DRUG TREATMENT AS A CRIME FIGHTING TOOL

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ABSTRACT

Drugs and crime are known to be correlated, but the direction of causality and the magnitude of
the relationship have not been well established. We take a new approach to estimating this relationship
and examine a little used, multi-site dataset of 3,500 inner-city drug users entering treatment. We analyze
the change in crime and in drug use pre and post treatment, controlling for other covariates. We take first
differences to address omitted variable problems. For our sample, we find that treatment reduces drug
use which, in turn, reduced drug decreases crime. Reduced drug use due to treatment is associated with
54% fewer days of crime for profit, ceteris paribus. Our evidence suggests that, reduced drug use is
causally related to reduced crime. This finding is robust to different specifications and subsamples. Our
findings broadly suggest that drug treatment may be an effective crime-fighting tool. Given the huge and
growing expense of the criminal justice system, drug treatment might be cost-effective relative to
incarceration.

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I.   **Introduction**

Crime reduction is a current top priority of society. The primary approach to reducing crime in the US has been through the criminal justice system, especially the prison system. The increasingly large number of people incarcerated has been correlated with a fall in crime, but it has taken a large toll on society in terms of government expense for prisons, as well as in personal and family costs. The toll on the minority community has been disproportionately heavy. Because many who are incarcerated use and abuse illicit drugs, treatment for illicit drugs has the potential for being an effective tool for prevention of crime. For instance, data collected on defendants in 23 cities indicates that 51% to 83% of arrested males and 38% to 80% of arrested females were under the influence of at least one illicit drug at the time of arrest.[1]

If drugs cause crime, then reducing drug use through treatment could also reduce crime. Treatment is considerably less costly, both monetarily and in other ways as well. Outpatient counseling-based treatment can cost about $300 per episode, methadone treatment costs less than $3,000 per year and a year in prison costs about $23,000 on average. The government funds both the criminal justice system and most treatments for inner city illicit drug abusers. Thus, the government might be able to produce crime reduction more cost-effectively by moving towards treatment. To a very limited extent, treatment is used to reduce crime through jail diversion programs, drug courts, and other programs. However, in order to make better use of treatment as an alternative, more needs to be known about the magnitude of the impact of treatment for drug abuse on crime and whether the reduction in treatment caused the change in crime.

Objective. The objective of this paper is to estimate the extent to which a change in drug use that results from treatment reduces crime and whether changes in drug use are causally related to changes in crime. We focus only on crime-for-profit (e.g. theft, larceny, prostitution, and drug dealing). We exclude drug possession because it is almost tantamount to drug use. Further, it is not *per se* the type of crime that has the greatest negative externalities for society.

Methods. We use a longitudinal data set composed of inner-city drug users who sought treatment for their drug dependence. Inner-city drug users would be a group

likely targeted for a policy designed to reduce crime via drug treatment. We have evidence on crime and drug use at baseline and also at about seven months later for 3,502 individuals entering treatment. We also have information on socio-economic, demographic, health, and criminal justice characteristics. We calculate the change in drugs and crime, comparing the drug user at entry into a treatment program and at seven months post entry. While much research in this area is plagued by the omitted variable problem and unobserved individual heterogeneity that can be causing both crime and drugs, we overcome this problem, in part, by taking advantage of the longitudinal data. We are also able to address the issue of causality.

Findings. We find that for our sample of those in treatment, there is a strong positive and significant relationship between the change in drug use and crime. We find that treatment reduces drug use and that reduced drug use is associated with more than half as many days of crime-for-profit. Further, we establish that, for these drug users in treatment, reduced drug use is causally related to reduced crime.

Enhancements to the literature. There are several features of our study that represent enhancements to the extant literature. We tackle a policy relevant question. We have a large sample, which allows precise estimates. Our sample is composed of inner-city drug users, which may be a group at high risk of committing crime and a target group for crime prevention interventions. We can overcome aspects of the omitted variable problem and unobserved individual heterogeneity that can be causing both crime and drugs. We are able to establish the causal relationship between drug use and crime. Further, we draw on several lines of research that complement each other yet are typically not analyzed together in economics.

II.   Background

We analyze the extent to which treatment reduces drug use and reduced drug use, in turn, reduces crime. We structure our investigation based on findings from two lines of research: 1) the drug/crime linkage and 2) treatment effectiveness. We combine these lines of research and use treatment effectiveness data to investigate issues of causality for drugs and crime.

1. Do drugs cause crime?

Despite all of the attention and concern focused on the crime/drug link, the causal relationship between drugs and property crime is still murky. Findings conflict and empirical estimates that control for simultaneity and confounding factors are not conclusive. Ample statistics show an association between drugs and crime. Descriptive statistics indicate that about two thirds of the adult arrestees and more than half of the juvenile arrestees tested positive for at least one drug. About 22% of Federal prisoners, 37% of property offenders, and 42% of drug offenders said they had committed their current offense while under the influence of drugs.[2] Some are in prison for drug possession alone while many are drug users incarcerated for other crimes.

Theories

There are several theories as to why drugs could cause crime. Perhaps the most common view is that drug users commit crimes to finance their habit. Another view is that some stimulant drugs, such as cocaine, amphetamines and their derivatives, are thought to induce violent behavior through their pyschopharmocological properties ([3], [4],[5],[6],[7]). There is evidence that some drugs change the nervous system, temporarily and/or long-term, in ways that may predispose an individual to commit crimes. Goldstein [8] and others suggest that, because illicit drugs are consumed, conflicts are resolved outside the law, very often in violent ways.

Yet, there are reasons to question the causal relationship. Drug use may be correlated with crime, but not caused by drug use. The vast majority of people who use drugs do not commit crimes other than that of drug possession. Another view is that both drug use (especially heroin) and crime are caused by third factors, such as social isolation and economic marginality ([9], [10], [11]). Speckhart and Anglin [12] find that criminality precedes drug use temporally. This could be evidence that drugs do not cause crime, supporting the view, instead, that individuals involved in crime are drawn into use of drugs. However, there is some evidence that, even for those individuals that commit crime prior to drug use, a reduction in drug use decreases crime and treatment for drug dependence reduces drug use and crime ([13],[14]).

Empirical Evidence

Economic studies. There are some economic studies on the extent to which drugs cause crime using aggregate longitudinal data. Corman and Mocan [15] ind a causal relationship between drug use and property-related felonies. Grogger and Willis [16] find that the introduction of crack in New York City during the 1980's had substantial effects on violent crime, but essentially no effect on property crime. They suggest that crack cocaine was a technological innovation that increased violence on the part of distributors, but decreased property crime on the part of consumers. DeSimone [17] studies the relationship between cocaine prices and property and violent crime accounting for the endogeneity of cocaine prices. He shows that higher cocaine prices decrease rates of murder, rape, robbery and assault, although the result for assault is sensitive to the inclusion of other variables.

