

“Falling Through the Cracks:” Young Adults, Drugs, and Incarceration

Follow-up on: Welty LJ, Harrison AJ, Abram KM, et al. Health disparities in drug- and alcohol-use disorders: a 12-year longitudinal study of youths after detention. Am J Public Health. 2016;106(5):872–880.

As a clinician working with high-risk youths in New York City, many of whom are justice-involved and substance users, I applaud Welty et al.¹ for their illuminating article in the May issue of *AJPH*. Their study revealed many noteworthy findings, including the declining prevalence of substance-use disorders (SUDs) among justice-involved youths from about 50% at baseline to nearly 20% 12 years later.¹ However, that level of involvement remains substantially higher than the 8.4% of Americans in the general population with SUDs.²

Sustained involvement with alcohol and drugs may be an important factor predisposing individuals to continued engagement in criminal activities. Approximately 30% of the more than two million adults incarcerated in the United States were arrested as juveniles, and more than 84% report involvement with substances.³

Given the extraordinary economic burden of mass incarceration on society—not to mention its profound effects on the individual, their family, and their community—it is critical that we examine strategies to address factors contributing to reducing recidivism, including effective substance abuse treatment.

Furthermore, we need to also be mindful that substance use is often comorbid with other health problems. I run a program called Project

STAY (Services to Assist Youth) that provides comprehensive medical and psychosocial services to youths at risk for, or living with, HIV. The following case is illustrative of the syndemic connections between substance use, incarceration, and other health issues:

Ricky is a 19-year-old African American male who was arrested on a robbery charge and sent to a New York City jail. Prior to incarceration, he reported substantial involvement with multiple drugs (marijuana, cocaine, and ecstasy), as well as alcohol. He was screened for sexually transmitted infections and HIV while incarcerated, and initial tests were negative. He was discharged with no specific aftercare plans. Upon reentry into the community, he quickly reengaged in alcohol and substance use to reduce “stress.” Additionally, he had unprotected sex with multiple partners (male and female) and subsequently developed a penile discharge. He was seen at the New York City Department of Health and Mental Hygiene clinic and was found to have gonorrhea, for which he was treated. A rapid HIV test done at this time was positive, and he was referred to Project STAY for comprehensive disease management.

While this is a solitary case, review of the literature suggests that there may be many more “Ricky’s” falling through the cracks in our legal, correctional, social service, educational, and health systems. Previous work by Teplin et al. revealed that 63% of detained youths with SUDs engaged in five or more sexual risk behaviors that enhance vulnerability for acquiring sexually transmitted infections and HIV.⁴ Furthermore, SUDs are often comorbid with mental health conditions, which may complicate and prolong treatment regimens.⁵

Therefore, failure to address SUDs and comorbid conditions may have substantial health consequences. Conversely, providing appropriate services may reduce community burden of disease and provide a stabilizing effect on communities. However, available evidence suggests that assessment for SUDs among justice-involved youths is inconsistent. For example, in a national survey of 141 juvenile institutional and community corrections facilities, only 47.6% used standardized substance use assessments.⁶ Similarly, delivery of services is limited; 44.5% of facilities provided substance abuse treatment, often only in the form of group counseling sessions. Only 51% of substance-using youths in residential facilities and 31% in jail were referred to community-based treatment facilities upon discharge.⁶

Recommendations for improving assessment and service delivery have been developed by the National Institute on Drug Abuse and the Substance Abuse and Mental Health Services Administration. They reflect findings in addiction research that substance abuse is a chronic condition that often requires long-term intervention. For individuals involved in the justice system, recommendations include “intercepting” individuals with behavioral and substance use issues at key

points along the carceral continuum (at prearrest, arrest and early detention, and reentry from detention, jails, and prison back into the community). These recommendations also call for more flexibility within the judicial system in identifying individuals with mental health and substance use problems, and diverting them, if possible, to community-based programming or linking them with targeted services following incarceration to prevent further involvement with the judicial system.

Additionally, the National Center on Addiction and Substance Abuse at Columbia University (CASA) suggests the importance of providing health care, education, and job training to assist in stabilizing justice-involved youths throughout the process of substance use treatment. However, closing gaps in care requires structural changes in communication between service providers, along with better coordination and integration of services. Furthermore, it requires an infusion of resources to establish, maintain, and evaluate. The Affordable Care Act will enhance insurance coverage, and Medicaid redesign efforts, coupled with the development of patient-centered medical homes, has potential to improve services for vulnerable populations. But a concerted focus on justice-involved youths is needed to ensure that they benefit from these initiatives.

Furthermore, concern is raised about the capacity to meet the needs of justice-involved youths with SUDs. It is estimated that more than 800 000 of these

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young people need treatment, but that figure is six times greater than the number of available treatment slots.⁷ Therefore, there is a concomitant need to recruit and train more substance use treatment and mental health professionals, arm them with evidenced-based assessments and interventions, and develop opportunities for them to work with youths, families, and interdisciplinary teams of other professionals and service providers.

Ideally, we also need to develop primary upstream interventions aimed at improving social determinants of health and reducing the number and severity of adverse childhood experiences or ACEs that may contribute to SUDs and delinquency, while simultaneously addressing factors contributing to the hyperincarceration of minority youths. In the interim, youths presenting at the various doorsteps of the justice system are in need of, and deserve, a second chance to turn their lives around.

