

Cocaine Use and Characteristics of Young Adult Users from 1987 to 1992: The CARDIA Study

ABSTRACT

Objectives. This study examined the relationship of sociodemographic factors and use of substances other than cocaine to cocaine use from 1987 to 1992 in a cohort of Black and White men and women 20 to 32 years of age.

Methods. Data were collected as part of the Coronary Artery Risk Development in Young Adults study. Self-reported cocaine use was analyzed through chi-square tests and repeated measures analyses of variance to determine the bivariate and multivariate relationships of sociodemographics and substance use behaviors to cocaine use over the 5-year period.

Results. Cocaine use declined in Whites but remained stable in Blacks from 1987 to 1992. Cross-sectional results showed that use was related to being Black, male and in the older half of the cohort, single, and unemployed; it was also related to higher levels of other substance use in 1987 and 1992. Over time, the magnitude and strength of the relationship were consistent for each variable except for increased odds of cocaine use among the unemployed and Blacks in 1992.

Conclusions. Sociodemographic characteristics and substance use behavior consistently identify individuals at risk for cocaine use. As a result, intervention programs should be targeted at these high-risk groups. (*Am J Public Health.* 1996;86:1736-1741)

Barbara L. Braun, PhD, David Murray, PhD, Peter Hannan, MStat, Stephen Sidney, MD, MPH, and Chap Le, PhD

Introduction

Despite a decline in cocaine use prevalence in the United States from 1987 to 1992,¹⁻⁵ the problems related to cocaine use are significant and appear to be increasing in magnitude.^{4,6} For example, cocaine has continued to be strongly implicated in medical emergencies,⁷ in drug abuse deaths,^{8,9} and in violent behavior and violent crime.¹⁰⁻¹⁴

Previous studies have identified factors associated with cocaine use and abuse in young adults (e.g., use of other illicit drugs in both adulthood¹⁵⁻¹⁷ and adolescence¹⁸). Cocaine use among young adults is negatively associated with educational level, is higher among those who are unemployed, and has been shown to be higher among Blacks than Whites more than 35 years of age but higher among Whites than Blacks at younger ages.⁶ Young adult cocaine users are more likely to have unstable societal roles, reflected in higher divorce rates, less job stability, and more criminal convictions.¹⁵ They are less likely to have been married and more likely to have lived or to currently live with a nonmarital partner.¹⁵

Although cocaine use has been studied, there are methodological limitations in the published data and understudied aspects of use. Previous studies have been characterized by lack of ethnic diversity, limited age groupings, few women, and an inability to assess the simultaneous effect of factors such as ethnicity, sex, and age. Data collection has often involved face-to-face or telephone interviews; such methods have been reported to increase the likelihood of underreporting in comparison with more anonymous methods such as self-administered questionnaires.¹⁹ Adult risk factors for current cocaine use

may differ from adolescent predictors, and adults 26 years of age or older may have different characteristics than the younger adults surveyed in previous studies. In addition, characteristics of cocaine users may have changed in recent years.

The Coronary Artery Risk Development in Young Adults study (CARDIA) provided an opportunity to address cocaine use without some of the limitations of previous studies. The goal of CARDIA was to identify and monitor the distribution of coronary heart disease risk factors (including illicit drug use) in a randomly sampled biethnic cohort of men and women of varied socioeconomic status who were 20 to 32 years of age in 1987. The CARDIA data set also includes unique data on lifestyle and behavioral characteristics that may influence cocaine use. This unique longitudinal cohort study allowed us to assess cocaine use by sociodemographic characteristics and to assess the simultaneous effect of these and other factors in relation to cocaine use. The purpose of the present study was to determine the proportion of cocaine users in this cohort and to evaluate the relationship of cocaine use to sociodemographic factors and other substance use

At the time of the study, Barbara L. Braun, David Murray, and Peter Hannan were with the Division of Epidemiology, University of Minnesota School of Public Health, Minneapolis; Dr Braun is now with Duluth Clinic, Duluth, Minn. Stephen Sidney is with the Kaiser-Permanente Division of Research, Oakland, Calif. Chap Le is with the Division of Biostatistics, University of Minnesota School of Public Health.

