

The misuse of the ‘Gateway Theory’ in US policy on drug abuse control: A secondary analysis of the muddled deduction

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Abstract

Much research (mostly from general population surveys) suggests that people typically use alcohol, tobacco and then marijuana, so called ‘gateway drugs’, prior to any potential use of ‘hard drugs’ like cocaine powder, crack and heroin. Other research (mostly with surveys of special populations) indicates that hard-drug use is associated with numerous social problems such as crime, routine violence, and lower productivity. A muddled interpretation of these separate findings has been widely misused in support of the US drug abuse prevention policies to suggest that gateway drugs cause hard-drug use and its associated problems. This paper superimposes secondary analyses of data from the National Household Survey on Drug Abuse (NHSDA) and the Arrestee Drug Abuse Monitoring (ADAM) program. The findings indicate that (1) extremely few members of the general population become persistent daily hard-drug-using criminal offenders; and (2) an increasing percentage of daily hard-drug-using criminal offenders did not follow the gateway sequence of substance use progression. These results strongly suggest that the use of gateway drugs by youths is not the central cause of hard-drug use and its associated problems. Thus, fighting the use of gateway drugs by youths may not be a particularly appropriate approach to drug abuse prevention. © 2002 Elsevier Science B.V. All rights reserved.

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Introduction

That ‘gateway drugs’ cause drug abuse and its associated problems is a central tenet of American drug policy. Advocates of this perspective derive support by superimposing research findings that youths tend to progress through a specific sequence of substances with other findings of correlations between drug use, crime, violence, unemployment, poverty, family dissolution and other social problems. This paper examines the accuracy of this linkage through a secondary analysis of two data sets, the National Household Survey on Drug Abuse (NHSDA) and the Arrestee Drug Abuse Monitoring (ADAM) program. The goals of the analysis are twofold. First, to identify what proportion of the general population survey (NHSDA) is similar to the types of hard drug users that pass into the criminal justice system (ADAM

survey). Second, to identify whether the early drug use experiences observed in general population surveys is representative of those prevailing among persons who tend to get into trouble with drugs and the law.

The remainder of this introduction presents further background on the gateway theory and its use in American Drug Policy. The discussion examines profound limitations of the NHSDA data for studying drug abuse and discusses the implications for drug abuse prevention policy.

The gateway theory

The identification of the *gateway sequence* is commonly credited to the scientific research of [Kandel \(1975, 1978\)](#) that found that adolescent substance use tends to progress through a series of stages (1) non-use; (2) alcohol and/or tobacco; (3) marijuana; and (4) other or ‘hard’ drugs. In this paper, we use the term ‘hard drugs’ to refer to the use of cocaine powder, crack or heroin; these drugs that can cause dependence, have

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been used widely since the 1960s, and have been the focus of much public policy concern. This regularity of the gateway sequence has been confirmed in numerous studies most of which have used samples drawn either from household or school populations (Andrews, Hops, Ary, Lichtenstein, & Tildesley, 1991; Blaze-Temple & Lo, 1992; Brook, Whiteman, & Gordon, 1982; Brook, Whiteman, Balka, & Hamburg, 1992; Cohen & Sas, 1997; Donovan & Jessor, 1983; Elliott, Huizinga, & Menard, 1989; Fergusson & Horwood, 2000; Fleming, Leventhal, Glynn & Ershler, 1989; Golub, Johnson, & Labouvie, 2000a; Golub, Labouvie, & Johnson, 2000b; Hays & Ellickson, 1991; Kandel, Yamaguchi, & Chen, 1992; Mills & Noyes, 1984; Welte & Barnes, 1985).

The consistent finding of these stages was quite remarkable given the complexity of adolescent development. Much research and theory suggests that early substance use is but one potential marker of a broader complex of developmental difficulties (Elliott et al., 1989; Haggerty, Kosterman, Catalano, & Hawkins, 1999; Jessor & Jessor, 1977; Newcomb, 1997). Other research suggests that substance use is embedded within a culture or subculture along with fashions in clothes, hair, and music as well various other symbols, values, norms and behavior patterns (Johnson & Muffler, 1997; Musto, 1993; Schulenberg, Maggs, & Hurrelmann, 1997).

Limitations to the gateway theory

Early on, Kandel carefully contextualized the stages findings as a part of more complex developmental and cultural processes (Yamaguchi & Kandel, 1984, p. 671):

The existence of stages of progression, however, does not necessarily imply causal linkages among different drugs since the observed sequences could simply reflect the association of each class of drugs with different ages of initiation and/or individual attributes rather than the specific effect of the use of one class of drug on the use of another.... [U]se of a drug at a particular stage does not invariably lead to the use of other drugs higher up in the sequence. Many youths stop at a particular stage and do not progress further. In addition, the particular sequence of progression that has been identified may be determined partly by secular trends.

Indeed, the gateway sequence may be a cultural artifact. Primary socialization theory holds that behavioral norms, including substance use, develop through interactions with three proximal sources: family, peer clusters, and school (Oetting & Donnermeyer, 1998). In early childhood, the family plays the central socialization role. This may help explain why youths have tended

to start their substance-use progression with alcohol and tobacco, substances that older members of their family might use regularly. As they progress through adolescence, school and peers become more central to the process of enculturation. Peer groups introduce youths to the prevailing youth culture, the use of whichever substances are 'in', and the avoidance to those substances that are 'out'. In this context, the first illicit drug used might be marijuana, because its use is the most widespread among their peers, and because it is broadly perceived as not particularly harmful (Bachman, Johnston, & O'Malley, 1998).

The universality of the gateway theory might therefore be limited to the extent that cultures differ across locations and evolve over time. In support of this idea, several studies of hard drug users from inner-city New York found that a substantial percentage of them had not followed the gateway sequence (Golub & Johnson, 1994, 2001a; Mackesy-Amity, Fendrich, & Goldstein, 1997). Additionally, Golub and Johnson (2001b) found that the risks of progression through the gateway sequence changed dramatically over time. Use of marijuana, cocaine powder, crack and heroin was virtually nonexistent among persons born before World War II. The gateway sequence emerged with the baby boom generation and declined afterwards. Even though marijuana use increased in the 1990s, use of hard drugs has not increased even among persons who tend to get in trouble with both drugs and the law (Golub & Johnson, 2001c).

The gateway theory and America's war on drugs

The US Government has been waging a war on drugs for decades. The largest expenditure goes to combat the 'alien force' of illegal drugs (and the forces behind them) by means of border patrol, source-country control and domestic law enforcement (Office of National Drug Control Policy, 2001). Illicit drug users have sometimes been treated as victims of this dangerous marauder. However, they have often been constructed as traitors leading to an unprecedented expansion of the nation's prison population, especially among African Americans and Hispanics (Blumstein & Beck, 1999).

