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Changes in the association of drug use with depressive disorders in recent decades: the case of cocaine

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Abstract

The social meaning of cocaine changed during the 1980s and 1990s. The present study examined changes in the psychological profile of cocaine users. We used Baltimore data of the NIMH-funded Epidemiologic Catchment Area study during 1981 ($n = 3,006$; 60% female) and 1993–1994 ($n = 1,679$). The Diagnostic Interview Schedule measured cocaine use and depressive disorders (Dysthymia, Major Depressive Disorder). The odds ratio of cocaine use for those with depression was 1.28 and 3.53 in 1981 and 1993–1994 respectively. The results suggest a historical period effect in the association of cocaine use and depression. Limitations and implications are discussed.

Keywords

cocaine; depressive disorders; co-occurring; historical; Epidemiologic Catchment Area study

Introduction

Recent changes in the use and social meaning of cocaine warrant a revisit of the substantial body of work about the association of cocaine use with psychiatric disorder (DeGroot et al., 2003; Drake et al., 2004; Hall, 1996; SAMHSA, 2002). As cocaine's reputation changed from glamorous to dangerous throughout recent decades (Johnston et al., 2005; Jonnes, 1996), so too did its clientele and the consequences of their cocaine use. Current evidence to support major changes in the use and social context of cocaine use include the finding that the socioeconomic profile of the cocaine user shifted down from upper to lower socioeconomic status in recent decades (Miech, 2008; Miech et al., 2005), and that the consequences of cocaine use have become more lethal (Paulozzi, 2006; SAMHSA, 2005). These changes make it increasingly important to fill the gap in our knowledge and to

examine recent changes in the psychological profile of cocaine users, with an eye toward identifying newly-emerged, psychological risk factors for cocaine use.

The present study examines changes in the association of cocaine use with depressive disorders in recent decades, and posits that having a depressive disorder became a risk factor for cocaine use in the 1990s and was not in the preceding years. The analysis is based on the Baltimore component of the Epidemiologic Catchment Area Study (Eaton et al., 1997; Regier et al., 1984). This dataset is particularly well-suited to examine the study hypothesis because it the study collected information on cocaine use before and after the key year of 1990, when a major shift occurred in the reputation and clientele of cocaine. In addition, the data contain measures of depressive disorders in accordance with DSM criteria (American Psychiatric Association, 1980).

Background

Cultural studies provide extensive documentation that the cultural meaning of cocaine use underwent a dramatic transformation through the 1980s. Drug historian David Musto noted that during the mid-1970's in the United States, both cocaine and marijuana were viewed by many to be relatively benign, and the two substances were often compared to make the argument that both should be legalized (Musto, 1999). In an article appearing in *Scientific American* in 1982, the authors acknowledged that cocaine had obtained a reputation as a fashionable drug, and declared that the degree to which its use is habit-forming is comparable to that of "peanuts or potato chips" (Van Dyke and Byck, 1982, pp. 140). However, Musto (1999) observed that over the course of the 1980s the most severe effects of cocaine use became apparent as its use became more widespread, and public opinion shifted to view cocaine as a more dangerous drug than previously perceived. Data from national studies show a sharp increase in the perceived risk of cocaine between the years 1986 and 1987, which continued to rise more gradually into the early 1990s (Johnston et al., 2005).

Multiple factors drove these changes in the cultural meaning of cocaine use. One was highly-publicized cocaine-related deaths of celebrities, such as the cocaine-related death of Len Bias in 1986, just one day after the Boston Celtics selected him second overall in the NBA basketball draft. A second factor was a national media campaign that forcefully stigmatized illegal drug use, known as the "Just Say No" campaign headed by Nancy Reagan (see Musto, 2002). Additionally, the introduction of crack cocaine during the later years of the 1980s is thought to have shifted cocaine use towards poorer individuals (Royal College of Psychiatrists, 2000), hastening the fall of cocaine from its reputation as a "glamour" drug. Finally, the perceived dangerousness of cocaine was also driven by increasing objective evidence of its addictive properties and potentially lethal consequences (Jonnes, 1996). This evidence has increased to the point where today cocaine amounts for over half of all drug-related emergency room visits (SAMHSA, 2005), cocaine-related overdose deaths now outnumber heroin-related overdose deaths (Paulozzi et al., 2006), and a recent rate of increase in cocaine-related overdose deaths is about double that of heroin-related deaths (Paulozzi et al., 2006).