In contrast to the aggregate data studies, Markowitz [18] uses individual level data. The use of micro level data on individuals can overcome some of the problems associated with the use of aggregate time series data. Markovitz examines the relationship between drug and alcohol prices and the incidence of criminal violence using the 1992, 1993, and 1994 National Crime Victimization Surveys. She finds that decriminalizing marijuana results in higher incidence of robbery, and higher cocaine prices decrease these crimes. Higher beer taxes lead to lower assault rates, but not a reduction in rape or robbery. Markovitz uses data on victims, thus excludes "victimless" crimes (e.g., prostitution and drug dealing) and some other crimes. As in the use of official reports, victim reports result in under-reporting.

Non-economic studies. Researchers using other disciplinary approaches have also investigated the extent to which drug use causes crime. McClothin [19] and Hser [20], for instance, use an ethnographic approach and analyze data from the Civil Addict Program, a treatment program in California. Males were duressed into treatment by the criminal justice system. The researchers followed these individuals over decades, producing studies at various points in time. A key finding is that, when drugs are used most actively, crime is committed most intensively. They view this result as evidence that drugs and crime are correlated, but not necessarily evidence that drugs cause crime. Later studies by this group, using more sophisticated analytical modeling, concluded that drug use causes crime in the US. They noted, however, that in other countries, such as Great Britain, drug use and crime were not necessarily correlated ([21]).

Fagan [22] and Inciardi [23] draw on literature from sociology, psychology and other areas. They conclude that there is insufficient evidence to conclude that drug use causes crime. They cite the reasons listed above, such as: 1) third factors causing both crime and drugs; and 2) evidence on crime temporally predating drug use. Fagan [22] further argues that the expansion of crack marketing created economic opportunities for those previously unemployed, underemployed in informal work, and/or working for low wages. Thus, by creating alternative sources of income, drug selling might have had a negative effect on robbery and theft instead of a positive one.

Our work draws on the disparate lines of economic research cited above. The economic studies use aggregate time series data, rely on official reports of crime, and sometimes focus on price of drugs. Governmental data under-report crime substantially and aggregate data do not allow study of individual behaviors. Price of drugs is considered one of the main policy tools, e.g., greater drug interdiction and enforcement would increase the price of drugs. Instead, we focus on individual behavior, use self-reported crime, and analyze treatment as the crime prevention tool. Like most of the economic studies, and unlike other lines of research, we use a large data set. Our data set is composed of pooled multi-site drug treatment effectiveness studies that gather data from the drug addict prior to treatment and seven months after. We focus on causality and take advantage of the pre/post data to address causality and to control for omitted variables.

2. Drug treatment effectiveness

There are many studies of the effectiveness of drug treatment in reducing drug use. See Gerstein and Harwood's report [24] for a review of effectiveness treatment. The evidence is that, on average, treatment reduces drug use, although there is heterogeneity by individuals, type of drug, and by treatment modality. While treatment has been shown to reduce drug use significantly, many people do not completely quit using drugs, but rather reduce their quantity or frequency. Relapse and re-entry into treatment is common. Thus, treatment is not a cure, but rather reduces use for some.

Despite the fact that many do not get completely "cured," there are gains to treatment. Weatherburn et al. [25] argue that treatment of drug dependence has consistently been shown to be effective at reducing both drug use and the crime associated with this use. French et al.[26], for instance, find that drug treatment produces

gains to society that outweigh the costs. The reduction of crime is an important component in the benefits of treatment. Rajukmar and French [27] found a reduction in crime-related costs in the year following treatment that averaged more than $19,000 per patient, comparing very favorably to the yearly cost of almost any kind of treatment. Also, there are a few papers that try to compare the cost-effectiveness of drug abuse treatment to incarceration for adults and juveniles, i.e., Caulkins, Rydell, Everingham, Chiesa and Bushway [28], Hubbard et al. [29], and Spooner Mattick and Noffs [30].

Our analyses differ from most treatment effectiveness studies in several ways. Many treatment studies have a relatively small number of observations. We use a large, multi-site data set that allows estimation of precise relationships. Most effectiveness studies have used drug use as their primary outcome. Instead, we focus on the reduction in drug use as a mechanism for reducing crime. Treatment effectiveness studies that have focused on crime are Ball [14], Anglin and Perrochet [21], Anglin and Speckhart [31], and Chaiken and Chaiken [32]. Dole and Nyswnder ([33], [34]) use findings on reduction in crime as a primary focus in garnering support for the development and expansion of methadone maintenance.

III. Model

In this section, we propose a theoretical model of individual behavior in which drug users' decisions to commit crime-for-profit are related to drug use. The implications of this model justify our empirical approach, as explained in Section V. Formally, we assume that the drug users' utility depends on drug consumption (d), the composite good (x), and illegal activities that produce income (c). Besides entering the utility function directly, the number of crimes affects individuals' marginal utility of drug use and their purchasing capacity.[1] The number of crimes for profit and drug use increases the probability of arrest. We exclude drug consumption in our indicator of crime, c, because we are interested in other types of crime, not drug possession. Drug use would necessarily imply drug possession. Our indicator of crime does not include mere "drug possession," but individuals may be "caught" for drug use. Besides, drug

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[1] Our sample is mostly unemployed, thus, for simplicity, we do not include the possibility that crime substitutes for work ("crime as work" model) and we do not look at the labor supply decision. Nevertheless, note that we could include hours of work as another decision variable without much variation in the analysis. A further problem of the "crime as work" model in this setting is the possibility of joint production, i.e., that illegal and legal work can happen simultaneously.

use may alter the perception of crime risks and benefits, and, thus, the probability of being caught by the criminal justice system.

We assume that agents choose the optimal goods consumption, drug use, and number of crimes in order to maximize their expected utility, *EU(x,d,c)*. We assume that the utility function is separable in drug use, crime, and consumption, and that individuals take into account the odds of being "caught" by the criminal justice system and the costs, in terms of utility, that being caught would involve. Thus, the individual's problem is to choose the amount of composite good, *x,* drug use, *d,* and the number of crimes, *c,* that maximize his expected utility subject to his budget constraint:

$$EU_{x,d,c}(x,d,c) = p[U(x) + V(d;\varepsilon_d) + W(c;\varepsilon_c) - k(d,c,z)] + (1-p)[U(x) + V(d;\varepsilon_d)$$
$$+ W(c;\varepsilon_c)],$$

subject to:

$$P_x x + P_d d = I + c w_c$$

where $p = p(c,d,z,e)$ denotes the probability of being caught, which depends on: the number of criminal activities for profit committed, *c*; the level of drug use, *d*; the individual characteristics, *z;* and, the level of police enforcement, *e*.

