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The Formation of a Socioeconomic Disparity: A Case Study of Cocaine and Marijuana Use in the 1990s

Richard Miech, PhD^{1,*} and Howard Chilcoat, ScD¹

1 Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD

Abstract

Background—Around the year 1990 the reputation of cocaine use changed from glamorous to undesirable and at the same time a socioeconomic disparity in cocaine use emerged. This study examined: (1) whether the socioeconomic disparity was created by differential incidence, differential cessation, or both; (2) whether a socioeconomic disparity also developed in marijuana use; and (3) whether disparities formed across race, Hispanic ethnicity, and/or gender.

Methods—The analyses center on 6544 respondents aged 14–21 in 1979 in the National Longitudinal Survey of 1979 (NLSY79) who provided information on past-year use of powder cocaine and marijuana use before and after 1990: specifically, in 1984, 1988, 1992, 1994, and 1998.

Results—Both differential incidence and differential cessation across education contributed to the formation of the socioeconomic disparity in cocaine use, although differential cessation played a more influential role in this cohort. A socioeconomic disparity in marijuana use also created at about the same time. No emerging disparities by race, Hispanic ethnicity, or gender were observed.

Conclusions—This case study suggests that the redefinition of a health behavior as unhealthy will result in a socioeconomic disparity in the behavior across socioeconomic strata as a result of both differential incidence and cessation, but disparities will not necessarily form by race, ethnicity, or gender.

Introduction

The year 1990 was a watershed in the social distribution of illegal drug use, at least for cocaine. It was at this year that a disparity in cocaine use that disadvantaged adults with lower educational attainment first appeared in nationally-representative surveys, and this disparity has since persisted.¹ The emergence of this disparity was a “historical period” effect that occurred simultaneously across all age groups from 18 to 35,¹ and coincided with national change in the perception of cocaine use from glamorous to unsavory.² This socioeconomic disparity in cocaine use presents a rare case-study to use modern, detailed, and representative data to examine the processes that are involved in the formation of health disparities, an area of study that warrants more attention.³

Correspondence and reprint requests: Richard Miech, PhD, Associate and Chair, Department of Health and Behavioral Sciences, University of Colorado at Denver and Health Sciences Center, Campus Box 188, P.O. Box 173364, Denver, Colorado 80217-3364, Phone: 303-556-8422; E-mail: Richard.Miech@cudenver.edu

*At the time research was conducted, author worked at Johns Hopkins

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This study used panel data from a nationally representative cohort with measures of illegal drug use before and after 1990 and had three research goals. The first aspect to be examined was the extent to which the socioeconomic disparity in cocaine use resulted from differential cessation among people who had used cocaine previous to 1990, and the extent to which is resulted from differential incidence among those who took up cocaine use after 1990. The price of cocaine plummeted after 1990 to its lowest level in history,⁴ which may have brought new users to the drug. Second, the question was asked whether trends in cocaine disparities across education were paralleled across gender, race, and ethnicity. And the third aspect of the study was an examination of whether trends in disparities in marijuana use paralleled those in cocaine use.

Methods

Data

Data for this analysis came from the National Longitudinal Study of 1979 (NLSY79),⁵ a strategic data set for three reasons. First, the NLSY79 includes comparable questions on illegal drug use before and after the year 1990, allowing us to examine the impact of a known historical period effect within a cohort as it aged. Second, the large sample size of the NLSY79 provides ample statistical powder for analysis. Finally, because the sample is nationally-representative the results can be generalized to a wider population. The analyses of this study are based on respondents who provided information on their use of marijuana and powder cocaine in the 1984, 1988, 1992, 1994, and 1998 surveys for a total analysis pool of 6544, which is 78% of all respondents surveyed in 1998 and 68% of the target population that was not known to be deceased by 1998.⁵ Cocaine use and marijuana use in 1984 were not significantly related to subsequent attrition or retention in later survey waves.

