



# HHS Public Access

Author manuscript

*J Am Acad Child Adolesc Psychiatry*. Author manuscript; available in PMC 2018 February 01.

Published in final edited form as:

*J Am Acad Child Adolesc Psychiatry*. 2017 February ; 56(2): 140–148. doi:10.1016/j.jaac.2016.10.018.

## Trajectories of Substance Use Disorder in Youth After Detention: A 12-Year Longitudinal Study

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### Abstract

**Objective**—Identify trajectories of substance use disorders (SUDs) in youth during the 12 years after detention, and how gender, race/ethnicity, and age at baseline predict trajectories.

**Method**—As part of the Northwestern Juvenile Project, a longitudinal study of 1,829 youth randomly sampled from detention in Chicago, Illinois, 1995–1998, participants were re-interviewed in the community or correctional facilities up to 9 times over 12 years. Independent

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Supplemental material cited in this article is available online.

Disclosure: Drs. Hershfield, Han, and Byck report no biomedical financial interests or potential conflicts of interest.

interviewers assessed SUDs using the Diagnostic Interview Schedule for Children 2.3 (baseline) and the Diagnostic Interview Schedule IV (follow-ups). Primary outcome was a mutually exclusive 5-category typology of disorder: no SUD, alcohol alone, marijuana alone, comorbid alcohol and marijuana, or “other” illicit (“hard”) drug. We estimated trajectories using growth mixture models with a 3-category ordinal variable derived from the typology.

**Results**—During the 12-year follow-up, 19.6% of youth did not have an SUD. The remaining 81.4% were in 3 trajectory classes. Class 1 (24.5%), a bell-shaped trajectory, peaked 5 years after baseline when 42.7% had an SUD and 12.5% had comorbid/“other” illicit drug disorders. Class 2 (41.3%) had higher prevalence of SUD at baseline (73.8%). Although prevalence decreased over time, 23.5% had an SUD 12 years later. Class 3 (14.6%), the most serious and persistent trajectory, had the highest prevalence of comorbid/“other” illicit drug disorders—52.1% at baseline and 17.4% 12 years later. Males, Hispanics, non-Hispanic whites, and youth who were older at baseline (detention) had the worst outcomes.

**Conclusion**—Gender, race/ethnicity, and age at detention predict trajectories of SUDs in delinquent youth. Findings provide an empirical basis for child psychiatry to address health disparities and improve prevention.

### Keywords

substance use disorders; trajectories; high-risk youth; delinquents; longitudinal

## INTRODUCTION

Substance abuse is common and persistent in delinquent youth. Among youth in the juvenile justice system, more than 90% report using illicit drugs<sup>1</sup> and as many as three-quarters of males and females<sup>2–4</sup> have a substance use disorder (SUD). Prevalence remains high as youth age: 5 years after detention, more than 30% of males and 20% of females have an SUD.<sup>5</sup> By the median age of 28 years, 91.3% of males and 78.5% of females have ever had an SUD.<sup>6</sup> Substance abuse in adolescence can have lifelong consequences.<sup>7</sup> It predicts substance abuse later in life and among delinquent youth is also associated with recidivism,<sup>8,9</sup> sexually transmitted diseases,<sup>10</sup> psychiatric comorbidity, and early violent death.<sup>11–13</sup>

Although informative, most longitudinal studies provide few data about patterns of substance abuse over time. For example, a study may find that 30% of participants have marijuana use disorder at Time 1 and at Time 2. But, are these the same people? For some youth, substance abuse is limited to adolescence; for others, it may begin in adulthood.

Trajectory analysis addresses this limitation by identifying subgroups of people who share similar patterns (trajectories) of substance abuse over time. Trajectory analysis identifies (1) the most common patterns of substance abuse as youth age and (2) variables—such as gender and race/ethnicity—that predict trajectories. Trajectory analysis thus addresses critical questions: Are there subgroups whose substance abuse increases over time (escalation)? Whose substance abuse decreases (desistance)? Do gender and race/ethnicity predict escalation and desistance?

Many studies of general population youth have examined trajectories of marijuana use and heavy drinking.<sup>14–22</sup> Among studies of marijuana use, a common trajectory is “abstainers” (approximately 45% of youth).<sup>17,18,20</sup> “Occasional” marijuana users comprise approximately 30% of youth,<sup>17,20</sup> and several studies<sup>16–18,20,22</sup> identified 2% to 12% of youth as “early” marijuana users. Among studies of heavy or binge drinking, a common trajectory is “abstainers” or “infrequent” users (approximately 30%–50% of youth).<sup>14,20,21</sup> Several studies identified groups (8%–15% of youth)<sup>14,20,21</sup> whose heavy drinking peaked in their teens and early 20s, and 10% to 15% of youth<sup>14,20</sup> were classified as “increasers.”

Findings, however, are not generalizable to youth in the juvenile justice system for two reasons. First, the demographic characteristics of youth in detention differ from those in the general population.<sup>23</sup> Youth in detention are disproportionately poor, and racial/ethnic minorities are overrepresented.<sup>23–27</sup> Second, delinquent youth are systematically underrepresented in general population studies, which typically sample from schools or use household surveys. Even studies of “high-risk” youth (e.g., children of alcoholics<sup>28,29</sup> or those living in high-crime neighborhoods<sup>30</sup>) provide little information about delinquent youth. Although these studies would have included delinquent youth, none distinguished between youth with and without histories of delinquency. (Summary tables of these studies are available on request.)