Clearly, this will be expensive. However, the estimated annual costs to society attributed to

substance-using, justice-involved youths is between 27.5 and 42.2 billion dollars.⁸ These include costs for law enforcement, detention, probation, and providing services for victims of juvenile felonies. And, just as clearly, the current standard of care is failing young men like Ricky.

Conversely, it is estimated that if all substance-using juvenile and adult offenders were provided evidence-based treatment services during confinement and upon release back into the community, the annual costs may be upward of 12.6 billion dollars.³ While this represents a significant investment in resources, we would recoup our costs if just 11% of these individuals remained substance-free, out of jail or prison, and gainfully employed for one year. Further benefits to society accrue if these patterns continue over time—at levels reaching more than \$90 000 per inmate per year with respect to savings in decreased crime, lower incarceration rates, and improved health coupled with the benefits of employment.³

At the Incarceration and Public Health Action Network—a coalition composed of schools of

public health and other academic institutions concerned about the impact of mass incarceration on the health of our communities—we look forward to working with community advocates, governmental and private funders, and others in the judicial, correctional, legal, educational, vocational, and health sectors to develop creative solutions designed to enhance health outcomes for individuals involved with the justice system. Since his referral to our program, Ricky's viral load is undetectable, his substance use is reduced, he is employed, and he is going to college. But it took getting HIV for him to get the type of coordinated, integrated services needed to stabilize his life. We can, and must, do better. **AJPH**

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A Public Health of Consequence: Review of the June 2016 Issue of *AJPH*

This month, in our invited editorial, Westreich et al.¹ provide an important illustration of the implications that a public health of consequence lens has for causal thinking in the population health sciences. Centrally, Westreich et al. make two points. First, they note that thinking about the consequences of our work for population health elevates the importance of external validity. Simply put, our work is unlikely to be consequential if we cannot use it

to guide inference about the populations whose health we aim to improve. This point may seem simple at face value, but it both challenges conventional wisdom in the field² and upends our currently established hierarchy of study designs. As Westreich et al. and others continue to note, randomized clinical trials (RCTs) depend on stringent inclusion criteria, aimed at improving these studies' internal validity. This, however, frequently limits the extent to which RCTs

are representative of broader populations, limiting the inferences we can extend from the findings of these studies to these same populations. This observation is readily

borne out by the abundant examples of RCT results³ coming in conflict with findings from equally well-done observational studies.⁴ This challenges our notion that RCTs represent a gold standard. While they might represent an outstanding study design to improve internal validity, they are less well suited to external validity and

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Health Disparities in Drug- and Alcohol-Use Disorders: A 12-Year Longitudinal Study of Youths After Detention

Leah J. Welty, PhD, Anna J. Harrison, MS, Karen M. Abram, PhD, Nichole D. Olson, PhD, David A. Aaby, MS, Kathleen P. McCoy, PhD, Jason J. Washburn, PhD, and Linda A. Teplin, PhD

Objectives. To examine sex and racial/ethnic differences in the prevalence of 9 substance-use disorders (SUDs)—alcohol, marijuana, cocaine, hallucinogen or PCP, opiate, amphetamine, inhalant, sedative, and unspecified drug—in youths during the 12 years after detention.

Methods. We used data from the Northwestern Juvenile Project, a prospective longitudinal study of 1829 youths randomly sampled from detention in Chicago, Illinois, starting in 1995 and reinterviewed up to 9 times in the community or correctional facilities through 2011. Independent interviewers assessed SUDs with Diagnostic Interview Schedule for Children 2.3 (baseline) and Diagnostic Interview Schedule version IV (follow-ups).

Results. By median age 28 years, 91.3% of males and 78.5% of females had ever had an SUD. At most follow-ups, males had greater odds of alcohol- and marijuana-use disorders. Drug-use disorders were most prevalent among non-Hispanic Whites, followed by Hispanics, then African Americans (e.g., compared with African Americans, non-Hispanic Whites had 32.1 times the odds of cocaine-use disorder [95% confidence interval = 13.8, 74.7]).

Conclusions. After detention, SUDs differed markedly by sex, race/ethnicity, and substance abused, and, contrary to stereotypes, did not disproportionately affect African Americans. Services to treat substance abuse—during incarceration and after release—would reach many people in need, and address health disparities in a highly vulnerable population. (*Am J Public Health.* 2016;106:872–880. doi: 10.2105/AJPH.2015.303032)

The Department of Justice estimates that, among males born in 2001, 1 in 3 African Americans and 1 in 6 Hispanics will be incarcerated at some point during their lifetime, compared with 1 in 17 non-Hispanic Whites.¹ Racial/ethnic minorities are disproportionately incarcerated, especially for drug crimes.^{2–4} More than 2.4 million youths and adults are currently incarcerated in the United States.^{5–7} Every year, there are nearly 1.4 million arrests of juveniles; more than 250 000 cases result in detention.⁸ Substance abuse is a significant problem among youths in the juvenile justice system.^{9,10} More than 90% report having used illicit drugs.¹¹ Irrespective of sex or race/ethnicity, substance-use disorders (SUDs) are the most common psychiatric disorders among delinquent youths: 49% to 76%^{12,13} of males and 34% to 77%^{12–14} of females have an SUD.