Evidence suggests that as the perception of the dangers of cocaine use shifted, the profile of cocaine users shifted from advantaged to more disadvantaged individuals. A study of national trends in substance use found that a disparity in cocaine use formed around the year 1990 such that cocaine use developed an association with lower educational attainment (Miech et al., 2005). This was a “historical period” change, in which the newly-emerged association of cocaine use with lower educational attainment among individuals between the ages of 18 and 35 occurred at the same time for all birth cohorts. Harder and Chilcoat (2008) found that few individuals initiated use of cocaine across levels of educational achievement during the 1990s, but non-high school graduates were more likely than those with higher educational attainment to continue to use cocaine after 1990. Similarly, in a study of drug use trajectories between 1984 and 1998, Miech (2008) found that those individuals who used cocaine before and after 1990 had lower educational attainment than those people who stopped using around 1990 or never used.

The Present Study

The present study extends prior work by examining the relationship between cocaine use and depressive disorders over time. As cocaine use became increasingly deviant and stigmatized through the 1980s, we hypothesized that normal, healthy users eschewed the drug. Prior research has found that those who continued to use cocaine were more likely to be socioeconomically disadvantaged (Miech, 2008; Miech et al., 2005), and we hypothesized that those who continued to use were also more likely to have psychopathology. In the present study, we examined and compared the relationship of cocaine use and depressive disorders before and after the year 1990. The association of cocaine use with depressive disorders is of particular interest because of the important role of psychopathology in drug research and treatment (DeGroot et al., 2003; Drake et al., 2004).

The present study uses two waves of data on drug use and mental diagnoses in accordance with DSM criteria from adults collected in 1981 and in 1993–1994 in Baltimore, Maryland, as part of the Epidemiologic Catchment Area (ECA) study (Eaton et al., 1997; Regier et al., 1984). This dataset has several strengths for the purpose of testing the proposed hypothesis. The data collection of the ECA study allows the measurement of depressive disorders according to validated diagnostic categories. The sample of the ECA study includes people with a wide range of ages, which allows some examination of age effects. Finally and most importantly, there were two waves of data collection that serendipitously occurred before and after 1990, the time of the proposed shift.

Methods

Sample

The present study used a longitudinal selection of data from the Baltimore site of the ECA study before and after the year 1990. The ECA has been described in detail elsewhere (Eaton et al., 1997; Regier et al., 1984). The primary purpose of the ECA study was to estimate rates of psychopathology and health care utilization in the United States. Data was collected using multistage probability sampling of individuals aged 18 or older at several

locations in the United States. Original data collected at the Baltimore site occurred during the year 1981 (n=3,006 observations included in the present study). Additional follow-up data at the Baltimore site on the original sample was collected between the years of 1993–1994 (n = 1,679 observations). Written informed consent was obtained for all participants after the study procedures were fully explained. Demographic characteristics of the sample are reported in Table 1.

Measures

Depressive Disorders—Trained laypersons conducted diagnostic interviews via the Diagnostic Interview Schedule (DIS; Robins et al., 1981). Participants were considered as having a depressive disorder if they met criteria for lifetime Major Depressive Disorder and/or Dysthymia, based on DSM-III criteria (American Psychiatric Association, 1980), which was the form of the DSM available during the time of the baseline assessment in 1981. Interviews in 1993–4 allowed diagnoses of Major Depressive Disorder and Dysthymia using both DSM-III and DSM-IV criteria; DSM-III criteria were used at the 1993–4 wave to have a consistent diagnostic framework for the two waves of assessment. Participants were categorized as having or not having a depressive disorder for the observation at each wave of data collection based on their responses to the DIS questions at that time point alone.

