

SPECIAL ARTICLE

DISABILITY INCOME, COCAINE USE, AND REPEATED HOSPITALIZATION AMONG SCHIZOPHRENIC COCAINE ABUSERS

A Government-Sponsored Revolving Door?

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Abstract *Background.* Many patients with serious mental illness are addicted to drugs and alcohol. This comorbidity creates additional problems for the patients and for the clinicians, health care systems, and social-service agencies that provide services to this population. One problem is that disability income, which many people with serious mental illness receive to pay for basic needs, may facilitate drug abuse. In this study, we assessed the temporal patterns of cocaine use, psychiatric symptoms, and psychiatric hospitalization in a sample of schizophrenic patients receiving disability income.

Methods. We evaluated 105 male patients with schizophrenia and cocaine dependence at the time of their admission to the hospital. They had severe mental illness and a long-term dependence on cocaine, with repeated admissions to psychiatric hospitals; many were homeless. The severity of psychiatric symptoms and urinary

concentrations of the cocaine metabolite benzoylecgonine were evaluated weekly for 15 weeks.

Results. Cocaine use, psychiatric symptoms, and hospital admissions all peaked during the first week of the month, shortly after the arrival of the disability payment, on the first day. The average patient spent nearly half his total income on illegal drugs.

Conclusions. Among cocaine-abusing schizophrenic persons, the cyclic pattern of drug use strongly suggests that it is influenced by the monthly receipt of disability payments. The consequences of this cycle include the depletion of funds needed for housing and food, exacerbation of psychiatric symptoms, more frequent psychiatric hospitalization, and a high rate of homelessness. The troubling irony is that income intended to compensate for the disabling effects of severe mental illness may have the opposite effect. (*N Engl J Med* 1995;333:777-83.)

MANY patients with severe mental illness are addicted to drugs and alcohol, creating additional problems for the patients and for the clinicians, health care systems, and social-service agencies that provide services to this population. Drug abuse often exacerbates psychiatric symptoms and contributes to homelessness, violence, and poor compliance with treatment.¹ About half the psychiatric patients in emergency rooms and inpatient psychiatric programs have problems that are complicated by substance abuse,² and many of these patients have schizophrenia. In a large epidemiologic survey,³ the lifetime prevalence of substance abuse among schizophrenic patients was estimated at 47 percent; the prevalence of cocaine use was 17 percent. In a sample of hospitalized schizophrenic patients, the overall rate of substance use was 56 percent, and 27 percent of the patients used cocaine.⁴

Cocaine use is particularly destructive in the presence of schizophrenia, because cocaine is dopaminergic,⁵ and excess dopamine has been associated with the pathophysiology of schizophrenia.⁶ Cocaine and similar stimulants can exacerbate the course of schizophrenia by causing dysphoria, insomnia, agitation, and increased aggressiveness.^{7,8} Abuse of stimulants has also been associated with an increased rate of psychiatric hospitalization. These findings suggest a pattern of repeated

cycles of emergency hospitalization for acute psychosis precipitated by drug use.⁹⁻¹¹

Many schizophrenic persons receive disability income from the Social Security Administration or, if they are veterans, from the Department of Veterans Affairs. This income is intended to cover the basic needs of people with severe mental illness. Public attention has recently focused on the troubling possibility that substance abusers who have no other mental disorder may use their disability income to purchase drugs.¹² In 1994, Congress passed reform legislation to address this issue. Although the debate has centered on people with a primary diagnosis of substance abuse, the issue also pertains to those with a primary diagnosis of a severe mental illness and a secondary diagnosis of substance abuse.

Conventional wisdom holds that this problem can be resolved by appointing a payee who receives and manages disability income on behalf of the disabled person. Physicians or others who have knowledge of the patient recommend a payee to the Social Security Administration or the Department of Veterans Affairs. In practice, however, this approach routinely breaks down.^{13,14} It can be difficult to find reliable people who are willing to act as payees for drug abusers with psychotic illnesses, and some mentally ill patients who are already receiving disability income avoid treatment rather than risk losing direct control of their income. As a result, many people, even those in good treatment programs, do not have payees. Despite these practical problems, the payee approach enjoys widespread support.¹⁵

This approach, however, is based on the assumption that drug abusers routinely misuse disability payments

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to buy drugs — an assumption that has never been tested scientifically. Interviews of cocaine addicts with no mental disorder other than that related to substance abuse suggest that the receipt of large sums of money may lead to recurrent cocaine use.¹⁶ If this is also true of cocaine-abusing schizophrenic patients, then monthly disability payments will result in monthly cycles of cocaine use. Because cocaine can worsen the symptoms of schizophrenia, this pattern of use may lead to similar cycles of exacerbated symptoms and psychiatric hospitalization. In this study, we hypothesized that drug use, psychiatric symptoms, and hospital admissions would all peak at the beginning of the month, shortly after the receipt of a disability payment on the first day of the month.