To our knowledge, only one study of delinquent youth (Pathways to Desistance) examined trajectories of substance abuse.<sup>31</sup> This investigation, sampling only serious juvenile offenders, found that substance use had initiated by 15 years of age and that frequency of both alcohol and marijuana use increased between 15 and 20 years of age.<sup>31</sup> However, the trajectory analysis has several limitations: (1) participants were followed up for only 3 years; (2) serious offenders constitute a small fraction of youth processed through the juvenile justice system; (3) the analysis excluded females, who comprise an increasing proportion of youth in the juvenile justice system; and (4) the study focused only on substance use, not disorder. Definitions of substance use vary widely, may not differentiate experimentation from problematic use, and are difficult to compare across studies.

In sum, no comprehensive study has examined trajectories of substance disorder in delinquent youth. This omission is critical for two reasons. First, because juvenile detainees have a median length of stay of 15 days,<sup>32</sup> delinquent youth with SUDs become a community public health problem when they are released. Second, data on gender and racial/ethnic differences are needed to address health disparities and improve prevention and treatment. More than any other racial/ethnic group, African Americans are disproportionately incarcerated,<sup>23</sup> comprising approximately 14% of the general population<sup>33</sup> but approximately 40% of youth and young adults in corrections.<sup>34,35</sup> Females represent a growing proportion of youth in the juvenile justice system,<sup>23</sup> comprising 27.9% of youth processed in juvenile court<sup>34</sup> and 13.6% of incarcerated youth.<sup>34</sup>

We present data from the Northwestern Juvenile Project, the first large-scale study of psychiatric disorders in youth after they leave detention. The sample is large (N=1,829), is racially/ethnically diverse, and includes males and females. This is the first paper to examine trajectories of SUDs. We have two goals: (1) to identify trajectories of SUDs during the 12

years after detention (median age, 28 years) and (2) to examine how age at detention, gender, and race/ethnicity predict trajectories of SUDs.

## METHOD

We summarize the information from the Northwestern Juvenile Project most relevant to this study. Additional information is available in Supplement 1 (available online) and is published elsewhere.<sup>2,5,6</sup>

### Sample and Procedures

We recruited a stratified random sample of 1,829 youth at intake to the Cook County Juvenile Temporary Detention Center (CCJTDC) in Chicago, Illinois, from November 20, 1995, through June 14, 1998, who were awaiting the adjudication or disposition of their case. The CCJTDC is used for pretrial detention and for offenders sentenced for fewer than 30 days. To ensure adequate representation of key subgroups, we stratified our sample by gender, race/ethnicity (African American, non-Hispanic white, Hispanic, other), age (10–13 years or 14 years), and legal status (processed in juvenile or adult court). Face-to-face structured interviews were conducted at the detention center in a private area, most within 2 days of intake (baseline interview).

We conducted follow-up interviews: (1) at 3, 4.5, 6, 8, and 12 years after baseline for the entire sample; (2) at 3.5 and 4 years after baseline for a random subsample of 997 participants (600 males and 397 females); and (3) at 10 and 11 years after baseline for the last 800 participants enrolled at baseline (460 males and 340 females). Participants were interviewed whether they lived in the community or in correctional facilities.

Participants signed either an assent form (if they were <18 years old) or a consent form (if they were 18 years old). The institutional review boards approved all study procedures and waived parental consent for persons younger than 18 years, consistent with federal regulations regarding research with minimal risk.<sup>36</sup>

### Measures and Variables

**Typology of Substance Use Disorders**—To assess SUDs at baseline, we administered the Diagnostic Interview Schedule for Children, version 2.3 (DISC 2.3),<sup>37,38</sup> based on the *DSM-III-R*, the most recent version available at the time. The DISC 2.3 generates diagnoses for alcohol, marijuana, and “other” illicit drug use disorders (e.g., “hard drugs” such as cocaine, opiates, hallucinogens/PCP) for the past 6 months. At follow-up interviews, we administered the Diagnostic Interview Schedule, Version IV (DIS-IV)<sup>39,40</sup> based on the *DSM-IV*, because the DISC was not sufficiently comprehensive to cover the substance use behaviors of aging delinquent youth. The DIS-IV assesses SUDs in the year before the interview. Consistent with prior studies, such as the National Comorbidity Survey Replication,<sup>41</sup> (1) participants who met diagnostic criteria for an SUD with “partial recovery” were scored as having the disorder,<sup>41</sup> and (2) we defined SUD as a diagnosis of abuse or dependence.<sup>41–43</sup> Among participants with any SUD, approximately two-thirds met criteria for dependence (see Supplement 1, available online, for additional estimates). As detailed in Supplement 1, prior analyses demonstrated that changes in the prevalence of drug

and alcohol use disorders (abuse or dependence combined) from baseline to later time points did not appear to be due to changes in measurement.<sup>5</sup> However, the proportion of diagnoses attributable to dependence may have decreased over time because *DSM* criteria changed (see Supplement 1, available online, for details).

We used a mutually exclusive 5-category typology, validated in our prior work,<sup>1</sup> to score participants' SUD at each follow-up: none, alcohol alone, marijuana alone, comorbid alcohol and marijuana, and any "hard" drug (those other than marijuana, such as cocaine or hallucinogens). A participant with, for example, alcohol and cocaine use disorder would be in the last category. For convenience, we refer to the last category as "other" illicit drug.