Measures

Cocaine use in the past year is a dichotomous, self-reported of powder cocaine use within the past year at the time of survey. For the purpose of comparable measures, the analyses do not include information on crack cocaine, which was not assessed in the pre-1990 surveys when it was generally not available in the U.S.

Marijuana use in the past year is a dichotomous, self-reported measure of marijuana use within the past year at the time of survey. In the first two survey waves of 1984 and 1988 a single question asked respondents about their use of “hashish and marijuana;” as a result, questions about marijuana use were inextricably included with questions about hashish use. A negligible difference was expected between this question and one that would have asked about marijuana exclusively, for reasons outlined in the discussion section below. Information about marijuana use in the later survey waves of 1992, 1994, and 1998 came from questions that asked exclusively about marijuana use.

The analysis included dichotomous variables to indicate membership in demographic groups. These include **No High School**, **Male**, **Black**, and **Hispanic**.

Statistical Analysis

The first analyses present the bivariate odds ratios of illegal drug use by demographic indicators for each survey wave. For example, for the total sample, the odds ratios are presented of educational status and illegal drug use in 1984, 1988, 1992, 1994, and 1998 in order to observe whether odds ratios increase, decrease, or stay the same across the year 1990.

To examine whether any changes were due to differential incidence or differential cessation across demographic groups during the 1990s, parallel analyses are presented for two subgroups.

The first subgroup excludes respondents who reported that they had ever used the focus drug (i.e. cocaine or marijuana) before the first assessment in the 1990s. For example, in analysis of cocaine the first subgroup excludes respondents who reported that they had ever used cocaine in either the 1984 survey or the 1988 survey. Results for this subgroup indicate the extent to which onset of new cocaine use after 1988 differed across demographic groups. The second subgroup excludes respondents who reported that first onset of drug use occurred after the last assessment in the 1980s. For example, in analysis of cocaine the second subgroup excludes respondents who reported that their first onset of cocaine use took place by 1992, 1994, or 1998. Results for this subgroup represent how the odds ratios of cocaine use and demographic characteristics would appear in the absence of new cocaine use during the 1990s, and indicate the extent to which cessation of cocaine use among those who started before the 1990s differed across demographic groups.

The analysis also presents results from Generalized Estimating Equations (GEE) ^{6, 7} to evaluate whether changes in the odds ratios for demographic groups across 1990 were statistically significant at the .05 level. The GEE methodology adjusts for the correlation of responses from the same individual and produces correct standard errors. In the GEE analyses five data records were included for each individual (one for each survey wave) and the following basic model was estimated:

$$Y = \alpha + \beta_1(\text{No High School}) + \beta_2(\text{Male}) + \beta_3(\text{Black}) + \beta_4(\text{Hispanic}) + \beta_5(\text{Wave1988}) + \beta_6(\text{Post 1990 Wave}) + \beta_7(\text{No High School})(\text{Post 1990 Wave}) + \beta_8(\text{Male})(\text{Post 1990 Wave}) + \beta_9(\text{Black})(\text{Post 1990 Wave}) + \beta_{10}(\text{Hispanic})(\text{Post 1990 Wave})$$

where Y equals past-year powder cocaine use for the first set of analyses and past-year marijuana use for the second set of analyses, the demographic variables associated with β_1 through β_4 are defined as described above, “Wave 1988” is coded 1 for information from the 1988 wave and 0 otherwise, and “Post 1990 Wave” is coded 1 for information from the 1992, 1994, or 1998 waves and 0 otherwise. Coefficients β_7 through β_{10} test whether the concentration of illegal drug use across demographic groups significantly changed across the year 1990. These GEE equations include all demographic indicators and interactions in the same model, so that significant interactions are net of other trends present in the data.

All odds ratio and GEE analyses used the analytical weights of the 1998 survey to adjust for sampling procedures and make the results generalizable to the national population of the same age range.