METHODS

Study Subjects

Patients were recruited for the study on admission to a large, urban Veterans Affairs medical center. Data were drawn from a study that compared the efficacy of two experimental treatment programs for schizophrenic cocaine abusers.¹⁷ In one program, case managers coordinated separate services for psychiatric disorders and substance abuse. In the other program, a new treatment unit provided integrated services for the two disorders. Patients were evaluated by emergency room psychiatrists, hospitalized for several days to three weeks, and then discharged to outpatient care.

Patients were enrolled in the study if they met the criteria of the *Diagnostic and Statistical Manual of Mental Disorders* (third edition, revised) (DSM-III-R) for current cocaine dependence and for schizophrenia or schizoaffective disorder.¹⁸ Diagnoses were made with the use of the structured clinical interview for DSM-III-R,¹⁹ supplemented by information from collateral interviews and hospital records whenever possible. All enrolled patients, including those with a diagnosis of schizoaffective disorder, met four of the criteria for schizophrenia (characteristic psychosis, functional deterioration, chronic illness, and exclusion of organic causes). Patients were excluded if all prior psychotic episodes had occurred only during, or shortly after, delimited periods of drug use. The study was approved by the medical center's institutional review board, and all the subjects gave informed consent.

Measures

Total income, disability income, and expenditures for drugs and alcohol during the previous month were determined at the time of enrollment, with the use of the Addiction Severity Index.²⁰ The index is based on a comprehensive, structured interview used widely in substance-abuse research, and its validity and reliability have been established in studies of hospitalized substance abusers.²¹ Disability income included Supplemental Security Income, Social Security Disability Income, and disability compensation from the Department of Veterans Affairs.

Assessments were made weekly during and after the index hospitalization, for a total of 15 weeks. The severity of psychiatric symptoms was evaluated with the expanded Brief Psychiatric Rating Scale (BPRS),²² a version of the scale²³ that is widely used in psychiatric research. We used the total score for the principal analysis. In subsequent analyses, five clusters of symptoms (psychosis, anergy, agitation, dysphoria, and hostility) were used. In almost all cases, the raters were unaware of the subjects' drug-use status, since they did not have access to the results of urine tests and did not question the patients about drug use before assessing their psychiatric symptoms. On rare occasions, the blinding was unavoidably compromised because the subject either appeared intoxicated or mentioned recent drug use.

Drug use was determined by testing urine samples, collected weekly under direct observation. Urine was assayed for cocaine (in the form of its major metabolite, benzoylecgonine), amphetamine, meth-

amphetamine, marijuana (in the form of delta-9-tetrahydrocannabinol), opiates (in the form of morphine), and phencyclidine. Testing was performed with the fluorescence polarization immunoassay (TDx, Abbott Laboratories, Abbott Park, Ill.). This assay can detect the use of cocaine up to five days previously.²⁴ Positive results of benzoylecgonine tests were confirmed by high-pressure liquid chromatography with diode-array detection in selected urine samples.²⁵ Quality control of the immunoassay methods was performed with the use of high-performance liquid chromatography and diode-array detection²⁶ for benzoylecgonine, morphine, delta-9-tetrahydrocannabinol, and barbiturates and with the use of gas-liquid chromatography with nitrogen-phosphorous detection²⁷ for amphetamine, methamphetamine, and phencyclidine. Values below 100 ng per milliliter were recorded as zero.

Because of occasional missing data, data from an average of 10 clinical assessments were available for each of the 105 subjects. The frequency of attendance at weekly assessments ranged from 86 percent at week 1 to 52 percent at week 15 (median, 74 percent). Occasional missing data did not reflect withdrawal from the study, since patients might miss an assessment session and then reappear. The drop in the sample size was linear (about two to three subjects weekly) during the 15-week study period, with the exception that the frequency of attendance returned to 84 percent when a comprehensive clinical assessment was performed at week 12.