## Data Analysis

**Prevalence of Disorder at Specific Time Points**—Prevalence was calculated using commercial software (Stata 12<sup>44</sup>) with its survey routines. To generate prevalence estimates that reflect the population of the CCJTDC, each participant was assigned a sampling weight augmented with a nonresponse adjustment to account for missing data.<sup>45</sup> Taylor series linearization was used to estimate standard errors.<sup>46,47</sup>

As in our prior work,<sup>5,6</sup> because some participants were interviewed more often than others, we summarize prevalence at 6 time points for the entire sample: baseline (Time 0) and Time 1 through Time 5, corresponding to approximately 3, 5, 6, 8, and 12 years after baseline. Table 1, summarizing sample demographics and retention, shows that 83% of participants had a Time 5 interview (retention for Time 1 to Time 4 was 91%, 85%, 77%, and 73%, respectively).

**Trajectories of Substance Use Disorders Over Time**—We determined trajectories of SUDs using growth mixture models (GMMs), estimated with software package *Mplus*, version 6.<sup>48</sup> Figure S1, available online, illustrates our model. SUDs were measured at baseline and at up to 9 additional time points in the subsequent 12 years (a total of 12,511 interviews from 1,825 participants). We hypothesized that there were "c" distinct trajectory classes of SUD. Within each trajectory class, the shape of the trajectory was determined by three parameters: intercept (i), slope (s), and a quadratic term (q); variances were estimated freely. This model allowed the shapes of trajectories to vary across classes. We treated SUD as an ordinal outcome. We used demographic characteristics—gender, race/ethnicity (African American, Hispanic, and non-Hispanic white), and age at detention—to predict trajectory class membership within the GMM. There was no evidence that demographic characteristics were significantly associated with intercept and slope within class. We excluded four participants who self-identified as "other" race/ethnicity and estimated all models with sampling weights to account for study design.

Because incarceration may restrict access to substances, the time incarcerated before the follow-up interview was treated as a time-varying exogenous factor. To match the measurement period for SUDs, we used incarceration information from the year preceding each follow-up interview. Depending on time point, between 36.0% and 48.8% of the sample had been incarcerated in the year before the interview; their median time

incarcerated ranged from 177 to 237 days. Between 9.3% and 15.7% of the sample had been incarcerated the entire year before the interview.

We estimated models with one, two, three, and four classes using maximum likelihood with numerical integration. We evaluated models using the following metrics: (1) sample size adjusted Bayesian information criterion (BIC),<sup>49,50</sup> with smaller values indicating better models; (2) average posterior probabilities of trajectory membership, with higher values indicating better classification of individuals; (3) entropy, with higher values indicating better classification of individuals; and (4) ease of interpretation—that is, the trajectories distinguished differences that were clinically meaningful.

**Missing Data**—Although attrition was modest (Table 1), and we augmented sampling weights with nonresponse adjustments, we used multiple imputation by chained equations to examine the sensitivity of our findings to unplanned missing data. We imputed data under the assumption that participants who dropped out had up to twice the odds of disorder compared with participants who remained in the study. Because there were no substantive differences in trajectories (tables and figures available from authors), we present results using the original data.

## RESULTS

### Prevalence

Figures 1 and 2 present prevalence estimates for any SUD and its mutually exclusive subcategories (defined above) during the 12 years after detention for males and females, respectively. Prevalence of marijuana alone and comorbid alcohol and marijuana generally decreased, whereas alcohol alone increased slightly. Up through 8 years after baseline, alcohol alone was less prevalent than marijuana alone. Throughout the follow-up period, approximately 5% of females and less than 5% of males had an “other” illicit drug use disorder, such as cocaine or hallucinogen/PCP disorder. Table S1, available online, provides the specific prevalence estimates shown in the figures. Gender and racial/ethnic differences in the prevalence of disorders of specific drugs are published elsewhere.<sup>6</sup>

### Trajectories of Substance Use Disorders

Because prevalence of alcohol alone and “other” illicit drug use disorder was low at baseline and throughout much of the follow-up, to estimate trajectories, we collapsed the 5-category typology of SUD into a 3-category ordinal variable: (1) no disorder, (2) alcohol or marijuana alone, and (3) comorbid alcohol and marijuana or “other” illicit drug (any “hard” drug). Hereafter, we refer to the latter category as comorbid/“other” illicit. Prevalence estimates are shown in Table S2, available online.

Because our goal was to model trajectories of disorder, we omitted from the analysis participants who did not have an SUD at any interview (19.6% of youth). This approach is common in trajectory analysis.<sup>20,28,51</sup> Compared with males, females were more likely to have no SUD (30.4% versus 18.7%; adjusted odds ratio [AOR] = 2.0; 95% CI, 1.5–2.6). African Americans were more likely to have no SUDs than non-Hispanic whites (20.6% versus 11.7%; AOR = 2.1; 95% CI, 1.3–3.3).

## Model Selection

We estimated models with two, three, and four trajectory classes. We present the three-class model because it offered the best combination of fit and parsimony (sample-size adjusted Bayesian information criterion 14573.6 for three-class versus 14924.1 and 14848.5 for two- and four-class, respectively). Average posterior probabilities for the three-class solution were acceptable: 0.71, 0.77, and 0.78. Although the four-class model classified participants better than the three-class model (entropy of 0.65 versus 0.46), too few participants ( $n = 4$ ) were assigned to the fourth class to interpret the trajectory. Entropy was reduced by using sampling weights (e.g., three-class unweighted entropy of 0.61 versus 0.46 weighted). We present the weighted three-class model because it offered the best combination of fit and parsimony (see Supplement 1, available online, for details).

## Trajectory Classes

Figure 3 depicts prevalence of any SUD and its subcategories (alcohol or marijuana alone; comorbid/“other” illicit) for each of the three trajectory classes. Table S3, available online, shows the corresponding prevalence estimates. We discuss classes in order of increasing severity.