Within this larger fight, drug abuse prevention appears to be constructed as an effort to prepare youths for the evil and immoral forces they might encounter. Prevention rhetoric stresses that a strict policy of 'no fraternization with the enemy' can reduce casualties for example as follows:

A stage model of drug use for primary prevention seems to suggest that avoiding or delaying experimentation with tobacco could reduce later more serious involvement (Kandel, 1984; Newcomb & Bentler, 1988). ... Most of OSAP's mass media efforts

focus on preventing use of ‘gateway’ drugs at early ages in an attempt to reduce likelihood of developing alcohol and other drug problems and multi-drug use patterns (Funkhouser, Goplerud, & Bass, 1992 p. 34–35).

These gateway drugs serve as almost essential precursors to the use of other drugstobacco and alcohol prevention programs also are important as a means of preventing use of other drugs. Prevention of cocaine and heroin use begins with preventing tobacco use! (Indiana Prevention Resource Center, 1995).

We must renew our commitment to the drug prevention strategies that deter first-time drug use and halt progression from alcohol and tobacco to illicit drugs (President Clinton in a forward to Office of National Drug Control Policy, 1997).

Goals of the National Drug Control Strategy. Goal 1: Educate and enable America’s youth to reject illegal drugs, as well as alcohol and tobacco. Drug use is preventable. If children reach adulthood without using illegal drugs, alcohol or tobacco they are unlikely to develop a chemical-dependency problem later in life (Office of National Drug Control Policy, 2001, p. 6).

These claims suggest universality to the gateway sequence as if it were the pharmacological properties of alcohol, tobacco and then marijuana that cause youths to become drug abusers. Indeed, others have explicitly suggested that the link is biochemical (Nash, 1997). Baumrind (1983) argued that such common and incorrect causal attribution exemplifies a simplistic approach to social science that evades understanding and addressing the complex social context and multiple direct and indirect influences on human behavior.

Methods

This study compares the substance-use sequences prevailing in four virtually nested samples that range from the broadest cross-section of the US down to a sub-population of individuals who became involved with both hard drug use and the law. It also examines the extent of overlap between sample populations from two important American surveys; a general population survey (NHSDA) and a survey of arrestees (ADAM). To ensure that respondents had completed their substance-use progression, the analysis was limited to respondents who were at least 26 years old when interviewed. Prior research suggests that most individuals who do not initiate hard-drug use by about age 25 never will (Chen & Kandel, 1995; Golub et al., 2000a,b; Johnston, 1991). Moreover, the nature of substance-use progression after age 25 is almost certainly quite

different from progression in adolescence and early adulthood.

The study examined the NHSDA data collected from 1991 to 1993—hereafter, the *NHSDA National Sample*. Inner-city communities tend to produce a disproportionate number of hard drug users. The first subsample is the oversample of neighborhoods ranking in the lowest third on median housing value and median rent from Chicago, Denver, Los Angeles, Miami, New York City, and Washington, DC included in the NHSDA survey from 1991 to 1993—*NHSDA Six-Metro Sample*. Conceivably, there is great heterogeneity of experiences in these putative high-risk communities and those who become hard drug users might come from different circumstances than other community residents. To examine this possibility, the second subsample includes NHSDA Six-Metro respondents that reported having used hard drugs—*NHSDA Six-Metro-Hard Sample*.

A major problem in studying drug problems is distinguishing use from abuse. Many people that experiment with hard drugs never progress to regular use, dependence, and other health, social, and legal problems. Wright, Gfroerer, and Epstein (1997) (p. 479) report that the NHSDA survey systematically under-samples many of the most serious users. These hardcore drug users are well represented in the criminal justice system. So, this study also examined the relevance of the gateway sequence for hard-drug-using arrestees interviewed by the ADAM program from 1991 to 1993 in the same six cities as the NHSDA oversample—*ADAM Six-Metro-Hard Sample*.

The remainder of this section describes the NHSDA and ADAM datasets and the statistical analyses performed. All datasets were obtained from the public release files available through the National Archive of Criminal Justice Data stored at the University of Michigan.

The National Household Survey on Drug Abuse

The US Government has conducted the NHSDA periodically since 1971 and annually since 1990 ‘(to serve as) the primary source of statistical information on the use of illegal drugs by the US population’ (Substance Abuse and Mental Health Services Administration, 2000, p. 7). To obtain high response rates, the NHSDA program sends specially trained interviewers to personally administer the questionnaire at each of the residences selected. From 1991 to 1993, 79–84% of persons approached agreed to participate in the survey (Substance Abuse and Mental Health Services Administration, 1993, 1994, 1995). Self-administered answer sheets were employed to assure confidentiality and facilitate disclosure of alcohol and drug use (Turner, Lesser, & Gfroerer, 1992).

From 1991 to 1993, the NHSDA used a complex sampling procedure with unequal selection probabilities, stratification and clustering (Substance Abuse and Mental Health Services Administration, 1993, 1994, 1995). To account for this non-proportional sampling, the NHSDA program constructed a sample weight for each respondent proportional to her or his probability of inclusion. These weights were used in this study to obtain unbiased estimates. Due to the complexity of the analysis, conventional hypothesis tests that do not account for design effects were used in this study.

A small proportion of cases from the NHSDA National (4.8%), NHSDA Six-Metro (6.2%) and NHSDA Six-Metro-Hard (4.2%) Samples were missing information on birth year, age at first use or lifetime use for any substance. These cases were excluded from the study, yielding final samples of 41 086, 11 026 and 1540 cases, respectively. This exclusion could have potentially biased estimates of progression rates to the extent that persons who had used more drugs also tended to be missing information. Logistic regression was used to identify appropriate adjustments to the sample weights to account for variation in the probability of inclusion systematically associated with substances ever used, region, urbanicity, MSA size, demographic characteristics, and educational attainment.

The Arrestee Drug Abuse Monitoring Program

The ADAM Program (formerly known as the Drug Use Forecasting or DUF Program) has been interviewing arrestees about their drug use at police booking facilities across the US since 1987. The program also obtains urine samples to test for recent use of illegal drugs. Survey responses and urinalysis results are kept confidential and used for scientific research purposes only, and participation is voluntary. Approximately 95% of arrestees approached agreed to participate and about 85% of those provided urine samples (National Institute of Justice, 1996). The EMIT test employed provides a particularly valid indication of any use of cocaine (as either a powder or crack) and opiates (including heroin) in the last 2–3 days (National Institute of Justice, 2000).

The final sample included 7456 arrestees from Chicago, Denver, Los Angeles, Miami, Manhattan (one borough of New York City), and Washington, DC. The few respondents (0.5% of the sample) who did not provide information about age at first use or lifetime use of alcohol, tobacco or marijuana were excluded from the analysis. Arrestees in suburban counties for these MSAs were not surveyed under the ADAM program, unlike in the NHSDA Six-Metro Sample.