The project was affiliated with the UCLA Clinical Research Center for Schizophrenia and Psychiatric Rehabilitation, supported by the National Institute of Mental Health. The center maintains the reliability of measurements among many projects through standardized training and quality assurance.²⁸ High levels of interrater reliability were achieved by training five masters'-level psychologists in the use of the structured clinical interview for DSM-III-R ($\kappa \geq 0.80$ for symptoms and 100 percent agreement on diagnosis)²⁹ and the expanded BPRS (intraclass correlation coefficient ≥ 0.80), with standardized ratings by senior diagnosticians at the UCLA Clinical Research Center used as gold-standard criteria. Separate studies of diagnostic reliability have not been performed among schizophrenic substance abusers.

Statistical Analysis

The percentage of legal income spent on drugs and alcohol, as reported by the subjects, was documented. Many subjects reported spending more — sometimes considerably more — than their total legal income on drugs. Thus, the percentage in some cases was well over 100 percent. Distributions of income and expenses were highly skewed, so medians were better descriptors than means.

Patterns of monthly drug use were analyzed with repeated-measures mixed models. Data collected during the first 15 weeks of treatment (i.e., during 4 months for each subject and 2 years for the entire study sample) were grouped according to 10 three-day intervals based on the calendar day (i.e., interval 1 was the 1st through the 3rd days of each month, interval 2 the 4th through the 6th days, and so on); the 31st of the month was included in interval 10. Thus, data collected during all months of the study were collapsed into a single prototypal month.

The statistical model for most analyses was an unbalanced, mixed, linear, main-effects model with repeated measures. The model included a fixed effect of the three-day interval (10 three-day intervals) and random subject and error effects (which were assumed to be independent). A dichotomous transformation of the results of urine tests (positive or negative) was analyzed with the generalized estimating equation as described by Liang and Zeger,³⁰ with the specification of a logit link function, binomial error, and exchangeable correlation structure. The overall significance of the fixed effect was determined with a Wald chi-square test; the program for the generalized estimating equation reports the results of separate robust z-tests for each of the fixed parameter estimates. For continuous variables, we used the SAS Proc MIXED program, a general, linear, mixed-model analysis of variance that yields estimates of the maximal likelihood of the model's effects, specifying compound symmetry for the covariance matrix. (The usual autocorrelation one would expect in sequentially gathered data did not occur, because data were collapsed into the intervals across months.)

Analyses of cocaine concentrations in positive specimens were per-

formed only for the subgroup of subjects who used cocaine at each time point. These analyses provide information about the amount of cocaine used when drug use occurred. Because the data were extremely skewed, they were log-transformed. To check the effect of the non-normal distribution of data on the analyses, several supplementary analyses (including analyses of raw and ranked data and of truncated Tobit regression models) were performed. Since the results were in no case affected by the choice of the analytic method, these data are not presented here. As in the generalized-estimating-equation analysis, the overall F test was used to evaluate the significance of differences among the three-day intervals; separate t-tests were used for each interval to determine which deviated from the overall average. To rule out possible confounding effects of other cycles (e.g., weekend drug use), the day of the week was included as a categorical covariate in supplementary analyses of the primary statistical models of urine-test results. BPRS scores for symptom severity were also analyzed with the general, linear, mixed-model analysis of variance, with data again grouped into 10 intervals during the month. The dependent variable was the total 24-item BPRS score, with each item rated on a seven-point Likert scale. Each data point was concurrent with the result of a urine test, which was either positive or negative for cocaine. The statistical model in this case was an incomplete 2 (use of cocaine vs. no use)-by-10 (interval) factorial with repeated measures for each subject (with subjects again treated as a random design factor in the model).

The ideal way to study the covariation between drug use and hospital admission during each month would have been to examine admission prospectively, without clinical or experimental intervention. However, the subjects were in a treatment group specifically designed to prevent readmission soon after discharge, even when drug use occurred. Thus, we reasoned that the initial hospital admissions, which occurred before any intervention, could be used to study the variation in admissions throughout the month. Like the other dependent measures, these initial admissions were tallied in three-day intervals. The concurrent and lagged cross-correlations with cocaine concentrations were evaluated with a conventional transfer-function model (with the use of SAS Proc ARIMA software). First-degree autoregressive models characterized both variables. Because the series is very short (n = 10), only the first-degree lagged cross-correlations were considered.