Results

Prevalence of Cocaine and Marijuana Use over Time

Tables 1 and 2 present parallel analyses of past year use of powder cocaine and marijuana. The third row of Tables 1 and 2 presents the prevalence of past-year illegal drug use at each survey wave. As expected, the prevalence of both cocaine and marijuana use substantially decreased as the cohort aged from 1984 to 1998. Cocaine use dropped precipitously between 1988 and 1992, as a result of a combined aging effect and a historical period effect in which cocaine use became redefined as undesirable. The prevalence of marijuana use dropped more gradually as the cohort aged, from 36% to 10%.

The fourth row of Tables 1 and 2 presents the percentage of marijuana and powder cocaine use due to people who used these drugs before the 1990s. For example, in 1992 the prevalence of cocaine use was 3.57%, and 84% of this 3.57% consisted of individuals who had reported that

they had ever used cocaine in either the 1984 or 1988 waves. In general, about 15-20% of cocaine use in the 1990s consisted of new users who had onset after 1988. In contrast, at all waves in the 1990s the percentage of marijuana prevalence due to new onset was extremely low and was less than 2%.

Cocaine Use Across Demographic Groups Before and After 1990

The fifth row in Table 1 presents the odds ratios of cocaine use by high school degree status for the total sample. As expected, the odds ratios showed an increase over time that was most apparent around 1990: the odds ratio increased 40% from 1988 to 1992. The average odds ratio after 1990 was significantly larger than the average odds ratio before 1990, as indicated in the GEE model described in the Methods section above.

The sixth and seventh rows of Table 1 present analyses to examine whether the change in the odds ratio of cocaine use and high school degree status over time resulted from differential incidence or differential cessation. The results showed that both processes played a role in the changing odds ratio over time, but that differential cessation was more influential. The sixth row shows that new incidence of cocaine use in the 1990 waves was much higher among people without a high school education, with odds ratios above 3 ($p < .01$). The seventh row shows that of those who reported cocaine use by the 1980s, people without a high school degree were more likely to continue cocaine use during the 1990s. This group of former cocaine users is large – more than 80% of respondents who used cocaine in the 1990s had used it previously before the 1990s – and it is the odds ratios for this group that were closest to and largely determined the odds ratio for the total sample (see row 5).

The eighth row of results in Table 1 present the odds ratios of cocaine use for black as compared to non-black respondents for the total sample. The odds of cocaine use for black v. non-black respondents significantly increased after 1990; the average odds ratio after 1990 was significantly larger than the average odds ratio before 1990, as indicated in the GEE model described in the Methods section. However, the trends suggest that this increase was not specific to the year 1990, and was spread out more gradually over the five survey occasions.

The ninth and tenth rows in Table 1 present analysis to examine whether the change in the odds ratios of cocaine use for black v. non-black respondents over time resulted from differential incidence or differential cessation. As with analysis of high school status, both processes played a role in the changing odds ratio over time. Onset of cocaine in the 1990s waves was markedly higher among black as compared to non-black respondents (see row nine). Among those who had used cocaine by the 1980s black and non-black respondents were about equally likely to use cocaine in the 1990s, which represents a substantial change from the pre-1990 period when blacks were significantly less likely to use cocaine. Because the group of cocaine users who first started in the 1990 waves is much smaller than the group of former users, it was the latter group that has odds ratios closer to and largely determined the odds ratio of the total group (see row 8).

The subsequent rows of Table 1 present odds ratios over time for cocaine use by Hispanic ethnicity and gender. Across these demographic groups, no trend in odds ratios could confidently be ascribed to more than random fluctuation in sampling. In sum, as the prevalence of cocaine use dramatically declined, the odds of cocaine use for Hispanic v. non-Hispanic and for male v. female respondents was the same before and after 1990.

Marijuana Use Across Demographic Groups Before and After 1990

The fifth row of Table 2 presents the odds ratios of marijuana use by high school degree status for the total sample. The average odds ratio was significantly higher after 1990 as compared

to before 1990, as indicated in the GEE model described in the Methods section. However, the trends suggested that this increase was not specific to the year 1990, and was spread out gradually over the five survey waves.