Comparison of sample characteristics

The study examined the demographic, mainstream status attainment, and substance use characteristics of each sample using the limited variables available for both the NHSDA and ADAM surveys. For the purposes of this study, hard-core use (a key dependent variable) was operationalized as current daily use measured by the self-reported use on at least 25 of the last 30 days. A standard *z*-test was used to identify variation in the prevalence of each characteristic between the NHSDA Six-Metro Sample and members of the NHSDA National Sample not included in the NHSDA Six-Metro Sample. A similar procedure was used to compare the NHSDA Six-Metro and NHSDA Six-Metro-Hard Samples. The characteristics of the ADAM Six-Metro-Hard and NHSDA Six-Metro-Hard Samples were also compared with a *z*-test.

Substance-use sequences

Each respondent's progression sequence was inferred from answers to questions about age at first use of alcohol, tobacco (note, the NHSDA survey asks about cigarettes only), marijuana and hard drugs. Using age at first use of each substance resulted in some ambiguity regarding the exact sequence of substances used, due to ties. For example, an individual who initiated use of both alcohol and marijuana at age 13 may have progressed from alcohol to marijuana or vice versa.

Consistent with prior research on the gateway theory, the first stage was defined as use of alcohol and/or tobacco, whichever occurred first. Research has found that youths typically start substance use with alcohol or tobacco and that either can serve as a predecessor to marijuana use (Kandel, 1978). Hence, alcohol and tobacco are included in the first stage of the gateway sequence despite their vastly different modes of consumption and psychopharmacological effects. The age at first use of hard drugs was defined as first use of cocaine powder, crack or heroin; other drugs including inhalants, hallucinogens and amphetamines were not included in this analysis. Golub et al. (2000b) found that persons tend to reliably report the order in which they initiated alcohol/tobacco, marijuana, and hard drugs; but that they frequently switch their response as to whether they started with alcohol or tobacco.

The individual sequences were summarized using a transition diagram that characterized progression as a sequence of *states* (defined as the collection of substances ever used up to a given time) and *transitions* resulting from initiation of one or more substances. Golub and Johnson (2001b) summarized research evidence suggesting that transition risks estimated in this manner using the NHSDA data are accurate to the extent that people are willing to disclose lifetime use of

various substances and not severely affected by the NHSDA sampling biases or the unreliability of reported age at first use.

Multivariate analysis of deviation from the gateway sequence

Logistic regression was employed with the NHSDA National and ADAM Six-Metro-Hard Samples to study the two most common deviations from the gateway sequence observed: starting with marijuana and skipping marijuana use. *Marijuana starters* (those who used marijuana at least 1 year before alcohol/tobacco or hard drugs) were contrasted with alcohol/tobacco starters; all other respondents were excluded from this analysis. *Marijuana skippers* (those who progressed from alcohol/tobacco to hard drugs without the intermediate use of marijuana) were contrasted with respondents that clearly followed all of the steps of the gateway sequence from alcohol/tobacco to marijuana and then hard drugs. The following description justifies inclusion of each variable as associated with differences in prevailing subcultures and an individual's place relative to them. The Wald statistic was used to provide a rough measure for the relative importance of each covariate controlling for other factors and to test for statistical significance (Hosmer & Lemeshow, 1989).

Birth year was coded as five-year intervals from 1940 to 1969. Persons born prior to 1940 were included in a single category. Marijuana use became more commonplace after World War II (Johnson & Gerstein, 1998). Hence, the proportion of marijuana starters was expected to be higher among later birth cohorts.

Race/ethnicity was coded as white, black, Hispanic, and other/missing. Subcultural differences across groups could have resulted in different substance-use development sequence (Oetting, Donnermeyer, Trimble, & Beauvais, 1998). The analysis was highly constrained because only broad categories of race/ethnicity were used; individual differences in intensity of racial/ethnic identification were not measured; and numerous social, economic, and political factors correlated with race/ethnicity were not available.

Gender: the widely documented differences in cultural expectations for boys and girls (Oetting et al., 1998) could have resulted in different substance-use development sequences.

Metropolitan area: NHSDA Inner-city residents (as well as ADAM respondents) were expected to have used illegal drugs earlier in their sequence than the NHSDA National Sample because they may have observed their use at an early age, perhaps even among family members. For the NHSDA sample, respondents of the Low-SES subsample were identified by city. Respondents outside of these six areas (including the rest of the oversample of six-metropolitan areas and the remaining

national sample) were designated as having a metropolitan area of "other". Individual weights were rescaled so that the sum of the weights matched the number of cases for each of the low-SES metropolitan areas in each year. This reweighting scheme would have biased the transition diagram analysis because respondents from the metropolitan areas were oversampled. However, the potential bias was controlled in this multivariate analysis by including each metropolitan area as an independent variable.

Hard drug use (study of marijuana starters with NHSDA data only). An increased likelihood of eventual hard drug users to have started with marijuana would suggest that the gateway sequences was less characteristic of their experience than for those who never became hard drug users.

Interview year was included to measure whether any changes over time in the nature of the questionnaire, selection procedures, or general willingness of individuals to disclose information had an effect on substance-use sequences reported.

Analysis of variation across birth cohorts

Restricting the marijuana starters analysis to respondents age 26 and above also restricted the analysis to persons born in 1967 and earlier. To examine the first substance used among more recent birth cohorts, the study compared the prevalence of marijuana starters to alcohol/tobacco starters among all NHSDA respondents age 12 and above interviewed from 1991 to 1998, and all ADAM arrestees (not just hard-drug users) age 18 and above from the six metropolitan areas interviewed from 1991 to 1999.

Findings

Sample characteristics

Table 1 presents the demographic, mainstream achievement and substance use characteristics of each sample. The NHSDA National and NHSDA Six-Metro Samples were similar with regard to average age (48 and 46 years) and percent female (53 and 55%). The NHSDA Six-Metro-Hard and ADAM Six-Metro-Hard Samples tended to be younger (average age of 34 and 33 years) and included fewer females (39 and 28%) (note, the ADAM program purposefully oversamples female arrestees in order to facilitate comparisons of drug use by gender.) The NHSDA Six-Metro and NHSDA Six-Metro-Hard samples included far more blacks (33 and 34%) and Hispanics (33 and 26%) than the NHSDA National Sample (10 and 7%). The ADAM Six-Metro-Hard Sample included even more blacks (60%) and slightly fewer Hispanics (19%) than the