After detention, SUDs present a continuing challenge for the community mental health system. Most stays in detention are brief (median, 15 days),¹⁵ and when detained youths return to their communities, a substantial proportion may need treatment of SUDs as they age.¹⁶ Delinquent youths face

challenges attaining adult social roles,¹⁷ such as establishing stable careers¹⁸ and families¹⁹; continued substance abuse further compromises their futures.

Despite its importance, few longitudinal studies of delinquent youths have examined the prevalence of substance abuse during young adulthood. We searched the literature for prospective longitudinal studies of youths in the juvenile justice system conducted since 1990 that met the following criteria: (1) followed youths during young adulthood (≥ 21 years) and (2) measured alcohol or drug use or disorder. Only 3 studies met these criteria (summary table available from authors).^{16,20–22} These studies found that substance abuse remained prevalent as youths aged.

Although these previous investigations provide important information, they have limitations. Ramchand et al. examined only symptoms of dependence, not diagnoses.²⁰ Diagnoses provide a more systematic, consensually understood, and clinically meaningful description of the frequency, severity, and recency of symptoms.^{23–26} Moreover, this study oversampled offenders referred for substance abuse treatment, thus biasing the sample.²⁰ Chitsabesan et al. sampled fewer than 100 participants and had nearly 50% attrition; this study was conducted in the United Kingdom, limiting generalizability to

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the United States.²² Teplin et al. examined youths only up to a median age of 20 years.^{16,21} Most important, all 3 studies combined drugs with dramatically different etiologies and consequences—for instance, marijuana (now legal in some states^{27–33}) and “hard drugs” (e.g., cocaine, hallucinogens or PCP [phencyclidine], opiates). This approach obfuscates important differences: substances vary widely in their immediate and long-term effects on brain chemistry,^{34–38} effects on health (such as risk for HIV, fatal overdose, drug-induced psychosis, myocardial infarction, liver disease, neurotoxic effects, and pancreatitis),^{39–43} and social consequences (e.g., unemployment⁴⁴ and risk for adolescent pregnancy⁴⁵).

We addressed the limits of previous investigations. To our knowledge, this is the first comprehensive epidemiological study of SUDs in delinquent youths during young adulthood (up to median age 28 years). We used data from the Northwestern Juvenile Project to assess 9 SUDs: alcohol, marijuana, cocaine, hallucinogen or PCP, opiate, amphetamine, inhalant, sedative, and unspecified drug. Focusing on sex and racial/ethnic differences, we used multiple follow-up interviews to examine (1) lifetime prevalence of SUDs and (2) changes in the past-year prevalence of SUDs during the 12 years after youths leave detention. The sample is large ($n = 1829$), includes males ($n = 1172$) and females ($n = 657$), and is racially/ethnically diverse.

This study is timely, providing data needed to address health disparities. Hispanics are especially important to study because they are now the largest ethnic minority in the United States, constituting 16.3% of the population.⁴⁶ Together, African Americans and Hispanics constitute more than one third of young adults in the general population⁴⁷ but approximately two thirds of persons incarcerated in juvenile⁷ and adult facilities.⁴⁸

METHODS

The most relevant information is summarized here. Additional detail is in the “eMethods,” available as a supplement to the online version of this article at <http://www.ajph.org>, and is published elsewhere.^{12,16,49,50}

Sample and Procedures

We recruited a stratified random sample of 1829 youths at intake to the Cook County Juvenile Temporary Detention Center in Chicago, Illinois, between November 20, 1995, and June 14, 1998, who were awaiting the adjudication or disposition of their case. The Cook County Juvenile Temporary Detention Center is used for pretrial detention and for offenders sentenced for less than 30 days. To ensure adequate representation of key subgroups, we stratified our sample by sex, race/ethnicity (African American, non-Hispanic White, Hispanic, other), age (10 to 13 years or ≥ 14 years), and legal status (processed in juvenile or adult court). The sample included 1172 males and 657 females; 1005 African Americans, 296 non-Hispanic Whites, 524 Hispanics, and 4 other race/ethnicity; mean age, 14.9 years (Table A, available as a supplement to the online version of this article at <http://www.ajph.org>). Face-to-face structured interviews were conducted at the detention center in a private area, most within 2 days of intake.

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. Interviews were conducted through 2011.

Participants signed either an assent form (if they were aged < 18 years) or a consent form (if they were aged ≥ 18 years). The Northwestern University institutional review board and the Centers for Disease Control and Prevention institutional review board approved all study procedures and waived parental consent for persons younger than 18 years, consistent with federal regulations regarding research with minimal risk.²³

Measures

Baseline. We administered the Diagnostic Interview Schedule for Children, version 2.3 (DISC 2.3),^{51,52} based on the *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition (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 or PCP) for the past 6 months. We derived diagnoses for specific “other” illicit drug use—disorders the same way the DISC 2.3 scores alcohol- and marijuana-use disorders.

Follow-up interviews. For follow-up interviews, we administered the Diagnostic Interview Schedule, version IV (DIS-IV)^{53,54} because the DISC was not sufficiently comprehensive to cover the substance use behaviors of aging delinquent youths. The DIS-IV assesses SUDs in the year before the interview for alcohol, marijuana, and the following specific “other” illicit drugs: amphetamines, sedatives, cocaine, opiates, hallucinogens or PCP, inhalants, and unspecified drugs. As in our earlier work,¹⁶ we checked that changes in prevalence over time were not attributable to changes in measurement. To facilitate comparison with other large-scale epidemiological studies of SUDs,^{55–58} we report both lifetime and past-year prevalence.