The term *k(d,c,z)* denotes the disutility experienced by the individual when he is caught. We assume that being caught causes negative utility because of the possible embarrassment and discomfort that being caught may cause, the punishment received, and the opportunity costs of the punishment. Thus, it depends on: the number of crimes committed; the individual characteristics; and the intensity of drug use.[2]

U(x) is the utility derived from the composite good, *x*; $V(d;\varepsilon_d)$ is the utility derived from drug consumption, *d,* given the idiosyncratic taste for drugs, ε_d. $W(c;\varepsilon_c)$ is the utility obtained from committing crimes, *c*, given the idiosyncratic taste for criminal activity, ε_c. We assume that the unobserved idiosyncratic taste for drugs and for criminal

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[2] For simplicity, but without loss of generality, we assume that if the individual gets caught, he incurs in a disutility of *k(d,c,z)* instead of making the utility derived from other goods' consumption, drugs and crime, contingent on being caught or not. Note that we could easily include additional possible states, such as "being arrested but not incarcerated", and "being arrested and incarcerated" with their respective associated punishments. For the clarity of our exposition, we adopt this simpler more generic specification of "being caught" versus not and make the intensity of the punishment depend on the crime involvement of the individual, his drug use and his characteristics.

activities for profit, ε_d and ε_d, are correlated and distributed as a bivariate normal, $N(0, \sigma_d, \sigma_c, \sigma_{dc})$. We assume that $U'>0$, $U''<0$; $V_d'\geq 0$, $V_d''\leq 0$, $W_c'\leq 0$, and that $W_c''\geq 0$. [3]

We can rewrite the individual maximization problem as:

$$Max_{x,c,d} EU(x,c,d)= U(x) + V(d;\varepsilon_d) +W(c;\varepsilon_c) -p(c,d)k(d,c,z)$$

subject to:

$$x+P_d d=I+w_c c \quad (where\ P_x=1)$$

$$x\geq 0,\ c\geq 0,\ d\geq 0$$

The first order conditions (F.O.C.) of this constrained maximization problem are:

$$\partial EU(x,c,d)/\partial x=U'-\lambda=0$$

$$\partial EU(x,c,d)/\partial c=[W_c'(c)-p_c'k -pk_c'+\lambda\ w_c]\ c\leq 0$$

$$\partial EU(x,c,d)/\partial d=[V_d'(d)-p_d'k- pk_d'-\lambda\ P_d]\ d\leq 0,$$

where λ is the Lagrange multiplier and the F.O.C. for d and c allow for corner solutions, i.e., no drug use and/or no crime.

Note that the marginal utility of committing one additional criminal activity for profit equals $W_c'(c)-p_c'k-pk_c'$, which is composed of three elements:

a) $W_c'(c)$ is the marginal direct disutility of committing crimes;

b) $-p_c'k$ captures the fact that a change in crime activity changes the probability of being caught and this alters the likelihood of incurring in the utility loss, k;

c) $-pk_c'$ reflects how crime affects the severity of the expected "punishment" in terms of utility if the individual gets caught.

Observe that the marginal utility of committing crime is affected by *the level of drug use* through both $p_c'k$ and pk_c'. The intensity of drug use affects the marginal utility of crime-for-profit because drugs might alter: a) the perception of the risks and benefits of crime (captured by p'_c and p); and b) which type of punishment, in terms of utility, the individual faces if he gets caught.

The *marginal utility of consuming drugs* equals $V_d'(d)-p_d'k- pk_d'$, which, again, is composed of these factors:

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[3] We assume that the crime-for-profit that our sample of drug abusers commits does not produce utility in itself. Nevertheless, this model could be used to analyze the implications of a setting in which crime

a) $V_d'(d)$ is the marginal "immediate" utility of consuming drugs;

b) $-p_d'k$, reflects that a change in drug consumption changes the probability of being caught by p_d', altering the likelihood of incurring in the utility loss, k;

c) $-pk_d'$ connotes that using drugs affects the expected nature of the punishment, in terms of utility, k.

The marginal utility of drug use is affected by the *number of crimes* committed both through $p_d'k$ and pk_d'. The rationale is that crime committing alters the *non-monetary costs* of drug use by affecting the likelihood of being caught and the punishment, in terms of utility, that the individual has to face if caught.

From the first order conditions of the agent's expected utility maximization problem, it follows that, given the unobservable idiosyncratic taste for drugs and crime, ε_d and ε_c, we can obtain a reduced form for the demand of drugs and the number of crimes-for-profit. These reduced form demands depend on: the illegal drug prices; the average payoff of crime; the level of police enforcement; the individual's social-demographic characteristics; and, his income:

$$d^* = d(P_d, w_c, e, z, I; \varepsilon_d, \varepsilon_c)$$

$$c^* = c(P_d, w_c, e, z, I; \varepsilon_d, \varepsilon_c)$$

Although solving for the explicit expression of the optimal illegal activity level is beyond the scope of this paper, by using the budget constraint and the above results, given an amount of optimal drug intake, d^*, we can infer the optimally chosen amount of illegal activities for profit, c^*:

$$c^* = c(d^*, I, P_d, w_c; \varepsilon_d, \varepsilon_c) = 1/w_c(x^*-I) + (P_d/w_c)d^*(P_d, w_c, e, z, I; \varepsilon_d, \varepsilon_c)$$

Assuming linearity, crime at baseline can be expressed as:

$$c_1^* = \alpha + \beta_1 d_1^* + \beta_2 z_1 + \beta_3 w_{c1} + \beta_4 P_{d1} + \beta_5 e_1 + \beta_6 x_1^* + \beta_7 I_1 + (\varepsilon_{d1} + \varepsilon_{c1})$$

and, thus, crime at follow-up is:

$$c_2^* = \alpha + \beta_1 d_2^* + \beta_2 z_2 + \beta_3 w_{c2} + \beta_4 P_{d2} + \beta_5 e_2 + \beta_6 x_2^* + \beta_7 I_2 + (\varepsilon_{d2} + \varepsilon_{c2}).$$

Therefore, taking increments:

$$\Delta c^* = \alpha + \beta_1 \Delta d^* + \beta_2 \Delta z + \beta_3 \Delta w_c + \beta_4 \Delta P_d + \beta_5 \Delta e + \beta_6 \Delta x^* + \beta_7 \Delta I + (\Delta \varepsilon_d + \Delta \varepsilon_c). \quad (1)$$

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produces utility besides income.

Assuming that, for a time difference short enough, $\Delta w_c=0$, $\Delta P_d=0$, $\Delta e=0$, and $\Delta I=0$; and, introducing the fact that $\Delta x^*=0$ -since $U_x'(x_1{}^*)= U_x'(x_2{}^*)=\lambda$ =constant and $U''(x)<0$, we can rewrite *(1)* as:

$$\Delta c^* = \alpha + \beta_1 \Delta d^* + \beta_2 \Delta \check{z} + \Delta \varepsilon_d + \Delta \varepsilon_c, \quad (2)$$

where $\Delta \check{z}$ are those socio-economic and demographic characteristics that do change in the time interval considered.

In the following section, we explain the data set and the variables we have at hand. And, in section V, we detail how we estimate the equation of interest and how we overcome the implicit endogeneity problems.

