

# A Recent Decline in Cocaine Use among Youthful Arrestees in Manhattan, 1987 through 1993

## ABSTRACT

**Objectives.** Cocaine use among youths as measured by several annual surveys was most popular from about 1979 to 1986, after which it declined. This study carefully examines the nature of the decline by focusing on microdata for youthful arrestees in Manhattan.

**Methods.** Multiple statistical analyses examine whether the decline in cocaine use detected by urinalysis is attributable to fewer arrested youths born more recently having become regular users (cohort effect), to regular users decreasing their consumption (period effect), or to changes in arrest or sampling priorities (artifact).

**Results.** All analyses suggest that the dramatic decline in detected cocaine use among arrestees—from 69% in 1987 to 17% in 1993—was a cohort effect. Detected cocaine use, which was highest (78%) among arrestees reaching 18 in 1986 at the height of the crack epidemic in New York City, subsequently declined to a low of 10% among arrestees reaching 18 in 1993.

**Discussion.** These findings suggest that the epidemic in use of cocaine and crack entered a decline in the late 1980s. However, widespread use of these drugs will probably continue to prevail as an aging population with established habits persists in its use. (*Am J Public Health*. 1994;84:1250-1254)

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## Introduction

This paper examines recent trends in illicit drug use among very high-risk youths who have problems with both drug use and the law. Persons tend to establish lifetime drug use patterns by their teens or mid-20s.<sup>1-4</sup> Many adults eventually stop using certain drugs or decrease their frequency of use. However, some persons who begin using or abusing illicit drugs as teens persist in such use for a long time. Hence, trends in drug use among youths provide a harbinger of future drug use patterns by these persons as adults. For example, in New York City today, the majority of heroin injectors are currently in their late 30s, 40s, and 50s, and began injecting heroin in the 1960s and early 1970s.<sup>5-10</sup>

Table 1 reports trends in the use of certain illegal drugs among youths from three major ongoing surveys. Monitoring the Future obtains self-reported drug use histories from a national probability sample of high school seniors.<sup>11</sup> The National Household Survey on Drug Abuse uses a nationwide sample of households.<sup>12,13</sup> The Drug Use Forecasting (DUF) program, started in 1987, collects urine specimens along with self-reported information from a sample of arrestees at each of 24 central booking facilities nationwide.<sup>14-16</sup> Results from the first two surveys exhibit comparable trends in drug use over time; those from the Drug Use Forecasting program in Manhattan reveal much higher levels of drug use than the other two surveys.

A recent report by the US General Accounting Office suggests that the overall prevalence of drug use measured by each of these three surveys can be misleading.<sup>17</sup> Self-reported data from Monitoring the Future and the National Household Survey may be biased down-

ward by subjects' unwillingness to report drug use and by the fact that many serious drug abusers neither remain in school nor live in stable households. The Drug Use Forecasting program obtains an objective measurement of recent drug use with urine samples. Through use of the enzyme-multiplied immunoassay technique urinalysis screen, it detects cocaine use within the past 48 to 72 hours but does not distinguish mode of use (i.e., snorting, smoking, or injecting).<sup>15</sup> Consequently, many youthful arrestees detected as recent cocaine users may have been crack users.

The Drug Use Forecasting sample of arrestees, however, is not representative of the general community, and so the prevalence of detected drug use within it is typically much higher.<sup>17</sup> Most of its youthful arrestees in Manhattan were charged with a serious crime, 80% for a felony; additionally, most are male (82%) and minority (80% Black or Hispanic).

This study focuses less on the overall magnitude of drug use and more on changes over time, especially the decline in the detected use of cocaine from 69% in 1987 to 17% in early 1993 among Drug

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*Note.* The views expressed here are the authors' and do not necessarily represent the official positions of the US government, National Development and Research Institutes, Inc, or John Jay College of Criminal Justice.

**TABLE 1—Trends in Youthful Drug Use as Reported by Drug Use Forecasting—Manhattan, Monitoring the Future, and the National Household Survey on Drug Abuse, 1975 through 1993**