Statistical Analysis

We conducted all analyses with commercial software (Stata version 12; Stata Corp LP, College Station, TX) with its survey routines. To generate prevalence estimates and inferential statistics that reflect Cook County Juvenile Temporary Detention Center’s population, we assigned each participant a sampling weight augmented with a nonresponse adjustment to account for missing data.⁵⁹ We used Taylor series linearization to estimate standard errors.^{60,61}

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 A summarizes sample demographics and retention, and shows that 83% of participants had a time-5 interview. Race/ethnicity (African American, Hispanic, non-Hispanic White, other) was self-identified.

We used logistic regression to examine sex and racial/ethnic differences in lifetime prevalence 12 years after baseline.

Changes in prevalence over time. We used all available interviews, with an average of 7 interviews per person (range = 1–10

interviews per person). We used generalized estimating equations⁶² to fit marginal models examining (1) differences in the prevalence of SUDs by sex and race/ethnicity over time and (2) changes in the prevalence of disorders over time. Unless otherwise noted, odds ratios contrast sex and race/ethnicity over time.

All generalized estimating equation models included covariates for sex, race/ethnicity (African American, Hispanic, or non-Hispanic White), aging (time since baseline), age at baseline (10–18 years), and legal status at detention. We excluded the 4 participants who identified as “other” race/ethnicity. We modeled time since baseline with restricted cubic splines. When main effects were significant, we estimated models with the corresponding interaction terms. We included only statistically significant interaction terms in final models. For models with significant interactions between sex and aging, we report model-based odds ratios for sex differences at 3, 5, 8, and 12 years after baseline. There were no significant interactions between sex and race/ethnicity; for the interested reader, however, we provide prevalence estimates for specific subgroups in the tables available as supplements to the online version of this article at <http://www.ajph.org>. Because incarceration may restrict access to substances, all models included covariates for time incarcerated before each interview. We estimated all generalized estimating equation models with sampling weights to account for study design.

Missing data. Although attrition was modest (Table A), and we augmented sampling weights with nonresponse adjustments, we used multiple imputation by chained equations^{63–65} 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.^{66,67} Because there were no substantive differences in findings (tables available from authors), we present results with the original data.

RESULTS

Twelve years after baseline (median age = 28 years), more than 90% of males and nearly 80% of females had a lifetime SUD

(Table 1). Compared with females, males had higher lifetime prevalence of any SUD and its subcategories alcohol-use disorder, any drug-use disorder, and marijuana-use disorder. By contrast, females had higher lifetime prevalence of cocaine-, opiate-, amphetamine-, and sedative-use disorder. Lifetime prevalence of “other” illicit drug-use disorder and its subcategories—cocaine, opiate, amphetamine, and hallucinogen or PCP (males only)—were significantly higher among non-Hispanic Whites, followed by Hispanics, then African Americans (Tables B and C, available as supplements to the online version of this article at <http://www.ajph.org>). Among females, minorities had lower lifetime prevalence of alcohol-use disorder. Sex and racial/ethnic differences remained even when we excluded participants who had been incarcerated during the entire follow-up period (tables available from authors).

Prevalence of Past-Year Disorders Over Time

Figure 1 illustrates racial/ethnic differences over time for any SUD. Figures 2, 3, and 4 illustrate the differences for alcohol-, marijuana-, and cocaine-use disorders,

respectively. Additional figures are provided in Figures A through N, available as supplements to the online version of this article at <http://www.ajph.org>. Tables D through H (available as supplements to the online version of this article at <http://www.ajph.org>) provide specific prevalence estimates for all disorders. We describe findings by type of disorder.

Any SUD, Alcohol-Use Disorder, and Any Drug-Use Disorder

Although prevalence decreased, 12 years after baseline nearly 1 in 5 participants had an SUD and more than 1 in 10 had a drug-use disorder. The rate of decrease depended on sex (Table I, available as a supplement to the online version of this article at <http://www.ajph.org>).

Sex differences. There were no significant sex differences at baseline. After baseline, however, males had higher prevalence of SUDs than females (Figure A). For example, 5 years after baseline, males had 2.34 times the odds of alcohol-use disorder compared with females (95% CI = 1.76, 3.13). Sex differences were largest in the first half of the follow-up period.

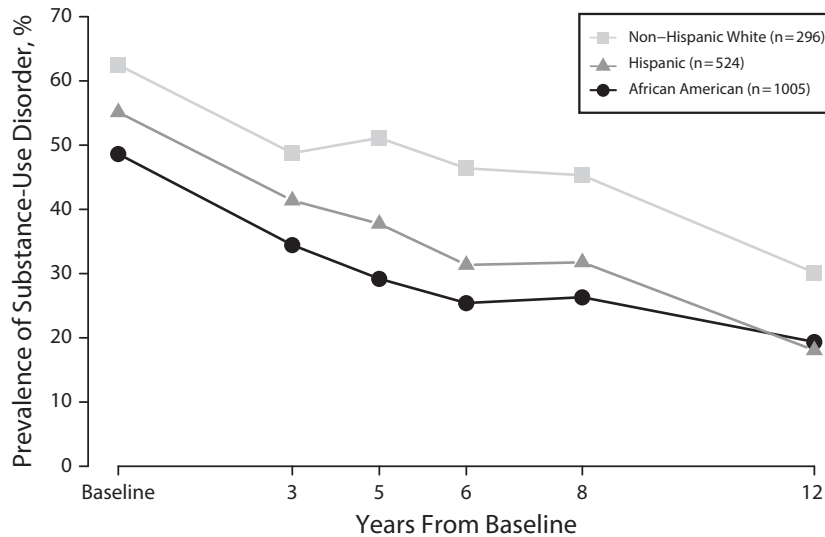
Racial/ethnic differences. Throughout the follow-up period, non-Hispanic Whites were significantly more likely than minorities to

