Drug Arrests and Injection Drug Deterrence

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Objectives. We tested the hypothesis that higher rates of previous hard drug–related arrests predict lower rates of injection drug use.

Methods. We analyzed drug-related arrest data from the Federal Bureau of Investigation's Uniform Crime Reporting Program for 93 large US metropolitan statistical areas in 1992 to 2002 to predict previously published annual estimates of the number of injection drug users (IDUs) per 10 000 population.

Results. In linear mixed-effects regression, hard drug–related arrest rates were positively associated (parameter = +1.59; SE = 0.57) with the population rate of IDUs in 1992 and were not associated with change in the IDU rate over time (parameter = –0.15; SE = 0.39).

Conclusions. Deterrence-based approaches to reducing drug use seem not to reduce IDU prevalence. Alternative approaches such as harm reduction, which prevents HIV transmission and increases referrals to treatment, may be a better foundation for policy. (*Am J Public Health.* 2011;101:344–349. doi:10.2105/AJPH.2010.191759)

Injection drug use is a risk factor for HIV, hepatitis B and C, infectious endocarditis, and overdose mortality[1–3] and a serious public health and social problem.[4] Each year, more than 1.5 million people inject drugs in the United States,[5] and injection drug use is also widespread internationally[6]; the effects of public policies on the extent of injection drug use are therefore important public health concerns.[7,8]

Domestic drug policy in the United States and many other countries has largely been founded on the belief that arrests deter crime. Analysts such as Becker[9] and Tonry and Wilson[10] hold that punishment and stigmatization deter criminal behavior by making it costly for the perpetrator, an idea that has shaped policies to reduce drug use. For example, the International Narcotics Control Board stated,

> The deterrent effect of law enforcement efforts influences the demand for illicit drugs. The risk of penal sanctions may act as a deterrent to members of the general population who have never abused drugs. Though the risk of such sanctions does not, in all cases, deter addicts who require drugs regardless of the consequences, the impact of law enforcement efforts on supply may force addicts to take advantage of treatment and psychosocial intervention.[11(p9)]

In the United States, these arguments have been accompanied by intensified street-level enforcement of drug laws and by increases in drug-related arrests and incarceration: the total number of jail and prison inmates increased from 1.2 million in 1990 to 2.2 million in 2006,[12,13] and arrests for unlawful possession, sale, use, or manufacture of illicit drugs rose from 1.0 million to 1.7 million in the same period.[14]

Drug-related law enforcement strategies founded on deterrence theory are increasingly controversial because of their cost and, in the United States, their racially disparate effects. At this writing, an estimated 500 000 adults are serving time in a US prison or jail for a drug-related offense.[15] The drug-related incarceration rate for African Americans is 756 per 100 000 adults, more than 8 times that of Whites (90 per 100 000 adults).[16] The drug-related incarceration rate for Latinos falls between these 2 rates, at approximately 300 per 100 000 adults.[16] A recent estimate of the average annual expense per prisoner (i.e., the cost of inmate food, shelter, security, and medical care) is $23 876,[17] suggesting that the United States is now spending almost $12 billion annually to incarcerate 500 000 inmates for drug-related offenses (this figure excludes the cost of drug-related policing initiatives and presentencing expenditures).

Considerable evidence suggests that high rates of arrest and incarceration may increase the spread of some infectious diseases, including HIV, sexually transmitted infections, and tuberculosis.[18–20] Arrest rates for heroin and cocaine possession or sale in US metropolitan areas in the mid-1990s were associated with higher HIV prevalence among injection drug users (IDUs) in 1998,[21] and arrests of individual drug users have been associated with higher rates of risk behaviors and with difficulty in using prevention programs.[22–24] The fear of arrest can induce drug users to become or remain drug injectors (to reduce the amount of drug purchased and thus the frequency with which they have to expose themselves by buying drugs, as well as through stigmatization effects on social integration and self-esteem) and may lead IDUs to inject less safely.[23,25–28] Furthermore, perhaps by intensifying shortages of men in some communities, high arrest and incarceration rates have been found to be associated with family disruption, excess rates of sexually transmitted infections, and other adverse health outcomes.[24,29] In Europe and central Asia, incarceration rates explain population increases in tuberculosis and in multidrug-resistant tuberculosis.[30]