RESULTS

A total of 105 patients were enrolled in the study. All were male and met the DSM-III-R criteria for cocaine dependence and either schizophrenia or schizoaffective disorder. The patients had had many psychiatric hospitalizations, had used cocaine for many years, and had used it extensively in the previous month; 34 percent were homeless (Table 1). The median monthly income was quite low and consisted almost entirely of disability income (Table 2). The proportion of monthly income spent on illegal drugs was high. The percentage of patients with positive tests for benzoylcegonine (Fig. 1) differed significantly among the 10 intervals (Wald chi-square = 18.56, df = 9, P = 0.03). Robust z-tests indicated that the proportion of patients with positive tests for cocaine was significantly higher during the second interval (z = 2.50, P = 0.01) and third interval (z = 2.74, P = 0.006) than during the other intervals.

Among the patients with positive tests, the peak benzoylcegonine concentration occurred during the first three-day interval. The statistical analysis indicated that the variation in the mean concentration was significant among the 10 intervals (F = 3.01, df = 9, 436; P = 0.002) (Fig. 2). The actual mean concentrations were higher than those shown, because the laboratory analysis had a ceiling value of 150,000 ng per milliliter

*Table 1. Characteristics of 105 Schizophrenic Patients with Substance Abuse.**

CHARACTERISTIC	VALUE
Age (yr)	40±6.6
Race (% of patients)	
Black	79
White	18
Other	3
Education (yr)	13±1.8
Marital status (% of patients)	
Never married	37
Married	13
Separated, widowed, or divorced	50
Homeless (% of patients)	34
Years of regular cocaine use	9±7.1
Days of cocaine use in the past month	12±10.8
No. of previous psychiatric hospitalizations	10±11.3

*Plus-minus values are means ±SD.

(approximately 10 percent of the sample had values at or above this level). Among the positive urine specimens, the cocaine concentration was significantly higher than average in the first two intervals (t = 3.45 and t = 2.12, P < 0.001 and P = 0.035, respectively; df = 436 for both), and significantly lower than average during the seventh interval — that is, days 19 through 21 (t = 2.68, df = 436, P = 0.008). Fewer than 2 percent of the urine samples had appreciable concentrations of any of the other illicit drugs tested. With the same method of analysis, there was no significant variation in the concentrations of these drugs among the 10 intervals of the month. The tendency for drug use to increase early in the month did not appear to be an artifact of weekly cycles. This was determined by performing analyses of the percentage of negative urine specimens and mean cocaine concentrations with the addition of the day of the week as a covariate. These analyses yielded essentially the same results as those for the three-day intervals.

The analysis of symptom severity (the total BPRS score) revealed a highly significant main effect of cocaine use (F = 37.79, df = 1, 1076; P < 0.001) and a significant interaction between drug use and the interval

Table 2. Monthly Income and Expenditures for Illegal Drugs and Alcohol among the 105 Schizophrenic Patients.

INCOME AND EXPENDITURES	MEDIAN VALUE	SEMI-INTERQUARTILE RANGE*
Total income (\$)	650	273
Disability income (\$)†	645	117
Expenditures for illegal drugs (\$)	250	300
Income spent on illegal drugs (%)‡	47	44
Expenditures for alcohol (\$)	10	30
Income spent on alcohol (%)‡	2	12

*The semi-interquartile range (25th to 75th percentile) is a useful index of variability when distributions are skewed or truncated.

†Seventy-six subjects received disability income. Nearly all the other subjects received monthly income from another source, such as the county welfare program or Aid to Families with Dependent Children.

‡Calculated for each subject rather than by dividing medians.

($F=2.69$, $df=9$, 1076; $P=0.004$). As shown in Figure 3, psychiatric symptoms tended to be more severe when the urine test for cocaine was positive (top curve) than when it was negative (bottom curve). However, the difference was greatest during the earlier intervals, when the level of cocaine use was maximal. Figure 3 also shows the average BPRS score without reference to cocaine use (middle curve). A separate statistical analysis of that curve indicated a significant variation among the three-day intervals ($F=2.07$, $df=9$, 1149; $P=0.03$). Symptoms tended to increase in severity at the start of the month and were less severe during approximately the third week. In a sense, this middle curve represents a weighted function of the other two. The increase in the severity of symptoms during the early part of the month was due to the larger number of patients with positive drug tests at that time. Conversely, the reduction in the severity of symptoms during the latter half of the month is due to the larger number of patients with negative tests. The monthly variation in the severity of symptoms for the sample as a whole is thus directly attributable to the relative proportions of patients with positive tests for cocaine during each interval. Separate analyses of the five BPRS symptom clusters revealed a significant effect only for positive psychotic symptoms (hallucinations, delusions, and conceptual disorganization; $F=2.18$, $df=9$, 1149; $P=0.02$).