TABLE 1—Lifetime Prevalence of Substance-Use Disorders by Sex From the Baseline Interview (1995–1998) Through Time 5 (12 Years Later): Cook County, Chicago, IL

Disorder	Prevalence, % (SE)			Male vs Female, OR (95% CI)
	Total	Male	Female	
Any substance-use disorder	90.4 (1.3)	91.3 (1.4)	78.5 (1.7)	2.9 (2.0, 4.2)
Alcohol-use disorder	77.4 (1.9)	78.6 (2.0)	62.4 (2.0)	2.2 (1.7, 2.9)
Any drug-use disorder	85.1 (1.6)	86.2 (1.7)	71.0 (1.8)	2.5 (1.8, 3.5)
Marijuana-use disorder	83.4 (1.6)	84.5 (1.8)	68.3 (1.9)	2.5 (1.9, 3.5)
Other illicit drug-use disorder	22.5 (1.6)	22.2 (1.8)	25.3 (2.0)	0.8 (0.6, 1.1)
Cocaine	10.9 (0.9)	10.5 (0.9)	16.6 (1.9)	0.6 (0.4, 0.8)
Hallucinogen or PCP	11.3 (1.2)	11.3 (1.3)	11.6 (1.9)	1.0 (0.6, 1.5)
Opiate	3.6 (0.6)	3.4 (0.6)	5.8 (0.8)	0.6 (0.4, 0.9)
Amphetamine	1.3 (0.2)	1.1 (0.2)	3.5 (0.6)	0.3 (0.2, 0.5)
Inhalant	0.5 (0.1)	0.4 (0.1)	1.0 (0.3)	0.4 (0.2, 1.02)
Sedative	1.1 (0.2)	0.8 (0.2)	5.0 (1.8)	0.2 (0.1, 0.4)
Unspecified drug ^a	9.3 (1.3)	9.4 (1.4)	7.9 (1.0)	1.2 (0.8, 1.9)

Note. CI = confidence interval; OR = odds ratio; PCP = phencyclidine. Descriptive statistics are weighted to adjust for sampling design and to reflect the demographic characteristics of the Cook County Juvenile Temporary Detention Center. All substance-use disorders are measured without impairment. At baseline, the sample included 1172 males and 657 females. At time 5, the sample included 943 males and 576 females.

^aIncludes other drugs not listed (e.g., betel nut, nitrous oxide, amyl nitrate [poppers], and ecstasy). Not assessed at baseline.

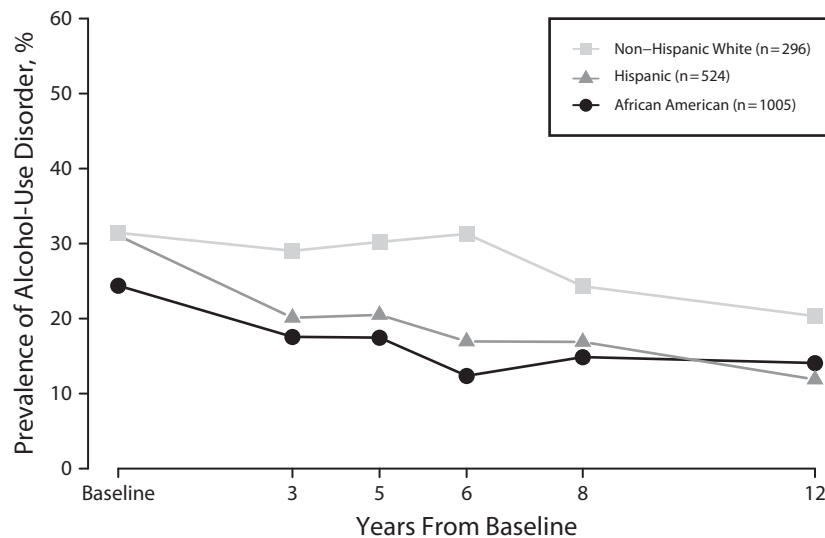


Note. Adjusted odds ratios (95% confidence intervals) for racial/ethnic differences over time were 1.9 (1.5, 2.3) for non-Hispanic White vs African American, 1.4 (1.1, 1.7) for non-Hispanic White vs Hispanic, and 1.4 (1.1, 1.7) for Hispanic vs African American.

FIGURE 1—Prevalence of Substance-Use Disorder by Race/Ethnicity From Baseline (1995–1998, at Detention) Through Time 5 (12 Years Later): Cook County, Chicago, IL

have any SUD and its subcategories, alcohol-use disorder and any drug-use disorder (Table I). For example, 8 years after baseline, nearly half of non-Hispanic Whites

had any SUD compared with about a quarter of African Americans and nearly a third of Hispanics (Table E). Moreover, Hispanics had significantly higher prevalence of any SUD



Note. Adjusted odds ratios (95% confidence intervals) for racial/ethnic differences over time were 1.7 (1.4, 2.2) for non-Hispanic White vs African American, 1.4 (1.1, 1.8) for non-Hispanic White vs Hispanic, and 1.2 (0.96, 1.5) for Hispanic vs African American.