Past Year Cocaine Use—Use of cocaine was determined by self-report. Dichotomous variables were created where “1” indicated cocaine use in the past year as well as use on five or more occasions ever in one’s lifetime. This cut-off of five occasions of use was chosen to represent cocaine use that exceeded experimentation. The cocaine use variable was coded as a “0” if the respondent had not ever used on five or more occasions, or had not used in the past year.

Control Variables—The race of participants was measured by self-report. Given the low prevalence of individuals who were neither Caucasian nor Black, participants in the present study were categorized as “Caucasian,” “Black,” or “Other.” For all regression analyses, “Caucasian” is the referent. A dichotomous variable of currently (at the time of interview) married or not married, with not married as the referent, indicated participants’ marital status. Similarly, a dichotomous variable represented having (at the time of the interview) a high school diploma or more education, with less than a high school education as the reference group. Gender was determined by the observation of the interviewers at the baseline interview, with male gender as the referent. Additionally, self-reported age was measured at each assessment. Gender and race were time-invariant covariates, while marital status, education, and age were time-variant.

Data Analysis

Analysis of longitudinal time trends was undertaken through a series of logistic regression models. Past-year cocaine use was regressed on depressive disorders, stratified by time period (1981 and 1993–1994). Multivariable regression modeling was theoretically-driven in order to test the proposed hypothesis of an interaction of depressive disorders and time period in the prediction of illegal cocaine use. Generalized estimating equations were used to handle the repeated measurement. The multivariable modeling strategy was repeated

using age in the place of time period to assess the possibility of age effects. For both multivariable models, the p -value for interaction terms was set at 0.10 due to the limitations in power when testing for multiplicative interactions. All models were estimated using STATA, version 9 (Statacorp, 2005).

Missing Data

Of all observations available from the two assessments, 4,685 of 5,484 (78.7%) had complete data on all variables included in the multivariable regression model. Observations with and without missing data were compared on the variables of interest using χ^2 and t -tests. Those observations missing data were not different from those included in modeling for either of the variables of primary interest; i.e., they were not different in rates of depressive disorders or past-year cocaine use. Observations that had missing data were more likely to be from the 1981 assessment (25.5% having missing data vs. 12.6% at the 1993–1994 assessment, $p < 0.001$) and from participants who were not married (20.6% vs. 16.8% for those who were married, $p < 0.001$), female (22.3% vs. 19.7% for males, $p = 0.02$), older (mean of 58 for those with missing data and 49 for those without, $p < 0.001$), caucasian or of other race (21.7% and 63.8% respectively compared to 16.9% of black participants, all $p < 0.001$), and who have less than a high school degree (24.8% vs. 17.4% for those with a high school degree, $p < 0.001$).

Results

In simple logistic regression models of past-year cocaine use stratified by time period, having a depressive disorder was not associated with cocaine use at the 1981 assessment ($\beta = 0.28$, $p = 0.39$) but was at the 1993–1994 assessment ($\beta = 1.26$, $p < 0.05$). A multivariable model, where all observations from the two assessments are combined into one analysis pool, is reported in Table 2. The adjusted odds ratio (OR) of past-year cocaine use for those with a depressive disorder compared to those without was 1.28 ($e^{0.25}$) for the 1981 observations, controlling for demographic characteristics. For the 1993–1994 observations, however, the adjusted OR of past-year cocaine use for those with depression compared to those without was 3.53 ($e^{0.25 + 1.01}$) after controlling for demographic characteristics. The interaction term in the multivariable model indicated that the effect of depression on cocaine use was significantly different between the two waves ($p = 0.06$) after controlling for potential confounders.

Because age is inherently and highly correlated with time period in a cohort study, we could not include age in multivariable modeling and be able to examine effects of time period on the outcome. However, in separate analysis we explored the alternative possibility that the observed change in the relationship between cocaine use and depression over the course of the ECA study was due to an age effect rather than a historical period effect. In a multivariable logistic regression model that included depressive disorders, age, and an interaction term for depressive disorders and age, the interaction was not significant ($\beta = -0.01$, $p = 0.5$). This indicated that age effects were not important to the changing relationship between depression and cocaine use over time in this sample.