IV. Data and variables

Data: The data set that we use differs in source and type from those previously used to analyze the crime/drug connection. We use longitudinal, individual level data on inner-city drug users who enter treatment for drug addiction. The Central Data Registry comes from multiple clinical trials or experimental field studies of the effectiveness of drug treatment that were conducted in Philadelphia [35]. The studies were conducted by the Treatment Research Institute at the University of Pennsylvania and Modern Psychiatric System/Deltametrics, Inc. in Philadelphia. It is feasible to pool the data sets because a common instrument, the Addiction Severity Instrument, was used to collect data ([36]). Further, these studies and observations had many similarities, including the goals of treatment, questionnaire, sample characteristics, and timing of the baseline and seven month follow-up surveys. Individuals in our sample were in outpatient care, either methadone maintenance or a non-pharmacological counseling-based approach. In our analysis, we control for each specific study and type of treatment, but otherwise combine the data into a meta-data set. The sample is composed of individuals who entered treatment for drug dependence. Thus, they are not a random sample. However, for our purposes, they are an appropriate sample. The inner-city, drug-abusing individuals compose the group that includes many of the individuals who commit violent crimes and/or property crime, crimes that often cause negative externalities for the rest of the society. A relatively large percentage of them have been involved with the criminal justice system in their lifetime.

The *Addiction Severity Index (ASI)* is the standard assessment instrument used nationally to assess outcomes in treatment of addiction. The ASI was administered at baseline and at about 7 months afterwards. Many individuals in outpatient counseling-oriented treatment had about a month of treatment, thus, the follow-up interview occurred about 6 months after treatment had stopped. For those in methadone maintenance, treatment would likely still be ongoing at the seven-month follow-up. The ASI uses a 'last 30-day' recall period for 'current' drug use, crime and other problems. This same 30-day recall timeframe is used for both baseline and follow-up. The ASI relies on self-reported data, which is a potential limitation for the reports on drug use and crime. However, in these treatment settings, self-report drug use and urinalysis results tend to be highly correlated ([37], [38], [39]). Further, self-reported crime does not suffer the under-reporting of official records, which is more often used in studies of economic crime and drugs [40].

Data were collected on the standard set of social, economic and demographic variables, as well as on drug use and crime. In addition, variables were collected on past treatment for drug use, parole status, and previous prison terms. The ASI assesses other problems, such as medical, psychiatric, employment, social, and family functioning in the last thirty days.

Sample characteristics:

Demographics and labor market. We have 3,502 valid observations. This is largely a minority and male population. Table 1 reports the sample mean characteristics. The mean age is a little less than 36 years old, but the range is from 15 to 75. Almost 70% of the population is male. About 32 % of the population is white, while 56% is African –American and 11% is Hispanic. Seventy percent of these subjects had psychological problems in their lifetime and 30% a chronic condition. The average number of years of school completion is almost 12. The average monthly income before starting the treatment is $684 from which an average $148 comes from welfare and $70 is disability pension. In the thirty days prior to the baseline interview, they had worked an average of about seven days in a paid job and had been involved between one and two days in illegal activities for profit.

Crime. We focus on crime-for-profit, not drug possession, because drug possession would naturally occur with drug use. Crime-for-profit includes larceny,

burglary, shoplifting, drug dealing, prostitution and others. Approximately 9% of the sample reported to having committed crime-for-profit in the thirty days before entering treatment; and, 11% reported having committed crime-for-profit at either baseline or follow-up. About 24% of the population is on parole or probation at baseline and 38% have been in jail at some point in their lifetime. These latter numbers include individuals who could have been incarcerated for drug possession and sales, as well as income producing crimes and violence. Eight percent of the sample has received illegal earnings during the month prior to the baseline, and 9% has been detained during that same period. Almost 79% of the sample had committed crimes and/or had been involved with the criminal justice system at some point in their lifetime.

Drug use and treatment. For most of our sample, this is not the first time in treatment. At baseline, around 59% of the sample had been in treatment previously. This pattern of repeated treatment is consistent with drug treatment clientele across the nation. For drug abusers, treatment, relapse and re-entry are common. The substances used by those in our sample are: heroin, cocaine, cannabis, sedatives, amphetamines, barbiturates, hallucinogens, inhalants, other opiates (besides heroin and methadone), and alcohol.

Variables:

The variables that we use in the estimation are displayed in Table 2. The first part of the table contains the acronym, definition, mean, standard deviation and range for the key variables. We are interested in the change from baseline to follow-up for each variable. Thus, we calculate the change using data at baseline and follow-up.

Crime. As our measure of crime, we use the self-reported number of days in the last 30 that the individual has engaged in illegal activities for profit. The number of "days in illegal activity for profit" is an appropriate indicator for our study since it is a measure of crime that eliminates possession of controlled substances as a crime.   The ASI asks specifically about the number of days as an outcome because of the high validity in reporting when responding with number of days. The benefits of this measure of crime have been confirmed by several researchers [41]. Self-reporting of crime has a large advantage over alternative sources; official records picks up only a small percentage of the crimes that are committed. While there is likely to be some under-reporting of crime, this group of crime-involved drug users may be relatively willing to report crimes

as illicit activities are more acceptable among this group. For example, about 70% of the sample has been involved in crime at some point in their lifetime. That is, either at baseline, at follow-up or at other points during their lifetime, they have been either detained, arrested, in jail, or involved in illegal activities for profit.

Change in crime is measured as the change in the number of days committing crime from baseline to follow-up. On average, individuals in our sample reduce 'crime-for-profit days' by less than 1 day, with a standard deviation of 5.40 days, a minimum of -30 days and a maximum of +30 days. At baseline, the sample commits about 1.28 days of crime out of thirty. Thus, average crime is reduced by about 60% from baseline to follow-up.

Drug use. The ASI asks how many days in the past 30 the individual has used drugs by specific drug at baseline and follow-up. Because the same questions are asked at both time periods, we can calculate the changes in drug use. We examine separately heroin, alcohol, and an aggregate measure of use of all illicit drugs other than heroin. In the first specification, we consider heroin separately from other illicit drugs because treatments such as methadone have been designed specifically to treat heroin. Alcohol is treated as a separate category since its use is legal. Further, programs for illicit drug treatment do not typically, explicitly attempt to reduce alcohol use. We aggregate cocaine use into the category of "drugs other than heroin and alcohol".

Our sample used, respectively, 2.36, 9.05, and 6.87 days of heroin, other drugs and alcohol at baseline. The change in use of heroin, other drugs, and alcohol is -1.59, -5.66, and -4.62 days, respectively, with standard deviations of 6.51, 13.33, and 9.90. Our alternative specification of the set of drug variables aggregates heroin and all other drugs into a composite measure indicating "days of use of any drugs." Individuals in our data set reduced days using any drug by 7.24 with a standard deviation of 15.53.

Treatment. We include a set of dummy variables indicating each specific program from which the observations were drawn. These dummies control not only for type of treatment, but also for quality of treatment, geographic location and other clinic based factors. We report our results for outpatient.

Other variables. Social, economic and demographic variables are also available in the ASI. There are other outcomes measured in the ASI that may well be affected by drug treatment and change over time. These include psychological well-being, family

functioning, and physical health. The information relative to these variables is measured in the ASI at baseline and at follow-up. In each case, they are measured as the number of days out of the last 30 that the individual has had problems in each domain: physical health, mental health and family functioning. Days of psychological problems, family problems and medical problems are reduced, on average, by 3 days, 2 days and 1 day, respectively. We estimate alternative specifications using these variables.