The sixth and seventh rows of Table 2 present analyses to examine whether the change in odds ratios of marijuana use by high school status resulted from differential incidence of differential cessation. Incidence of marijuana use in the 1990 waves was rare – less than 2% of marijuana prevalence in the 1990s waves was due to people who hadn't used by the 1980s – but odds ratios above one at every wave in the 1990s suggest that it was more common among respondents without a high school degree. Among the 98% of marijuana users in the 1990s who had used by the 1980s, those without a high school diploma were more likely to continue use in the 1990s. It is the group of respondents who had used marijuana by the 1980s who largely determine the odds ratios in the total sample (see row 5).

The subsequent rows of Table 2 present odds ratios over time for marijuana use for black v. non-black respondents, Hispanic v. non-Hispanic respondents, and for men v. women. Across these demographic groups, no trend in odds ratios could confidently be ascribed to more than random fluctuation in sampling.

Discussion

Cocaine use during the 1990s is an important case study because it is a health behavior that became redefined as undesirable suddenly, due to a confluence of factors including a concerted, multi-billion advertising campaign to discourage drug use.² In the space of just a few years a behavior that had previously been glamorous and exotic became something to be avoided, and the prevalence of cocaine use consequently plummeted.⁸ Surprisingly much remains unknown about the impact of these changes on illegal drug use across socioeconomic status, race, ethnicity, and gender. In the future, at least some health-related behaviors that are currently accepted (such as drinking soft drinks or grilling meat) will be redefined as undesirable, and analysis of cocaine and marijuana use serves as an important benchmark to understand and predict the implications of such a redefinition for the emergence and/or widening of health disparities.

The sudden change in the perception of cocaine use was found to coincide with three changes in illegal drug use disparities. First, a disparity in cocaine use across socioeconomic status, as measured by educational attainment, emerged. As cocaine became undesirable, it was differential cocaine cessation among former users that primarily accounted for the socioeconomic disparity in cocaine use that emerged around the year 1990, at least for this cohort that was age 25-33 in 1990. Second, a widening disparity by education was also observed in the prevalence of marijuana use, a disparity that was also driven more by differential cessation than by differential incidence of new users in this cohort. Finally, the tendency for black respondents to be less likely to use cocaine than whites that was present before 1990 disappeared after 1990, when blacks and nonblacks were about equally likely to use cocaine. No change in black v. nonblack use of marijuana was observed across 1990, and for neither marijuana nor cocaine were any changes present in disparities across gender or Hispanic ethnicity. Below is a discussion on these findings in more detail, although study limitations are noted first.

Limitations

A first limitation is that these analyses did not focus on other illegal drugs such as hallucinogens or heroin. Questions on these drugs were not asked consistently across all five survey waves, and the reported prevalence is too low to support detailed statistical analysis. Consequently,

this limitation restricted the focus to analysis of the more common and prevalent illegal drugs of marijuana and cocaine.

A second limitation is that the wording of the questions about marijuana use changed across surveys. In 1984 and 1988 the NLSY used a single question to ask about use of both marijuana and hashish, so that information about the use of these two drugs is inextricably combined. To examine the potential bias of this difference on the current study results, the 1998 Monitoring the Future Survey, a national study that asked about marijuana and hashish use separately, was used. A cross-tabulation performed on the data analysis web site for the survey (<http://www.icpsr.umich.edu/cgi-bin/SDA12/hsda?samhda+mtf1298>) indicated that only 4 of 2541 respondents (or 0.16%) who reported marijuana or hashish use indicated that they had used hashish but not marijuana. Only a negligible difference would therefore be expected between the survey question that asked about both marijuana and hashish use together and another question that asked about marijuana use exclusively.

The Formation of Disparities

It was expected, on the basis of recent theoretical development in the field,⁹ that health disparities working against disadvantaged populations would develop and/or widen when a health behavior that is preventable becomes seen as undesirable. It was also expected that advantaged populations would have more resources to help change their behavior, resources that include social networks that encourage health and neighborhoods better able to curtail drug-dealing.³ However, current theoretical development on health disparities stops short on two counts. First, it is not known whether differential cessation, differential incidence, or both processes together contribute to the growth of health disparities. Second, while the development of a disparity across socioeconomic status was expected, it was not known if disparities would also form across race, ethnicity, and/or gender.

