Journal of Urban Health: Bulletin of the New York Academy of Medicine, Vol. 85, No. 2
doi:10.1007/s11524-007-9246-7

Long-Term Patterns of Drug Use Among an Urban African-American Cohort: The Role of Gender and Family

Elaine Eggleston Doherty, Kerry M. Green, Heather Schacht Reisinger, and Margaret E. Ensminger

ABSTRACT *Cross-sectional analyses and the little existing longitudinal analyses on substance use over the life course have been integral in providing information about the epidemiology of substance use in the United States. However, it is unclear whether these estimates provide an accurate portrayal of long-term substance use patterns among African-American men and women who have grown up in an inner city environment. The current study uses longitudinal data from a community cohort of African-American inner-city males and females followed from first grade through mid-adulthood. It identifies the substance use patterns through mid-adulthood, including lifetime prevalence, age of onset and termination, and sequencing of substance classes, as well as the risk of initiation of substance use changes over the life course using survival analysis. It also investigates whether early family structure and process play a role in drug use initiation throughout the life course, and whether the relationship between family factors and drug initiation differs by gender. Overall, among the general trends of use, we find a considerable amount of abstention with over 40% of the participants never using illegal drugs by mid-adulthood, over 70% never using cocaine, and over 90% never using heroin. With respect to onset, we find a long-term influence of early family factors on substance use, particularly for females. Family discipline in childhood and family cohesion and parental rule setting during adolescence seem to be key factors in predicting later substance use for females. The implications of these findings for future research and policy are discussed.*

KEYWORDS *Blacks/African Americans, Substance use, Epidemiology, Gender, Family*

INTRODUCTION

Cross-sectional studies have continually linked gender (i.e., males vs. females) and age to substance use with males using both legal and illegal substances at a higher rate than females[1] and both sexes initiating substances in mid to late adolescence.[2,3] The findings with regard to race and ethnicity are less clear. We use race here as a social construction rather than as an indicator of biological differences.[4,5] In urban centers where the population tends to be predominantly people of color, the

Doherty is with the Department of Criminology and Criminal Justice, University of Maryland, College Park, MD, USA; Green is with the Department of Public and Community Health, University of Maryland College Park School of Public Health, College Park, MD, USA; Reisinger is with the Center for Research in the Implementation of Innovative Strategies in Practice, Iowa City VA Medical Center, Iowa City, IA, USA; Ensminger is with the Department of Health, Behavior and Society, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA.

Correspondence: Elaine Eggleston Doherty, Department of Criminology and Criminal Justice, University of Maryland, 2220 LeFrak Hall, College Park, MD 20742, USA. (E-mail: edoherty@crim.umd.edu)

commonly held belief is that these neighborhoods are riddled with drug use and addiction. Counter to this perception, substance use is lower for African-American adolescents compared to non-Hispanic White adolescents and yet is higher for African Americans in young and mid-adulthood.[1,6] Longitudinal data that follow the same individuals over time offer additional information on initiation and desistance throughout the life course at the individual level.[7–9] However, most of this research focuses on White samples and has not followed individuals into mid-adulthood, leaving the long-term patterns of African-American substance use not well understood.

Patterns of drug use, in addition to varying by age, gender, and race/ethnicity, also vary by family factors.[10–13] Family structural forces, such as single-headed households and low education and occupational status among adults, to name a few,[14] are commonly assumed to be key influences on substance use and general delinquency. Family processes, such as parental attachment and involvement, have also been shown to be key elements in predicting adolescent substance use, especially among African Americans.[15–17] What remains unclear is how family factors affect substance use into mid-adulthood among African Americans and how these influences vary by gender.

The current study proposes to address each of these gaps. Whereas cross-sectional analyses and longitudinal data have been integral in providing information about the epidemiology of substance use in America, this study helps address whether current estimates provide an accurate portrayal of long-term substance use patterns among African-American men and women who have grown up in an inner city environment. The first objective of this study, then, is to outline substance use patterns for the legal and illegal substance classes of: (1) alcohol/tobacco, (2) marijuana, and (3) cocaine/heroin among an urban African-American cohort followed from first grade to age 42. In this paper, we focus on assessing the lifetime prevalence, the age of onset and termination, and the sequencing of different substance classes separately for males and females to examine gender differences. We then assess how the risk of initiation of substance use changes over the life course for different substances.

Our second objective is to investigate whether early family structure and process play a role in drug use initiation throughout the life course and if this impact differs by substance class. Specifically, we analyze the effects of family structure and process in childhood and adolescence on these substance classes controlling for childhood aggression and prior onset of other substances. We investigate the relationship between family factors and drug initiation separately by gender. Prior research has found few gender differences in the role of the family on substance use.[18,19] However, the existing research has not focused specifically on African Americans, and thus the notion of ethnicity by gender interactions has been overlooked. Therefore, we test if gender differences emerge in relation to how family influences initiation of drug use among a community cohort of African Americans from the Woodlawn community in Chicago.

METHODS

Study Population

The Woodlawn study is a prospective, longitudinal study of an epidemiologically defined cohort of 1,242 first graders, initiated in 1966–1967 (51.2% males).

Virtually all of the participants are African American (99%) and all attended one of the nine public and three parochial schools in Woodlawn, a community on the Southside of Chicago. The cohort of first graders was followed up in adolescence (ages 16–17), in early adulthood (ages 32–33), and most recently in mid-adulthood (ages 42–43). The initial sample included virtually all children within the first grade classrooms in the Woodlawn community resulting in little selection bias based on nonparticipation (only 13 families declined participation).

This community cohort provides a unique opportunity to test the heterogeneity in drug use patterns among urban African Americans over several decades. At the time of the initial study, Woodlawn was a socially disadvantaged, largely African American, inner-city community of Chicago. Although Woodlawn was predominantly poor in the mid-1960s, there was considerable diversity in economic and social structural backgrounds within this community because of the limited number of areas in which African Americans could live in Chicago. For instance, at the start of the study, 68% of the Woodlawn study families were not on welfare, 47% were above poverty level, and 42% of the participants mothers had 12 or more years of education.

