Does the Disbursement of Income Increase Psychiatric Emergencies Involving Drugs and Alcohol?

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Objective. To determine if the incidence of psychiatric emergencies involving drugs or alcohol supports the argument that mentally ill persons contribute to elevated mortality during the days following disbursement of private earnings and public income transfers.

Study Design. Interrupted time-series using Box-Jenkins methods.

Data Collection/Extraction Methods. Daily counts of adults admitted to psychiatric emergency services in San Francisco after using drugs or alcohol were derived from medical records for the period January 1 through June 30, 1997.

Principal Findings. Psychiatric emergencies among males who had used drugs or alcohol were elevated in the early days of the month. Such emergencies among females were not similarly elevated. Emergencies among females who had not used drugs or alcohol were elevated in the early days of the month.

Conclusion. Elevated mortality in the first week of the month may be attributable, in part, to the "check effect" or use of drugs and alcohol by mentally ill males in the days after they receive income. The contribution of women is more complex and may be induced by drug or alcohol abuse among persons in their social networks. The check effect suggests that persons with a history of substance abuse and mental illness should be offered the opportunity to have their income managed by someone who can monitor and influence how the money is being spent. The fact that drug- or alcohol-related admissions among males exhibit temporal patterns suggests that the provision of preventive as well as treatment services may be strategically scheduled.

Key Words. Psychiatric emergencies, substance abuse, check effect

BACKGROUND

Shaner and his colleagues (1995) have reported that comorbid (i.e., schizophrenia and cocaine abuse) males enrolled in a Veterans Affairs research panel were most likely to use drugs and alcohol in the days immediately

following their receipt of disability checks. The panel included 105 subjects observed over 15 weeks. This phenomenon, referred to as the "check effect," has been observed in other populations receiving income transfers (Satel, Reuter, Hartley, et al. 1997).

These studies, and more anecdotal reports, have significantly influenced federal policy (Gresenz, Watkins, and Podus 1998; Rosenheck 1997). Persons disabled by substance abuse disorders had been eligible for income support from the Social Security Administration (SSA) until January 1997. Congress ended this support in part as a result of the putative check effect. Advocates for the reform, citing the work just summarized, argued that the SSA programs were subsidizing bedlam in American communities during the early days of each month (Cohen 1994a,b).

Phillips, Christenfeld, and Ryan (1999) extended the check effect logic to hypothesize that the physical *sequelae* of income-induced drug and alcohol abuse should be more common during the first week of the month. They inspected death certificates from the United States for the years 1973 through 1988 to determine if deaths that could plausibly follow from substance abuse were elevated in the first week of the month. Deaths were classified as alcohol- or drug-related if they met either of two criteria. The first is whether the death certificate cited an alcohol- or drug-related illness as the primary or secondary cause of death. The second was whether the death was a homicide, suicide, or result of an accident. The authors report that deaths attributed to alcohol-related illnesses were most common in the first weeks of the month. They also report that both suicides and homicides were most frequent in the first week.

Consistent with the argument by Phillips, Christenfeld, and Ryan (1999), Catalano and McConnell (1999) noted that no reason exists a priori to believe that the check effect was ever limited to disabled persons receiving income transfers. They argued that if the check effect is real, the disbursement of salary and wages in the private economy should result in excess psychiatric

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This work was supported by NIH/NIMH Grant #RO1 MH54808-02.

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emergencies in the community at large during the first days of each month. They discovered an excess of such emergencies in San Francisco and reported that it has not been reduced by the cessation of the federal transfer payments to persons disabled by drug or alcohol disorder.

Combining these earlier findings leads to the inference that persons comorbid with mental illness and substance abuse are, at least in part, responsible for the high levels of violent and alcohol-related death in the early days of the month. Phillips and his co-authors (1999: 98) encourage this inference when they write that

> Shaner et al. (1995) and Satel (1995) suggested that monthly changes in the rate of psychiatric hospitalizations among users of cocaine might be reduced by changing the way in which some federal payments are disbursed, so that more of the money was used for food and shelter, and less for drugs and alcohol. Our findings suggest more generally that limiting the amount of discretionary income available for drugs and alcohol may reduce the number of deaths that occur in the beginning of the month.