	Percentage Reporting Use, by Interview Year																		
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
<b>Drug Use Forecasting<sup>a</sup></b>																			
Cocaine/crack													69	61	51	31	25	23	17 <sup>b</sup>
Opiates													14	8	8	5	2	8	4 <sup>b</sup>
Marijuana/hashish													35	34	27	28	31	40	24 <sup>b</sup>
Any of 10 drugs <sup>c</sup>														71	62	51	50	56	39 <sup>b</sup>
<b>Monitoring the Future<sup>d</sup></b>																			
Cocaine/crack	1.9	2.0	2.9	3.9	5.7	5.2	5.8	5.0	4.9	5.8	6.7	6.2	4.3	3.4	2.8	1.9	1.4	1.3	1.3
Heroin	0.4	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.2	0.2	0.3	0.2
Marijuana/hashish	27.1	32.2	35.4	37.1	36.5	33.7	31.6	28.5	27.0	25.2	25.7	23.4	21.0	18.0	16.7	14.0	13.8	11.9	15.5
Any illicit drug	30.7	34.2	37.6	38.9	38.9	37.2	36.9	32.5	30.5	29.2	29.7	27.1	24.7	21.3	19.7	17.2	16.4	14.4	18.3
<b>National Household Survey on Drug Abuse<sup>e</sup></b>																			
Cocaine/crack		2.0	3.7		9.3		6.8		7.6		4.5		2.2	2.0	1.8				
Heroin		0.0	0.0		0.0		0.0		0.0		0.0		0.1	0.1	0.2				
Marijuana/hashish		25.0	27.4		35.4		27.4		21.8		15.5		12.7	13.0	11.0				
Any illicit drug <sup>f</sup>					37.1		30.4		25.7		17.8		14.9	15.4	13.0				

<sup>a</sup>The Drug Use Forecasting—Manhattan program, which detects recent use via urinalysis, recruits around 200 arrestees under age 21 per year resulting in standard errors for drug use prevalence on the order of 3.0%.

<sup>b</sup>First quarter results only.

<sup>c</sup>Since 1988, the Drug Use Forecasting program has tested for cocaine, opiates, cannabis, amphetamines, barbiturates, benzodiazepines, methadone, methaqualone, propoxyphene, and phencyclidine.

<sup>d</sup>From Johnston et al.<sup>11</sup> Monitoring the Future interviews about 16 000 high school seniors each year regarding drug use within the past 30 days and thus obtains extremely accurate prevalence rates with standard errors on the order of 0.2%.

<sup>e</sup>From the National Household Survey on Drug Abuse.<sup>12,13</sup> The National Household Survey on Drug Abuse, which also is concerned with drug use within the past 30 days, typically surveys more than 1000 persons aged 18 to 25 in each sampling year, which results in standard errors on the order of 0.7%.

<sup>f</sup>Question initiated in the 1979 survey.

Use Forecasting Manhattan arrestees under age 21. The overall trends in the use of any illicit drugs, as shown in Table 1, primarily reflect changes in the popularity of marijuana—the most commonly used illicit drug—which peaked in 1979 and declined thereafter. A previous study reported in this Journal documented that these national trends are mirrored by those among high school students in New York State.<sup>18</sup>

Table 1 indicates that cocaine use among youths nationally also peaked by 1979. Unlike marijuana, however, cocaine maintained its popularity through about 1986, after which time its use declined precipitously. This is documented in other studies,<sup>23</sup> in which cocaine use increased from about 1979 and then declined starting in the late 1980s. Overall drug use and the use of heroin declined in the late 1980s, suggesting that these former cocaine users did not replace cocaine with other known hard drugs. The congruence of findings from these three extensive data sets, along with observations by ethnographers,<sup>19–22</sup> thus provides strong evidence of a *passing cocaine fad among youths* as well as among adults.

## Methods

The observed decline in detected cocaine use among Drug Use Forecasting—Manhattan youthful arrestees from 1987 to the first quarter of 1993 (1Q93) may have resulted from either of three phenomena: (1) a decline in use, as youths who previously used cocaine cut back on their frequency of use or terminated use completely; (2) a decline in initiation, as fewer of those youths who were born more recently initiated regular cocaine use; or (3) a change in sample characteristics, as changes in either policing priorities or Drug Use Forecasting—Manhattan recruitment procedures resulted in there being fewer cocaine-using offenders recruited in more recent samples.

Three statistical techniques were used to analyze this decline: an age-period-cohort analysis, logistic regression, and postdiction. The age-period-cohort analysis examined a two-way table displaying trends in prevalence of detected cocaine use as a function both of birth year down the rows (cohort effect) and of interview year across the columns (period effect). Any detectable period effect reflected

both changes in drug use over time and changes in Drug Use Forecasting sampling procedures. An age effect would be observed as any differences across diagonals.