All four waves of data were used in the current study. When the children were in first grade, their mothers or mother surrogates were interviewed about their child (ren) and their family. Teachers and clinicians reported on their behavior in the classroom and in standardized play situations. When the children were adolescents (ages 16–17), 75% of the mothers or mother surrogates ($N=939$) and 56% of the children ($N=705$) were reassessed. The retention percentage was relatively low at this assessment because only those who were living in the Chicago area were contacted during adolescence. Ninety-nine percent of adolescents assessed were living in Chicago, 26% still in Woodlawn. These adolescents were asked about family and school life, drug use, delinquency, sexual activity, and social bonds.[20–22]

When the participants were age 32, 80% ($N=952$) of the original living cohort were located and interviewed. These participants were interviewed about a variety of social, psychological, and behavioral domains, including involvement in a wide variety of legal and illegal substances. In 2002, 72% ($N=833$) of the living participants were interviewed using a similar interview schedule to the age 32 interview. Unlike most national surveys, interviews were conducted in jails and prisons. Taking the two adult interviews together results in 1,053 individuals with adult information, which is 85% of the original cohort (48% male).

Cohort Characteristics Although most of the cohort members had moved out of Woodlawn by the age 32 interview, they continue to represent urban dwellers enduring significant disadvantage. For instance, by age 32, 9% of the interviewed cohort still lived in Woodlawn and 65% remained in the city of Chicago. The remaining 26% had either moved to a Chicago suburb (10%) or moved outside of Chicago (16%). For the age 42 interviewed cohort, the majority of the cohort lived in an urban environment with 6% living in Woodlawn and 47% in the city of Chicago, with 15% and 32% living in a Chicago suburb or outside of Chicago, respectively. In addition, the rates of poverty were high, with over a third below the poverty level in 1992 (age 32) and a quarter in 2002 (age 42).

In terms of drug use, there are both similarities and differences between the Woodlawn cohort and rates from national surveys.[23] A comparison with the National Comorbidity Study (NCS), a cohort of similar age to the Woodlawn cohort, reveals that the Woodlawn cohort had higher rates of past year use of

marijuana, cocaine, and heroin than their national counterparts of all racial and ethnic backgrounds in young adulthood. Compared with the African-American subsample of the National Household Survey of Drug Abuse (NHSDA), the Woodlawn cohort reported consistently higher rates of lifetime illegal substance use and higher rates of past year use in young adulthood than their national African-American counterparts. Extending the past year comparisons to middle adulthood, the Woodlawn cohort assessed at age 42 began to have more similar past year prevalence to its national African-American counterparts assessed by the National Household Survey of Drug Abuse (NHSDA, ages 35–49). Both cohorts had 10–11% of individuals using marijuana in the past year, 5% reporting use of cocaine, and 1% reporting use of heroin in the past year.[24] Overall, these comparisons indicate that the Woodlawn cohort has higher rates of drug use than the nation as a whole and their national African-American counterparts until mid-adulthood when the Woodlawn cohort becomes more similar to other African Americans. However, there is still a great deal of heterogeneity in the prevalence of drug use even within this high-risk cohort, which needs to be elucidated to provide a more comprehensive portrayal of African-American substance use over the life course.

Measures

Substance Use Measures Both the early (1992) and mid-adult (2002) assessments of substance use were modeled after the modules developed at the University of Michigan for the National Comorbidity Survey (NCS) from the Composite International Diagnostic Interview (CIDI).[25,26] Each respondent was asked about his or her lifetime use of tobacco, alcohol, marijuana, cocaine, and heroin. If the answer to the lifetime use question was yes, the respondent was then asked the age of first and last use for each substance along with other details of use. For those participants who started using before age 32 and have data from both the early and mid-adult interviews, the early adult information on age of first use is used because it is the reporting time closest to the time of the behavior. Similarly, among those interviewed in both young and mid-adulthood, age of last use was drawn from the mid-adult interview to obtain the most current information.

Family Measures With regard to family structural variables, we include family type and mother's education assessed at the first interview (ages 6–7). *Family type* was based on the combinations of adults in the family of the first graders and included four types: mother and father present, mother alone, mother and other adults (not the father), and families with no mother present (mother absent). This variable was dichotomized into female-headed household (i.e., mother alone, 37%) or not. *Mother's education* is a continuous measure of years completed in school and ranged from 0 to 18 years (mean=10.6 years, s.d.=2.3 years). This measure also serves as a proxy for socioeconomic status (SES) at baseline as it is highly related to other measures of SES. For example, welfare receipt (whether the family was supported by welfare) and mother's education (0–11 years vs. 12+ years) are highly associated ($\chi^2=64.40$, $p<.001$). We did not include father's education as an additional measure of SES because of the high percentage of missing values for this measure (59%); most of the data came from families where the father was either no longer present in the family or had never been present in the family. In addition,

in this study as in many studies, father's education is significantly correlated with mother's education (r=.45; p<.0001).

Family process variables include family discipline, family communication, family affection, family involvement, and rule setting by parents. *Family discipline* is measured through two questions asked of the mother at the first grade assessment. These questions include the frequency of spanking, ranging from never to almost every day, and the frequency of punishment for misbehavior, ranging from hardly ever to always. The composite score of family discipline is a sum of these two items with a range of 1 to 9, a correlation of .27 (p<.001), and a mean of 5.4. The other family process variables were asked at the time of adolescence. *Family communication* includes questions about how often the child confides in adults in the family regarding family, friends, school, and the opposite sex. *Family affection* includes questions on how often the family act loving and warm to one another, hug and kiss, understand each other's moods, bring gifts, and say nice things to one another. *Family involvement* includes questions about spending time with the family, such as going out with the family for entertainment, playing sports or other recreation with the family, doing things around the house with the family, working on homework with family members, and going to community activities with the family. All of the responses range from less often than every few months (=1) to several times a week (=6). The diagnostics for the individual scales are as follows: family communication has a mean of 3.88, an alpha of .71 (4 items), and is significantly correlated with family affection (r=.45, p<.001) and family involvement (r=.45, p<.001); family affection has a mean of 3.61, an alpha of .74 (5 items), and is significantly correlated with family involvement (r=.54; p<.001), which has a mean of 3.47 and an alpha of .69 (five items). Although principal component analysis indicated that these three family process items load onto three factors, the fact that these factors are correlated with one another raises a concern with multicollinearity. Therefore, we used a composite scale of *family cohesion*, which combined these three factors, with an alpha of .83, a range from 1 to 6, a mean of 3.63, and a standard deviation of 1.05. We also ran the analyses on the individual factors yielding consistent results.

The measure for *parental rule setting* taps into the extent to which the parents set the rules for their child during adolescence regarding alcohol, cigarettes, and drugs. The responses to each of these three questions range from left up to the child (0) to forbidden (6). Principal components analysis indicated that these three measures load onto one factor. These scores were then averaged to create a mean scale of parental rule setting ranging from 1 to 6 with a mean of 4.09, a standard deviation of 1.39, and an alpha of .63.