This inference is reinforced by the epidemiologic fact that the interaction of substance abuse and acute mental illness is a stronger risk factor for violent behavior than is either condition by itself (Steadman, Mulvey, Monahan, et al. 1998). The inference, however, makes another assumption that has not been empirically tested, that is, that the incidence of acute mental illness accompanied by substance abuse increases in the days immediately following the disbursement of income to the population. We test the assumption using data from San Francisco. More specifically, we test the hypothesis that the number of persons admitted to psychiatric emergency services who have been using drugs or alcohol will be elevated in the early days of the month.

METHODS

Site

San Francisco is a combined city and county jurisdiction. Its 1995 population of 759,300 persons made San Francisco the fourth most populous city in California. The population is estimated to be 46.6 percent non-Hispanic white, 10.5 percent African American, 28.4 percent Asian/Pacific Islander, and 14 percent Hispanic. Forty-two percent of San Franciscans ages 5 and older speak a language other than English at home. The mean household income in 1990 was $33,414, which was $2,384 lower than that for California.

Data and Variables

The true incidence of psychiatric emergencies accompanied by substance abuse cannot be known. Admissions of persons under the influence of alcohol or drugs to psychiatric emergency services (PES) are probably the best proxies for true incidence. A clinician must judge persons admitted to these services to be mentally ill and not simply under the influence of drugs or alcohol.

We used daily counts of alcohol- or drug-involved admissions to the PES at San Francisco General Hospital for the 181 days beginning January 1, 1997 as our dependent variable. We abstracted data on substance use from the clinical records of all persons admitted to PES during the test period. We considered an admission to be alcohol- or drug-involved if the patient acknowledged substance abuse or had a positive urine screen for drugs or alcohol.

Figure 1 shows plots of drug- and alcohol-involved admissions for males and Figure 2 shows them for females for the 181 days.

Among our control variables was the number of admissions that did not involve drugs or alcohol. These should be affected by many of the phenomena that affect the incidence of drug- or alcohol-related admissions (e.g., PES staffing patterns). Admissions absent drugs or alcohol should not be affected, however, by the receipt of income if the check effect theory is correct. Including this variable in the test equation therefore controls unmeasured third variables that affect both types of admissions and that could coincide with the distribution of income.

Of the 3,036 admissions to the PES over the 181-day test period, 1,471 (about 48 percent) were drug- or alcohol-related. The alcohol- and drug-related admissions were generated by 1,051 individuals. Table 1 shows selected demographic characteristics of these individuals. Persons with alcohol-related admissions were more likely to be young and white than were those admitted without alcohol present.

The disbursement of earnings and income transfers was made operational in our tests with a binary variable scored one for the first day of each calendar month. All other days are scored zero. The weekday preceding the first day of the month was used if the first fell on a weekend or holiday.

Our tests included a control variable scored one for Saturday and Sunday. All other days were scored zero. The rationale for this variable was that weekends often bring people into contact with family and friends. Increased social contact provides for early detection and treatment of illness and thereby reduces the likelihood of an acute episode that would require emergency services (Cerbus 1970; Phillips and Liu 1980; Sanborn, Casey, and Niswander 1970).