**Class 1 (24.5% of youth)**—Participants in this class exhibited bell-shaped trajectories. Prevalence increased in the first 5 years after baseline, then decreased substantially. Alcohol or marijuana alone was more common than comorbid/“other” illicit drug use disorders. Twelve years after baseline, 17.9% of participants in this class had an SUD.

**Class 2 (41.3% of youth)**—Compared with Class 1, Class 2 had higher prevalence of SUDs at baseline. Prevalence then declined sharply in the first 6 years after detention. Similar to Class 1, alcohol or marijuana alone was more common than comorbid/“other” illicit drug disorder. Twelve years after baseline, 23.5% of youth had an SUD.

**Class 3 (14.6% of youth)**—This class, the most serious and persistent trajectory, had the highest prevalence of any SUD and its subcategory, comorbid/“other” illicit. Like Class 2, prevalence decreased over time. However, unlike Classes 1 and 2, comorbid/“other” illicit drug disorder was more prevalent than alcohol or marijuana alone at many time points. However, 12 years after baseline, 35.3% of participants had an SUD, 17.9% had alcohol or marijuana alone, and 17.4% had comorbid/“other” illicit drug disorder.

## Trajectory Classes: Gender, Racial/Ethnic, and Age Differences

Gender, race/ethnicity, and age at baseline were significant predictors of trajectory class. Table 2 shows odds ratios for demographic differences. Table 2 also shows demographic differences between the no-SUD group (discussed above) and participants included in the trajectory analyses.

**Gender Differences**—More than half of females were in Class 2, compared with 40.3% of males. Only 6.3% of females were in Class 3, compared with 15.2% of males. Compared with females, males had more than 3 times the odds of being in Class 3 than in Class 2 (AOR = 3.6; 95% CI, 2.0–6.7).

**Racial/Ethnic Differences**—Nearly one-third of Hispanics and nearly half of non-Hispanic whites were in Class 3. In contrast, only 9.1% of African Americans were in Class 3. Compared with African Americans, Hispanics had 3.8 times the odds—and non-Hispanic whites, 6.0 times the odds—of being in Class 3 than in Class 2 (95% CI, 1.8–12.2 and 2.9–12.4, respectively). In addition, compared with African Americans, non-Hispanic whites were more likely to be in Class 3 than in Class 1 (AOR = 4.7; 95% CI, 1.8–12.2).

**Age Differences**—More than half of participants who were 10 to 13 years of age at baseline were in Class 1, compared with 10.6% of those 17 years and older. In contrast, nearly half of participants 17 years and older at baseline were in Class 2, compared with only 11.9% of 10- to 13-year-olds. Similarly, only 3.6% of the 10- to 13-year-olds were in Class 3, compared with 17.9% of participants 17 years and older. Being older at baseline was significantly associated with being in Class 2 or Class 3, compared with Class 1 (AOR = 2.2 per year; 95% CI, 1.1–4.2; AOR = 2.1 per year; 95% CI, 1.4–3.3, respectively).

## DISCUSSION

Delinquent youth follow markedly different trajectories of SUD as they age. Nearly 1 in 6 youth were in the most serious and persistent trajectory (Class 3). At all time points, this group had the highest prevalence of SUD: nearly 90% at the baseline interview and more than one-third 12 years later. Comorbid SUDs and illicit drug use disorders—such as cocaine or hallucinogen—were far more common in this trajectory than in others. Youth who were older at baseline were more likely to be in this group; younger participants may not have had enough time to develop more serious or multiple SUDs.

Trajectory classes 1 and 2—24% and 41% of youth, respectively—were similar to the “adolescent-limited” trajectories of substance abuse found among general population youth.<sup>20, 52</sup> Class 2 contained disproportionately older detainees, who may have been closer to the “maturing out” phase when sampled at baseline.<sup>53</sup> More than half of youth who were 10 to 13 years old at detention were in Class 1. These youth may be the most amenable to preventive interventions because they have yet to develop SUDs. Moreover, they are more likely to receive services than older detainees.<sup>54</sup>

There were substantial gender differences. Consistent with studies of general population and other at-risk youth,<sup>15,17,28,29,55</sup> females had twice the odds of being in the no-SUD group compared with males. Compared with females, males had 3.6 times the odds of being in the most serious and persistent trajectory (Class 3). What accounts for these dramatic gender differences? Females may be more likely than males to desist as childcare demands evolve.<sup>56–58</sup> Moreover, females benefit from the greater provision of mental health services provided to them while they are incarcerated and when they return to their communities.<sup>5,59</sup>

Although the war on drugs has disproportionately affected African Americans,<sup>60–62</sup> less than 10% of African Americans were in the most serious and persistent trajectory (Class 3) compared with nearly 45% of non-Hispanic whites. Hispanics had trajectories more similar to non-Hispanic whites than to African Americans. Our findings add new information to the equivocal and often conflicting literature on racial/ethnic differences in trajectories of



substance abuse. However, it is difficult to compare our findings with the findings of prior studies because most investigated only use (not disorder), excluded Hispanics, or had too few racial/ethnic minorities to analyze differences.<sup>17,20,55,63–66</sup>

Our sample included participants from one jurisdiction; findings may not be generalizable to other regions. Our data are also subject to the limitations of self-report. Although participants were re-interviewed up to 9 times, some may have had SUDs outside the recall period. As in prior studies,<sup>41–43</sup> we defined SUDs as including abuse or dependence disorders. This approach does not account for the severity of disorder as measured by symptom counts. Estimating trajectories necessitated combining less common substances. Although the sample was large, we could not identify more than three trajectories or include predictors beyond demographic characteristics. To reflect the population of youth entering the juvenile justice system (10–18 years of age), we sampled a wide range of ages at baseline.<sup>2</sup> Trajectories might have been different had we focused on a specific age at baseline. We did not model trajectories based on the participant's age at each wave because of age cohort effects: participants sampled during early adolescence have different outcomes as they age compared with participants sampled during late adolescence.