Requests for reprints should be sent to Barbara L. Braun, PhD, Duluth Clinic, Division of Education and Research, 400 E Third St, Duluth, MN 55805.

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behavior over the 5-year period 1987 to 1992.

Methods

The data used in this study were collected at the second and fourth examinations of the CARDIA study. From March 1985 through June 1986, 5115 Black and White men and women 18 to 30 years of age were recruited and examined at one of four clinical sites: Birmingham, Ala; Chicago, Ill; Minneapolis, Minn; and Oakland, Calif. In Birmingham, Chicago, and Minneapolis, participants were randomly recruited from the community or from selected census tracts. At the Oakland center, participants were randomly recruited from the Kaiser-Permanente health plan membership. Recruitment methods effectively achieved the study aim of a cohort approximately balanced on two levels of age (24 years old or less in 1985 and more than 24 years old in 1985), ethnicity (Black and White), sex, and education level (high school or less or greater than high school in 1985). Details on sampling methods and clinic protocol have been published previously.²⁰⁻²² Participants were reexamined in 1987/88 (retention rate: 90.4%), 1990/91 (retention rate: 85.1%), and 1992/93 (retention rate: 80.6%).

Study Sample

The 4624 subjects who attended the second CARDIA examination are the focus of this report. Subjects were excluded from all analyses if they did not attend the fourth examination or if they had missing cocaine use data at either examination. Cocaine use data were missing for 52 participants in 1987. Thirty-six subjects died from 1987 to 1992, and 662 participants did not attend the 1992 examination. Cocaine use data were missing for 26 participants in 1992. Thus, the final sample included 3848 participants. Sample sizes in the analyses reported here may be slightly smaller as a result of other occasional missing data.

Ascertainment of Cocaine Use

Beginning in 1987, the self-administered illicit drug use questionnaire, modeled after the National Household Survey of Drug Abuse,²³ included questions about cocaine use. Current cocaine users were those reporting at least 1 day of cocaine use in the previous month, a generally accepted method for determining current use of an illicit substance.

TABLE 1—Prevalence of Cocaine Use in 1987 and 1992 by Ethnicity–Sex Group: The Coronary Artery Risk Development in Young Adults (CARDIA) Study

Ethnicity and Use Status	Examination 2: 1987		Examination 4: 1992		Difference in Prevalence of Current Use, % (% Change)
	No.	%	No.	%	
Men					
Black					
Current	95	12.5	64	8.4	-4.10 (32.8)
Ever	172	22.6	251	33.0	...
Never	494	64.9	446	58.6	...
White					
Current	87	9.0	20	2.1	-6.90 (76.7)
Ever	387	40.1	487	50.4	...
Never	492	50.9	459	47.5	...
Women					
Black					
Current	63	6.0	39	3.7	-2.30 (38.3)
Ever	188	17.9	248	23.6	...
Never	799	76.1	763	72.7	...
White					
Current	54	5.0	13	1.2	-3.80 (76.0)
Ever	425	39.7	489	45.7	...
Never	592	55.3	569	53.1	...

Sociodemographic Characteristics

Sociodemographic information was collected at each examination. Level of education was calculated as a semicontinuous variable ranging from 1 year to 20 or more years. Marital status at each examination was classified into four mutually exclusive categories: married, divorced, living in a marriage-like relationship, and single.

Employment was evaluated in terms of (1) the prevalence of full- or part-time employment, (2) the occupation of participants employed full or part time, and (3) a variable reflecting adoption of more traditional adult social roles. Occupation was coded in accordance with the *Alphabetical Index of Industries and Occupations, 1980 Census of Population, Final Edition, November 1982*²⁴ and the *Classified Index of Industries and Occupations*.²⁵

The participant's self-reported main daily activities hierarchically determined three mutually exclusive categories reflecting adoption of more traditional adult social roles. Full-time employment was the first employment consideration. The second level required a report of no full-time employment and one or more of the following activities: in school, working part time, raising children, and homemaking. The third level required self-reported

unemployment and none of the other activities.