Arguably, however, arresting and incarcerating drug users might nevertheless reduce population-wide infectious disease rates by decreasing the pool of individuals at risk for injection-related health problems. This might occur through 2 mechanisms. First, incarcerating drug users removes them from the community. Second, if deterrence works as envisioned by Becker[9] and Wilson and Kelling,[10] arresting drug users would reduce infections in a locality by deterring people from initiating or continuing drug use.

In the strictest sense, nonexperimental data cannot prove causality. However, if deterrence arguments are valid, then increasing the arrest rate for drug possession should be followed by decreases in drug use, and decreasing such arrests should be followed by increasing drug use. In others words, if increases in arrest rates cause decreases in drug use, we should at least observe an association, even if the association by itself is not

TABLE 1—Variables, Sources, and Descriptive Statistics for Study of Hard Drug Arrests in 93 Large US Metropolitan Statistical Areas, 1992–2002

Variable	Calculation	Source	Sample Size	Mean (SD)	Median (Interquartile Range)	Minimum	Maximum
IDU rate (1992–2002)	Estimated no. of IDUs aged 15–64 y/MSA population aged 15–64 y × 10 000	Brady et al.[5]	1023	118.59 (60.92)	101.92 (71.80–154.57)	30.04	348.49
Hard drug arrest rate (1992–2002)	No. of hard drug arrests in each MSA/MSA population × 10 000	FBI[32]	957	14.33 (10.93)	11.31 (6.18–19.42)	0.00	63.65
Hard drug arrest rate (1991)	No. of hard drug arrests in each MSA/MSA population × 10 000	FBI[32]	93	13.86 (11.46)	10.79 (4.65–20.66)	0.00	44.82
Hard drug arrest rate change (1991–2002)	Current y minus previous y	FBI[32]	955	−0.07 (1.55)	0.00(−0.86–0.61)	−7.61	10.17
Unemployment rate (1992–2002)	Ratio of unemployed persons to the civilian labor force	BLS[33]	1023	5.17 (2.16)	4.70 (3.70–6.00)	1.60	15.90
Unemployment rate (1991)	Ratio of unemployed persons to the civilian labor force	BLS[33]	93	6.44 (1.95)	6.10 (5.20–7.00)	2.00	13.70
Unemployment rate change (1991–2002)	Current y minus previous y	BLS[33]	1023	−0.07 (0.80)	−0.20 (−0.60–0.40)	−3.20	3.60
Religious congregational rate (1990)	No. of religious congregations/MSA population × 10 000	ARDA[34]	93	6.88 (2.78)	6.09 (5.05–7.86)	3.17	15.83

Note. ARDA = Association of Religious Data Archives; BLS = Bureau of Labor Statistics; FBI = Federal Bureau of Investigation; IDU = injection drug user; MSA = metropolitan statistical area.

sufficient to prove causality. Also, if there is separation in time between an observed increase in arrest rates and a decrease in drug use, that separation would help establish a causal direction, because it is more plausible that the variable measured earlier is a cause of the variable measured later. Time-lagged measures of arrest rates, along with models that calculate change in the prevalence of IDUs as a function of previous values of arrest rates, used in a regression-based analysis with appropriate controls, can assess deterrence effects.

We tested whether changes in arrests for possession of heroin or cocaine in large US metropolitan areas from 1992 to 2002 were associated with later changes in the population prevalence of injection drug use.