Maternal substance use is measured during the mother's component of the adolescent interview. This measure is a dichotomous variable, which measures whether the mother self-reported any amount of illegal (including not prescribed) substance use in her lifetime (i.e., marijuana, cocaine, heroin, hallucinogens, inhalants, stimulants, amphetamines, sedatives, tranquilizers) and/or regular use of alcohol in the past 12 months (as opposed to once/twice or occasional use). Thirteen percent of the mothers interviewed reported drug use or regular use of alcohol.

Control Measures Ninety-seven percent of the cohort used alcohol at some point in their lives (through mid-adulthood), 76% of the cohort smoked tobacco at some point in their lives, and 58% of the cohort used marijuana. For each of these substances, the majority of users began using in adolescence with close to 80% of users initiating by age

18 (mean=16.5, median=16). Given the prevalent nature of these substances, early onset of each is defined as initiating the substance before age 15. *Early onset of legal substances* is a dichotomous measure used to control for the propensity toward marijuana use; 24% had an early onset of alcohol/tobacco. *Early onset of marijuana* is used as a control for the propensity toward cocaine/heroin use; 14% had an early onset of marijuana use. *Aggression* is used as a control in all of the analyses to tap into general delinquent propensity. In first grade, teachers rated each child in their classroom on their aggressive behavior using the Teacher's Observation of Classroom Adaptation (TOCA) scale, which ranges from 0 to 3, adapting to severely maladapting.

Analysis

We identified the prevalence and pattern of substance use through mid-adulthood using discrete time survival analysis.[27] The axis for time in these survival models was age of first use. To obtain an overall portrayal of the risk of drug use over the life course, we estimated both the hazard rates and the cumulative survival rates for each drug. The cumulative survival rate indicates the probability that a person has used a drug by a certain age. The hazard rate indicates the instantaneous potential for drug use at each age among those who have not yet initiated by that age.

Survival analysis techniques have a few advantages when using the type of data found in the Woodlawn study. First, it accommodates censored cases, meaning those cases lost to follow-up. There were 221 people who had information up to age 32 but were lost to follow-up and did not complete the age 42 interview. Thus, those who did not report drug use by age 32 and were not interviewed at mid-life were censored after age 32.

The hazard and survival curves estimated first provide descriptive information about the epidemiology of drug use patterns for the men and women in the cohort into adulthood. Next, we estimated the relationships between family factors and drug use initiation for the total group and for males and females separately using a Cox proportional hazards model for time-independent covariates. This technique is a semiparametric model that can determine how the timing of drug use depends on a variety of family factors alone and in interaction with gender.[28] Proportionality by gender was confirmed before Cox regression was performed. We estimated hazard ratios to determine the expected change in the risk of drug use initiation for the different levels of the predictor variables. A hazard ratio of 1 indicates that there is no relationship between the independent variable and the risk of drug use. A hazard ratio less than 1 indicates that there is a decreased risk of drug use with the presence of the variable of interest and a hazard ratio of more than 1 indicates that there is an increased risk of drug use. We used SPSS to conduct the analysis and the Breslow method to handle tied failure times.

RESULTS

General Indicators of Drug Use

As Table 1 indicates, virtually everyone in the Woodlawn cohort used alcohol at some point in their lifetime (97%) and most had used tobacco (76%), with no differences by gender. The prevalence of other drug use varies by type such that 58% used marijuana by age 42, 30% used cocaine, and close to 8% used heroin at least once in their lifetime. For each of these illegal drug types, males had significantly higher lifetime prevalence estimates. The mean age of first use and the mean age of

TABLE 1 General indicators of substance use patterns for the Woodlawn cohort

	Lifetime prevalence	Age of first use	Age of last use[a]
Substance	Percent (SE)	Mean age (SE)	Mean age (SE)
Alcohol	97.0% (0.5)	16.5 (0.1)	–
Males	96.2% (0.8)	15.4 (0.2)*	–
Females	97.8% (0.6)	17.4 (0.1)*	–
Tobacco	75.7% (1.3)	16.5 (0.2)	25.8 (0.6)
Males	76.6% (1.9)	16.4 (0.2)	26.4 (1.0)
Females	74.9% (1.8)	16.6 (0.2)	25.4 (0.8)
Marijuana	58.3% (1.5)	16.6 (0.1)	26.5 (0.4)
Males	64.5% (2.1)*	16.2 (0.2)*	27.5 (0.6)*
Females	52.6% (2.1)*	17.1 (0.2)*	25.5 (0.6)*
Cocaine/Crack	29.9% (1.4)	23.6 (0.3)	31.1 (0.5)
Males	35.1% (2.1)*	23.6 (0.4)	31.6 (0.6)
Females	25.1% (1.8)*	23.6 (0.4)	30.7 (0.7)
Heroin	7.6% (0.8)	25.3 (0.8)	30.7 (0.9)
Males	9.7% (1.3)*	24.9 (1.0)	30.8 (1.1)
Females	5.6% (1.0)*	25.8 (1.2)	30.6 (1.4)

[a]Age of last use is among those users who had not used in the past 12 months.
*Significant gender differences at $p<.05$ based on t-test comparisons.

last use provide a general sense of the "careers" of use for each drug type among the Woodlawn population (see Table 1). For instance, alcohol, tobacco, and marijuana were initiated, on average, at age 16 and terminated at about age 26 (tobacco and marijuana); cocaine and heroin were first used in the mid-20s, and last used at age 31. Significant gender differences in age of initiation only emerged for alcohol and marijuana with males initiating use almost 1 to 2 years earlier, on average, than females, depending on the drug type. The only gender differences in age of last use appeared for marijuana with males terminating use later than females, on average.

Ordering of Substances

Another dimension of drug use is the order in which drugs are used. Kandel and Yamaguchi[29] found that in general, legal substances such as tobacco and alcohol are used before the illegal substance of marijuana, which in turn is used before the "harder" illegal substances of cocaine and heroin for both males and females. They term this progression the gateway hypothesis. The ages of onset among the Woodlawn sample shown in Table 1 are consistent with this hypothesis.[30] In fact, of those who used all three classes of drugs ($N=302$), 84% used these drugs in the expected order. For those who used two or more of these three drug categories ($N=627$), 85% used them in the expected order with the pattern of using legal drugs before marijuana as the predominant pattern. Males were significantly more likely to use substances from all three drug classes than their female counterparts (35% of males vs. 24% of females), whereas females were more likely to use from only one drug class, predominantly the legal drug class of alcohol and/or tobacco (45% of females vs. 33% of males, $\chi^2=21.53$, $p<.001$).