Figure 1: Drug- or Alcohol-related Admissions of Males to PES for the 181 Days Beginning January 1, 1997

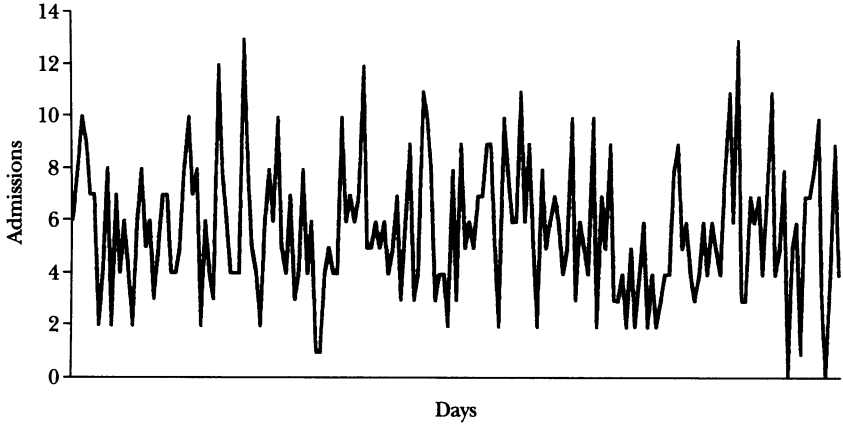
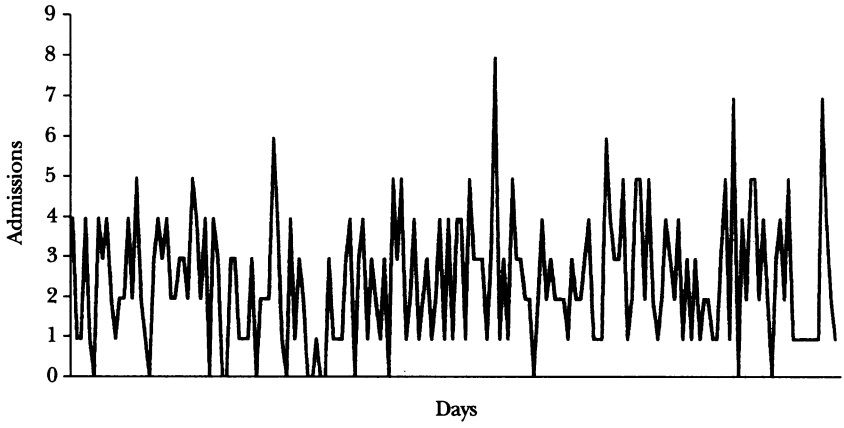


Figure 2: Drug- or Alcohol-related Admissions of Females to PES for the 181 Days Beginning January 1, 1997



Analyses

Our analyses were in the tradition of the interrupted time-series quasi-experiment (Box, Jenkins, and Reinsel 1994). The null hypothesis for our test was that the observed values of alcohol- or drug-related admissions in the early days of the month were not different from the values expected if the disbursement of income had no effect. We arrived at the expected values

Table 1: Demographic Characteristics of Persons Admitted to Psychiatric Emergency Services

	Drugs or Alcohol Detected	*No Drugs or Alcohol Detected*
Total	1051	1176
Males	69%	68%
Non-Hispanic white	58%	48%
Hispanic	11%	10%
African American	25%	22%
Asian	4%	18%
Other ethnicity	2%	1%
Age <36	42%	40%
Age 36–55	52%	48%
Age >55	6%	12%

under the assumption of no effect by modeling the dependent variable as a function of three phenomena. The first was the number of admissions that did not involve drugs or alcohol; second was the possible weekend effect alluded to earlier; and third was autocorrelation, which includes trends, cycles, and the tendency to remain elevated or depressed after high or low values, in the dependent variable.

More specifically, our tests proceeded through the following steps separately for males and females:

1. Daily admissions that involved drugs or alcohol were modeled as functions of weekends and of admissions that did not involve drugs or alcohol.
2. We identified and modeled autocorrelation in the residuals from the equation estimated in step 1. The augmented Dickey-Fuller test (Hamilton 1994) was used to determine if the series exhibited secular trends. We used the approach devised by Ljung and Box (1978) to identify autocorrelation other than secular trends. Any discovered autocorrelation was modeled using the methods attributed to Box and Jenkins (Box, Jenkins, and Reinsel 1994). These methods draw on a very large family of models that can include autoregressive, integrated, or moving average ("ARIMA") filters. Rules for identifying these models are well established.
3. The receipt of income variable was added to the equation resulting from step 2, and the new equation was estimated. Based on the findings of Shaner, Eckman, Roberts, et al. (1995) as well as Catalano and McConnell (1999), lags 3 through 6 of the variable were specified.