Discussion

This study set out to examine a potential, increasing association of cocaine use and depressive disorders in recent decades. We expected this increase in light of evidence that the cultural reputation of cocaine changed from the 1980s to 1990s, and with this change so too did cocaine's clientele change. To date the change in cocaine's clientele has been examined and documented in terms of socioeconomic status, but not yet in terms of psychopathology. This study is particularly well-suited to examine a potential increase in the association of cocaine use and depressive disorders because the data contain information on these factors before and after the year 1990, when the cultural changes in cocaine's reputation – as well as changes in its clientele – would have been complete (Miech et al., 2005; Miech, 2008).

The analysis indicates that an association of depressive disorders and cocaine use emerged in the 1990s, and emerged quite dramatically. In 1981 the association was small and not statistically significant. But by 1992–3 the association had grown and people with depressive disorders were more than three times more likely to report past-year cocaine use than those without depressive disorders.

This emerging association was most likely a historical period effect and not a result of the aging of the cohort. While it can sometimes be difficult to disentangle period effects from aging effects because both aging and historical time take place concurrently, in this case the evidence points to a period effect because the association of cocaine use and depressive disorders did not differ by age. Before discussing these findings in more detail, we first point out some limitations of this study.

Limitations

It is not possible for the present study to discern between cohort and historical time effects. However, in either case the main substantive conclusion of the study still holds: namely, that the association of cocaine use and depressive disorders emerged in the 1990s and was likely to be a result of social, rather than biological, processes.

The present study is also limited by its use of a lifetime measure of Major Depressive Disorder and Dysthymia to determine depressive disorder status. Using a lifetime diagnosis does not allow the examination of whether the cocaine use occurred at the same time when an individual met criteria for a depressive disorder, as well as whether initiation of cocaine use began before or after the onset of the disorder. Consequently, any implications regarding causation are beyond the scope of this research. Despite the use of lifetime measurements, however, the present research is strengthened by the use of DSM-III diagnoses of Major Depression and Dysthymia instead of simpler survey tools to measure psychopathology. Furthermore, studies of the course of Major Depressive Disorder (Wells et al., 1992) and Dysthymia (Klein et al., 1998; Klein et al., 2000) suggest that reoccurring episodes are common and recovery without relapse uncommon for Dysthymia in particular. Nonetheless, while the DSM diagnoses are considered “gold standards” for defining mental illnesses, they rely on some use of judgment which will result in some misclassification, and do not confer much meaning in terms of etiology or prognosis in and of themselves.

The introduction of crack cocaine may explain some of the change observed over time in the present study. Unfortunately, the survey instrument for the 1993–1994 wave did not differentiate between people who used only crack and who use crack and powder cocaine. Consequently, we were unable to examine the degree to which individuals who use crack cocaine and experience a depressive disorder may explain the change in the association of cocaine and depressive disorders over time.

Given the sample size and the relatively low prevalence of many specific mental illnesses and of cocaine use, issues of statistical power precluded us from examining personality disorders and other psychopathology. However, depressive disorders are one of the most prevalent types of psychological disorders in the community, and therefore have substantial public health importance. Power issues also required that we group the two diagnostic categories (Dysthymia and Major Depressive Disorder), rather than examine the relationship of cocaine use with each separately. However, the purpose of the study was to examine the association of cocaine use with depression that is serious enough to be considered clinically significant, and we felt that including only those individuals with MDD while individuals with Dysthymia were included in the non-depressive disorder group would lead to a misclassification bias. In order to handle the limitations of power when testing a multiplicative interaction, we used the commonly-practiced method of increasing the type-I error rate to 0.10 (e.g., Marler et al., 2000; Saitz et al., 2003), which does increase the risk of “false positive” findings. Despite the limitations of power and assessment methods, the present study is strengthened by the use of diagnostic criteria to assess psychopathology and assessments before and after the time of a known shift in the profile of cocaine users.

Public Health Implications

The association of depressive disorders and cocaine use that emerged during the 1990s suggests similar shifts may be expected when changes in pharmacokinetic properties (such as route of administration) or environmental conditions (policies, prices, and social acceptability) occur for specific substances of use and abuse. More broadly, such shifts may occur when a behavior, such as use of a specific substance, becomes stigmatized and pathologized. These shifts have important implications for service provision. Individuals with co-occurring problem substance use and mental illness greatly benefit from treatment programs tailored to comorbidity (Drake et al., 2003), and increases in the association of the use of a particular substance with mental illness will result in an increased need for this specialized treatment. Furthermore, understanding past shifts in illicit drug use among those with a mental illness may allow us to predict future changes and prepare for corresponding service needs.