The results indicate that both differential cessation and differential incidence were at play in the formation of cocaine and marijuana use disparities across socioeconomic status. For both cocaine and marijuana use the largest group of users in the 1990s were those who had a history of use before 1990, and among this group it was the ability of those with higher education to desist from use after 1990 that largely determined the growing socioeconomic disparity in the 1990s.

However, even among the small group of people who first started cocaine or marijuana use after 1990, onset was more likely among those with lower education. Because people who are going to use illegal drugs have usually done so by their mid-20s,¹⁰ it was expected that if the cohort had been younger during the 1990s differential incidence would have played a larger role. These results therefore suggest that the redefinition of illegal drug use as undesirable during the 1990s had an influence on both current users and also those who had never used previously. To the extent that future health-related behaviors become redefined as undesirable, these results lead to the expectation that a socioeconomic disparity will develop as the result of both differential cessation and differential incidence across socioeconomic strata.

In general, the formation of disparities across race, ethnicity, or gender after 1990 was not found. Although black respondents became increasingly likely to use cocaine in comparison to nonblack respondents throughout the survey, by the end of the 1990s black and nonblack respondents were about equally likely to use cocaine and no disparity was present. These results suggest that the ability to desist from a health behavior recently redefined as unhealthy is not differentially distributed by gender, race, or Hispanic ethnicity.

Conclusion

Disparities in health outcomes have emerged in the past, and will no doubt appear for new outcomes in the future. When currently accepted behaviors are discovered to be unhealthy, it is expected that their prevalence will drop, and, at the same time, a socioeconomic disparity will form. The results of this study show that, at least in the case of cocaine use, the disparity is specific to socioeconomic status, and involves changes in both the cessation and incidence of the outcome.

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Table 1

Cocaine use by gender, education, race, and ethnicity by survey year. results for entire sample and for two subsamples of respondents who did and did not report cocaine use prior to 1990 (95% confidence intervals in parentheses)

Year of interview	1984	1988	1992	1994	1998
Average age of cohort	22.69	27.16	31.10	33.14	36.96
Age range of cohort	19-27	23-31	27-35	29-37	33-41
Cocaine prevalence	11.03	10.22	3.57	2.92	2.08
% prevalence due to pre-1990 users	100.00	100.00	84.13	83.21	80.91
No high school v. high school					
Overall odds ratio	1.02	1.26	1.77	2.27	2.60**
(n=6544)	(0.80-1.29)	(1.00-1.58)	(1.25-2.51)	(1.59-3.23)	(1.68-4.01)
Odds ratio, onset after 1988 (n=4649)	--	--	4.25	5.47	3.36
Odds ratio, excluding Onset after 1988 (n=6438)	--	--	(2.08-8.71)	(2.62-11.44)	(1.41-8.02)
Black v. non-black & non-Hispanic					
Overall odds ratio	0.52	0.75	0.99	1.65	1.19
(n=5351)	(0.41-0.65)	(0.61-0.93)	(0.72-1.36)	(1.20-2.26)	(0.81-1.76)
Odds ratio, onset After 1988 (n=3799)	--	--	2.30	3.34	1.93
Odds ratio, excluding Onset after 1988 (n=5264)	--	--	(1.18-4.50)	(1.65-6.76)	(0.88-4.22)
Hispanic v. non-Hispanic & non-black					
Overall odds ratio	0.82	0.84	0.77	1.12	0.88
(n=4635)	(0.65-1.03)	(0.66-1.07)	(0.52-1.14)	(0.73-1.73)	(0.55-1.43)
Odds ratio, used Before 1988 (n=3157)	--	--	1.87	1.24	1.09
Odds ratio, started Use after 1988 (n=4587)	--	--	(0.81-4.27)	(0.43-3.60)	(0.40-2.96)
Male v. female					
Overall odds ratio	1.61	1.75	0.61	1.10	0.84
(n=6544)	(1.33-1.94)	(1.44-2.13)	(0.39-0.95)	(0.69-1.76)	(0.49-1.44)
Odds ratio, onset After 1988 (n=4649)	--	--	1.86	1.89	2.43
Odds ratio, excluding Onset after 1988 (n=6438)	--	--	(1.35-2.56)	(1.34-2.660)	(1.58-3.75)
			3.21	2.17	1.85
			(1.47-7.03)	(1.00-4.71)	(0.77-4.45)
			1.74	1.90	2.73
			(1.23-2.47)	(1.30-2.78)	(1.66-4.49)