METHODS

We obtained data on drug-related arrest rates and the prevalence of injection drug use in the 95 largest (as of 1992) metropolitan statistical areas (MSAs) in the 50 states from 1992 to 2002. MSAs are defined by the US Census Bureau as contiguous counties that contain a central city of 50 000 people or more and that form a socioeconomic entity (assessed by commuting patterns and social and economic integration in the constituent counties).[31]

Estimation

Our IDU estimation procedures have been described in detail elsewhere.[5] Briefly, we began by calculating the number of IDUs living in the United States in each year from existing estimates of the number of IDUs in 1992 and 1998, and then adjusted these estimates according to variations in IDU encounters with health services and with the criminal justice system for each year. We then allocated these national IDU population totals to the MSAs through (1) an estimate derived from published estimates of the number of IDUs living in each MSA in 1992 and in 1998 and (2) data on IDUs' service use and AIDS diagnoses. We divided the IDU population estimate in each MSA by the estimated population of that MSA to produce per capita rates (which we multiplied by 10,000 to facilitate presentation). To reduce stochastic variation, IDU rate estimates (as well as data on hard drug arrests) were smoothed against year in each MSA by locally weighted scatter plot smoothing regression (Table 1).[35]

We obtained data on hard drug arrests (for the unlawful possession of opium or cocaine or their derivatives, such as morphine, heroin, or codeine) from the Federal Bureau of Investigation's Uniform Crime Reporting Program.[32] Heroin and cocaine are the most commonly injected drugs in the United States.[36] We excluded 2 MSAs because of substantial missing data on hard drug arrests, leaving 93 MSAs in our analysis.

These data comprised arrests of both IDUs and non-IDUs. Although data on arrests of IDUs would more accurately measure the way arrests directly affect IDUs, we used data on all hard drug arrests because (1) data on arrests of IDUs were not available, (2) deterrence theory predicts that hard drug arrests of non-IDUs are likely to have some deterrent effects on IDUs, and (3) arrests of non-IDUs may lead some of them to become IDUs.[23,25–28]

Variables

To control for potential confounding of the relationship between hard drug arrests and IDU population rates, we included selected variables representing economic context and social cohesion. After preliminary analyses, we selected the unemployment rate to represent economic context. Unemployment rates calculated at the MSA level[33] were available for all MSAs and years.

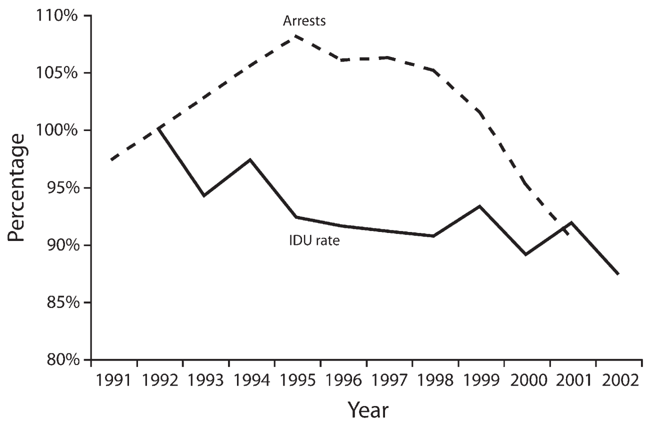
Social cohesion has been found to be associated with drug use and injection drug use.[37–39] Religiosity can be an important potential source of social cohesion. To represent social cohesion, we used data on the rate of religious congregations per 10 000 population in 1990, derived from the Association of Religious Data Archives.[34] In supplementary analyses, we also used data on a broader category, civic establishments (which included religious establishments as a subset).

Statistical Analysis

We used a series of linear mixed-effects models[40] to assess the impact of hard drug arrests on the population rate of injection drug use, with other variables controlled. This method used maximum likelihood to assess the associations of interest while adjusting for variance shared within MSAs across time. Because our data were derived from the entire population of large MSAs rather than from a sample, inferential statistics based on sampling error would have no precise meaning. Nonetheless, we used statistical tests of model parameters heuristically as a way to guard against accepting all associations as meaningful. We used a 1-year lag for arrest and unemployment rates; for example, we used arrest and unemployment rates in 1991 to model the injection drug use rate in 1992. For the fixed congregation rate variable, we used only the 1990 values and an interaction term representing those values multiplied by a time indicator (coded as years since 1992 [0–10]).