Patterns of Initiation

Building on these patterns, we next investigated the risk of initiation for each drug type taking into account those who never initiated drug use. Figure 1 shows the

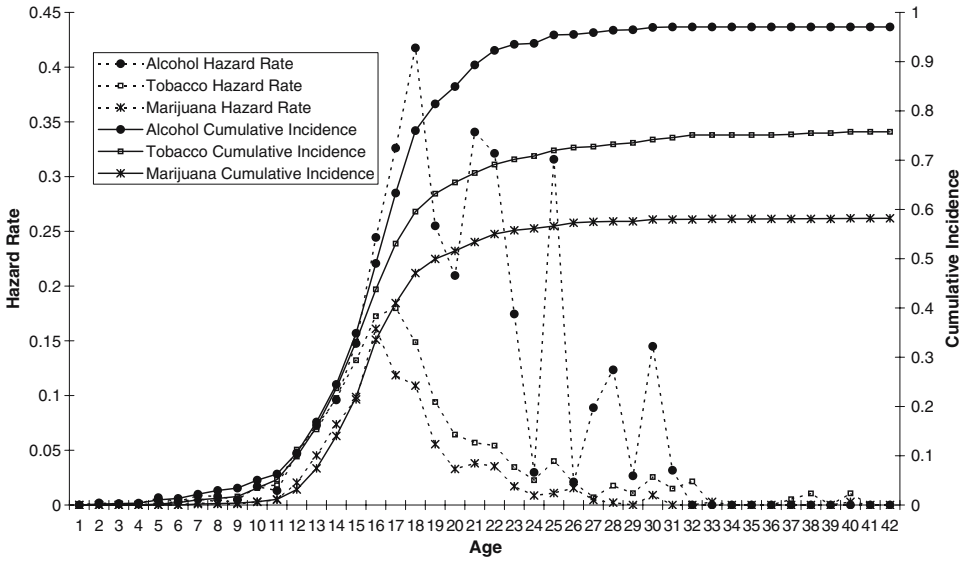

FIGURE 1. Initiation of alcohol, tobacco, and marijuana: a comparison of hazard rates and cumulative incidence.

cumulative incidence rates (right-hand axis) and the age-specific hazard rates (left-hand axis) for tobacco, alcohol, and marijuana. Consistent with prior research,[2,3] the age associated with the highest risk of initiating tobacco use, alcohol use, and marijuana use was 18, 19, and 17, respectively. For example, at age 17, those who have yet to initiate marijuana use had a 15% chance of initiating in that year. Although the alcohol estimates showed instability into later ages, 92% of the cohort used alcohol by age 21. The cumulative incidence rates indicate that initiation into these three drug types was largely confined to the teenage years and early adulthood. Comparisons by gender revealed similar patterns for males and females as those shown for the total group with a general trend toward higher rates of use among males, as expected (data not shown).

Figure 2 depicts the cumulative incidence rates (right-hand axis) and the age-specific hazard rates (left-hand axis) for cocaine and heroin initiation. Whereas the period from age 19 through age 30 were high-risk years for initiation of cocaine use, the highest risk of initiation is age 26, which coincides with the height of the crack epidemic in inner cities (about 1986). The hazard sharply declines at age 30 with a very low risk of initiation of cocaine use after age 33. In contrast, the hazard rates for heroin indicate that there is a relatively consistent risk for initiation across all ages.

Moreover, there is clear evidence of later onset ages among this African-American cohort than those in predominantly White samples, which have found virtually no onset after age 29.[7] In contrast, in the Woodlawn cohort, 29% of the heroin users and over 12% of the cocaine users initiated use at age 30 or older. Gender comparisons reveal similar patterns for both male and female heroin and cocaine users with a slightly higher percentage of the female heroin and cocaine users initiating at age 30 or older compared to the males (33% vs. 26% for heroin; 15% vs. 11% for cocaine, respectively).

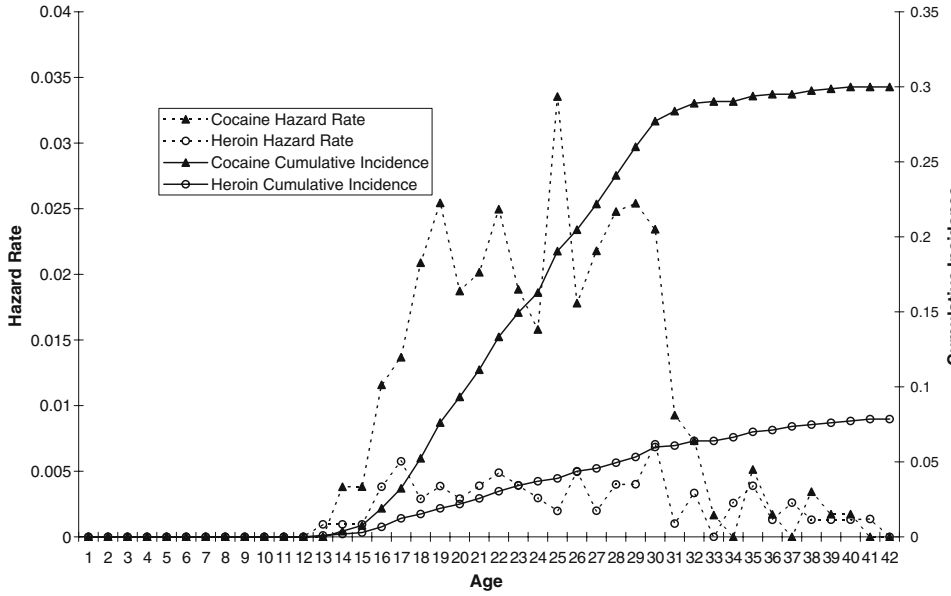

FIGURE 2. Initiation of cocaine and heroin: a comparison of hazard rates and cumulative incidence.

Gender and the Family

The descriptive analyses of drug use among this African-American cohort of males and females reveal that: (1) drug use among this cohort extended beyond adolescence and young adulthood; (2) substance use tended to follow a predictable sequence between legal drugs, marijuana, and "harder" illegal drugs such as cocaine and heroin; and (3) although the patterns were similar, gender was a key predictor of the timing of initiation and prevalence of substance use. The next phase of the analysis is a multivariate Cox proportional hazards model to investigate the influence of the family in childhood and adolescence on substance use initiation over the life course. We included prior drug use and childhood aggression as controls for initiation. The means for the predictor and control variables for each substance and by gender are included in Table 2. These means were calculated for the 571 participants (271 males and 300 females) who are included in the regression analyses.