V.   Econometric Model

To investigate the responsiveness of crime to drug use as derived in section III, we need to estimate an equation of the form:

$$\Delta c^* = \alpha + \beta_1 \Delta d^* + \beta_2 \Delta \check{z} + \eta \quad (2),$$

where η is the error term, i.e. $\eta = \Delta \varepsilon_c + \Delta \varepsilon_d$.

Equation (2) states that, for intervals of time short enough, the change in the optimal number of crimes for profit, Δc^*, depends on: 1) the change in the optimal level of drug use, Δd^*; 2) the change in those exogenous socio-economic and demographic characteristics that change in the time period studied, $\Delta \check{z}$; and, 3) the change in the idiosyncratic taste for drugs and crime, η. As explained in the previous section, we have data on individuals at entry into treatment and at a seven-month follow-up. Thus, we have their drug use, d_1 and d_2; their rates of crime, c_1 and c_2; and their time-dependent socio-economic and demographic characteristics, $\check{z}_1$ and $\check{z}_2$, at baseline and follow-up.[4] Therefore, we can calculate the change in crime, drug use, and time-variant social demographic characteristics from pre to post treatment.

Note that, by taking differences, we have eliminated most of the observed and unobserved individual fixed factors that might simultaneously influence drug use and crime. Nevertheless, estimating equation (2) requires solving the problem that, in principle, as explained in section III, the change in the optimal amount of drug use, Δd^*, depends on ε_d and ε_c. Therefore, Δd^* is not an exogenous variable. To solve this difficulty, we use the fact that the drug use reduction we observe is due to drug addiction treatment and, thus, an "externally induced" change in drug use. Thus, drug use change resulting from treatment is uncorrelated with the individual's taste for drugs

and crime. Under this assumption, the simultaneity problem of change in crime and change in drugs disappears. Therefore, Equation (2) can be modified in the following way:

$$\Delta c = \alpha + \beta_1 \Delta d^*(t) + \beta_2 \Delta \check{z} + \eta \qquad (2')$$

where, t, is drug abuse treatment, and $cov(\Delta d^*(t), \eta) = 0$.

There are several observational facts that support the view that substance abuse treatment imposes an 'exogenous' change in drug use. About 24% of our sample is coerced into treatment through the criminal justice system. For them, treatment is exogenously determined. For those who are not on parole, it is reported that most individuals enter treatment reluctantly with family or friends as the coercive factor [24]. Even for those who voluntarily seek care, treatment is a shock to their drug intake decision. Further, admittance to treatment is not always instantaneous. Patients have to wait often long periods of time to start treatment. Thus, even if the time to enter treatment might be decided 'endogenously', by the time patients get into treatment, the time might not be individually optimal anymore. We take advantage of the view that the reduction in drug use due to treatment is not related to the unobservable taste for drugs and crime, ε_d and ε_c, but to an external factor (treatment) that is exogenous to the individual stochastic idiosyncrasies. And, thus, the correlation of ε_d and ε_c is not relevant for the estimation of equation (2).

We could allow treatment to have a direct as well as an indirect effect on the change in crime. An alternative specification is:

$$\Delta c = \beta'_d \Delta d^*(t) + \beta'_z \Delta \check{z} + \beta'_t t + \eta \qquad (2'')$$

Nevertheless, there are grounds for believing that drug treatment would have only an indirect impact on crime through the change in drug use. Treatment for substance abuse is designed primarily to reduce drug use. In fact, there is an increasing demand for enhanced services to offer specialized services to affect directly areas such as employment, family functioning, health, etc., because of the concern that drug treatment is too narrowly focused on drug reduction alone. For most of our samples, we

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[4] Note that most individual traits affecting crime such as age, gender, race, and others do not change in the intervening seven months period. But, some factors, such as, family functioning, mental health, and physical health may be influenced by treatment and thus change over this short time period.

estimate β'_d using both specifications *(2')* and *(2'')* using program centers dummies as a proxy of treatment characteristics.

VI.   Results, Interpretation, and Limitations

a.   Results

Our results show that a change in drug use through treatment has a large and significant impact on the number of days involved in illegal activities. This conclusion is robust across specifications and sub-samples. We are primarily interested in the coefficients on the drug and alcohol indicators. Across different sets of control variables, the coefficients on these key indictors are always positive and significant and tend to be of similar magnitude. Results are displayed in Table 3 and are interpreted in Table 4.

Base results. We consider our base case to be the results corresponding to our largest sample. We will make comparisons to this case. These results are displayed in the first column of Table 3. The sample size is 3,502. The results indicate a positive and significant coefficient on each of the changes in days using heroin, other drugs and alcohol. The coefficient on the change in heroin use is 0.146 with a t-statistic of 5.93. Similarly, the coefficients on 'other drugs' and alcohol are also highly significant and positive. The coefficients for these are 0.075 and 0.026, respectively, with t-statistics of 6.88 and 2.87.

Family Functioning. In addition to the three drug and alcohol variables, we also have included the three other time varying indicators in the basic equation. They are change in family functioning, health, and mental health. We have suppressed the coefficients on these variables as they are of concern only as controls. Change in family functioning is typically significant across the specifications and is always positive. The other two are never significant.

Treatment Programs. Our sample is drawn from observations from multiple programs. Programs vary by treatment type, geographic location, and also by the average severity of drug dependence and/or criminality of those enrolled in the program. Thus, we use a set of identifiers that control for the factors that vary across programs. Unfortunately, the program identifier is missing for some of the observations. To determine how the program dummies affect the results, we estimate regressions with and without program dummies for the sample that does have the program identifiers (2,737 observations). We do not display the coefficients on treatment programs.

We can view the impact of controlling for program identifiers by comparing the specifications with and without these program identifiers with the sample of 2,737. Column 2 of Table 3 displays these results. When the program identifiers are added, the magnitude of the coefficient on heroin declines from 0.145 to 0.133 and the level of significance declines somewhat, while still remaining very significant. The coefficient and level of significance are very similar for "other drugs". Both the coefficient and the significance level increase for alcohol when the program identifiers are added. The coefficient goes from 0.023 to 0.037, and the t-statistic from 2.36 to 3.05.

Outpatient only. Outpatient and inpatient programs may differ in many ways that are not completely picked up by the program identifiers. Patients receiving inpatient care are likely more severely addicted, for example. Thus, we next restrict our sample to only those in outpatient care. There are too few individuals in inpatient to allow for an inpatient only regression. When we estimate the regressions for those in outpatient care only, we find very similar results to our base case (see Column 3 of Table 3). When we add the program controls to the outpatient group, the coefficient of heroin declines, as does the level of significance. Other drugs have a slight increase in both magnitude and significance. Alcohol increases in both magnitude and significance. This is the same pattern exhibited for the entire sample.