Despite these limitations, our findings have implications for future research, mental health policy, and clinical services. Regarding recommendations for future research:

### **(1) Incorporate trajectory analysis into longitudinal studies of psychiatric disorders in youth**

Trajectory analysis provides unique information about the course of psychiatric disorders, complementing information provided by studies of prevalence. Investigations of high-risk populations—youth in the child welfare system and homeless and runaway youth—are especially needed.

### **(2) Use trajectories to predict distal outcomes**

Trajectory analysis provides a comprehensive view of psychiatric disorder as youth age, not just at one point in time. Thus, trajectory analysis is a powerful tool to predict how the burden of disorder during adolescence affects outcomes in adulthood, such as educational achievement, employment, and responsible parenting.

### **(3) Examine multiple substances**

Most trajectory analyses focus on use (not disorder) and examine only one substance, such as alcohol or marijuana.<sup>21,22,30,67,18,20</sup> Few examine other illicit drugs, how the choice of substances changes with age, and the sequences of multiple SUDs. Thus, we have the fewest data on the most serious patterns of abuse.

### **We note the following implications for clinicians**

**(1) Design interventions for Hispanics**—Like non-Hispanic whites, Hispanics were more likely than African Americans to be in the most serious and persistent trajectory. Yet, few substance use prevention or treatment programs have been designed for Hispanic youth.

This omission is critical: Hispanics are now the largest minority in the United States<sup>68</sup> and are disproportionately incarcerated in many states.<sup>24,69,70</sup>

**(2) Provide gender-specific interventions**—The last decade has seen needed improvements in programs for delinquent females, who have been historically underserved in the justice system. However, males continue to be both overrepresented in juvenile justice and to fare worse than females; we found that 15.2% of males were in the most serious and persistent trajectory compared with 6.3% of females. Moreover, males have poorer outcomes after substance use treatment than females.<sup>71–73</sup>

**(3) Design preventive interventions for younger detainees**—Interventions that work with older adolescents may not be successful with younger adolescents. Our finding that more than half of the youngest participants had yet to develop SUDs indicates that interventions during early adolescence may provide the best return on treatment dollars.<sup>74</sup>

Many youth become involved in the juvenile justice system as a consequence of substance abuse.<sup>75</sup> A substantial proportion will resume abusing drugs after they are released from detention.<sup>76</sup> The challenge for child psychiatry is to slow the revolving door between the detention center and the community. The Patient Protection and Affordable Care Act (PPACA) provides reason for optimism because treatment for SUD is considered an “essential health benefit” that must be provided by Medicaid and the insurance exchanges to youth in the community.<sup>77</sup> (The PPACA does not pertain to services provided to prisoners.<sup>78</sup>) Nevertheless, challenges remain. Child psychiatrists and other mental health specialists must collaborate with the police, courts, and detention centers to ensure that youth accused of minor offenses are diverted from juvenile justice to receive needed services, develop more effective treatments for incarcerated youth, and improve the systems that serve released detainees when they return.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgments

This work was supported by National Institute on Drug Abuse grants R01DA019380, R01DA022953, and R01DA028763; National Institute of Mental Health grants R01MH54197 and R01MH59463 (Division of Services and Intervention Research and Center for Mental Health Research on AIDS); and grants 1999-JE-FX-1001, 2005-JL-FX-0288, and 2008-JF-FX-0068 from the Office of Juvenile Justice and Delinquency Prevention. Major funding was also provided by the National Institute on Alcohol Abuse and Alcoholism, the National Institutes of Health (NIH) Office of Behavioral and Social Sciences Research, Substance Abuse and Mental Health Services Administration (Center for Mental Health Services, Center for Substance Abuse Prevention, Center for Substance Abuse Treatment), the NIH Center on Minority Health and Health Disparities, the Centers for Disease Control and Prevention (National Center for Injury Prevention and Control and National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention), the NIH Office of Research on Women’s Health, the NIH Office of Rare Diseases, Department of Labor, Department of Housing and Urban Development, The William T. Grant Foundation, and The Robert Wood Johnson Foundation. Additional funds were provided by The John D. and Catherine T. MacArthur Foundation, The Open Society Institute, and The Chicago Community Trust.

Drs. Welty and Han served as the statistical experts for this research.

The authors thank their participants for their time and willingness to participate, as well as the Cook County Juvenile Temporary Detention Center, Cook County Department of Corrections, and Illinois Department of Corrections for their cooperation.

Dr. Welty has received an honorarium to cover travel costs as an invited speaker from the Association for Clinical and Translational Science. Dr. Abram has received travel reimbursements and an honorarium from the American Institutes for Research, Neglected or Delinquent Technical Assistance Center for the Education of Children/Youth Who Are Neglected or At-Risk (NDTAC). Dr. Teplin has received payment from [Indivior.com](http://Indivior.com) (McCann Complete Medical Inc.) to take part in a survey.