Table 1

Descriptive statistics for NHSDA and ADAM 1991–1993, respondents age 26+

		NHSDA National	NHSDA Six-Metro	NHSDA Six-Metro-Hard	ADAM Six-Metro-Hard
Sample size		42 372	11 026	1540	7456
Age	Average (years)	47.8	46.0**	34.2**	33.4**
Gender	Male	47.4	45.2**	60.8**	71.5**
	Female	52.6	54.8**	39.2**	28.5 ^{a**}
Race/ethnicity	White	79.1	28.3**	38.2**	20.2**
	Black	10.2	33.0**	33.9	59.5**
	Hispanic	7.4	33.3**	26.5**	19.1**
	Other/missing	3.2	5.4**	1.4**	1.3
Marital status	Single	10.6	19.4**	38.0**	51.4 ^{b**}
	Lives with someone	—	—	—	13.3 ^b
	Widowed	8.5	9.4**	1.9**	—
	Separated or divorced	11.9	17.3**	20.9**	21.3 ^b
	Married	69.0	53.9**	39.2**	13.9 ^{b**}
Educational attainment	High School degree ^c	78.0	62.0**	75.3**	63.8**
	College degree	23.7	13.7**	17.8**	7.6**
Employment status	Full-time	53.1	50.1**	61.1**	23.3**
	Part-time	9.9	8.0**	8.9	10.0
	Unemployed	4.8	8.5**	14.2**	— ^d
	Other ^e	32.1	33.3**	15.8**	46.3**
	Missing	—	—	—	20.5
Ever use (lifetime)	Alcohol	88.6	78.9**	98.5**	96.1**
	Tobacco	77.1	60.4**	89.8**	93.4**
	Marijuana	33.4	27.2**	95.7**	89.2**
	Coc/crack/heroin	11.9	11.5	100**	100
Currently use daily	Alcohol	5.5	4.6**	12.5**	24.5**
	Tobacco	24.7	25.1	49.3**	77.2**
	Marijuana	0.3	0.4	3.0**	6.2**
	Cocaine powder	0.01	0.1**	0.8**	9.8**
	Crack	0.01	0.1**	1.0**	20.2**
	Heroin	0.005	0.04**	0.5**	12.5**
	Coc/crack/heroin	0.03	0.2**	1.8**	33.2**
Ever arrested		8.9	6.4**	28.6**	100**
Arrested in past 12 months		1.1	1.3	5.8**	100**
Daily hard drug use and arrested in past 12 months (unweighted count)		11	7	7	2168

^a ADAM purposefully oversamples female arrestees.^b NHSDA does not distinguish lives with someone; ADAM combines widowed with separated or divorced.^c Includes persons who also graduated from college.^d ADAM does not identify unemployed as a job category.^e Includes full-time homemaker and student among others.*Significantly different from entry in previous column at the $\alpha = 0.05$ level; **significantly different from entry in previous column at the $\alpha = 0.01$ level.

NHSDA Six-Metro and NHSDA Six-Metro-Hard Samples.

Members of the ADAM Six-Metro-Hard Sample were much less likely than the NHSDA National Sample to have attained various markers of adult mainstream status: they were much less likely to have been married at the time of the interview (14 vs. 69%); less likely to have a college degree (8 vs. 24%); and less likely to have been employed full time (23 vs. 53%). Members of the NHSDA Six-Metro Sample were between the two on all three measures: married (54%), college degree (14%), and working full time (50%). In

contrast to the perception that any hard-drug use can result in social problems, persons from the NHSDA Six-Metro-Hard Sample reported higher mainstream status attainment than the NHSDA Six-Metro Sample on two of the three measures: they were more likely to have completed college (18%) and more likely to have been employed full-time (61%), but less likely to have been married (39%).

Members of the NHSDA Six-Metro Sample were less likely than the NHSDA National Sample to have used 'gateway' drugs (alcohol 79 vs. 89%, tobacco 60 vs. 77%, and marijuana 27 vs. 33%) and no more likely to have

used hard drugs (12% each). A substantial percentage of the NHSDA National and NHSDA Six-Metro Samples reported daily tobacco use (25% each), a small percentage reported daily alcohol use (6 and 5%) and extremely few reported daily use of marijuana (0.3 and 0.4%) or any hard drug (0.03 and 0.2%). Members of the NHSDA Six-Metro-Hard and ADAM Six-Metro-Hard Samples, respectively, were much more likely to report daily alcohol use (12 and 24%) and daily tobacco use (49 and 77%) and some reported daily marijuana use (3 and 6%). A much smaller percentage of the NHSDA Six-Metro-Hard Sample than the ADAM Six-Metro-Hard Sample reported daily use of hard drugs (2 vs. 33%).

This raises the question of the extent to which the daily hard-drug using criminal offenders that routinely pass through the criminal justice system are represented at all in the NHSDA data. A small percentage of the NHSDA National and NHSDA Six-Metro Samples reported having ever been arrested (9 and 6%) and much fewer reported having been arrested in the past twelve months (1% each). In contrast, the ADAM program only interviews recent arrestees. In six cities, from 1991 to 1993, the ADAM program recruited 2,168 self-reported daily hard-drug using recent arrestees aged 26 and above. Only 7 subjects from the NHSDA Six-Metro-Hard Sample reported daily hard-drug use and an arrest in the past 12 months. Indeed, of the 42 372 respondents in the NHSDA National Sample, only 11 reported both daily hard-drug use and a recent arrest. Without the oversample of low SES neighborhoods, the NHSDA would have recruited about 4 such persons, 0.01% of its total sample, about 1 case per year. Additionally, the comparison of status attainment between the NHSDA Six-Metro-Hard and ADAM Six-Metro-Hard Samples suggests that NHSDA respondents who reported any lifetime hard-drug use tended to have been leading very different kinds of lives than the hard-drug users sampled by ADAM. Evidently, the target populations of the NHSDA and ADAM programs are quite distinct even when living in the same cities.

Pathways to hard-drug use

Figs. 1–4 present the transition diagram derived for each of the four samples. The gateway sequence is represented as the horizontal (bold face) sequence of transitions from non-use to alcohol/tobacco, potentially followed by marijuana and then hard drugs. Fig. 1 indicates that most (90%) members of the NHSDA National Sample reported some substance use; conversely, only 10% reported never using any substances. Nearly all substance users nationwide ($94\% = 85/(100 - 10)$) clearly started with alcohol/tobacco. A moderate overall percentage ($26\% = 22/85$) of these alcohol/to-

bacco users next proceeded to marijuana, and a moderate percentage ($29\% = 8/(8 + 20)$) of marijuana users proceeded to hard drugs. These findings are similar to the rates Golub and Johnson (2001b) calculated with the 1979–1997 NHSDA data.

Fig. 1 also indicates that some individuals passed through more than one stage in a single year (dashed arrows at the top). For example, four percent of the sample went from non-use to alcohol/tobacco and marijuana in a single year. Whether these persons used alcohol/tobacco before marijuana or vice versa cannot be determined. These transitions are not necessarily consistent with the gateway model, but they are not clearly inconsistent either. Very few substance-use sequences were clearly inconsistent with the gateway model (solid arrows below the gateway sequence). Two percent of NHSDA respondents started with marijuana, yet nearly all of them ($88\% = 1.4/1.6$) subsequently initiated use of alcohol/tobacco. A few rare individuals (0.2%) proceeded directly from alcohol/tobacco use to hard drugs.