Increase versus decrease in drug use. Table 3 includes two additional sets of results: we analyze whether the positive relationship between the change in drugs and change in crime holds similarly for both those who decrease (1,413) and those who increase (293)[5] their drug use. Column 4 reports the estimates for the sample of individuals that experience a decrease in drug use while column 5 reports the estimates for those that increase drug use instead. We find positive relationships between crime and drugs (and alcohol) for both those who decrease and those who increase their drug use. The coefficients for those that decrease drug use are close to the full sample coefficients, especially without controls by program (although the alcohol intake change coefficient is not significant without controls for treatment effects). The coefficients for those that increase drug use have borderline levels of significance and, in general, are lower than the full sample coefficients. The lower level of significance for those that increase drug use could be due to the smaller sample size. Alternatively, it could be due

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[5] Note that 1,031 individuals do not change their number of days of aggregate drug intake.

to the fact that those who increase their drug use are unusual in some dimensions[6]. It is unlikely that treatment causes drug use to increase.

Policy targets. Treatment might be more cost-effective if it could be targeted towards those at higher risk for committing crime. Thus, we analyze two subgroups to determine the extent to which the drug/crime relationship holds. The first subgroup is those individuals that have committed crime at baseline or follow-up (342). The second group is those that are on parole at baseline (594). Columns 6 and 7 of Table 3 display the regression estimates for these two subgroups.

Those who have been involved in crime in the recent past might be a good group to target, as they may be likely to continue crime in the future as well. A previous history of crime could serve as a relatively observable indicator of a likelihood of future crime. In our sample, about 11% commit criminal activities at baseline and/or at follow-up. For this subgroup, the estimated coefficients and the levels of significance are greater than for the base case. The coefficients on the drug indicators are two to three times as large as for the base case sample when there are no controls for program. For the sample of those crime involved, adding program indicators reduces the magnitude of the coefficients and the levels of significance, although they are still larger than for other samples.

Those on parole at baseline have necessarily committed crime in the relatively recent past and may be likely to commit in the future as well. For those on parole and for which the program indicators are not missing, the coefficient on heroin is of smaller magnitude and significance level when compared to the base. The coefficient on other drugs is slightly larger, but of lower significance while still significant. The coefficient on alcohol is smaller but is not significant.

Comparing the coefficients for those on parole versus those who have recently committed crime, we could speculate that parole itself is aimed at reducing crime. Thus, it may be that, for this group, crime is not reduced as much as a result of reduced drug use as much as for others who have been crime involved but are not currently on parole. Those on parole are likely to have entered treatment as a

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[6] Drug use for this group of drug increasers may have been fluctuating rather than exhibiting a trend. Also, other factors may have contributed to a worsening situation. Their baseline drug use could have been abnormally low compared to their standard. And, although we cannot verify this possibility, they also may be composed of the group who dropped out of treatment early, in which case, their dropout, crime and drug behavior may have been affected by other factors.

stipulation of the criminal justice system and, in addition, they are being monitored by the criminal justice system.

b. Interpretation

We want to interpret these results so that they can be useful. We would like to know: Is the finding of a significant decline in crime due to a reduction in drugs important from a policy perspective? Is a coefficient of 0.323 important relatively? In this section, we place these numbers in the context and interpret them.

We calculate the change in crime attributable to reduced drug use by using the estimated coefficients on drug use and the actual change in drug use from the raw data (column 1 of Table 4). The coefficients reported in Table 3 are estimates of the partial derivative of crime with respect to drug use, $\partial c/\partial d$. From our data, we can calculate the *actual change in drug use* for each drug, Δd. Combining the *actual change in drug use* with the *coefficients* estimating the impact of the change in drug use reduction on the change in crime, we can calculate the *change in crime attributable to the change in drug use*, ceteris paribus, $\Delta C = \partial c/\partial d \, \Delta d$.

The coefficients, $\partial c/\partial d$, displayed in Table 3 are repeated in the first column of Table 4 for convenience. These coefficients correspond to the estimates obtained when controlling by the program, with the exception of our 'base case', which does not include program controls. Column 2 in Table 4 displays the statistics on the change in drugs, Δd. Column 3 reports the estimated change in crime attributable to the change in drugs, Δc, as explained above. In column 4, we report the decline in crime as a percentage of the total crime at baseline attributable to the decline in drug use *($\Delta c \, / \, c$)*. The number of days involved in illegal activities at baseline, c_1, is listed in column 6 of Table 4.

The estimated coefficients, the magnitude of days of drug use, and the number of days committing crime at baseline allow us to calculate the *elasticity of crime with respect to drug use*: $\varepsilon = \partial c/\partial d \cdot d_1/c_1$, where d_1 and c_1 are days of drug use and days of crime at baseline. Column 7 of Table 5 reports these elasticities for each sub-sample. These elasticities provide a measure of the sensitivity of the change in crime to the change in drug use. More specifically, the elasticity indicates the percentage change in

the level of crime at baseline for a 1% in the level of drug use at baseline. Below, we discuss these calculations for each subgroup.

Full sample. For the full sample, the mean number of days in illegal activities at baseline is 1.28 days. Using the template for calculations described above, we estimate a 18% reduction in crime due to the reduction in days of heroin use. Similarly, the reduction in crime days attributable to reduced consumption of other drugs and alcohol would explain 33% and 9% of all crime, respectively. Thus, while the coefficients may appear to be relatively small, they represent a fairly large percentage change in crime. For heroin, the impact on crime is relatively large (i.e., a relatively large coefficient), but the reduction in days using heroin is relatively small. For other drugs, the impact is relatively small, but there is a fairly large reduction in days of drug use. The implied elasticity is 0.27 for heroin, 0.53 for other drugs, and 0.14 for alcohol. To put this elasticitiy in perspective, the elasticity of the number of crimes to imprisonment calculated by Spelman [42], for instance, range from 0.12 to 0.20 with a best guess of 0.16, concluding that, taking into account recidivism, current incarceration rates avert perhaps no more than 8% of crimes. Note that, in our case, we obtain the elasticity of "days of crime-for-profit" with respect to a change in the number of days of drug use. To the extent that the number of actual crimes per day of crime might be more than one, our estimates are only a conservative estimate of the total crime averted due to each day of no drug use. The number of crimes per day of crime is not known. There exists a quite wide range of estimates on the number of crimes per year per offender (see [43] for a summary). Further, no nationally representative study has firm estimates of the number of crimes and days per crime that could be used to calculate crimes per day.

Outpatient. The sub-sample of those in outpatient treatment has a comparable number of days of drug use at baseline and approximately the same crime rate at baseline (1.31) as the overall sample. The reduction in heroin explains a higher percentage of the initial crime (25%), and the reduction in all other drugs and alcohol intake explain a lower percentage (21% and 6%, respectively) than they do for the full sample. The corresponding elasticities are higher than for the full sample for heroin and lower for other drugs and alcohol. Overall, the results for outpatient are somewhat similar to those for the full sample.