To minimize potential multicollinearity and to facilitate interpretations, we centered congregation rates and 1991 arrest and unemployment rate initial values around the grand mean.[40] To assess the potential effects of changes in hard drug arrest rates on changes in injection drug use, we separated hard drug arrest rate data into 2 components: the 1-year lagged initial values centered around the grand mean of the initial year and the year-to-year change, represented by subtracting the uncentered hard drug arrest rates of the previous year from the uncentered hard drug arrest rates in the current year.[40]

To control for potential time-varying effects of the initial values, we entered an interaction term between the initial centered hard drug arrest rate values and time. We did the same for unemployment rate data. This representation had the advantages of minimizing multicollinearity and maintaining the focus on year-to-year change of the predictors. Congregation rates during the study period were only available for 1990 and 2000, so we used only the grand mean–centered 1990 values and interactions with time to represent congregation rate data. Thus, the models had 2 regression parameters for congregation rate and 3 each for arrest and unemployment rates.



Note. IDU = injection drug user. The index for each series was constructed by dividing the mean value for a given year by the mean value for 1992.

FIGURE 1—Index values of average hard drug arrests per 10 000 population from 1991 to 2001 and of IDUs aged 15–64 years per 10 000 population aged 15–64 years from 1992 to 2002 in 93 large US metropolitan statistical areas.

RESULTS

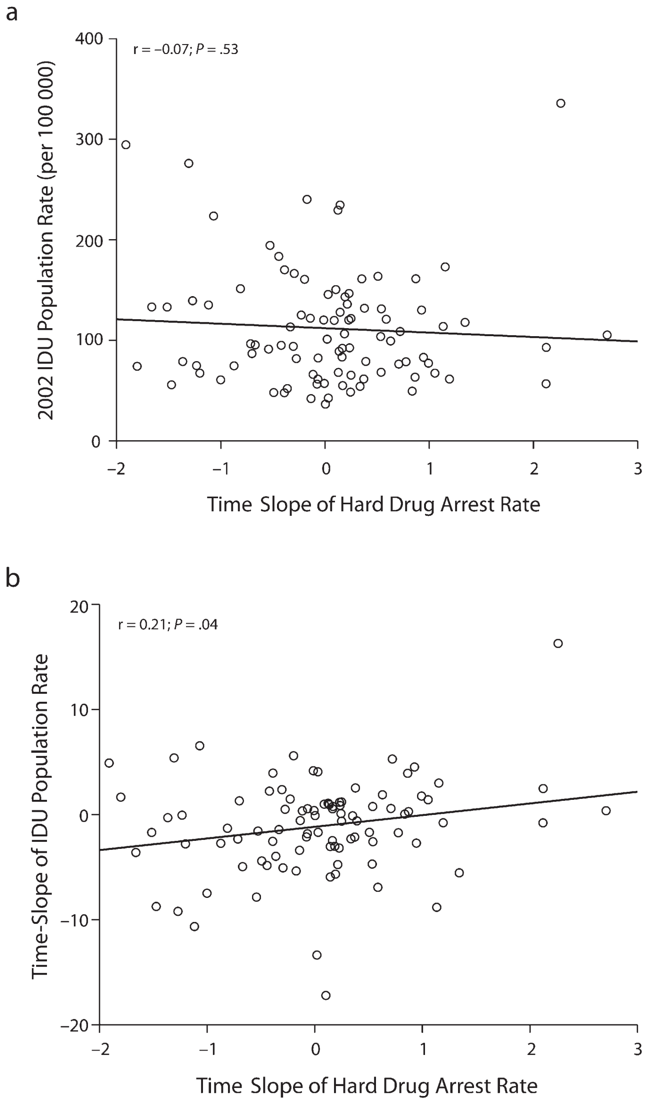
Absolute values of correlations among hard drug arrest, unemployment, and religious congregation variables ranged between 0.2 and 0.4 across the years. Figure 1 displays data on how the hard drug arrest rate and the prevalence rate of IDUs (each per 10 000 population) changed during the study period. To facilitate the comparison, these data are presented as index numbers standardized on their mean values in 1992. We found little visual evidence that trends in the prevalence rate of IDUs in the population followed the arrest rate trend.