Members of the NHSDA Six-Metro Sample (Fig. 2) were more likely to have never started any substance use than were members of the NHSDA National Sample (20 vs. 10%). A smaller percentage of the NHSDA Six-Metro Sample than the NHSDA National Sample progressed along each of the primary paths of the gateway sequence. However, about the same proportion eventually used hard drugs (9% each; the sum of all of the arrows leading to the rightmost column of states). These numbers differ slightly from the lifetime prevalence rates reported in Table 1 because they exclude persons that initiated hard-drug use after age 25).

The sequences in Fig. 2 conformed slightly less to the gateway model than those in Fig. 1. A few (2%) members of the NHSDA Six-Metro Sample started with marijuana. A barely discernible percentage of the population surveyed (0.5%) went from alcohol/tobacco use to hard drugs. However, these marijuana skippers comprised a noticeable percentage ($6\% = 0.5/9.0$) of all hard drugs users.

Even more deviation from the gateway sequence was identified among those who became hard-drug users (as reported both by members of the NHSDA Six-Metro-Hard Sample in Fig. 3 and the ADAM Six-Metro-Hard Sample in Fig. 4). Fewer members of the NHSDA Six-Metro-Hard and ADAM Six-Metro-Hard Samples (70 and 62%) started with alcohol/tobacco exclusively than did members of the NHSDA National or NHSDA Six-Metro Samples (84 and 73%, Figs. 1 and 2). A noticeable percentage of the NHSDA Six-Metro-Hard and ADAM Six-Metro-Hard Samples started exclusively with marijuana (7 and 10%). Additionally, a substantial percentage had not used both alcohol/tobacco and marijuana by the time they initiated use of hard drugs, some skipped marijuana only (6 and 13%); some

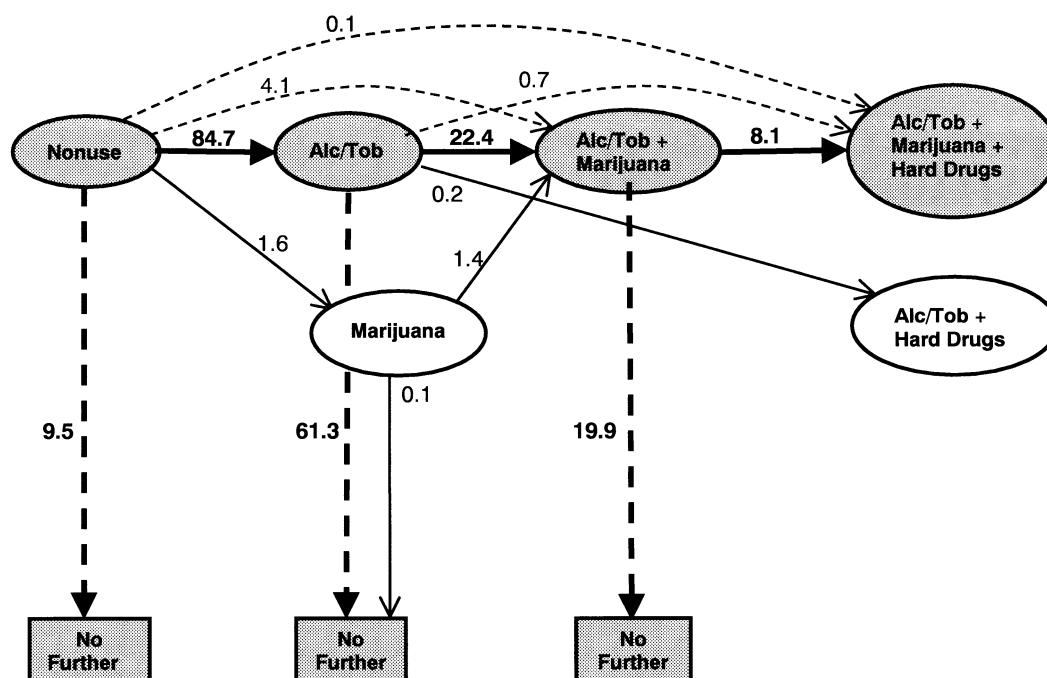


Fig. 1. Probability of drug use progression by age 25 nationwide (NHSDA National Sample 1991–1993, $N = 41\,086$).

skipped alcohol/tobacco only (1% each); and some skipped all of these gateway drugs (1 and 2%).

Covariates of deviation

The study found substantial variation across demographic characteristics in the likelihood of being a

marijuana starter (instead of alcohol/tobacco starter) and a marijuana skipper (instead of progressing from alcohol/tobacco to marijuana and then hard drugs).

Marijuana starters: the overall prevalence of marijuana starters was much lower for the NHSDA National Sample (2%) than the ADAM Six-Metro-Hard Sample (14%; Table 2). This appears to have been a composition

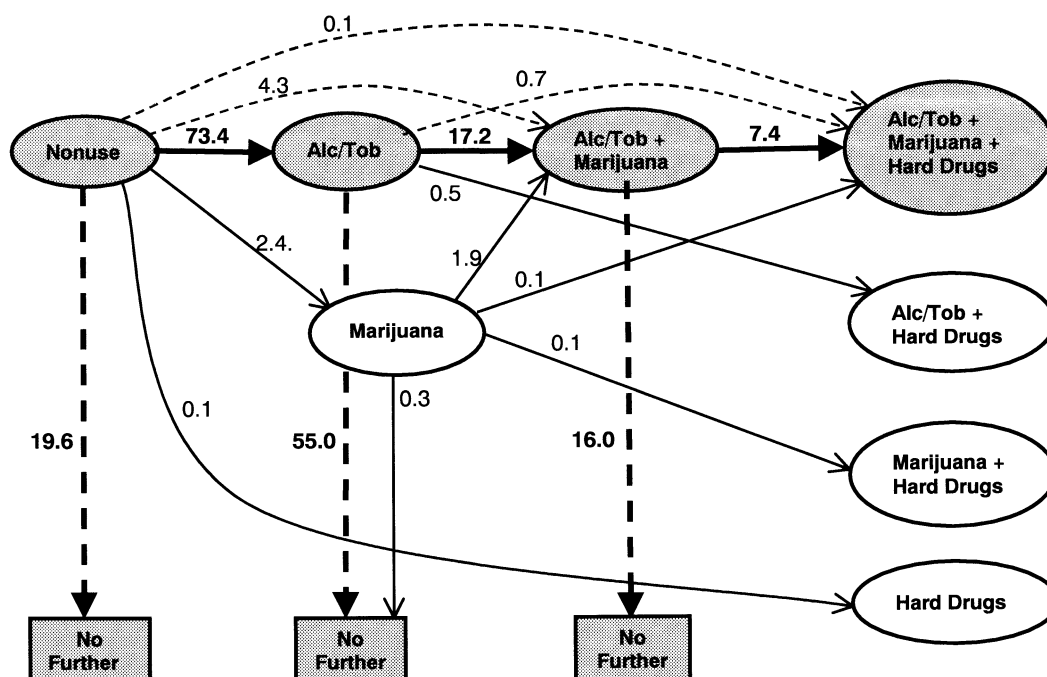


Fig. 2. Probability of drug use progression by age 25 in six inner cities (NHSDA Six-Metro Sample 1991–1993, $N = 11\,026$).