Some have suggested that we are currently experiencing a new period of reduced stigma towards cocaine (Ryzik 2007), citing the increased visibility of use by popular celebrities and the lack of recent “cautionary tales,” i.e. high-profile individuals dying from cocaine overdose. However, this has not borne out yet in an increased rate of lifetime use among youth in national studies (Johnston et al., 2005). The present results suggest the association of cocaine use with depression among cocaine users may again change if the speculated glamorization of cocaine continues.

Future Directions and Conclusion

The present study is a reminder of the importance for future research to consider specific substances when examining associations with psychopathology, in addition to analysis where all substances are grouped into a general, omnibus category. Analysis of time trends of comorbidity with Major Depression using all substances together did not find a dramatic change in the association over time (Compton et al., 2006). However, a study of cross-sectional time trends of the association of smoking and depression (measured by combining criteria of Major Depressive Disorder and Dysthymia) found that the association of the two did not arise until smoking became non-normative (Murphy et al., 2003). Taken collectively, these studies and the present study indicate the importance of substance-specific analysis in order to thoroughly understand the processes at work in determining the relationship between substance use and psychopathology.

Future research should also elucidate mediating factors that explain why individuals with depression are more likely to use illicit substance (such as cocaine) when use is stigmatized, such as social and economic resources, social network influences, employment opportunities, and access to treatment and health services. Future research should also further examine the social components of the association of mental illness with drug use. The present study examined historical trends as one aspect of the social component of co-occurring drug use and mental illness, but other research designs are also strategic for this purpose. For example, one innovative strategy might be qualitative studies of people with a depressive disorder who do and do not use cocaine as well as non-depressed individuals who do and do not use cocaine, in order to examine if cocaine use has different meanings between groups. An additional study design that may elucidate the role of social influences on the co-occurrence of drug use and mental illness is the study of twins. Specifically, ACE models may provide an estimate of the relative size of the genetic and the social components of this association. This is an important and fruitful line of research that should be pursued further in order to better understand the social context of the co-occurrence of drug use and psychopathology.

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Table 1

Demographic characteristics of the Baltimore, Maryland ECA study samples included in regression modeling for the 1981 and 1993–1994 assessment waves.^a

	1981 Wave Observation n = 3,006	1993–1994 Wave Observation n = 1,679
	%	%
Depressive Disorder (MDD or Dysthymia)	8.48	5.84
<i>Demographic characteristics</i>		
Race		
Caucasian	62.31	63.19
Black	36.36	35.32
Other	1.30	1.49
Female sex	59.61	62.30
Currently married	39.25	49.26
High school education	48.20	58.37
	Mean (S.D.)	Mean (S.D.)
Age	46.6 (0.37)	52.8 (0.39)

^aIn all, 3,286 unique participants provided data for the present analyses, such that some participants provided data for both waves while others did not due to loss to follow-up or missing data.

Table 2

Multivariable logistic regression model of past year cocaine use including 4,685 observations among 3,286 participants in the Baltimore, Maryland ECA, using generalized estimating equations for repeated observations.

Variable	β	95% Confidence Interval
Depressive Disorder (MDD or Dysthymia)	0.25	−0.39, 0.90
Time period: 1993–1994 (vs. 1981)	−0.34	−0.75, 0.07
Interaction of depression and time period	1.01 [^]	−0.05, 2.07
Demographic Variables		
Currently married	−0.57*	−0.97, −0.17
Female sex	−0.35 [^]	−0.70, 0.01
Black race (vs. Caucasian)	0.26	−0.10, 0.61
Other race (vs. Caucasian)	0.70	−0.48, 1.88
High school education	−0.19	−0.53, 0.16
Constant	−3.04	−3.42, −2.67

*
p < 0.05,

[^]
0.05 < p < 0.10