Logistic regression differs from ordinary least-squares regression primarily in that the dependent variable represents the odds for a particular trait—in this case, detected cocaine use. (For a thorough discussion of the properties of logistic regression, see Hosmer and Lemeshow.<sup>24</sup>) Just like ordinary least-squares regression, logistic regression has the important property of estimating the variation associated with each independent variable simultaneously and, thereby, controlling for the influence of all other variables included in the analysis. To control for any changes in the sample composition over time, the following arrest and demographic variables were included in this analysis: (1) most serious arrest charge, (2) whether the arrest was for a misdemeanor or a felony, (3) sex, and (4) race/ethnicity. Birth year was included to measure changes across birth cohorts. Similarly, interview year was included to identify any residual decline

TABLE 2—Variation in Detected Cocaine Use, by Birth Year and Interview Year

Birth Year	Proportion Detected as Cocaine Users (SE), and Count, by Drug Use Forecasting Interview Year <sup>a</sup>							Average <sup>b</sup>
	1987	1988	1989	1990	1991	1992	1993	
1966	0	75 (6)	79 (6)	59 (7)	58 (6)	72 (7)	68 (11)	0
1967	62 (8)	<b>93 (7)</b>	70 (5)	63 (7)	78 (6)	61 (7)	71 (9)	71 (7)
	34	<b>14</b>	74	56	50	46	24	48
1968	88 (6)	67 (7)	<b>87 (9)</b>	53 (6)	57 (7)	79 (7)	68 (10)	78 (4)
	34	43	<b>15</b>	62	54	38	25	92
1969	64 (10)	63 (8)	57 (7)	<b>62 (4)</b>	65 (6)	58 (7)	50 (13)	60 (4)
	22	38	56	<b>13</b>	57	48	16	129
1970	72 (11)	64 (9)	60 (6)	47 (8)	0	47 (9)	45 (16)	58 (4)
	18	33	60	45	0	30	11	156
1971	40 (16)	46 (10)	45 (9)	37 (7)	49 (8)	<b>58 (15)</b>	15 (10)	45 (4)
	10	24	31	46	45	<b>12</b>	13	168
1972		28 (11)	29 (7)	18 (6)	20 (7)	27 (9)	<b>31 (13)</b>	24 (3)
		18	38	44	35	26	<b>13</b>	174
1973			32 (11)	30 (7)	20 (6)	20 (7)	44 (18)	26 (4)
			19	44	40	35	9	147
1974			0 ... <sup>c</sup>	10 (6)	22 (7)	17 (6)	0 ... <sup>c</sup>	16 (3)
			1	30	37	36	5	109
1975			0 ... <sup>c</sup>	0 ... <sup>c</sup>	11 (6)	16 (7)	0 ... <sup>c</sup>	10 (4)
				3	27	25	12	67
1976			0 ... <sup>c</sup>	33 (33)	0 ... <sup>c</sup>	13 (13)	0 ... <sup>c</sup>	10 (7)
			1	3	5	8	3	20
1977					0 ... <sup>c</sup>	100 ... <sup>c</sup>	0 ... <sup>c</sup>	20 (20)
					1	1	3	5
1978							0 ... <sup>c</sup>	0 ... <sup>c</sup>
							1	1
Average <sup>b</sup>	69 (4)	61 (4)	51 (3)	31 (3)	25 (3)	23 (4)	17 (6)	41 (1)
	118	170	221	228	190	143	46	1116

<sup>a</sup>The bold italic figures indicate when a birth cohort reached age 21.

<sup>b</sup>Averages include only those arrestees under age 21.

<sup>c</sup>Standard error is meaningless when prevalence is either 0% or 100%.

resulting from former users decreasing or terminating use, controlling for both changes in sample composition and variation across birth cohorts. Quarter was included to detect any seasonal variation.

Postdiction examined the extent to which differences across birth cohorts and sample composition alone and in combination could account for the observed decline. The first step was to estimate a logistic regression model with detected cocaine use as the dependent variable. The independent variables included the sample composition variables and/or birth year. This regression model explicitly excluded the Drug Use Forecasting interview year and quarter as independent variables in order to determine how variation over time in the sample composition and birth cohort variables could reproduce (or postdict) the observed decline in detected cocaine use. The second step was to determine each subject's probability of detected cocaine use by employing the coefficient estimates from the logistic regression model. The last step was to calculate the postdicted

rate of detected cocaine use for each year as the sum of the appropriate individual, postdicted probabilities.

## Results

The substantial variation in detected cocaine use across birth years and the lack of a decline across interview years by birth cohort reported in Table 2 suggest that the decline in detected cocaine use was predominately a cohort effect and that few cocaine-using criminal offenders reduced or terminated use of cocaine. Overall, detected cocaine use declined dramatically across birth cohorts from a high of 78% among arrestees born in 1968 to a low of 10% among those born in 1975 and 1976.