4. Any parameters with insignificant coefficients (i.e., $p < .05$, two-tailed test) were deleted and the remaining equation estimated again.
5. A "drag" coefficient that measures the tendency of an effect in one period to carry over to the next was added for any remaining lags of the income disbursement variable, and the equation was estimated again.
6. Step 4 was repeated.

The general form of the test equation is:

$$\left(1 - \phi B^p\right)\left(Y_t - \mu\right) = \frac{\left(\omega_1 - \omega_2 B - \omega_3 B^2 - \omega_4 B^3\right) I_{1t-3}}{1 - \delta B} + \omega_5 I_{2t} + \omega_6 X_t + \left(1 - \theta B^q\right) a_t \quad (1)$$

where:

Y_t is admissions involving drugs or alcohol on day t.

μ is the mean of y over the 181 days analyzed.

I_{1t-3} is a binary variable scored one for the first day of each calendar month. All other days are scored zero. The first weekday preceding the first was used if the first fell on a weekend or holiday.

I_{2t} is a binary variable scored one for Saturdays and Sundays. All other days are scored zero.

X_t is the incidence of admissions not involving drugs or alcohol at time t.

δ is the "drag coefficient" or fraction of any effects among ω_1 through ω_4 that carries into the following day.

ω_1 to ω_6 are the effect parameters for the independent variables.

ϕ_n is the autoregressive parameter used in ARIMA modeling.

θ_n is the moving average parameter used in ARIMA modeling.

B is the "backshift operator" or value of the conditional series at time $t - p$ for the autoregressive parameter or $t - q$ for the moving average parameter.

a_t is the residual of the model at time t.

RESULTS

Steps 1 and 2 were applied separately to drug- or alcohol-related admissions of males and females. Admissions for both groups were significantly fewer on weekends. The number of admissions without drugs or alcohol was significantly related to drug- and alcohol-involved admissions for females but not males.

The augmented Dickey-Fuller test indicated that none of the four admissions variables exhibited deterministic trends. As indicated by the significant

Table 2: Results for Initial and Final Models Predicting Drug- or Alcohol-related Admissions for 181 Days Beginning January 1, 1997

	Males, Initial Model	*Final Model*	*Females, Initial Model*
Mean of admissions (i.e., μ in Equation 1)	5.69	5.69	2.43
Admission without drugs or alcohol	0.029		0.061*
Weekends	−0.793*	−0.792*	−0.745**
Disbursement of income			
Lag 3	−1.879		0.227
Lag 4	1.080		−0.185
Lag 5	2.546*	2.279*	0.093
Lag 6	0.9621		0.379
Drag coefficient		0.704**	
ARIMA parameters	$\phi B^4 = -.155$*	$\phi B^4 = -.171$*	$\theta B^{12} = .299$*

*$p < .05$, two-tailed test; **$p < .01$, two-tailed test.

autoregressive parameters shown in Table 2, however, both series exhibited other forms of autoregression.

The results of steps 3 and 4, estimating the parameters for the disbursement of income variable, are shown in columns 1 and 3 of Table 2. An increase occurred in admissions involving drugs and alcohol for males but not for females. Consistent with the findings of Shaner, Eckman, Roberts, et al. (1995), the association among males appeared approximately five days after income was disbursed.

The results of steps 5 and 6 for males are shown in column 2 in Table 2. There is no final model for females because no significant effects were found in the initial model (i.e., column 3 of Table 2) for the disbursement of income.