Substance Use Behavior

Licit and illicit substance use data were collected. Tobacco smoking, a yes-no variable, was defined as smoking at least five cigarettes a week almost every week. Alcohol consumption was classified as (1) prevalence of past-year drinking, (2) mean ethanol intake per week, and (3) a dichotomous variable reflecting high and low alcohol intake. Past-year drinkers were those who reported consuming any alcoholic beverage within the previous year. Ethanol intake was calculated with the following formula²⁵: mean mL ethanol/day = (usual number of 12-oz beers per week/7 × 14.2 mL ethanol/beer) + (usual number of 5-oz glasses of wine per week/7 × 17.2 mL ethanol/wine) + (usual number of 1.5-oz hard liquor drinks per week/7 × 19.09 mL ethanol/drink). High alcohol intake was defined, for each ethnicity-sex group, as greater than the 75th percentile of alcohol consumed per day among those consuming at least one drink per week (approximately two beers per day for men and approximately one beer per day for women). Current marijuana use was classified as at least 1 day of use in the past month; at least 1 day of amphetamine or heroin use in the past

TABLE 2—Sociodemographic Characteristics and Substance Use in 1987 and 1992, by Cocaine Use Status: The Coronary Artery Risk Development in Young Adults (CARDIA) Study

	1987		1992	
	Nonuse (n = 3549)	Current Use (n = 299)	Nonuse (n = 3712)	Current Use (n = 136)
Ethnicity, %				
White	53.4	47.2	54.0	24.3
Black	46.6	52.8	46.0	75.7
Sex, %				
Male	43.5	60.9	44.3	61.8
Female	56.5	39.1	55.7	38.2
Age, %				
Younger ^a	42.1	41.8	42.2	39.7
Older ^b	57.9	58.2	57.8	60.3
Mean education level, y	14.3	13.3	14.7	12.9
Employment, %				
Employed full time	68.9	60.9	72.1	48.9
Employed part time, student, or homemaker	28.9	32.0	26.0	37.0
Unemployed	2.2	7.1	1.9	14.1
Marital status, %				
Married	32.7	18.5	45.6	18.4
Marriage-like relationship	12.8	19.1	12.9	22.1
Divorced	4.8	3.4	7.1	8.8
Single	49.8	59.1	34.4	50.7
Substance use				
Current drinkers, %	84.0	97.6	81.2	94.1
Mean alcohol intake, mL/d	10.1	33.2	10.2	34.9
Smoking prevalence, %	25.5	58.9	24.8	71.3
Past-month illicit drug use, %				
Marijuana	19.4	79.6	13.3	71.3
Heroin or speed	0.93	7.0	0.54	8.1

Note. All differences by cocaine use status, except for age, were significant ($P < .05$).

^a20–26 years old in 1987.

^b27–32 years old in 1987.

the conservative Bonferroni criterion of $.05/8 = .0063$.³⁰ As a result of the number of time-related interactions, odds ratios (ORs) and confidence intervals (CIs) were calculated from logistic regression models stratified by examination date (SAS PROC LOGISTIC²⁷).

Results

Self-reported current cocaine use among CARDIA participants declined between the second and fourth examinations across all ethnicity–sex groups (Table 1). Although the percentage decline was greater among Whites than among Blacks, higher never-use rates were noted in Blacks relative to Whites and in women relative to men in both 1987 and 1992.

The phi coefficient between self-reported cocaine use in 1987 and 1992 was .37, suggesting a moderate level of individual change in cocaine use status over the 5 years. Eighty participants reported current cocaine use at both points; 3493 reported nonuse at both points. Fifty-six participants reported a change from nonuse to current use, and 219 reported a change from current use to nonuse. Among current cocaine users in 1992, 58.8% were current cocaine users in 1987 (80/136). The overlap between current cocaine use in 1987 and 1992 varied across ethnicity–sex groups. Among Black men, 56.3% of current users in 1992 were also current users in 1987. The corresponding overlap rates among Black women, White men, and White women were 46.2%, 80.0%, and 76.9%.