The pattern of hospitalization appeared to be quite similar to that observed for cocaine concentrations, with a clear peak at the start of the month and a trough at

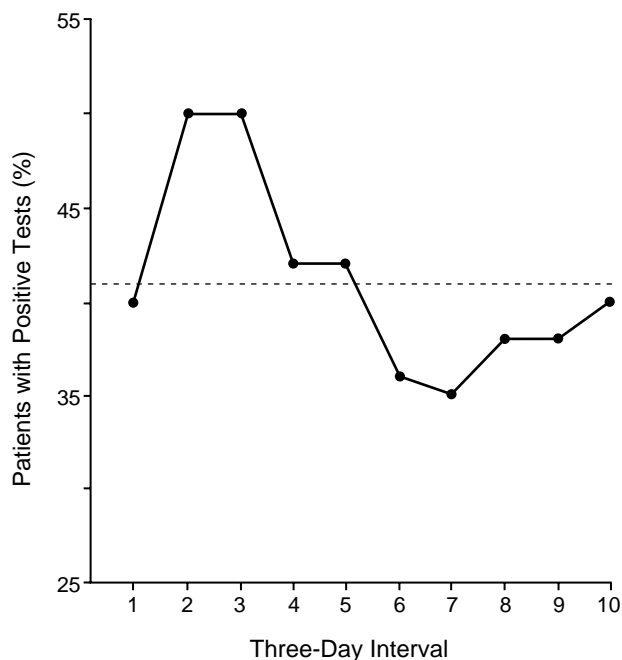


Figure 1. Mean Percentages of Patients with Positive Tests for Cocaine, According to the Three-Day Interval in the Course of the Month.

The dotted line indicates the mean value (41 percent) for all 10 intervals.

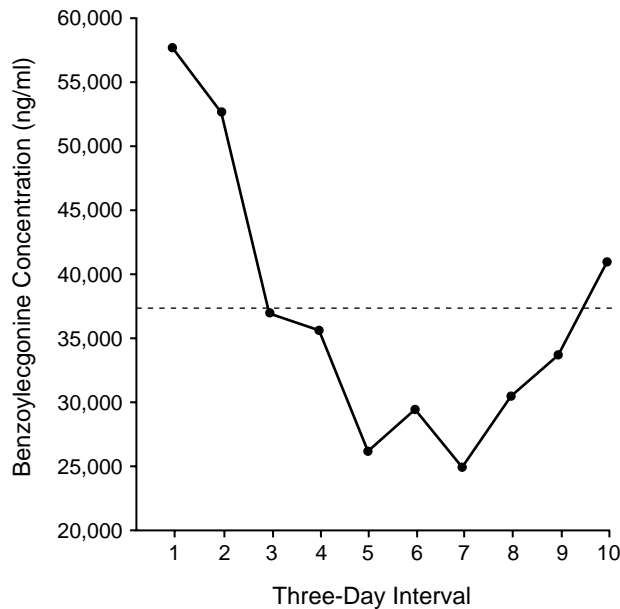


Figure 2. Mean Benzoyllecgonine Concentrations in Positive Specimens, According to the Three-Day Interval in the Course of the Month.

The dotted line indicates the mean value (36,852 ng per milliliter) for all 10 intervals.

about the third week (Fig. 4). Analysis of the relation between these two variables indicated a significant association, with the peak in admissions occurring one interval after the peak in cocaine concentration. The cross-correlations between the cocaine concentration and hospital admission were -0.014 concurrently and 0.635 with a lag of one interval ($t=2.74$, $df=8$, $P=0.03$). Thus, changes in the cocaine concentration were predictive of changes in the rate of hospitalization three to five days later.