Three regression analyses were conducted, one for each class of substance (alcohol/ tobacco; marijuana; cocaine/heroin). For each drug class we ran three models. Model 1 included the total group and analyzed the bivariate relationships of gender and family measures on drug use initiation and then the multivariate relationship, controlling for prior drug use and aggression. In the multivariate analysis, we include those measures that reach a statistical significance level of .20 or lower in the bivariate analysis to identify competing risks. We then replicated the Model 1 analyses on females and males separately to investigate the potential differences in the influence of family by gender (Models 2 and 3, respectively).

The alcohol and smoking regression results indicated that for the total group who initiated alcohol or tobacco use in adolescence or later, living in a family with more rules about drinking and drug use reduced the hazard of initiating these legal substances (hazard ratio [HR]=0.88, $p<.01$), with maternal substance use and

TABLE 2 Means and percents for predictor and control variables by gender and lifetime substance use

	Total		Alcohol users		Tobacco users		Marijuana users		Cocaine users		Heroin users	
	N = 571		*N* = 557		*N* = 473		*N* = 346		*N* = 180		*N* = 53	
	M	F	M	F	M	F	M	F	M	F	M	F
Predictors:												
Family discipline (1–9)[a]	5.7	5.2	5.7	5.3	5.7	5.4	5.6	5.4	5.6	5.4	5.8	5.3
Family communication (1–6)[b]	3.7	4.0	3.7	4.0	3.8	3.9	3.8	3.8	3.8	3.8	4.0	3.9
Family affection (1–6)[b]	3.6	3.5	3.6	3.5	3.6	3.5	3.6	3.4	3.6	3.4	3.8	3.6
Family involvement (1–6)[b]	3.4	3.5	3.4	3.5	3.4	3.4	3.4	3.3	3.4	3.3	3.5	3.3
Rule setting (1–6)[b]	3.8	4.3	3.8	4.3	3.7	4.1	3.8	4.2	3.8	4.2	3.7	3.7
Mother's education (0–18)[a]	10.5	10.6	10.5	10.6	10.5	10.5	10.5	10.4	10.5	10.4	10.5	10.6
Female-headed household (%)[a]	40.2	31.7	40.8	31.5	41.2	33.2	38.7	27.9	40.4	26.3	44.1	31.6
Maternal substance use (%)[b]	14.0	9.7	14.1	9.8	14.7	11.2	13.8	10.3	17.3	14.5	20.6	15.8
Controls:												
Teacher's rating of aggression (0–3)[a]	0.7	0.3	0.7	0.3	0.7	0.4	0.8	0.4	0.8	0.4	1.2	0.4
Alcohol and tobacco use by age 15 (%)[c]	47.6	30.1	48.5	30.5	55.0	36.5	53.6	33.5	57.7	39.5	73.5	47.4
Marijuana use by age 15 (%)[c]	19.9	8.3	19.8	8.5	25.1	10.8	29.8	15.2	33.7	22.4	35.3	36.8

M = males; F = females

[a]Measured during the childhood interview (age 6); higher values indicate more frequent discipline, more years of education, and more aggression.

[b]Measured during the adolescent interview (age 16); higher values indicate more communication, more affection, more involvement, and more definite rules set by parents about alcohol use, smoking, and drug use.

[c]Assessed using young (age 32) and mid-adult (age 42) reports and verified with adolescent reports.

aggression in the multivariate model. Specifically, those with more stringent rules about drug use had around a 10% smaller hazard of initiating alcohol and tobacco use than those with less stringent rules. Alcohol and smoking were not statistically significantly related to growing up in a female-headed household, mother's education, family discipline, or family cohesion. Moreover, when separated by gender, both males and females with more parental rules about substance use had a significantly lower hazard of initiating alcohol and tobacco use, controlling for aggression (HR=.87, $p<.05$ and HR=.89, $p<.05$, respectively) (data not shown).

Although there were no gender differences in the effect of family on alcohol and tobacco use, these differences emerged when we look at illegal substances. Table 3 outlines the regression models including the hazard ratios, 95% confidence intervals, and p values for marijuana use. Gender was significantly related to the initiation of marijuana use with the hazard of initiation for males close to 1.5 times that of females (see Model 1). In the multivariate model among the total group, gender, growing up in a female-headed household and parental rule setting were significant predictors of initiation of marijuana use, controlling for early onset of legal substances and aggression (Model 1). Models 2 and 3 indicate that family cohesion reduced the risk of marijuana use in females, yet this had a nonsignificant bivariate effect on males. Thus, although the effect of family cohesion was nonsignificant in the multivariate model for the total group (see Model 1), the analyses separated by gender revealed that high levels of family cohesion reduced the hazard of marijuana use for females.

With respect to cocaine and heroin use, having physical and frequent discipline as a child and having a history of maternal substance use increased the hazard of initiation for the total group, independent of early marijuana use and childhood aggression (see Table 4, Model 1). Model 2 indicates that there was a reduced risk of drug use initiation among females who had less autonomy in setting the rules about drug use in adolescence and an increased risk among those who were disciplined physically and more frequently as children. Again, these effects were apparent while controlling for childhood aggression and for early marijuana use, which strongly increased the hazard of initiation of cocaine and heroin use. Model 3 revealed that again, none of the family factors significantly affected the risk of cocaine or heroin use among males.

DISCUSSION

Many scholars argue that inner cities are plagued by drug addiction and dealing as well as other social deterioration.[31,32] Indeed, previous analyses on the African-American cohort under study found that those who continued their residence in Chicago's urban center were more likely to use drugs at age 32 as opposed to those who had moved outside of the inner city.[23] This perception that substance use is rampant in our inner cities where a greater percentage of the population is African American, however, leads to stereotypes that African Americans who grow up in disadvantaged neighborhoods are "destined" to use drugs.[33,34] The Woodlawn Study provides a unique opportunity to examine rates and patterns of drug use among a cohort of urban, African Americans who were born around 1960 and followed for 35 years until age 42.