The logistic regression analysis further documents the contribution of each explanation for the observed decline. The estimated odds of detected cocaine use reported at the bottom of Table 3 are for the reference population, persons whose attributes matched the reference levels for each attribute analyzed (identified in

italics). These odds are referred to as the "reference rate." Hence, urine tests of youthful, male, Black arrestees for a larceny misdemeanor, interviewed by Drug Use Forecasting—Manhattan in 1Q87 and born in 1967, were nine times as likely to give evidence of cocaine use as not. (These odds of 9:1 correspond to a 90% probability of detected cocaine use.)

Table 3 also reports estimated odds ratios associated with each attribute level that differs from the reference level. The odds of detected cocaine use for nonmembers of the reference population equals the product of the reference rate times the odds ratio associated with each attribute differing from the reference level. For example, the analysis indicates that arrestees for drug possession whose other attribute values matched the reference levels were about twice as likely as the reference population to be detected as cocaine users. Their estimated odds are 18:1 (2.04 × 9).

The Wald statistics reported in Table 3 test whether the variation in estimated odds ratios across the levels of each

**TABLE 3—Covariates of Detected Cocaine Use among Youthful Arrestees (n = 1113)<sup>a</sup> (Logistic Regression)**

Attribute	Level	Estimated Multiplier
Interview year Wald(6) = 5.5	1987 <sup>b</sup>	1.00
	1988	0.64
	1989	0.67
	1990	0.54
	1991	0.55
	1992	0.50
	1Q93	0.29
Quarter Wald(3) = 13.9*	First	1.00
	Second	0.53
	Third	0.57
	Fourth	0.51
Birth year Wald(11) = 58.1*	1967	1.00
	1968	1.73
	1969	0.86
	1970	0.87
	1971	0.55
	1972	0.23
	1973	0.28
	1974	0.15
	1975	0.10
	1976	0.12
	1977	c
1978	c	
Arrest charge Wald(8) = 27.6*	Drug possession	2.04
	Drug sales	1.76
	Robbery	0.81
	Burglary	1.17
	Larceny/ auto theft	1.00
	Violent index	0.60
	Other income generating	1.44
Other serious crime	Other serious crime	0.61
	Other	0.62
	Misdemeanor/ felony	1.00
Misdemeanor/ felony Wald(1) = 16.5*	Misdemeanor	1.00
	Felony	0.41
Sex Wald(1) = 1.8	Male	1.00
	Female	0.76
Race/ethnicity Wald(3) = 5.6	Black	1.00
	White	1.27
	Hispanic	0.97
	Other/missing data	0.41
Odds of detected cocaine use for the reference population = 9:1		

Note.  $-2 \times \log\text{-likelihood} = 1213.6$ .

<sup>a</sup>Excludes three cases that were missing demographic data.

<sup>b</sup>Italics indicate reference level.

<sup>c</sup>Too few cases to accurately estimate a coefficient.

\*Statistically significant  $\alpha = .01$  level.

**TABLE 4—Postdicted Decline in Detected Cocaine Use, 1987 through 1993, Based on Changes in Arrest Sample Composition and Birth Cohorts**

Model	Percentage Detected as Cocaine Users (SE) by Interview Year						
	1987	1988	1989	1990	1991	1992	1Q93
Observed	69 (4)	61 (4)	51 (3)	31 (3)	25 (3)	23 (4)	17 (6)
Postdicted by composition and birth cohort differences	66	61	49	33	26	23	19
Postdicted by sample composition differences alone	45	46	43	36	39	40	39
Postdicted by birth cohort differences alone	67	59	49	36	25	21	18

attribute are statistically significant, based on an asymptotic  $\chi^2$  distribution. The Wald statistics also provide a rough rank ordering of the partial influence of each independent variable, controlling for all others. The most important variable was birth year, followed by arrest charge, misdemeanor/felony, and quarter. The variation in detected cocaine use associated with interview year was not statistically significant ( $\alpha = .01$  level), suggesting that the observed decline probably did not result from a reduction or termination of cocaine use.

Youthful arrestees born in 1968 exhibited the highest rate of detected cocaine use, controlling for the influence of all other variables. These youths reached age 18 in 1986, which was near the height of the epidemic-like growth in the prevalence of crack use.<sup>25-27</sup> The rate of detected cocaine use declined steadily among arrestees born after 1968. Those born in 1976 were 14 times less likely to be detected as cocaine users than those born in 1968 (1.73/0.12), controlling for all other variables.