DISCUSSION

In this sample of cocaine-abusing schizophrenic patients, cocaine use, psychiatric symptoms, and hospitalization were temporally related. All three variables were characterized by peaks early in the month and troughs late in the month. Psychiatric symptoms were more severe on the days when cocaine was present in the urine than on other days. On the average, patients spent almost half their income on illicit drugs. Because the cost of board-and-care homes in Los Angeles approved by the Department of Veterans Affairs (a minimum of \$680 per month) exceeded the patients' median monthly income, one can surmise that cocaine use contributed to homelessness by depleting the funds required for shelter. Our interpretation of the data is that the increased rate of hospitalization a few days after the peak in cocaine use resulted from the deleterious effects of cocaine use, in the form of exacerbated psychiatric symptoms and homelessness.

It is hard to escape the conclusion that this cycle was facilitated by the arrival of a disability payment on the first day of each month. An interesting and unexpected

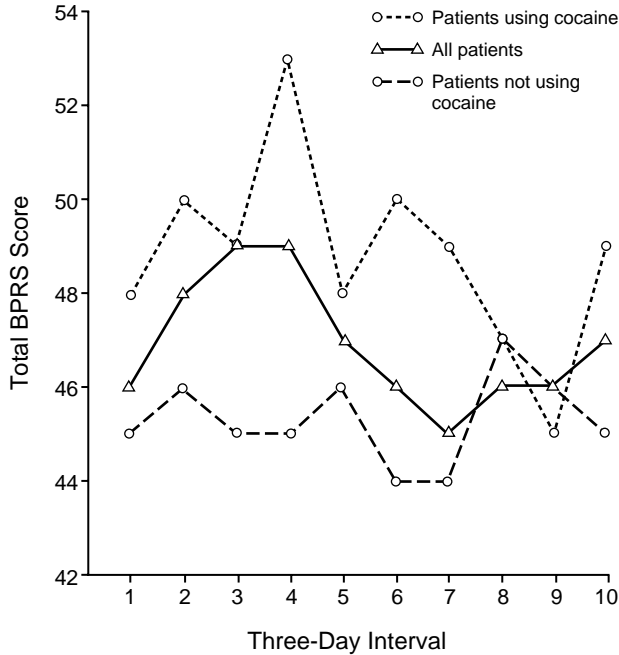


Figure 3. Severity of Psychiatric Symptoms According to Cocaine Use and the Three-Day Interval.

The severity of symptoms was determined on the basis of the overall score on the 24-item Brief Psychiatric Rating Scale (BPRS). A higher score indicates more severe symptoms.

finding was that cocaine use, psychiatric symptoms, and hospitalization actually began to increase a few days before the first of the month. This pattern may be due to a business practice reported by many of the patients we studied. During the last week of the month, local drug dealers extend credit to persons who receive monthly disability income. In a perverse sense, the certainty of the monthly payments makes these patients good credit risks.

The markedly poor clinical and social outcomes among the patients in our study contrast with the relatively good outcomes reported among substance-abusing schizophrenic patients who become abstinent. Two studies suggest that substance-abusing schizophrenic patients have better social functioning and a better prognosis than other schizophrenic patients. During periods of substance abuse, patients with schizophrenia are severely ill, and their symptoms are difficult to manage. When abstinent, however, such patients have less severe psychotic symptoms and better social functioning than those who have never abused substances.^{31,32}

It is important not to overgeneralize these findings, for several reasons. First, our study was clinical, not epidemiologic, and the sample was not intended to be broadly representative of schizophrenic persons. Strictly speaking, the results apply only to schizophrenic patients who abuse cocaine. Most schizophrenic persons do not abuse cocaine. Moreover, our sample is somewhat atypical of those who do. All the patients were men. Women who met our enrollment criteria might have had different characteristics. All our patients were

veterans. As compared with other cocaine-abusing schizophrenic persons, they probably had histories of less severe psychiatric disorders and a higher level of social functioning, at least when they entered the military. In addition, most of our patients were black. A racial distribution similar to that in our study has been reported in other studies of cocaine abuse. Whether this distribution reflects socioeconomic status or other factors associated with race or ethnic group remains unclear.³³⁻³⁵ Second, since the research setting was a large urban hospital, the findings may not apply to persons who live in rural areas, where a host of social and cultural factors, including the availability of drugs, may be different. Third, the patients entered the study during a period of exacerbated symptoms and social problems requiring hospitalization. The mental, physical, and social condition of our patients may thus not be typical of that of the overall population of schizophrenic persons, whether or not they are receiving treatment.