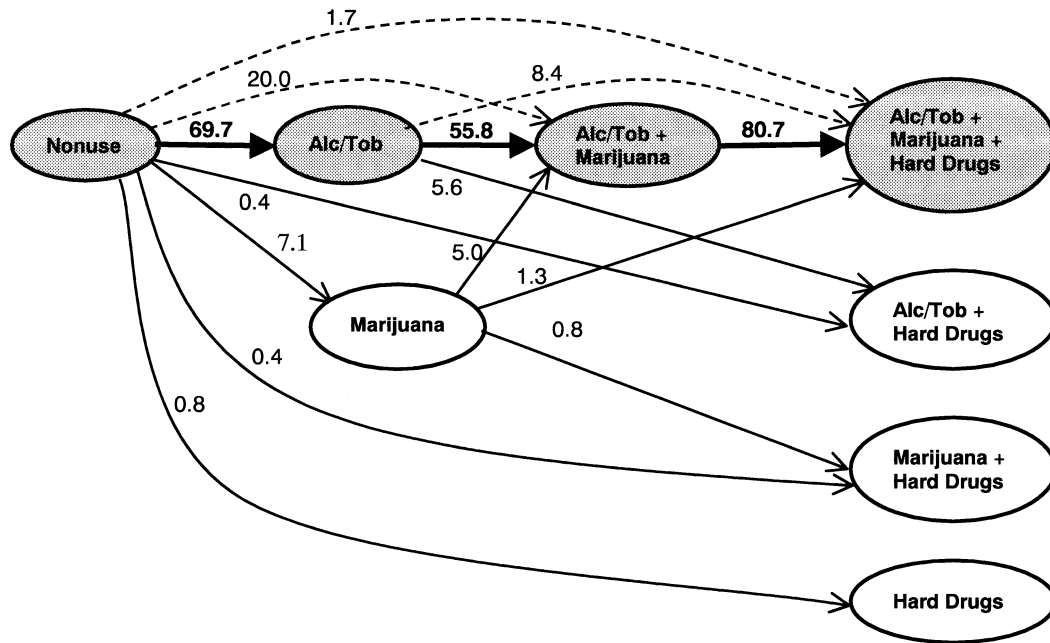


Fig. 3. Probability of transition by age 25 among hard-drug users in six inner cities (NHSDA Six-Metro-Hard Sample 1991–1993, $N = 1540$).

effect, because the parameters estimated with logistic regression were remarkably similar as were the base odds (0.21 and 0.19). The largest effect was associated with birth year (see Wald statistic). Respondents to the NHSDA National Sample born before 1945 were extremely unlikely to have started with marijuana (0.3–0.4%); persons born before 1945 from the ADAM Six-Metro-Hard Sample were more likely to have started with marijuana (4–7%). Among subsequent birth cohorts, the prevalence increased steadily to a high

among respondents born 1965–1967 (7 and 19% for the NHSDA National and ADAM Six-Metro-Hard Samples, respectively).

Blacks were somewhat more likely to have been marijuana starters than were whites; the rate among Hispanics was in between. Males and females were comparably likely to have started with marijuana, as were subjects interviewed in each year 1991–1993. Hard-drug users were much more likely (7%) to be marijuana starters than were members of the general

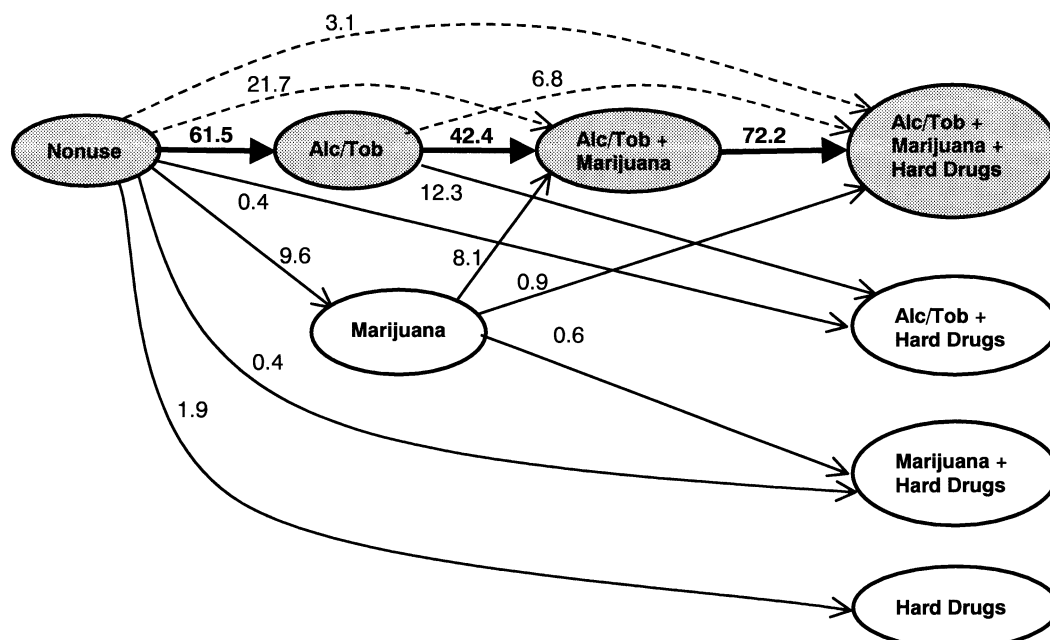


Fig. 4. Probability of transition by age 25 among hard-drug using criminal offenders (ADAM Six-Metro-Hard Sample 1991–1993, $N = 7456$).