This finding helps explain the observed decline in detected cocaine use among youthful arrestees, given that the 1968 birth cohort comprised a declining proportion of the sample over time. Since the 1968 birth cohort turned 21 in 1989, the 1989 sample contained fewer arrestees born in 1968—they were included in the youthful arrestee sample when an arrest preceded the offender's 21st birthday—and samples from 1990 and later contained no one born in 1968. Analysis of quarterly data not presented here indicates that the highest levels of detected cocaine use among youthful arrestees occurred in mid-1989 and decreased dramatically in the fourth quarter of that year.

Table 4 presents results from various postdiction models of the decline in detected cocaine use as a function of

various independent variables. The first row shows the observed decline in detected cocaine use from 1987 to 1Q93, for comparison. The second row shows time variation in detected cocaine use postdicted by the combined effects of changes in sample composition and differences across birth cohorts. The combined model closely recreates the observed decline, corroborating the finding from the logistic regression analysis, which suggests that the overall decline does not reflect a reduction or termination of cocaine use.

The last two rows of Table 4 show the decline attributable to changes in sample composition alone and birth cohort alone, respectively. Sample composition alone postdicted a modest decline from 45% in 1987 down to 39% in 1Q93, which is much smaller than the observed decline from 69% to 17%. Hence, changes in policing priorities and/or Drug Use Forecasting practices as measured through the individual attributes included in this analysis can account for, at most, 12% [(45%–39%) ÷ (69%–17%)] of the observed decline in detected cocaine use from 1987 to 1Q93.

On the other hand, the decline postdicted by differences across birth cohorts alone recreates the observed decline as well as the model, including sample composition variables and birth cohort. This further supports the idea that the decline in detected cocaine use resulted primarily from differences in the proportion of youthful arrestees initiating use of cocaine across birth cohorts, and was not owing to changes in sample composition or in cocaine use patterns among members of earlier birth cohorts.

## Discussion

Three different statistical analyses with the Drug Use Forecasting–Manhattan data—age-period-cohort analysis, lo-

gistic regression, and postdiction—all strongly suggest that the observed decline in cocaine use among youthful arrestees resulted from a spectacular decline in the proportion of persons who grew up more recently becoming habitual users of cocaine or crack. Arrestees born in 1968 reached age 18 in 1986, the height of the crack epidemic,<sup>26,27</sup> and were the most likely to be detected as cocaine users (78%). Detected cocaine use declined sharply among eight subsequent cohorts of youthful arrestees to 45% among those born in 1971 and a low of 10% among those born in 1975 and 1976. Furthermore, cohorts of arrested youths who initiated cocaine use during the height of the cocaine/crack epidemic during the mid-1980s tend to have continued regular use. Whether new cohorts of youthful arrestees, those born between 1976 and 1979, continue to avoid cocaine and crack before reaching age 21 (and at older ages as well) in 1997 to 2000 remains to be documented. Additional research is also needed to document whether parallel declines in detected cocaine use have been occurring among youthful arrestees in other Drug Use Forecasting cities.

By way of explanation, some ethnographic research suggests that youths reaching their teens in the late 1980s and 1990s saw the ravages of crack smoking and heroin injecting by adults and consciously chose not to use these drugs.<sup>21,28</sup> Alternatively, this dramatic decline may represent a major and important victory for the various efforts such as school-based drug-abuse prevention programs and street sweeps of drug dealers aimed at reducing cocaine abuse in inner-city New York. Additional research is needed to identify the role (if any) of various policy initiatives. Identifying the nature of the most effective programs could help inform future drug abuse prevention policy.

The finding that high-risk, inner-city youths reaching age 18 in the 1990s were dramatically less likely to initiate regular use of cocaine suggests that the cocaine and crack epidemics are ebbing. Widespread use of any particular drug cannot be sustained indefinitely unless large numbers of youths continue to become habitual users. The use of cocaine, and in particular crack, may persist for another 20 or 30 years if those who began using it in the mid-1980s continue regular consumption. Perhaps New York City's crack epidemic will parallel the city's experience with heroin injection, initiation to which was quite common during the 1960s and early 1970s but is undertaken by relatively

few young people today.<sup>9</sup> Many persons who began injecting heroin during its period of widest popularity (1963 to 1973) are still injecting it even though they tend to be in their 30s, 40s, and 50s in 1994. An analogous trajectory for crack cocaine would result in substantial numbers of middle-aged crackheads but few youthful crack users in the 2010s. □

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