partner didn't know well	29 (18)	50 (23)	.000
	Cheated on romantic partner	32 (24)	28 (15)	.145
	Unprotected or risky sex	38 (28)	45 (28)	.201
	Trouble w/ law b/c of driving	32 (21)	46 (32)	.049
	Driven recklessly	31 (24)	46 (36)	.029
	Trouble keeping up with debts	49 (41)	57 (38)	.011
	Frequent unplanned moves	17 (11)	26 (17)	.198
	Arrested in past 2 yrs	19 (2)	43 (13)	.000
	Kept in jail overnight	17 (4)	43 (13)	.000

Table A6: Prevalence of individual antisocial behaviors at 8 year follow-up for youth in treatment for alcohol/drug abuse, Continued

	Female % yes (% yes Independent of substance use)	Male % yes (% yes Independent of substance use)	p-value
Convicted of felony in past 2 yrs	4 (1)	15 (6)	.008
Involved in illegal occupations	15 (3)	29 (8)	.018
Fired from job or demoted	20 (13)	24 (13)	.352
Child gone hungry at any time	4	3	.530
Sick child not taken to a doctor	3	1	.435
Child stay with neighbors for meal/sleep	7	3	.101
Spent grocery money on non-necessities	8	4	.122
Children removed from the home	7	1	.004

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