FIGURE 2—Prevalence of Alcohol-Use Disorder by Race/Ethnicity From Baseline (1995–1998, at Detention) Through Time 5 (12 Years Later): Cook County, Chicago, IL

and its subcategory, any drug-use disorder, compared with African Americans.

Marijuana-Use Disorder

Prevalence of marijuana-use disorder decreased over time, but the rate of decrease depended on sex (Figure E and Table I).

Sex differences. There were no significant sex differences at baseline or 12 years later. In the interim, however, males had significantly higher prevalence than females. For example, 5 years after baseline, prevalence was 22.1% among males and 13.5% among females (adjusted odds ratio [AOR] = 2.51; 95% CI = 1.93, 3.26).

Racial/ethnic differences. Non-Hispanic Whites had greater odds of marijuana-use disorder compared with African Americans.

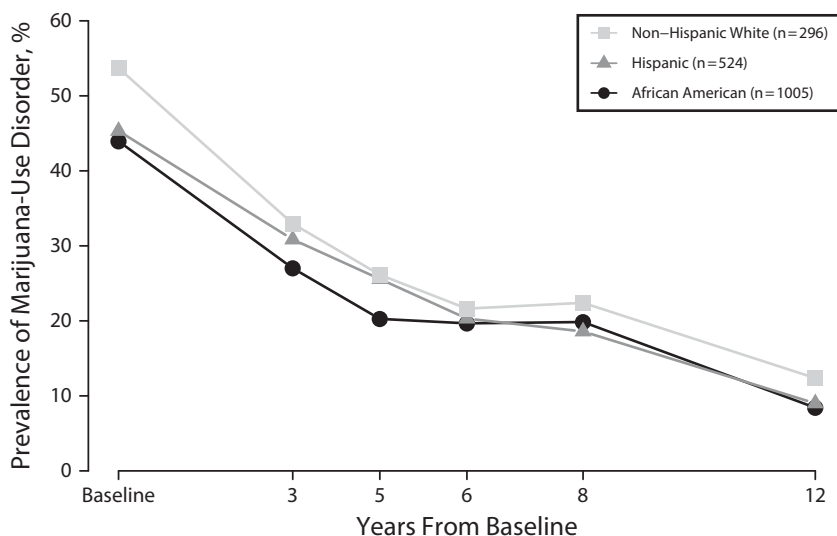
“Other” Illicit Drug-Use Disorder

“Other” illicit drug-use disorder includes “hard drugs,” such as cocaine-, hallucinogen or PCP-, opiate-, amphetamine-, sedative-, and unspecified drug-use disorder. Overall, prevalence did not decrease over time, and there were no significant sex differences (Table J, available as a supplement to the online version of this article at <http://www.ajph.org>).

Racial/ethnic differences. African Americans had the lowest prevalence of “other” illicit drug-use disorder, followed by Hispanics, then non-Hispanic Whites (Tables E through G). For example, 5 years after baseline, prevalence was 1.7% (African Americans), 7.1% (Hispanics), and 20.0% (non-Hispanic Whites). At this time point, non-Hispanic Whites had more than 19 times and Hispanics had more than 8 times the odds of “other” illicit drug-use disorder compared with African Americans (Table J). However, prevalence increased over time among African Americans (e.g., 8 years after baseline, 2.6%; AOR = 1.16 per year; 95% CI = 1.14, 1.28).

Subcategories of “Other” Illicit Drug-Use Disorder

Prevalence of hallucinogen or PCP-use disorder and amphetamine-use disorder decreased; opiate-use disorder and unspecified drug-use disorder increased. Table K (available as a supplement to the online version of this article at <http://www.ajph.org>) shows AORs describing sex and racial/ethnic



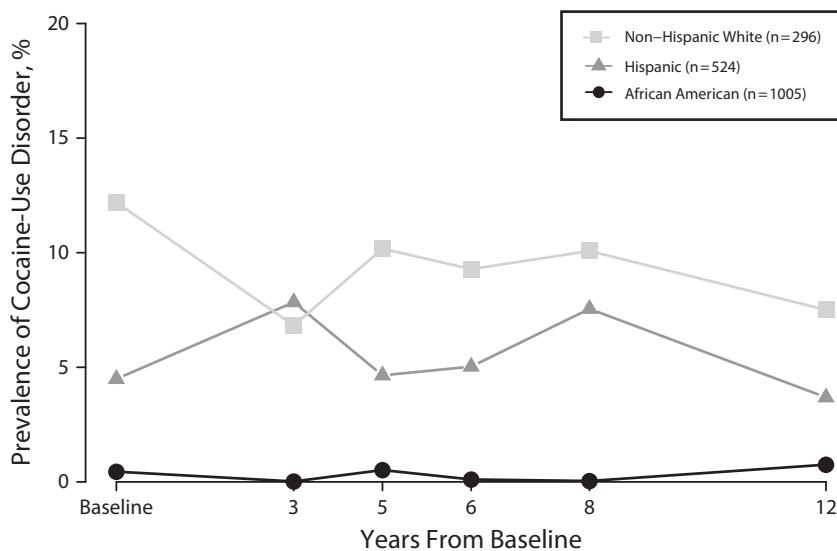
Note. Adjusted odds ratios (95% confidence intervals) for racial/ethnic differences over time were 1.3 (1.02, 1.6) for non-Hispanic White vs African American, 1.05 (0.8, 1.3) for non-Hispanic White vs Hispanic, and 1.2 (0.96, 1.5) for Hispanic vs African American.