Involved in crime. Compared to the full sample, the subsample of those involved in crime has more days of drug use and alcohol at baseline, substantially more crime at baseline (10.97), a greater drop in days of drug use, and coefficients of greater magnitude as. While decline in the absolute number of days of crime is large, nevertheless, the reductions in heroin and other drugs explain a lower percentage of all crime committed by this group at baseline (15%, 21% and 12%, respectively). The corresponding elasticities are lower for heroin and other drugs, but higher for alcohol as compared to the full sample.

On parole. The subsample of those in outpatient treatment has a similar number of days of heroin use, lower days of other drugs days, alcohol, and crime (1.04) at baseline as compared to the full sample. The reduction in heroin explains the same percentage of all crime (19%) as compared to the full sample, and the reduction in all other drugs and the alcohol explain a higher (37%) and lower percentage (5%), respectively. The corresponding elasticities are almost identical for heroin, a bit higher for other drugs, and lower for alcohol. Overall, the results for those on parole are comparable to those for the full sample.

c. Limitations

Although we suggest that this data set has many strengths, it poses some limitations as well. One is that we do not have a random sample of all drug users. On the other hand, we believe that our sample may be representative of inner-city drug addicts seeking treatment, which may be a target group for crime reduction, especially crime reduction via treatment. Another concern is that both drug use and crime are self-reported. However, studies have shown self-reported drug use to be a good proxy for objectively measured drug use (e.g. urinalyses). The primary alternative source of data for crime is official records, which are well known to under-report crime. Studies have suggested that self-reports are better measures of crime than official reports [40]. Further, we are making comparisons of self-reports pre and post treatment; any self-report bias is not likely to vary much in over a seven-month period. Another consideration is that these individuals are less stigmatized by reporting drug use and crime as compared to a random sample of all individuals and, thus, may be less likely to make false reports.

The use of a thirty days timeframe is potentially a concern in that it may offer too short of a horizon. However, one concern is that a with a longer time horizon, the response becomes less accurate. Thirty days is used as the timeframe in the ASI on the grounds that crime and drugs are reported with greater reliability and ease using this time frame as opposed to a longer timeframe [36]. A large number of studies of drug treatment effectiveness use the ASI for evaluating drug and crime outcome. Thus, the use of a 30-day timeframe is common in the effectiveness literature. Further, frequency of 'days' of crime and drug use is used in the ASI instead of reporting quantity of drug use and of crimes on the grounds that frequency (days) is highly correlated with quantity. Ball and Ross [41] recommend the use of 'days of crime' as opposed to crime acts. Nonetheless, we do not know the extent to which thirty days is representative of a longer time horizon nor do we know the precise correlation between quantity and frequency (days) for each crime and drugs.

The measure of crime that we use is defined to be 'crime-for-profit'. This would include robbery, burglary, drug dealing, and other crimes that produce some income. It explicitly excludes drug possession as a crime. Thus, the impact of treatment on crime for a broader definition including drug possession would be underestimated. With respect to violent crimes, note that violence may occur in some crime-for-profit but not others. Thus, our estimates account for only a part of violent crimes.

VII. Summary, conclusions and policy

Our study uses longitudinal data to analyze how the reduction in drug use due to substance abuse treatment affects criminal activity for profit. We use a novel approach and data set to analyze the relationship between crime and drugs. Using longitudinal data pre and post treatment and first differencing to measure change, we are able eliminate some of the omitted variable problems that plague previous studies. We analyze a low-income, inner-city, drug-addicted sample. This is a sample that is likely to commit property crime and other crimes-for-profit in order to finance their drug habit. We use self-reported crime, which avoids the problem of under-reporting of crime detected in official records of arrests and convictions. Our use of individual level data is an improvement over the aggregate level data used in the past. We focus only

on crime-for-profit, not drug possession, as the crime of drug possession must occur with drug use.

We find a strong positive relationship between a reduction in crime-for-profit and a reduction in drug use. Moreover, we find that the crime reduction induced by reduced drug use and alcohol intake explains a very high percentage of the crime at the beginning of the treatment. In terms of elasticities, for each 1% reduction in heroin, other drugs and alcohol use days, we calculate that there is a reduction in crime-days of 0.27%, 0.53% and 0.14%, respectively.

Our findings broadly suggest that drug treatment may be an effective crime-fighting tool. Treatment reduces not only the crime of drug possession, but also crime-for-profit. Current public policy emphasizes the criminal justice system, and incarceration in particular, as a mechanism to combat crime. Given the huge and growing expense of the criminal justice system, drug treatment might be a policy to expand relative to incarceration for some drug users. Treatment is currently used to some extent both in and out of prison. For example, drug courts allow judges to mandate treatment instead of prison. However, drug courts and treatment in prison are used to only a very limited extent compared to their potential use.

The government pays all of the costs of incarceration and most of the costs of treatment. A treatment episode is much cheaper than an episode of jail: a year in jail costs about $23,000 on average and an 'episode' can be multiple years. An outpatient treatment costs less than $300 for the full course of outpatient counseling based treatment and less than $3,000 for a year of methadone treatment[26]. Both prison and treatment have high recidivism rates, but treatment has positive side effects (e.g., reduction in HIV and better family functioning), while prison has largely negative side effects (e.g., 'deviance training', disintegration of the family, and predatory acts in prison). Much of the recent increase in the prison population is due to drug possession. Thus, drug treatment would reduce this type of crime to the extent that it is effective in reducing drug use as well are crime-for-profit. Of course, one would need more specific information on costs and benefits to be able to make cost-benefit comparisons across prison versus treatment. However, these results suggest strongly that treatment should be analyzed to determine if it is a cost-effective alternative to prevent future crime for drug abusing individuals. Targeting treatment to high-risk populations might make it

more cost-effective in reducing crime, e.g. treating only drug users who have been arrested and/or convicted of crime.

California's so called "proposition 36" is a current focal point for the ongoing debate about treatment versus criminal justice. According to this policy, some individuals who are caught using illicit drugs will be sent to treatment for drug dependence instead of prison. Implementation of this policy highlights that the issue of prison versus treatment is more than an academic debate. It also highlights that implementation demands more than information that 'treatment' may be cost-effective. There are many aspects that need to be known that are beyond the scope of this paper. Both treatment and prison have high recidivism rates and drug treatment has high drop out rates. Thus, a detailed comparison is difficult. There are many kinds of treatment ranging from counseling only to medical maintenance to aftercare. Criminal justice interventions can vary as well. Determining which type of treatment is more effective as a crime fighting tool is beyond the scope of the paper. However, we have provided empirically-based findings that reduced drug use due to treatment can reduce crime. These can serve as a building block for policy development.