** Average of odds ratios after 1990 is significantly higher than average of odds ratios before 1990 ($p<0.01$)

Table 2

Marijuana use by gender, education, race, and ethnicity by survey year. results for entire sample and for two subsamples of respondents who did and did not report marijuana use prior to 1990 (95% confidence intervals in parentheses)

Year of interview	1984	1988	1992	1994	1998
Average age of cohort	22.69	27.16	31.10	33.14	36.96
Age range of cohort	19-27	23-31	27-35	29-37	33-41
Marijuana prevalence	36.25	22.00	14.14	14.19	10.39
% prevalence due to pre-1990 users	100.00	100.00	98.83	98.57	98.38
No high school v. high school					
Overall odds ratio	1.23	1.48	1.52	1.46	1.87*
(n=6544)	(1.06-1.43)	(1.25-1.75)	(1.24-1.85)	(1.20-1.78)	(1.50-2.31)
Odds ratio, onset	1.87	1.87	1.87	2.62	1.42
After 1988 (n=1955)	--	--	--	(0.94-7.29)	(0.45-4.47)
Odds ratio, excluding	1.52	1.52	1.52	1.45	1.88
Onset after 1988 (n=6500)	--	--	(1.24-1.85)	(1.19-1.78)	(1.52-2.34)
Black v. Non-black & non-Hispanic					
Overall odds ratio	0.90	0.84	0.71	0.90	0.89
(n=5351)	(0.79-1.02)	(0.73-0.98)	(0.59-0.85)	(0.76-1.07)	(0.73-1.08)
Odds ratio, onset	1.81	1.81	1.81	6.26	2.36
After 1988 (n=1528)	--	--	(0.56-5.86)	(2.00-19.59)	(0.69-8.09)
Odds ratio, used	0.70	0.70	0.70	0.86	0.87
Before 1988 (n=5313)	--	--	(0.58-0.84)	(0.72-1.02)	(0.71-1.06)
Hispanic v. non-Hispanic & non-black					
Overall odds ratio	0.78	0.67	0.66	0.64	0.63
(n=4635)	(0.67-0.91)	(0.56-0.82)	(0.52-0.84)	(0.51-0.81)	(0.48-0.83)
Odds ratio, onset	0.98	0.98	0.98	0.98	1.54
After 1988 (n=1315)	--	--	(0.04-2.90)	(0.17-5.59)	(0.38-6.28)
Odds ratio, Used	0.66	0.66	0.66	0.64	0.61
Before 1988 (n=4617)	--	--	(0.52-0.84)	(0.50-0.81)	(0.46-0.81)
Male v. Female					
Overall odds ratio	1.60	1.87	1.78	1.84	1.88
(n=6544)	(1.42-1.81)	(1.62-2.15)	(1.50-2.11)	(1.55-2.18)	(1.55-2.28)
Odds ratio, onset	1.69	1.69	1.69	2.40	1.13
After 1988 (n=1955)	--	--	(0.44-6.52)	(0.87-6.59)	(0.31-4.12)
Odds ratio, excluding	1.79	1.79	1.79	1.84	1.91
Onset after 1988 (n=6500)	--	--	(1.51-2.12)	(1.55-2.18)	(1.57-2.32)

** Average of odds ratios after 1990 is significantly higher than average of odds ratios before 1990 ($p<0.01$)