Bivariate relationships between current cocaine use and sociodemographic characteristics or licit and illicit substance use in 1987 and 1992 are presented in Table 2. Results were similar across ethnicity–sex groups; therefore, data are presented in aggregate form. In 1987 and 1992, higher proportions of current cocaine users than nonusers were Black and male. Cocaine users at both time points were less educated than nonusers, although a mean educational level of at least 12 years was noted. No age differences were noted by cocaine use status.

Lower proportions of cocaine users than nonusers were employed full time and married; higher proportions were unemployed and single (Table 2). Among cocaine users, 76.9% and 62.5% were employed either full or part time in 1987 and 1992, respectively; among nonusers, the corresponding proportions were 89.3% and 92.4% (data not shown in Table 2). The relationship between professional

month defined current use of other illicit drugs.

Data Analysis

The proportion of self-reported cocaine users in the cohort was examined in 1987 and in 1992. The consistency between self-reported cocaine use status in 1987 and 1992 was evaluated with a phi coefficient (SAS PROC CORR²⁷). The bivariate relationship between each sociodemographic characteristic or substance use behavior and cocaine use status was assessed cross sectionally in 1987 and in 1992 by means of chi-square (SAS PROC FREQ²⁷) or linear regression (SAS PROC GLM²⁷) analysis techniques. Cross-sectional log linear modeling (SAS PROC CATMOD²⁷) was used to determine two- and three-way interactions between the sociodemographic variables, the sub-

stance use variables, and cocaine use status. The multivariate relationship of the sociodemographic characteristics and the substance use behaviors to current cocaine use from 1987 to 1992 was analyzed longitudinally through repeated measures analysis of variance techniques²⁸ via the GLIMMIX macro for SAS PROC MIXED²⁹; this procedure allows differentiation of within-person effects and between-person effects. A final repeated measures model composed of those literature-based factors and interactions related to current cocaine use was identified. The type I error rate was established a priori at .05; however, each of the eight terms in the final model had a P value below .006. Thus, with the exception of the Time \times Employment interaction ($P < .007$), each of the terms would have been significant even under

occupational status and cocaine use differed by ethnicity–sex group. Among Blacks, cocaine use was associated with nonprofessional occupations in both 1987 and 1992. Among Black men, 11.0% of cocaine users and 17.3% of nonusers reported professional status in 1987. In 1992, 17.5% of current users and 23.1% of nonusers reported professional occupations. In 1987, 17.2% of Black female nonusers and 9.4% of users reported professional occupations; the corresponding percentages in 1992 were 25.2% and 0.0%. Among White men, occupational status was not related to cocaine use; 40.3% of nonusers and 20.0% of users in 1987, and 48.3% of nonusers and 31.6% of users in 1992, reported professional occupations. Among White women, however, cocaine use was associated with nonprofessional occupational status. Among nonusers, 40.0% in 1987 and 46.9% in 1992 reported professional occupations; 35.6% and 28.6% of users in 1987 and 1992, respectively, reported such occupations.

The proportions reporting current drinking, smoking, or other illicit drug use were higher in current cocaine users than in nonusers. Cocaine users also reported a higher mean daily alcohol intake than nonusers.

The multivariate, longitudinal relationship between current cocaine use and sociodemographic characteristics and substance use behavior was also examined. Interactions in the prediction of current cocaine use were found between ethnicity and age and between sex and age. No other two- or three-way interactions were identified. In 1987, Blacks 27 to 32 years old were more likely to be cocaine users than Whites or younger Blacks (Table 3). In 1992, however, Blacks were 3.46 (95% CI = 2.21, 5.41) times as likely as Whites to be cocaine users, regardless of age (data were derived from a simpler model). From 1987 to 1992, cocaine use increased by 10% among Blacks (OR = 1.10, 95% CI = 0.68, 1.77) but declined by 63% among Whites (OR = 0.37, 95% CI = 0.22, 0.63). Men in the older half of the cohort (i.e., those 27 to 32 years of age in 1987) were more likely to be cocaine users than women or men in the younger half of the cohort (i.e., those 20 to 26 years of age in 1987) at each examination.