**Table 1: Descriptive Statistics: Social Demographics and
Other Characteristics (3,502 observations)**

Variable (values at baseline)	Average	Standard Deviation
% males	69%	
Years of age	35.73	8.41
Years of education	11.64	2.23
% White	32%	
% African-American	56%	
% Hispanic	11%	
Total Income	$684.13	$891.96
Welfare	$148.33	$253.26
Pension	$70.77	$302.09
# days worked	6.43	9.49
# days illegal activities	1.28	5.09
Have been in a drug treatment before	59%	
Had psychological problems lifetime	71%	
Has chronic condition	30%	
Ever in jail	38%	
On parole or probation at baseline	24%	
Involved in illegal activities last 30 days at baseline	9%	
Received illegal earnings during last 30 days at baseline	8%	
Was detained last 30 days at baseline	9%	

Table 2: Variables Names, Meaning and summary statistics
Variables measuring change from baseline to the 7 months follow-up:

Variable*	Meaning	Aver-age	Stand. Dev.	Mini-mum	Maxi mum
b-crime	Number of days involved in illegal activities for profit (besides drug possession) in the last 28 days at baseline	1.28	5.09	0	30
f-crime	Number of days involved in illegal activities for profit (besides drug possession) in the last 28 days at follow-up	0.50	3.22	0	30
c-crimeday	Change in number of days involved in illegal activities for profit (besides drug possession) in the last 28 days	-0.78	5.40	-30	30
b-heroin	Heroin use days in the last 28 days at baseline	2.36	6.69	0	30
f-heroin	Heroin use days in the last 28 days at follow-up	0.69	3.58	0	30
c-heroin	Change in heroin use days in the last 28 days	-1.59	6.51	-30	30
b-othdrug	All drugs but heroin use days in the last 28 days at baseline	9.05	14.62	0	140
f-othdrug	All drugs but heroin use days in the last 28 days at follow-up	3.40	8.84	0	90
c-other	Change in all drugs but heroin use days in the last 28 days	-5.66	13.33	-120	64
b-alldrugs	All drugs (including heroin) use days in the last 28 days at baseline	4.09	10.12	0	90
f-alldrugs	All drugs (including heroin) use days in the last 28 days at follow-up	11.34	16.96	0	140
c-alldrugs	Change in number of all drug-use days in the last 28 days	-7.24	15.53	-120	64
b-alcoh302	Alcohol use days in the last 28 days at baseline	6.87	9.63	0	30
f-alcoh301	Alcohol use days in the last 28 days at follow-up	2.25	5.57	0	30
c-alcohol	Change in alcohol use days in the last 28 days	-4.62	9.90	-30	30
b-psycday	Number of psychological problem days in the last 28 days at baseline	7.82	11.10	0	30
f-psycday	Number of psychological problem days in the last 28 days at follow-up	4.43	8.50	0	30
b-famprob	Family problems' days in the last 28 days at baseline	2.34	6.36	0	30
f-famprob	Family problems' days in the last 28 days at follow-up	1.25	4.70	0	30
c-famprob	Change in the number of psychological problems' days in the last 28 days	-1.08	7.28	-30	30
b-medprob	Medical problems' days in the last 28 days at baseline	4.74	9.32	0	30
f-medprob	Medical problems' days in the last 28 days at follow-up	3.74	8.29	0	30
c-medprob	Change in medical problems' days in the last 28 days	-1.01	10.53	-30	30

*Note "b-s" stands for (variable at) baseline, "f-" for follow-up and "c-" for change from baseline to follow-up.

Table 3: Estimates of the impact of the change in heroin, other drugs and alcohol intake on illegal activities days

Model :	Ordinary Least Squares*												
Dependent variable:	c-crime												
	1	**2**		**3**		**4**		**5**		**6**		**7**	
Sample:	Full Sample	Full Sample-Tx controlled		Outpatient Only		Decrease drugs		Increase Drugs		Crime Involved		On Parole	
# obs :	3502	2737		2204		1413		293		342		594	
		wo prg	with prg	wo prg	with prg	wo prg	with prg	wo prg	with prg	wo prg	with prg	wo prg	with prg
c-hr	0.146	0.146	0.133	0.151	0.139	0.146	0.110	0.135	0.133	0.323	0.236	0.124	0.115
	(5.93)	(5.62)	(4.87)	(5.63)	(4.81)	(5.22)	(3.24)	(1.84)	(1.65)	(5.57)	(3.55)	2.54	(2.02)
c-oth	0.075	0.080	0.085	0.070	0.075	0.083	0.095	0.062	0.058	0.234	0.234	0.101	0.100
	(6.88)	(6.13)	(6.17)	(4.58)	(4.63)	(5.25)	(4.98)	(1.75)	(1.12)	(5.88)	(4.72)	3.50	(3.20)
c-alc	0.026	0.023	0.037	0.027	0.036	0.019	0.034	0.090	0.101	0.307	0.259	0.017	0.023
	(2.87)	(2.36)	(3.05)	(2.10)	(2.42)	(1.16)	(1.94)	(1.88)	(1.894)	(4.37)	(3.20)	0.65	(0.93)
R-sq	0.11	0.11	0.34	0.10	0.11	0.13	0.17	0.14	0.16	0.35	0.43	0.18	0.16

T-statistics between brackets. Heterocedastic consistent standard deviations used.

*These coefficients were obtained controlling for the change in the number of days of medical problems, the change in the number of days of psychological problems, the change in the number of days of family problems, and program identifiers.

Table 4: Summary of the Effects of Changes in Drug Use or Crime Days

	1	2	3	4	5	6	7
	Coefficient $(\partial c/\partial d)$	Change in Days Drug Used (Δd)	Calculated Change in Crime (Δc)	% change in Crime from Baseline $(\Delta c/c_1)$	Days Drug Use at Baseline (d_1)	Days Crime At Baseline (c_1)	Elasticity
Sample: Full **# Observations = 3,502** **Actual Decrease in Crime = -0.78 days**							
Heroin	0.146	-1.6	-0.23	**18%**	2.36	1.28	**0.27**
Other	0.075	-5.7	-0.42	**33%**	9.05	1.28	**0.53**
Alcohol	0.026	-4.6	-0.12	**9%**	6.87	1.28	**0.14**
VIII. Sample: Outpatient **# Observations = 2204** **Actual Decrease in Crime = -0.64 days**							
Heroin	0.151	-2.2	-0.33	**25%**	3.18	1.31	**0.37**
Other drugs	0.070	-4.0	-0.28	**21%**	7.93	1.31	**0.42**
Alcohol	0.027	-3.1	-0.08	**6%**	5.48	1.31	**0.11**
Sample: Crime Involved **# Observations = 342** **Actual Decrease in Crime =-6.25 days**							
Heroin	0.323	-5.2	-1.69	**15%**	8.13	10.97	**0.24**
Other drugs	0.234	-9.6	-2.25	**21%**	19.66	10.97	**0.42**
Alcohol	0.307	-4.1	-1.26	**12%**	7.55	10.97	**0.21**
Sample: On Parole **# Observations = 594** **Actual Decrease in Crime =-0.57 days**							
Heroin	0.124	-1.6	-0.20	**19%**	2.07	1.04	**0.25**
Other drugs	0.101	-3.8	-0.38	**37%**	5.99	1.04	**0.58**
Alcohol	0.017	-2.8	-0.05	**5%**	4.91	1.04	**0.08**

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