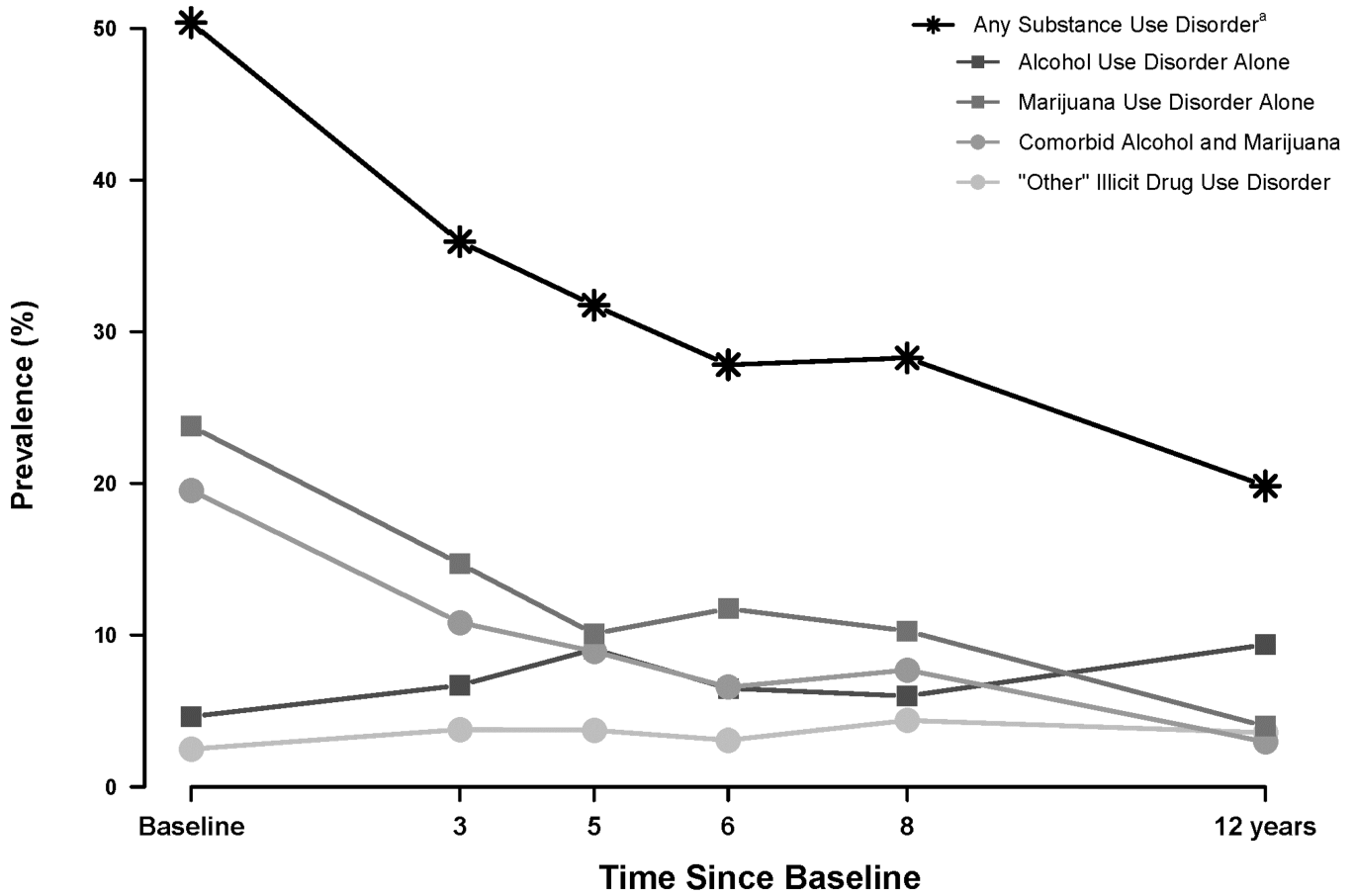
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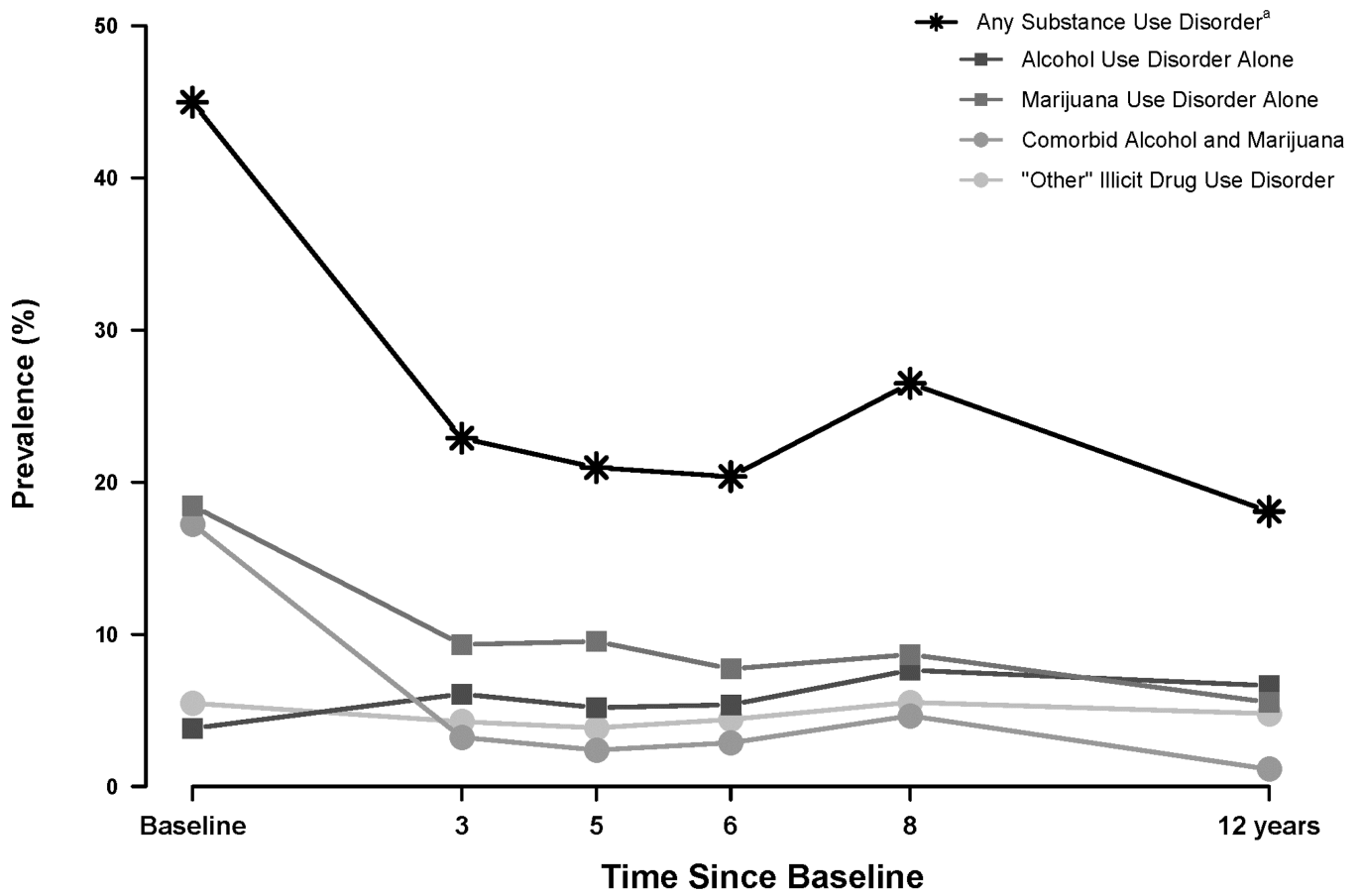
**Figure 1.** Prevalence of substance use disorders (SUDs) during the 12 years after detention in Cook County (Chicago): males (n = 1,142). Note: Prevalence estimates for any SUD and its mutually exclusive subcategories during the 12 years after detention for males are shown.