The significant drag coefficient for males implies that the effect that appeared on the fifth day following disbursement of income carried over to the sixth. The combined effects suggest an excess of approximately four drug- and alcohol-related admissions in the fifth and sixth days following the disbursement of income (i.e., $2.279 + [2.279 \times .7]$) or about 24 over the six-month study period. This represents an increase of approximately 35 percent over the yield on two average days (i.e., $4/[5.69 \times 2]$).

Our findings for males were consistent with the work by Catalano and McConnell (1999), which reported increased psychiatric emergencies in the early days of the month. Our finding that admissions of females were not elevated in the first week of the month was at odds with Catalano's and

McConnell's findings for all admissions. This led us to speculate post hoc that admissions of females without drug or alcohol involvement might be elevated in the early days of the month. We tested this possibility by reversing the position of Y_t and X_t in Equation 1 and following the six steps listed earlier. The results suggested that admissions to PES of females without substance abuse were significantly elevated on the third and fourth days following the disbursement of income. The excess yield was approximately 3.5 admissions over the two days or 21 over our test period. This represents an increase of approximately 20 percent over the average two-day yield of 17 admissions unrelated to drugs or alcohol.

DISCUSSION

Our results suggest that acute mental illness accompanied by substance abuse is most likely to occur among males soon after they receive income or transfer payments. The findings converge with those of Shaner, Eckman, Roberts, et al. (1995), and support Catalano and McConnell's (1999) argument that the check effect was not limited to persons disabled by substance abuse who lost their federal income transfers on January 1, 1999. The finding is also consistent with the argument implied by Phillips, Christenfeld, and Ryan (1999) that mentally ill persons are accountable, at least in part, for the excess mortality in the early days of the month.

The excess admissions of mentally ill women who have not used drugs or alcohol may be attributable to ecological effects of alcohol abuse by other persons. It is possible that women provide care to friends and relatives who abuse drugs and alcohol after receiving income. Coping with drug or alcohol abusers may prove so stressful that the caregiver is at elevated risk of acute mental illness even though she did not abuse these substances.

Considerable literature also suggests that acute disorder is more likely to occur among the persistently mentally ill when they lose the help of others in coping with the demands of the environment (Cerbus 1970; Phillips and Liu 1980; Sanborn, Casey, and Niswander 1970). Family and friends, for example, cannot intervene to avert an acute episode if they are not present or able to detect such precursors of disorder as failure to take medications, changes in mood, or disruption of daily routines. It is possible that persons who use drugs or alcohol in the early days of the month are not able to provide help to mentally ill women who depend on them. The latter, in turn, may be at elevated risk of psychiatric emergencies in the first week of the month although they are not using drugs or alcohol.

Our findings have implications both for the disbursement of income and the provision of mental health services. The check effect suggests that persons with a history of substance abuse and mental illness should be offered the opportunity to have their income managed by someone who can monitor and influence how the money is being spent. Many such programs have been implemented, but evaluations of them are rare and not convergent (Ries and Dyck 1997; Rosen and Rosenheck 1999; Rosenheck, Lam, and Randolph 1997).

The fact that drug- or alcohol-related admissions among males might exhibit temporal patterns suggests that the provision of preventive as well as treatment services may be strategically scheduled. Our findings intuitively suggest, for example, that outreach programs might be offered at check cashing businesses often used by men not able to maintain banking accounts and that PES staffing should be increased in the first week of the month. Public service announcements regarding ways to cope with anger or with persons who use drugs or alcohol might be strategically broadcast in the first week of the month.

Less intuitive is that the increasing use of prepaid, capitated financing should make these findings of interest to service providers. HMOs, for example, might find it economically rational to remind subscribers at or near payday of preventive services.

We are aware that all of our results may be peculiar to San Francisco. Replication is obviously needed before recommendations for service providers can be formulated. The methods and hypotheses described in this article will, we hope, stimulate similar research in other communities.

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