Employment was related to current cocaine use at both examination points (Table 3). The odds ratios for current cocaine use among the unemployed, in comparison with those employed full time, were 2.42 in 1987 and 4.00 in 1992.

TABLE 3—Odds Ratios for Current Cocaine Use in 1987 and 1992 from Multivariate Logistic Regression Models: The Coronary Artery Risk Development in Young Adults (CARDIA) Study

	1987		1992	
	Odds Ratio	95% Confidence Interval	Odds Ratio	95% Confidence Interval
Ethnicity				
Black				
Younger ^a	1.00	...	1.00	...
Older ^a	2.43	1.54, 3.85	3.13	1.70, 5.76
White				
Younger ^a	1.32	0.88, 1.99	0.41	0.21, 0.82
Older ^a	1.47	0.93, 2.33	0.71	0.35, 1.43
Sex				
Male				
Younger	1.00	...	1.00	...
Older	2.43	1.54, 3.85	3.13	1.70, 5.76
Female				
Younger	0.98	0.65, 1.49	1.25	0.67, 2.32
Older	1.27	0.78, 2.06	1.40	0.73, 2.72
Employment status				
Employed full time ^a	1.00	...	1.00	...
Employed part time, student, or homemaker ^a	1.21	0.87, 1.69	1.10	0.64, 1.89
Unemployed ^a	2.42	1.27, 4.64	4.00	1.77, 9.03
Marital status				
Married	1.00	...	1.00	...
Divorced	0.95	0.45, 2.04	1.64	0.74, 3.65
Marriage-like relationship	1.37	0.89, 2.11	2.11	1.16, 3.87
Single	1.73	1.20, 2.48	2.11	1.24, 3.60
Smoking status (yes vs no)	1.74	1.32, 2.30	2.80	1.83, 4.28
Marijuana and alcohol use				
No past-month marijuana use				
Low alcohol intake ^a	1.00	...	1.00	...
High alcohol intake ^a	6.35	3.72, 10.84	2.18	1.10, 4.32
Past-month marijuana use				
Low alcohol intake ^a	18.06	11.54, 28.28	9.79	5.64, 17.00
High alcohol intake ^a	34.88	21.89, 55.62	18.67	10.87, 32.07
Past-month heroin or speed use (yes vs no) ^a	2.41	1.28, 4.52	8.10	3.03, 21.70

Note. The younger age group comprised participants who were 20–26 years old in 1987; the older age group comprised those who were 27–32 years old in 1987. Alcohol intake was divided at the 75th percentile among drinkers consuming at least one drink per week (ethnicity–sex specific).

^aObserved relationship with cocaine use changed from 1987 to 1992.

Homemakers, those employed part time, and those in school were no more likely to be cocaine users than those employed full time. Current cocaine use increased 3.23-fold (95% CI = 1.38, 7.57) among the unemployed.

Single people were more likely to be current cocaine users than married people (ORs = 1.73 in 1987 and 2.11 in 1992). Those divorced or living in a marriage-like relationship in 1987 were no more likely to be cocaine users than married people, but living in a marriage-like relationship was associated with increased cocaine use in 1992 (Table 3). Longitudinal analysis, however, suggested no change in the

overall relationship between marital status and cocaine use from 1987 to 1992.

The licit and other illicit substance use behaviors were strongly and consistently related to current cocaine use in both 1987 and 1992 (Table 3). Smoking status and past-month use of amphetamines or heroin were related to increased odds of current cocaine use. Past-month marijuana use, the strongest predictor of current cocaine use status, interacted with alcohol intake and increased the odds of current cocaine use. The strength of the relationship between alcohol and marijuana use and cocaine use declined between 1987 and 1992, al-

though alcohol use and marijuana use both remained strong predictors.

Discussion

Previous studies have suggested that cocaine use is declining among young adults.¹⁻⁶ Such studies have also shown that use of cocaine is associated with other licit and illicit drug use, lower educational levels, unemployment, ethnicity, being divorced or living in a marriage-like relationship, and criminal activity.^{6,10,11,13-18} These investigations have suffered from methodological issues such as limited representation by sex, ethnicity, and age or an inability to simultaneously evaluate the effects of sociodemographic characteristics and substance use behavior. The present study provided an opportunity to simultaneously assess these factors in a cohort of Black and White men and women 20 to 32 years of age in 1987, sampled to provide adequate representation by sex and ethnicity.