First and foremost, we found significant heterogeneity in drug use among African Americans born, raised, and educated in disadvantage, demonstrating that the investigation of within-group variations in patterns of drug use into mid-

TABLE 3 Hazard ratios, 95% confidence intervals, and p values analyzing the association between childhood and adolescent family factors and marijuana onset by age 42 in the Woodlawn cohort ($N=571$)

	Model 1: Total		Model 2: Females		Model 3: Males	
	Bivariate	Multivariate[d]	Bivariate	Multivariate[d]	Bivariate	Multivariate[d]
Gender	1.46 (1.18–1.80) $p<.001$	1.25 (1.00–1.56) $p=.047$	–	–	–	–
Female-headed household[a]	0.86 (0.69–1.08) $p=.191$	0.77 (0.61–0.97) $p=.024$	0.81 (0.58–1.14) $p=.233$	–	0.83 (0.62–1.12) $p=.229$	–
Mother's education[a]	0.98 (0.94–1.02) $p=.300$	–	0.97 (0.92–1.03) $p=.348$	–	0.98 (0.93–1.05) $p=.608$	–
Family discipline[a]	1.03 (0.97–1.09) $p=.351$	–	1.06 (0.97–1.15) $p=.180$	1.06 (0.97–1.16) $p=.178$	0.97 (0.90–1.05) $p=.505$	–
Parental rule setting[b, c]	0.90 (0.83–0.96) $p=.003$	0.93 (0.86–1.00) $p=.050$	0.91 (0.81–1.01) $p=.075$	0.93 (0.83–1.04) $p=.183$	0.92 (0.83–1.02) $p=.094$	0.93 (0.84–1.03) $p=.187$
Family cohesion[b]	0.90 (0.82–1.00) $p=.043$	0.93 (0.84–1.02) $p=.131$	0.81 (0.71–0.94) $p=.004$	0.79 (0.68–0.91) $p=.001$	1.00 (0.87–1.15) $p=.982$	–
Maternal substance use[b]	1.16 (0.84–1.61) $p=.359$	–	1.20 (0.73–1.98) $p=.477$	–	1.07 (0.70–1.63) $p=.771$	–

[a]Measured during the childhood interview (age 6)
[b]Measured during the adolescent interview (age 16)
[c]Rule setting pertains to rules about alcohol use, smoking, and drug use.
[d]Multivariate models also adjust for onset of alcohol and tobacco use by age 15 and teacher's rating of aggressive behavior in first grade.

TABLE 4 Hazard ratios, 95% confidence intervals, and p values analyzing the association between childhood and adolescent family factors and cocaine/heroin onset by age 42 in the Woodlawn cohort ($N = 571$)

	Model 1: Total		Model 2: Females		Model 3: Males	
	Bivariate	Multivariate[d]	Bivariate	Multivariate[d]	Bivariate	Multivariate[d]
Gender	1.68 (1.25–2.25) $p = .001$	1.30 (0.96–1.77) $p = .089$	–	–	–	–
Female-headed household[a]	0.93 (0.68–1.26) $p = .621$	–	0.70 (0.42–1.17) $p = .173$	0.70 (0.42–1.19) $p = .191$	1.03 (0.70–1.52) $p = .874$	–
Mother's education[a]	1.03 (0.97–1.10) $p = .368$	–	1.09 (0.98–1.21) $p = .097$	1.07 (.97–1.20) $p = .190$	0.99 (0.91–1.07) $p = .781$	–
Family discipline[a]	1.09 (1.01–1.18) $p = .031$	1.09 (1.01–1.18) $p = .036$	1.11 (0.98–1.26) $p = .103$	1.15 (1.00–1.32) $p = .045$	1.05 (0.94–1.16) $p = .398$	–
Parental rule setting[b, c]	1.28 (0.57–2.89) $p = .553$	–	0.79 (0.68–0.93) $p = .004$	0.82 (0.70–0.97) $p = .017$	0.92 (0.81–1.05) $p = .229$	–
Family cohesion[b]	0.96 (0.84–1.10) $p = .589$	–	0.81 (0.66–0.99) $p = .041$	0.86 (0.69–1.07) $p = .168$	1.13 (0.94–1.36) $p = .203$	–
Maternal substance use[b]	1.72 (1.16–2.54) $p = .007$	1.62 (1.09–2.41) $p = .016$	1.81 (0.95–3.42) $p = .070$	1.44 (0.75–2.80) $p = .276$	1.55 (0.94–2.54) $p = .085$	1.42 (0.86–2.33) $p = .169$

[a]Measured during the childhood interview (age 6).
[b]Measured during the adolescent interview (age 16).
[c]Rule setting pertains to rules about alcohol use, smoking, and drug use.
[d]Multivariate models also adjust for onset of marijuana use by age 15 and teacher's rating of aggressive behavior in first grade.

adulthood is crucial. Importantly, our findings refute the stereotype showing clear evidence that not all African Americans who grow up in disadvantaged urban neighborhoods become illegal drug users. In the Woodlawn cohort, over 40% of the participants reported never using illegal drugs by mid-adulthood, over 70% reported never using cocaine, and over 90% reported never using heroin. These Woodlawn rates of abstention are higher than those of Brunswick's urban African-American sample who were born between 1951 and 1957. However, her sample also shows evidence of heterogeneity with 54% of males and 41% of females reporting cocaine use and close to 15% of both genders using heroin in their lifetime.[9]

This is not to say that drug use is not a significant problem among African Americans, especially into midlife. National reports show that among African-American adolescents substance use is less prevalent than Whites and that this trend changes in young and mid-adulthood. For instance, in the 2005 Monitoring the Future study,[3] 52% of 12th grade White adolescents used alcohol in the past 30 days compared with 29% of their Black counterparts. Similarly, 22% of White adolescents used marijuana compared to 15% of Blacks in the sample. A similar conclusion is drawn from the 1998 National Household Survey of Drug Abuse, with 14% of Black adolescents (12 to 17 years) using an illegal substance in the past year compared to 17% of Whites that age.[6] However, in the 18 to 25 and 26 to 34 age ranges, these percentages begin to converge before Blacks surpass Whites with a significant difference of 8% of Blacks age 35 or older using an illegal drug in the past year compared to 5% of their White counterparts, indicating that Blacks initiate later and/or continue their use further into adulthood than Whites.

In the Woodlawn population, for those who did experiment with legal and illegal drugs, initiation risk peaked at a young age—during the late teenage years. However, over 30% of marijuana, cocaine, and heroin users had not terminated their use by the age of last interview (either age 32 or 42). This represents a significant problem because use during this life stage can interfere with fulfilling important social roles (e.g., employment, parenting). Moreover, almost 30% of heroin users and over 12% of cocaine users began use in their 30s or 40s. These findings are much higher than those among White samples. Kandel and her colleagues have followed a New York State cohort of males and females from grades 10 and 11 (in 1971) through ages 34 and 35. The follow-up cohort is 87% White representing all parts of New York State (urban, suburban, and rural).[7,8] Among the male cohort, they found that by age 35, 79% had used marijuana, 46% had used cocaine/crack, and 8% had used heroin (lifetime prevalence).[7] As expected, the females showed lower prevalence rates with 69% reporting marijuana use by age 35, 29% reporting cocaine use, and 1% reporting heroin use. With respect to late onset, Chen and Kandel[7] found that virtually no one initiated substance use other than prescription drugs after age 29. For example, for this later onset of illegal drug use among males, the highest percentage was for heroin, with 7.9% of all heroin users, 3.1% of cocaine users, and 0.4% of marijuana users initiating use after age 29. For the females who indicate any heroin use in their lifetimes, three of six report initiating after age 29. The cocaine and marijuana percentages for females are comparable to the males, with 3.5% of cocaine users and none of the marijuana users initiating use after age 29.