FIGURE 3—Prevalence of Marijuana-Use Disorder by Race/Ethnicity From Baseline (1995–1998, at Detention) Through Time 5 (12 Years Later): Cook County, Chicago, IL

differences. Figure 4 and Figures I through N illustrate these differences for cocaine, opiate, and hallucinogen or PCP.

Sex differences. Females had significantly higher odds of opiate-, amphetamine-, and sedative-use disorder.

Racial/ethnic differences. Throughout the follow-up, prevalence was highest among non-Hispanic Whites, followed by Hispanics then African Americans. Compared with African Americans, non-Hispanic Whites had more than 30 times the odds of cocaine-use



Note. Adjusted odds ratios (95% confidence intervals) for racial/ethnic differences over time were 32.1 (13.8, 74.7) for non-Hispanic White vs African American, 1.5 (1.04, 2.2) for non-Hispanic White vs Hispanic, and 21.2 (9.0, 50.1) for Hispanic vs African American.

FIGURE 4—Prevalence of Cocaine-Use Disorder by Race/Ethnicity From Baseline (1995–1998, at Detention) Through Time 5 (12 Years Later): Cook County, Chicago, IL

disorder (Figure 4), 18 times the odds of hallucinogen or PCP-use disorder, and 50 times the odds of opiate-use disorder (Table K). Hispanics had more than 20 times the odds of cocaine-use disorder, and more than 7 times the odds of hallucinogen or PCP-use disorder and opiate-use disorder compared with African Americans.

Substance-Use Disorders Among Participants in the Community

Because substance use is restricted in jails and prisons, we examined SUDs only among participants who had lived in the community the entire year before their 12-year interview. This subgroup consisted of 434 males and 480 females. The racial/ethnic distribution was 499 African Americans, 239 Hispanics, 174 non-Hispanic Whites, and 2 “other” race/ethnicity.

Tables L, M, and N (available as supplements to the online version of this article at <http://www.ajph.org>) show prevalence estimates and demographic differences at time 5 (12 years after baseline) for all SUDs. Prevalence estimates and demographic differences for the subgroup were substantially similar to those for the overall sample.

DISCUSSION

To our knowledge, this is the first study of delinquent youths to document that SUDs during young adulthood differ markedly by sex, race/ethnicity, and substance abused. Drug-use disorders such as cocaine, hallucinogen or PCP, opiate, amphetamine, and sedatives were rare among African Americans, but prevalent among non-Hispanic Whites. Marijuana-use disorder was the most prevalent SUD during most of young adulthood, and more common among males than females. However, 12 years after baseline, alcohol-use disorder surpassed marijuana-use disorder.

Prevalence of SUDs dropped from about 50% at baseline (median age = 15 years) to nearly 20% 12 years later (median age = 28 years) among males and females. Similar to other delinquent behaviors, prevalence among females declined more rapidly than among males. This difference may be because delinquent females are more likely than delinquent males to receive services,⁶⁸ which may hasten recovery. Moreover, males are

incarcerated more frequently and for longer periods of time than females, thus decreasing their ability to build a stable life and positive connection in the community.^{17,69} Despite the decrease over time, prevalence of drug-use disorders is still higher than in the general population.^{55,56,70}

We found striking racial/ethnic differences. Contrary to popular stereotypes of African Americans,^{71,72} prevalence of drug-use disorders such as cocaine and hallucinogen or PCP was lowest among African Americans, followed by Hispanics, then non-Hispanic Whites. For example, non-Hispanic Whites had more than 30 times the odds of having cocaine-use disorder than African Americans. These racial/ethnic differences persisted even after we controlled for the additional time that African Americans spend in correctional facilities, where access to substances is restricted. Our findings add to the growing debate about how the “War on Drugs” has disproportionately affected African American youths and young adults.^{73–75} Recent investigations have found that although African American adolescents are no more likely than non-Hispanic Whites to use or sell drugs, they are more likely to be arrested on drug-related charges.^{76,77}

Lifetime SUDs were the rule, not the exception. By median age 28 years, more than 90% of males and nearly 80% of females had 1 or more SUDs—rates substantially higher than in the general population—irrespective of sex or race/ethnicity. (Comparative analyses of estimates obtained from the National Epidemiologic Survey on Alcohol and Related Conditions [NESARC], for those aged 25–30 years, are available from the authors.) The magnitude of difference, however, is notable. For example, two thirds of African American females had lifetime marijuana-use disorder compared with less than 10% of those in the NESARC; more than 85% of non-Hispanic White males had lifetime marijuana-use disorder compared with less than one fifth in the NESARC. A quarter of Hispanic females had ever had a hallucinogen or PCP-use disorder compared with about 2% in the general population.

Limitations

Our sample included participants from only 1 jurisdiction and may not be

generalizable to other parts of the country. We had too few participants of “other” race/ethnicity to generalize to racial/ethnic groups such as Asian American or Native American.