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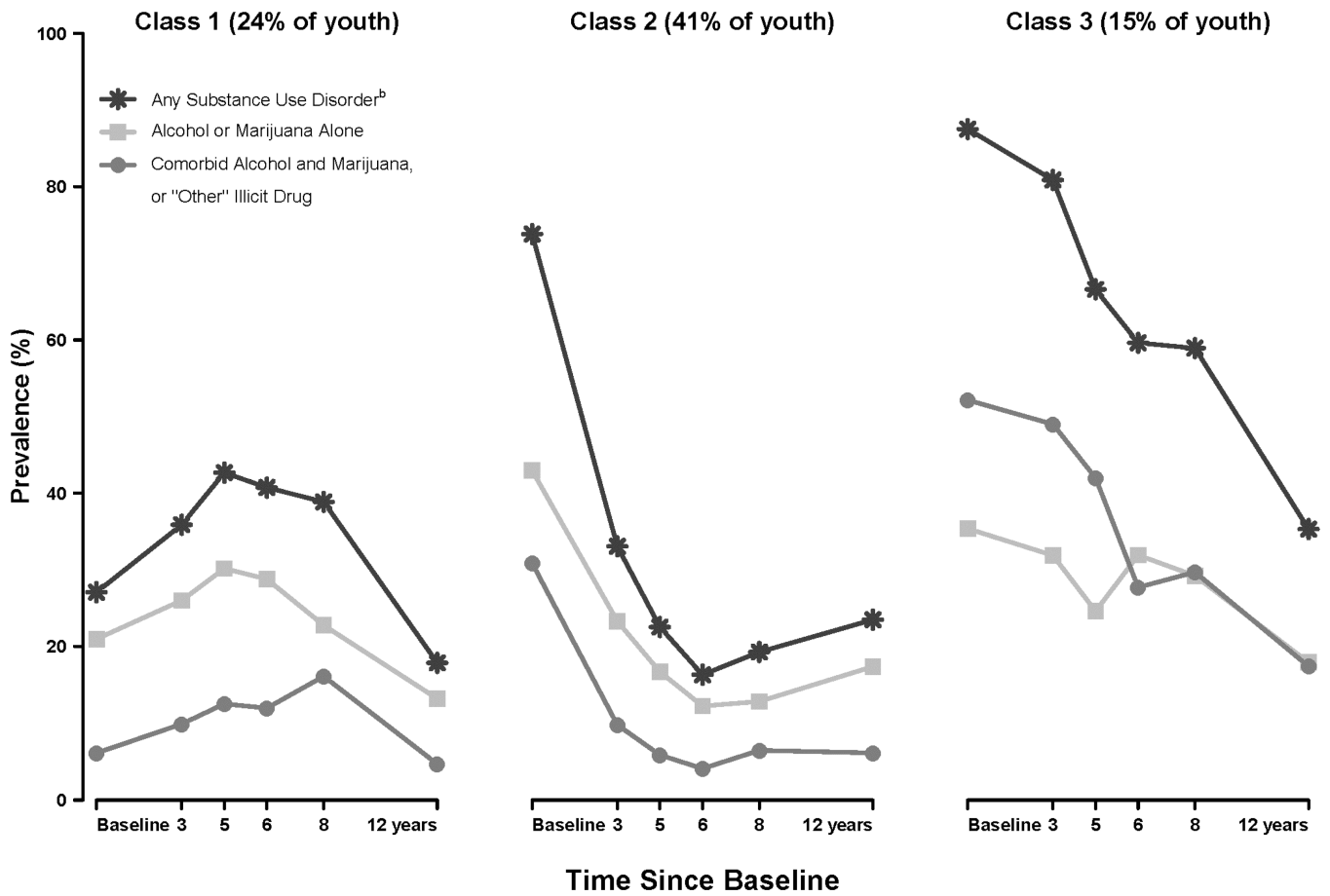
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**Figure 2.** Prevalence of substance use disorders (SUDs) during the 12 years after detention in Cook County (Chicago): females (n = 631). Note: Prevalence estimates for any SUD and its mutually exclusive subcategories during the 12 years after detention for females are shown.