Finally, with respect to the family, we found that family factors influence the onset of drug use, especially among females. We found parental rules about substance use during adolescence predicted alcohol and/or smoking initiation for

males and females. Interestingly, for the illegal substances of marijuana, cocaine, and heroin, we found a consistent association with family factors for females only with no influence of family factors for males. Specifically, family cohesion related to marijuana onset and parental rules regarding substance use and family disciplinary practices related to cocaine or heroin onset among females.

However, our understanding of drug use into midlife and the role of gender and the family remains quite limited. Our study provides a glimpse into drug use among one cohort of African Americans who grew up in an urban environment followed over time. Our findings suggest that future research must consider broader life stages than just adolescence and young adulthood, especially among African Americans. Although this study has many advantages, mainly its focus on a community cohort of urban African Americans and its considerable length of follow-up, it has some limitations, which are outlined in the following section.

Limitations

Attrition Like all longitudinal studies, the Woodlawn Study has experienced attrition because of death, the inability to locate every participant at each wave, and refusal to participate. The concern with attrition can be exacerbated in a population with high rates of crime such as Woodlawn because of increased rates of death and incarceration. Attrition because of death affected less than 7% of the cohort, with 45 participants dead by the age 32 interview and 86 dead by the age 42 interview. In an effort to reduce the loss of follow-up because of incarceration, 36 participants were located and interviewed in prison at the age 32 follow-up and 18 were interviewed in prison at the age 42 interview.

The concern with attrition is that it can lead to potential bias caused by selective attrition. To address these potential biases, we have conducted extensive attrition analyses with the different samples interviewed. The overall result is that selective attrition does not seem to be a major concern. For example, because only those who remained in Chicago were interviewed at adolescence, we first compared those who were missing in adolescence with those who had an adolescent interview. Those interviewed in adolescence did not differ from those not interviewed on several key factors such as gender, early family type, mothers' education, early family income, poverty, adult arrest, adult drug use, or having a substance use disorder in adulthood. Importantly, those missing in adolescence were less likely to have an adult interview and more likely to not graduate from high school.[35]

For the adult sample, we compared the 85% of the cohort who had at least one adult interview with those who did not. Among these comparisons, we found no difference on such key variables as gender, several socioeconomic indicators (e.g., mother's education, welfare participation at baseline), early childhood behavior, adolescent drug use, self-reported delinquency, age of first arrest, and 1970 and 1980 census variables (e.g., percent white collar workers, percent unemployed, percent Black). However, those interviewed in adulthood were more likely to have graduated from high school and less likely to have been in poverty growing up. Interestingly, cohort members with a criminal record for a violent or drug-related crime were significantly more likely to have an adult interview than not.

In this study, 571 participants were included in the multivariate regression analyses. The primary reason for exclusion is that only those who still lived in the Chicago area were contacted for the adolescent follow-up ($N=705$). A comparison of the 571 participants included in the analyses and the 671 participants who were

excluded revealed no differences on gender and the following childhood variables: family income, mother's education, welfare participation, poverty status, number of children in the family, female-headed household, school readiness, and first grade teacher's rating of conduct problems, aggressive behavior, or shyness. There were significant differences between those included in the regression analyses and those excluded on frequency of residential mobility before first grade and reading and math achievement in first grade with those moving more and doing more poorly on reading and math standardized tests more likely to be excluded.

Retrospective Self-Report Data There is also the limitation that drug use initiation is recalled retrospectively because of the design of the Woodlawn study. This introduces the potential of bias with the possibility that individuals may increase their reported age of first use as they age,[36] especially when the interval between the report and the first use is large.[37] However, we have examined the consistency between ages of onset reported at young adulthood and mid-adulthood for those with both interviews and found strong and significant correlations, which suggests that this is not an overriding concern. Further, in a published report of the Woodlawn data, which analyzed the consistency between adolescent reports and adult retrospective reports of adolescent marijuana use and frequency of use, Ensminger and her colleagues found that only about 9% were inconsistent in their reporting of the age of initiation between adolescence and adulthood.[35] Therefore, whereas the potential bias of misreporting the age of onset, especially among early onset users, is unclear, in general we expect the patterns to be similar.

Research and Policy Implications

Future research using a variety of samples and measurement designs, such as annual assessments that extend into mid-adulthood, is necessary to increase the confidence in these findings. Further, minority group membership is likely to be just one of several social position influences on age of initiation, age of cessation, and the drugs used, as cohort and geographic location are other important influences. The finding that early family interactions relate to drug use over the life course, especially for women, also suggests that early family life continues to be influential. More research is needed to assess the role of other key factors such as peer associations and school factors to better understand the key influences in both male and female drug use. Research could also investigate the mediational and moderational pathways between the family and social factors. Further, future research could investigate potential gender differences as to why family factors are more important for drug initiation for females. Perhaps gender stereotypes are at play. Parents may have stronger rules and different expectations for girls; indeed, among this cohort the mean number of parental rules is greater for females than males.

With respect to policy, while it is known that adolescence and young adulthood are key times for the initiation of drugs, drug use initiation is also prevalent into midlife among this African-American cohort. Thus, drug prevention and intervention programs should continue beyond school-aged cohorts, the traditional target of such programs, and seek to reach adults in young and mid-adulthood. Our findings also indicate that family-focused prevention could be an effective prevention strategy, especially for females. Among females, a family that sets rules for drug use and has high levels of family cohesion reduces the risk of illegal drug use. Prevention strategies for females, then, should include parent training programs and strategies highlighting family process mechanisms.

ACKNOWLEDGMENT

This research was partially funded by NIDA grants R01 DA06630 and T32 DA07292.