Consistent with the extant adolescent and young adult literature,^{6,15-18} bivariate analyses in this study showed that a higher proportion of current cocaine users than nonusers were Black, unemployed, single, and had a low educational level. Also, higher proportions reported licit and other illicit substance use. These data suggest that cocaine use in adults 20 to 37 years old continues to be associated with less adherence to societal norms of lowered levels of substance use among adults and less adoption of adult roles such as marriage and employment.

Our multivariate analyses, however, revealed some important differences suggesting that limited ethnic or sex representation and the lack of simultaneous analyses have provided a somewhat distorted picture of cocaine use in young adults. After adjustment for the other terms in the model, no decline in cocaine use was observed among Blacks, while a marked decline was noted in Whites; similar levels of cocaine use were seen in men and women born from 1962 to 1967, while, in those born from 1955 to 1961, higher levels of use were reported by men than women. Increased cocaine use continued to be associated with single marital status and, in 1992, with living in a marriage-like relationship; higher levels of alcohol, marijuana, and other illicit drug use; smoking; and unemployment. The relationship between unemployment and cocaine use had strengthened significantly by 1992.

The results of this study must be interpreted in light of three design features: the analysis plan, the subjects included, and the reliance on self-reported data. A multisequential analysis plan was established a priori. The likelihood of a type I error increases with multiple analyses, and a Bonferroni correction, while considered conservative,³⁰ may be applied to reduce the likelihood of a type I error. All terms included in the final model met the criteria for inclusion under this stringent correction except for the Time \times Employment interaction ($P < .007$), suggesting low probability of a type I error.

The CARDIA participants were more likely to be stable individuals than the general population since they were followed for 7 years and were able to comprehend and comply with a 4-hour examination. No differential loss to follow-up was noted in 1992 by cocaine use status in 1987. Thus, these participants were not likely to have suffered the extreme effects of chronic, heavy drug use.

Finally, the validity and reliability of self-reported substance use data have been questioned. Self-reported illicit drug data have been viewed as underrepresenting the prevalence of drug use as a result of hesitancy in admitting illegal, socially unacceptable behaviors and poor recall of sporadic drug use.^{31,32} Several features of the CARDIA study design helped to minimize underreporting of illicit drug use. For example, a self-administered questionnaire, rather than a face-to-face or telephone interview, was used to assess substance use, and the examination site was an isolated clinic not associated with any law enforcement agency, governmental agency, employer, or medical care facility. In addition, only 8.0% of the sample had discrepant drug use reports from 1987 to 1992. Of these individuals, 82.9% reported 10 or fewer lifetime experiences with cocaine as of 1987, suggesting that discrepant reporting was the result of inaccurate recall of low usage. Nevertheless, findings in this study may be attenuated as a result of underreporting of cocaine use.

The results of this study provide important data for the prevention and control of cocaine use among young adults. Cocaine initiation and cessation occurred at a moderate level, suggesting that prevention and control efforts may be warranted in this age group. The high never-use and ever-use rates in both 1987 and 1992, however, suggest that preven-

tion efforts may be most efficient if directed toward those at high risk of cocaine use. Identification of adults likely to use cocaine is possible; in the present study, factors associated with current cocaine use were essentially stable from 1987 to 1992. In 1992, more traditional adult roles such as marriage, employment, and homemaking were associated with a reduced likelihood of cocaine use, while higher levels of licit and illicit substance use and unemployment were associated with an increased likelihood of use. These findings suggest that cocaine use is part of a complex set of social problems found in poorer young adults. Unemployment, multiple drug use, drinking, and smoking were all associated with cocaine use. Even after adjustment for these factors, Blacks and older men were at greater risk than Whites and younger men, suggesting that cocaine use is a more common part of this syndrome in these subgroups than in other subgroups. Programs designed to reduce cocaine use may have limited success in the presence of other, continued social problems. \square

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