Our study had several limitations. The increase in the cocaine concentration preceded the increase in the proportion of patients with positive tests by a few days. This suggests that instances of cocaine use very early in the month involved greater quantities of cocaine. However, the result is at least partly an artifact of two aspects of the study method. First, benzoylecgonine could be detected in the urine up to five days after cocaine use. Second, patients were tested during scheduled appointments that must have occurred at varying intervals after use. Thus, a patient who used cocaine would be counted as positive regardless of whether the

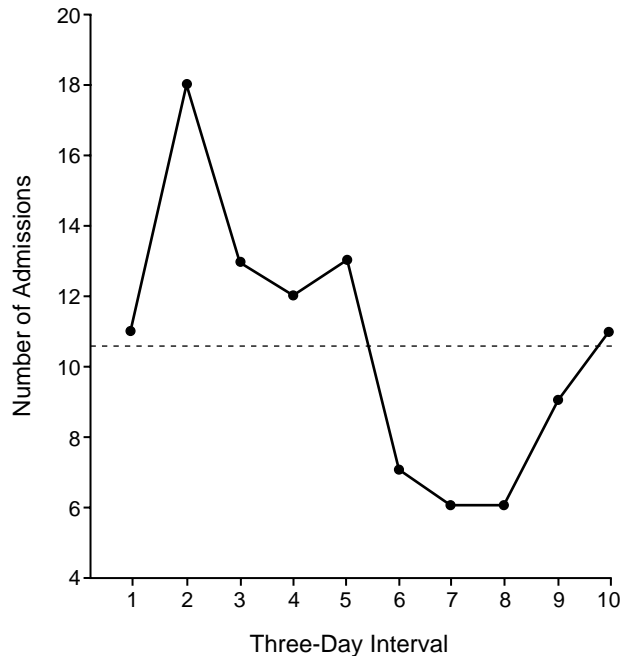


Figure 4. Mean Numbers of Psychiatric Admissions According to the Three-Day Interval.

The dotted line indicates the mean value (10.6 admissions) for all 10 intervals.

urine was sampled immediately or up to five days after use occurred. However, the measured concentration of benzoylecgonine would be systematically lower as a function of how much time had passed since use. Also, it is unclear whether cocaine use exacerbated psychotic symptoms directly or indirectly, perhaps through non-compliance with a medication regimen. Unfortunately, data on compliance were not available. Patients were treated with a wide range of antipsychotic medications in more than a dozen inpatient units and outpatient clinics, and urine samples were not tested for antipsychotic drugs. Another limitation of the study was that hospital admissions were index admissions occurring at the beginning of a 15-week rating period, whereas data on cocaine use and psychiatric symptoms were obtained subsequently. Finally, the data on income were based on information provided by the patients themselves. To avoid these limitations, future studies should include a more broadly representative sample, prospective measures of hospitalization, and objective measures of both income and medication use. The portion of disability income spent on food and shelter should also be determined.

The findings of our study present a dilemma. How are we to provide for the basic needs of disabled schizophrenic persons without simultaneously facilitating a cycle of drug abuse and psychiatric hospitalization? Simply discontinuing the disability payments will not eliminate drug abuse and might exacerbate hunger and homelessness. A partial solution may be to direct disability payments to responsible payees who ensure that the funds are used for food and shelter. However, even payees cannot prevent the use of drugs purchased with funds obtained by other means, such as panhandling. Therefore, the payee approach must be integrated into a comprehensive treatment program that addresses both the psychiatric disorder and the substance abuse and includes behavioral treatment, case management, and antipsychotic medications.^{17,36,37} We are currently evaluating various behavioral interventions, including the practice of giving patients a small portion of the monthly disability payment each day, contingent on their abstinence from cocaine use.³⁸

The *Social Security Handbook* states that "no restrictions, implied or otherwise, are placed on how people spend their SSI [Supplemental Security Income] benefit" and that SSI is "paid under conditions that are as protective as possible of people's dignity."³⁹ Our data suggest that these policies may conflict with one another. For cocaine-abusing schizophrenic persons, the misuse of disability income intended to compensate for the disabling effects of schizophrenia can actually make the illness worse. Instead of protecting the dignity of patients, direct payment of disability income may deprive them of their dignity by initiating a cycle of cocaine use, exacerbated symptoms, homelessness, and psychiatric hospitalization.

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