REFERENCES

1. LaVeist TA. Beyond dummy variables and sample selection: what health services researchers ought to know about race as a variable. *Health Serv Res*. 1994;29:1–16.
2. LaVeist TA (ed). *Race, Ethnicity, and Health*. San Francisco, CA: Jossey-Bass; 2002.
3. Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE. *Monitoring the Future national survey results on drug use, 1975–2005. Volume I: secondary school students* (NIH Publication No. 06-5883). Bethesda, MD: National Institute on Drug Abuse; 2006.
4. Kandel DB, Logan JA. Patterns of drug use from adolescence to young adulthood: I. Periods of risk for initiation, continued use, and discontinuation. *Am J Public Health*. 1984;74:660–666.
5. National Research Council. *Preventing Drug Abuse: What Do We Know?* Washington, DC: National Academy Press; 1993.
6. French K, Finkbiner R, Duhamel L. *Patterns of Substance Use Among Minority Youth and Adults in the United States: An Overview and Synthesis of National Survey Findings*. Washington, DC: SAMHSA, Center for Substance Abuse Treatment; 2002.
7. Chen K, Kandel D. The natural history of drug use from adolescence to the mid-thirties in a general population sample. *Am J Public Health*. 1995;85:41–47.
8. Chen K, Kandel D. Predictors of cessation of marijuana use: an event history analysis. *Drug Alcohol Depend*. 1998;50:109–121.
9. Brunswick AF, Messeri PA. Life stage, substance use and health decline in a community cohort of urban African Americans. *J Addict Dis*. 1999;18:53–71.
10. Hirschi T. *Causes of Delinquency*. Berkeley: University of California Press; 1969.
11. Laub JH, Sampson RJ. Unraveling families and delinquency: a reanalysis of the Gluecks' data. *Criminology*. 1988;26:355–380.
12. Brook, JS, Brook DW, Gordon AS, Whiteman M, Cohen P. The psychosocial etiology of adolescent drug use: a family interactional approach. *Gene Soc Gen Psych*. 1990;116:111–267.
13. Catalano RF, Morrison DM, Wells EA, Gillmore MR, Iritani B, Hawkins JD. Ethnic differences in family factors related to early drug initiation. *J Stud Alcohol*. 1992;53:208–217.
14. Rutter M, Giller H, Hagell A. *Antisocial Behavior by Young People*. Cambridge: Cambridge University Press; 1998.
15. Biafora F, Zimmerman RS. Developmental patterns of African American adolescent drug use. In: Vega WA, Gil AG, eds. *Drug Use and Ethnicity in Early Adolescence*. New York: Plenum Press; 1998:149–175.
16. Ensminger ME, Juon H-S, Fothergill KE. Childhood and adolescent antecedents of substance use in adulthood. *Addiction*. 2002;97:833–844.
17. Fothergill KE, Ensminger, ME. Childhood and adolescent antecedents of drug and alcohol problems: a longitudinal study. *Drug Alcohol Depend*. 2006;82:61–76.
18. Guo J, Hill KG, Hawkins JD, Catalano RF, Abbott RD. A developmental analysis of sociodemographic, family, and peer effects on adolescent illicit drug initiation. *J Am Acad Child Psy*. 2002;41:838–845.
19. Ary DV, Duncan TE, Biglan A, et. al. Development of adolescent problem behavior. *J Abnorm Child Psych*. 1999;27:141–150.
20. Ensminger ME, Kellam SG, Rubin BR. School and family origins of delinquency: comparisons by sex. In: Van Dusen KT, Mednick SA, eds. *Prospective Studies of Crime and Delinquency*. Boston: Kluwer-Nijhoff Publishing; 1983:73–97.
21. Ensminger ME. Sexual activity and problem behaviors among black, urban adolescents. *Child Dev*. 1990;61:2032–2046.

22. Kellam SG, Brown CH, Rubin BR, Ensminger ME. Paths leading to teenage psychiatric symptoms and substance use: developmental epidemiological studies in Woodlawn. In: Guze SB, Earls FJ, Barrett JE, eds, *Childhood Psychopathology and Development*. New York: Raven Press; 1983:17–51.
23. Ensminger ME, Anthony JC, McCord J. The inner city and drug use: initial findings from an epidemiological study. *Drug Alcohol Depend*. 1997;48:175–184.
24. Ensminger ME, Doherty EE, Fothergill KM, Green KM, Juon H-S, Robinson JA. *The Woodlawn Project: 35 Years and Counting*. A presentation to the National Institute of Drug Abuse, Washington, DC; 2006.
25. Anthony JC, Warner LA, Kessler RC. Comparative epidemiology of dependence on tobacco, alcohol, controlled substances, and inhalants: basic finding from the National Comorbidity Survey. *Exp Clin Psychopharmacol*. 1994;2(3):244–268.
26. Kessler RC, McGonagle KA, Zhao S, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. *Arch Gen Psychiatry*. 1994;51:8–19.
27. Allison P. *Event History Analysis*. Beverly Hills, CA: Sage Publications; 1982.
28. Lee ET, Wang JW. *Statistical Methods for Survival Data Analysis*. Hoboken, NJ: John Wiley & Sons, Inc.; 2003.
29. Kandel DB, Yamaguchi K. Stages of Drug Involvement in the U.S. Population. In: Kandel DB, ed. *Stages and Pathways of Drug Involvement: Examining the Gateway Hypothesis*. Cambridge University Press; 2002:65–89.
30. Yamaguchi K, Kandel DB. Patterns of drug use from adolescence to young adulthood, II: sequences of progression. *Am J Public Health*. 1984;74:688–762.
31. Shaw CR, McKay HD. *Juvenile Delinquency and Urban Areas*. Chicago: University of Chicago Press; 1942.
32. Inciardi JA, McBride DC, Rivers JE. *Drug Control and Drug Courts*. Thousand Oaks, CA: Sage; 1996.
33. Turner WL, Wallace B. African American substance use: epidemiology, prevention, and treatment. *Violence Against Women*. 2003;9:576–589.
34. Wallace JM, Forman TA, Guthrie BJ, Bachman JG, O'Malley PM, Johnston LD. The epidemiology of alcohol, tobacco, and other drug use among black youth. *J Stud Alcohol*. 1999;60:800–809.
35. Ensminger ME, Juon HS, Green KM. Consistency between adolescent reports and adult retrospective reports of adolescent marijuana use: explanations of inconsistent reporting among an African American population. *Drug Alcohol Depend*. 2007;89:13–23.
36. Golub A, Johnson BD, Labouvie E. On correcting bias in self-reports of age at first substance use with repeated cross-section analysis. *J Quant Criminol*. 2000;16:45–68.
37. Johnston RA, Gerstein DR, Rasinski KA. Adjusting survey estimates for response bias: an application to trends in alcohol and marijuana use. *Public Opin Q*. 1998;62:354–377.