Findings do not take into account mental health or substance abuse services. Although recent studies find few differences in results between *DSM-IV* and *DSM-V* criteria,^{78,79} prevalence estimates might have been somewhat different had we used *DSM-V*. We did not examine comorbid psychiatric disorders, or the age at onset of SUD relative to comorbid disorders. Despite these limitations, our findings have implications for future research and public health policy.

Directions for Future Research

First, investigate incarcerated persons after release. Incarcerated populations have among the highest lifetime prevalence of SUDs.^{12,80,81} Yet nearly all large-scale epidemiological studies of SUDs exclude them.^{16,82} Ironically, we know least about the people who are at the greatest risk for the consequences of SUDs. Studies of US populations are especially needed because it has the highest incarceration rate in the world⁸³: 707 inmates per 100 000 residents, compared with 118 in Canada, 148 in England and Wales, and 470 in Russia.

Second, examine how patterns of incarceration affect substance abuse. Drug abuse and involvement in the drug economy often lead to arrest and incarceration. Incarceration may also exacerbate risk factors for substance abuse—for example, increasing depression,⁸⁴ interrupting education,⁸⁵ disrupting intimate relationships,^{86,87} and increasing deviant peer associations.^{88,89} Yet, to our knowledge, no large-scale study has examined how patterns of incarceration—number and duration of incarcerations, age when incarcerated, and experiences during parole and probation—affect the development, persistence, desistance, and recurrence of SUDs. Prospective studies are essential to address these public health concerns.

Implications for Public Policy

First, address—as a health disparity—the disproportionate incarceration of African Americans for drug offenses. Drug abuse appears to have greater consequences for racial/ethnic minorities, especially African

Americans, than for non-Hispanic Whites. Poor people, who are disproportionately racial/ethnic minorities, may be less able to afford treatment and, if arrested, less able to obtain effective legal counsel than persons of greater means. Specialized drug courts have the potential to divert persons to treatment, avoiding incarceration and associated consequences.^{90–92}

Second, improve the breadth and quality of preventive interventions, services during correctional stays, and care after prisoners are released. To date, insufficient services have been available to treat substance abuse. For example, about half of youths in detention⁹³ and nearly 80%⁹⁴ of adults in prison do not receive needed treatment of drug abuse.^{94–96} Although prisoners continue to be ineligible for Medicaid while serving time,⁹⁷ the Patient Protection and Affordable Care Act⁹⁷ expands services after release: it mandates equal coverage for SUD treatment, including it as an “essential health benefit,”⁹⁷ which must be provided by Medicaid and the insurance exchanges. Parity increases treatment provision for SUDs.⁹⁸ Moreover, of people released from jails, 25% to 30% could enroll in Medicaid in states that expanded Medicaid, and about 20% could enroll in a marketplace insurance plan.⁹⁹

Despite these improvements, service provision will continue to challenge the field for several reasons:

1. Prisoners are dependent on services provided by their facility.⁹⁹ Evidence-based treatment of mental disorders and substance abuse is critical. Yet, availability and quality of services vary.⁹⁹
2. Substance use disorders are often comorbid with other psychiatric disorders, particularly among youths in the juvenile justice system.^{21,49} Accurate diagnosis of comorbid conditions requires systematic assessment of both mental health and substance use problems.^{100,101} Traditional treatments are less effective for persons with comorbid disorders. Integrated treatment approaches are preferable, but not widely available.¹⁰²
3. After release, residents of states that have not expanded Medicaid (19 states as of January 2016¹⁰³) will have fewer resources available to them as federal funding declines for safety net services.^{104,105} Nearly

80% of funding for SUD treatment comes from public sources, of which Medicaid accounts for approximately one fourth.¹⁰⁶

4. Even in states that expanded Medicaid, specialty outpatient services (where most SUD treatment takes place) that accept Medicaid are unavailable in 40% of counties¹⁰⁵; inpatient programs that have more than 16 beds are not covered.¹⁰⁷

Substance abuse is among the most serious health problems in the United States. Illicit drug use and excessive alcohol consumption cost \$193 billion¹⁰⁸ and \$223.5 billion per year,¹⁰⁹ respectively, which includes costs associated with disruptions in work, increased health problems, and crime. Services to treat substance abuse—during incarceration and after release—would reach a sizeable proportion of people in need,⁹⁴ and address health disparities in a highly vulnerable population. **AJPH**

CONTRIBUTORS

All authors contributed to drafting and revising the article for important intellectual content. L. A. Teplin, A. J. Harrison, K. M. Abram, N. D. Olson, J. J. Washburn, and K. P. McCoy developed the rationale for the study. L. A. Teplin, K. M. Abram, A. J. Harrison, L. J. Welty, and J. J. Washburn conceptualized and designed the study. L. J. Welty, A. J. Harrison, K. M. Abram, N. D. Olson, J. J. Washburn, and L. A. Teplin conceptualized and designed the analysis. A. J. Harrison, D. A. Aaby, and L. J. Welty conducted the statistical analysis. L. J. Welty, A. J. Harrison, L. A. Teplin, K. M. Abram, D. A. Aaby, and J. J. Washburn interpreted the analysis and results. L. A. Teplin, K. M. Abram, L. J. Welty, and J. J. Washburn obtained funding. L. A. Teplin, K. M. Abram, and L. J. Welty supervised the study.

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HUMAN PARTICIPANT PROTECTION

The Northwestern University institutional review board and the Centers for Disease Control and Prevention institutional review board approved all study procedures consistent with federal regulations regarding research with minimal risk.

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