Table 2

Percent of marijuana starters by demographics and logistic regression (NHSDA National Sample^a and ADAM Six-Metro-Hard Sample, 1991–1993, age 26+)

		Bivariate comparisons		Odds ratio	
		NHSDA	ADAM	NHSDA	ADAM
Birth year	(Wald(6))			(393.4)**	(83.9)**
	Pre-1940	0.3	7.1	0.1	0.3
	1940–1944	0.4	4.0	0.1	0.2
	1945–1949	1.0	7.0	0.2	0.3
	1950–1954	1.8	7.5	0.3	0.4
	1955–1959	3.6	11.4	0.5	0.6
	1960–1964	6.0	17.1	0.9	0.9
	1965–1967 ^b	6.7	18.7	1.0	1.0
Gender	(Wald(1))			(0.6)	(0.0)
	Male ^b	2.2	13.2	1.0	1.0
	Female	1.9	14.3	0.9	1.0
Race/ethnicity	(Wald(3))			(56.0)**	(16.7)**
	White ^b	1.6	11.0	1.0	1.0
	Black	3.8	14.3	2.1	1.5
	Hispanic	2.5	14.3	1.2	1.3
	Other/missing	2.6	6.1	1.4	0.5
Metro area ^c	(Wald(6))			(16.1)**	(13.7)*
	Chicago	3.2	10.3	0.7	0.7
	Denver	3.2	13.1	0.8	1.0
	Los Angeles	2.9	15.0	0.7	1.1
	Miami	2.0	13.7	0.5	0.9
	New York City ^b	3.6	14.5	1.0	1.0
	Washington, DC	3.4	11.7	0.7	0.8
	Other	1.8	–	0.6	–
	(Wald(1))			(149.5)**	–
Hard drug use ^d	No	1.4	–	0.4	–
	Yes ^b	6.8	–	1.0	–
	(Wald(2))			(2.3)	(0.5)
Interview year	1991	1.8	13.3	0.9	1.0
	1992	2.2	13.0	1.0	0.9
	1993 ^b	2.3	14.0	1.0	1.0
	(Wald(2))			(2.3)	(0.5)
Overall prevalence/base odds		2.1	13.5	0.21	0.19
Sample size		34 606	5304	34 606	5304

^a Sample weights rescaled to sum to size of sample analyzed by year and metropolitan area.

^b Reference category.

^c For the NHSDA data, these are the low SES neighborhoods only. The 'other' category includes other higher SES neighborhoods, other metropolitan areas and all non-metropolitan areas nationwide.

^d Hard drugs include cocaine (as powder or crack) and heroin.

*Statistically significant at the $\alpha = 0.05$ level; **statistically significant at the $\alpha = 0.01$ level.

population who never used hard drugs (1%). Modest variation in marijuana starters was found across the six metro areas with a range from 2 to 4% for the NHSDA National Sample and 10–15% for the ADAM Six-Metro-Hard Sample. However, the rank ordering of the cities was not consistent between the two surveys. NHSDA respondents from outside the six metropolitan sample were somewhat less likely to have started with marijuana (2%).

Marijuana skippers: Skipping marijuana use was quite common among ADAM Six-Metro-Hard arrestees (22%) and much less so among NHSDA National respondents who had used hard drugs (5%; Table 3). The greatest systematic variation in the prevalence of marijuana skippers was associated with metropolitan

area for the ADAM Six-Metro-Hard Sample. Skipping marijuana was the least common among arrestees in Denver, Los Angeles, and Miami (9–16%). More than a quarter of hard-drug using arrestees from Chicago (26%) and New York City (30%) and even more of the arrestees from Washington DC (41%) skipped marijuana use. Even though the bivariate analysis for the NHSDA National sample identified a wide range across metropolitan areas (3–11%), the differences disappeared in the logistic regression analysis after controlling for other variables such as race/ethnicity.

In both the NHSDA National and ADAM Six-Metro-Hard Samples, black (11 and 26%, respectively) and Hispanic (13 and 24%) hard-drug users were substantially more likely to have skipped marijuana

Table 3

Percent of hard drug users that skipped marijuana by demographics and logistic regression (NHSDA National Sample^a and ADAM Six-Metro-Hard Sample, 1991–1993, age 26+)

		Bivariate comparisons		Odds ratio	
		NHSDA	ADAM	NHSDA	ADAM
Birth year	(Wald(6))			(20.2)**	(18.8)**
	Pre–1940	2.8	45.5	0.4	3.0
	1940–1944	15.9	27.4	1.7	1.5
	1945–1949	10.0	26.7	1.5	1.4
	1950–1954	5.2	26.0	1.1	1.4
	1955–1959	2.8	20.0	0.5	1.1
	1960–1964	4.8	22.1	1.0	1.2
	1965–1967 ^b	5.0	19.9	1.0	1.0
Gender	(Wald(1))			(7.6)**	(7.9)**
	Male ^b	4.0	21.7	1.0	1.0
	Female	5.5	24.8	1.5	1.3
Race/ethnicity	(Wald(3))			(71.9)**	(33.5)**
	White ^b	2.6	13.7	1.0	1.0
	Black	10.9	25.8	4.2	1.6
	Hispanic	12.8	23.7	4.6	2.2
	Other/missing	2.7	17.6	0.8	1.5
Metro area ^c	(Wald(6))			(9.4)	(191.6)**
	Chicago	8.3	26.0	0.9	1.0
	Denver	8.2	8.6	1.3	0.2
	Los Angeles	10.7	16.5	1.0	0.5
	Miami	10.0	15.3	0.9	0.5
	New York City ^b	10.5	29.8	1.0	1.0
	Washington, DC	5.7	40.8	0.6	1.7
	Other	3.3	–	0.6	–
	(Wald(2))			(0.7)	(0.5)
Interview year	1991	4.9	22.5	1.2	1.0
	1992	4.5	21.7	1.1	1.0
	1993 ^b	4.2	23.2	1.0	1.0
		4.6	22.5	0.03	0.20
Overall prevalence/base odds					
Sample size		4070	4084	4070	4084

^a Sample weights rescaled to sum to size of sample analyzed by year and metropolitan area.

^b Reference category.

^c For the NHSDA data, these are the low SES neighborhoods only. The ‘other’ category includes other higher SES neighborhoods, other metropolitan areas and all non-metropolitan areas nationwide.

*Statistically significant at the $\alpha = 0.05$ level; **statistically significant at the $\alpha = 0.01$ level.

than were white hard-drug users (3 and 14%). Females (6 and 25%) were somewhat more likely to have skipped marijuana than were males (4 and 22%). The prevalence of marijuana skippers declined across more recent birth cohorts. For the NHSDA National Sample, the rate peaked among persons born 1940–1944 at 16% and dropped to about 5% or less among persons born since 1950. For the ADAM Six-Metro-Hard sample, the rate dropped from 46% among arrestees born before 1940 down to 26–27% among those born 1940–1954 and then to 20–22% among those born since 1955. There was no significant variation across interview years.

Variation across birth cohorts

The analysis of covariates indicates that persons born more recently have been increasingly likely to be marijuana starters and less likely to be marijuana

skippers. Fig. 5 presents the prevalence of marijuana starters (in contrast to alcohol/tobacco starters) for all NHSDA and ADAM respondents, not just those who were age 26 and above at the time of the interview. Marijuana starters were uncommon among persons born before 1945 (less than 5% for the ADAM sample and 0% for the NHSDA sample). Among arrestees, the rate increased steadily with each successive birth cohort up until 1963. Among arrestees born 1963–1975, 15–20% were marijuana starters. Among arrestees born in the late 1970s and early 1980s the rate jumped up to 25–30%. Marijuana starters were never as prevalent among the NHSDA population. The rate increased from 1947 to 1960 and then held steady at about 5% from 1960 to 1970. The percentage of marijuana starters then dipped down to as low as 3% in 1977, returned to about 5% in 1980 and then dipped back down to 3% by 1984.