**Figure 3.** Trajectories of substance use disorder (SUD) in juvenile delinquents during the 12 years after detention (n = 1,822). Note: Prevalence of any SUD and its subcategories (alcohol or marijuana alone; comorbid/“other” illicit) for each of the three trajectory classes. The 19.6% of youth who never had a SUD at any follow-up interview are not shown. Subcategories of any SUD are mutually exclusive.

**Table 1**Demographic Characteristics of the Sample at the Baseline Interview and 12 Years Later<sup>a</sup>

Characteristic	Baseline (n = 1,829)		Time 5, 12 years later <sup>b</sup> (n = 1,519)	
	No.	(%)	No.	(%)
<b>Race/Ethnicity</b>				
African American	1,005	(55)	879	(58)
Non-hispanic white	296	(16)	228	(15)
Hispanic	524	(29)	410	(27)
Other	4	(0)	2	(0)
<b>Gender</b>				
Male	1,172	(64)	943	(62)
Female	657	(36)	576	(38)
<b>Legal Status at Detention</b>				
Processed in adult court	275	(15)	230	(15)
Processed in juvenile court	1,554	(85)	1,289	(85)
<b>Age (years)</b>				
Mean (SD)	14.9	(1.4)	27.6	(1.4)
Median	15		28	
Range	10–18		22–32	
<b>Nonresponse</b>				
Died	—		97	
Refused	—		69	
Skipped interview <sup>c</sup>	—		135	
Interview out of range <sup>d</sup>	—		9	

<sup>a</sup>Percentages may not sum to 100% due to rounding error.<sup>b</sup>At Time 5, 83.1% (n=1,519) of the sample was retained.<sup>c</sup>Participant was not located in time to be interviewed.<sup>d</sup>The participant was interviewed more than 1.5 years after the interview due date.

**Table 2** Predicting Trajectory Class Membership Using Gender, Race/Ethnicity, and Age at Baseline (N = 1,822)<sup>a</sup>

	% in Each Group			Odds Ratios (95% CI) Predicting Class Membership <sup>b</sup>			
	No SUD	Class 1	Class 2	Class 3	No SUD vs. All Classes	Class 3 vs. Class 2	Class 2 vs. Class 1
<b>Overall</b>	19.6	24.5	41.3	14.6			
<b>Gender</b>							
Female	30.4	8.6	54.7	6.3	Reference <sup>b</sup>	Reference <sup>b</sup>	Reference <sup>b</sup>
Male	18.7	25.8	40.3	15.2	<b>0.5 (0.4–0.7)</b>	1.1 (0.4–3.3)	<b>3.6 (2.0–6.7)</b> 0.3 (0.1–1.1)
<b>Race/Ethnicity</b>							
African American	20.6	25.5	44.8	9.1	Reference <sup>c</sup>	Reference <sup>c</sup>	Reference <sup>c</sup>
Hispanic	17.2	22.1	29.8	30.9	0.8 (0.5–1.2)	2.5 (0.9–6.5)	<b>3.8 (1.6–9.2)</b> 0.6 (0.2–1.9)
Non-Hispanic white	11.7	18.4	26.3	43.5	<b>0.5 (0.3–0.8)</b>	<b>4.7 (1.8–12.2)</b>	<b>6.0 (2.9–12.4)</b> 0.8 (0.3–2.0)
<b>Age at Baseline<sup>d</sup></b>					1.0 (0.9–1.2)	<b>2.1 (1.4–3.3)</b>	1.0 (0.6–1.5) <b>2.2 (1.1–4.2)</b>
10–13 years	31.0	53.6	11.9	3.6			
14–16 years	14.2	34.3	38.5	13.0			
17+ years	22.3	10.6	49.2	17.9			

Note: Odds ratios in boldface type are significantly different from 1.0 with P < .05. SUD = substance use disorder.

<sup>a</sup>Prevalence estimates and odds ratios are weighted to adjust for sampling design and to reflect the demographic characteristics of the Cook County Juvenile Temporary Detention Center. Four participants who identified as “other” race/ethnicity and 3 participants who never completed the Diagnostic Interview Schedule for Children (DISC) (baseline interview) or the Diagnostic Interview Schedule (DIS) (follow-up interviews) are excluded from the table.

<sup>b</sup>Odds ratios comparing Classes 1, 2, and 3 were estimated within our growth mixture model to account for uncertainty in assigning participants to the latent classes. Odds ratios comparing the no-SUD group to all classes were estimated using logistic regression outside the growth mixture model framework.

<sup>c</sup>The reference group is females.

<sup>d</sup>The reference group is African Americans. Odds ratios (95% CI) for Hispanics compared with non-Hispanic whites are as follows: Class 3 vs. Class 1, 1.9 (0.7–5.1); Class 3 vs. Class 2, 1.6 (0.7–3.5); Class 2 vs. Class 1, 1.2 (0.3–4.4); and no SUD vs. all others, 1.6 (0.9–2.6).

<sup>e</sup>Odds ratios (95% CI) are given per every year. For example, the odds ratio of 2.1 means that compared with a participant who is 14 years at baseline, a participant who is 15 years has 2.1 times the odds of being in Class 3 compared with Class 1.