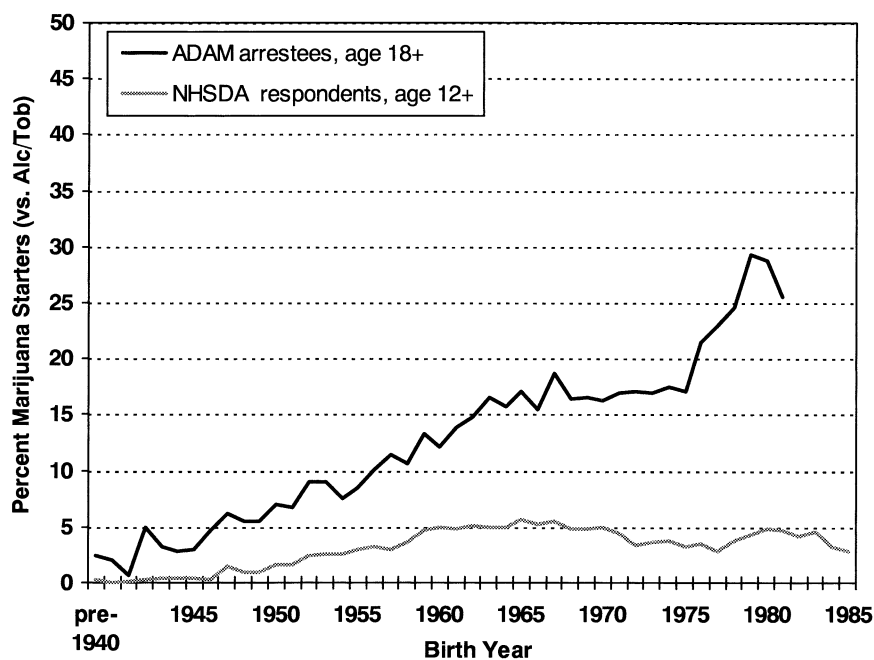


Fig. 5. Percent of marijuana starters by birth year (NHSDA respondents, 1991–1998, age 12+, $N = 134\,921$; ADAM Six-Metro arrestees, 1991–1999, age 18+, $N = 47\,015$).

Discussion

The secondary data analysis presented in this paper indicates that the NHSDA survey routinely fails to recruit persons who disclose daily use of cocaine powder, crack and heroin, the types of hard-drug using persons that routinely pass through the criminal justice system and are recruited by the ADAM survey program. Consequently, the NHSDA data (even the oversample from low-SES inner-city neighborhoods collected from 1991 to 1993) are poorly suited for studying hard-drug use and its consequences. There are several possible alternative explanations for this finding: non-disclosure, differential attrition, and mutual exclusivity. Insufficient empirical evidence is available to definitively identify the relative importance of each explanation. Conceivably, the NHSDA sample may include a substantial number of hard-drug using persons with arrest histories who are unwilling to self-report their current daily use of hard drugs and criminal record to survey-takers in spite of the many NHSDA procedures to ensure confidentiality. Alternatively, as persons develop serious drug use problems they may become increasingly less likely to reside in households sampled by the NHSDA or increasingly less willing to complete the survey constituting differential attrition from the survey's sampling frame.

Based on the authors' experience with ethnographic and survey research, we favor the third possible explanation, mutual exclusivity. We suspect that members of the general population typically sampled by the NHSDA rarely become the daily hard-drug using,

criminal offenders routinely surveyed by the ADAM program. This is not to say that youths growing up under better circumstances do not experiment with hard drugs. [Murphy and Rosenbaum \(1997\)](#) described how the support network available to such persons helps them overcome any potential setbacks from drug use and eventually establish a more productive lifestyle. Conversely, many (if not most) of the hard-drug-using criminal offenders that routinely pass through the criminal justice system grew up under severely distressed conditions in inner-city households where poverty, drug abuse, crime and interpersonal violence are commonplace and routinely transmitted across generations ([Johnson, Dunlap, & Maher, 1998](#); [Dunlap, Johnson, Golub, & Wesley, 2002](#)). Such unstable households may be rarely selected for inclusion in the NHSDA, and when selected, persons from these households may routinely decline to participate or severely under-report their actual behaviors.

Most centrally, the paper raises grave doubts about whether the gateway sequence is relevant to high-risk populations. The gateway sequence best characterized the substance use histories for the NHSDA National Sample, which was dominated by persons who had never used any illegal drugs. The gateway sequence proved substantially less useful for characterizing the substance-use sequences reported by ADAM arrestees, especially those born more recently. This finding strongly suggests that it is not the use of alcohol, tobacco and then marijuana that causes inner-city youths to get in trouble with both drugs and the law. The analysis also raises doubts about whether youths

from more fortunate circumstances who experiment with drugs at each stage of the gateway sequence really face much risk of becoming one of the daily hard-drug-using criminal offenders that routinely pass through the nation's criminal justice system.

These insights suggest that to be effective, drug-use prevention policies should consider the varied social contexts in which youth are developing today. A cornerstone of this policy should involve amelioration of the conditions in the inner cities that place youths at high risk (Anderson, 1999; Furstenberg, Cook, Eccles, Elder & Sameroff, 1999). Scholars, policy makers and service providers have contended that a comprehensive solution to improve conditions is the best approach to a long-term reduction in drug abuse and its associated problems (e.g. Clear & Karp, 2000; Currie, 1998; Dryfoos, 1998; Morley, Rossman, Kopczynski, Buck, & Gouvis, 2000). Special efforts are needed for the most disaffiliated drug users to establish healthy productive lifestyles (De Leon, 2000).

The limitations of zero-tolerance policies for youthful substance use are also evident. Any use is not the same as abuse or even daily use of hard drugs. The data suggest that the vast majority of NHSDA respondents who had used alcohol/tobacco, marijuana, and even hard drugs, very rarely become daily users or abusers of these substances. Moreover, the continually high levels of lifetime alcohol use and daily cigarette smoking among high school seniors suggests the futility of trying to keep youths from ever using them; Johnston, O'Malley, and Bachman (2000) (p. 149) found that 79–93% of each class of high school seniors from 1975 to 1999 reported having used alcohol at some time in their life. Rather, some scholars contend the most appropriate approach to drug abuse prevention among youths involves teaching them how to make decisions, giving them accurate information about substances, helping them develop coping skills for relating to their peers, and helping them learn how to integrate controlled use of some substances (like coffee and alcohol) into a healthy, productive lifestyle (Botvin, Schinke, & Orlandi, 1995; Hanson, 1996). Widespread substance use is part of our culture, however, substance abuse and its associated problems need not be.

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