We also modeled arrest rates and IDU rates in each MSA as linear functions of time. We then graphed the slopes of hard drug arrest rates over time for each MSA by IDU rate in that MSA in 2002 (Figure 2a) and slopes of IDU rates over time (Figure 2b). These results indicated little association in the hypothesized direction. In fact, the slope of hard drug arrest rates was positively associated with the slope of the IDU rate (r=0.21; P<.05). The nonsignificant correlation between the slope of hard drug arrests and IDU rate in 2002 (r=–0.07) was accounted for by other variables, primarily the initial values of hard drug arrest rates and IDU rates.

Linear Mixed-Effects Models

Model results are shown in Table 2. First, regressing IDU rate on time revealed a small but significant decline in IDU rate averaged over MSAs per year (model 1).

We added hard drug arrest variables to model 2 and found a positive association of the hard drug arrest rate in 1991 with the IDU rate in 1992. This association may indicate that some MSAs with high prevalence of IDUs in the 1980s engaged in a drug policy that included large-scale arrests of IDUs. If this proposition is true, this association would exemplify reverse causation. The association of arrests in 1991 (–0.08) with the change in IDU rate over time was a statistical artifact of the initial correlations of arrests in 1991 (r=0.43) with IDU rates in 1992, combined with the general decline in IDU rates over time. We confirmed this interpretation by adding IDU rates in 1992 as a control variable in model 2, after which arrest rates (1991) were no longer associated with change in the IDU rate. In model 2, the change in arrest rates had no relationship with later changes in IDU rate.



Note. IDU = injection drug user.

FIGURE 2—Time slope of hard drug arrest rate in 93 large US metropolitan statistical areas in 1992–2002 by (a) IDU population rate per 10 000 in 2002 and (b) IDU population rate from 1991–2001.

Model 3 shows the results of adding control variables. In this model, hard drug arrest rates in 1991 remained significantly associated with 1992 IDU rates, but 1991 arrest rates were no longer significantly associated with IDU rate change over time. In addition, 1991 unemployment rates were significantly associated with 1992 IDU rates, and we observed a trend for an association of higher 1990 congregation rates with a less steep decline in IDU rate over time. Decreases in unemployment rates were associated with decreases in IDU rates. Changes in hard drug arrest rates were not significantly associated with changes in IDU rates over time.

Sensitivity and Supplementary Analysis

Arrest data are known to have limitations, mostly related to inconsistent reporting within counties.[41] To assess whether incomplete reporting affected our results, we reran the analyses with denominators for arrest rates that were adjusted for incomplete reporting.[41] Results of these models were quite similar to results of the main analyses: significant parameters remained significant and in the same direction, and nonsignificant associations remained nonsignificant. Arrest rates remained unrelated to changes in the IDU rate.

Because methamphetamine use spread during the study period, we added a variable to estimate the number of non-IDUs entering treatment for methamphetamine use per 10 000 population to Model 3. The relationships between arrests and injection drug use rates were unchanged.

Religious establishments may vary regionally for reasons unconnected to social cohesion, so we ran 2 additional models with an alternative measure of cohesion. One model incorporated both 1990 data for religious establishments and 2000 data for total civic establishments. The other included data for civic establishments but excluded data on religious establishments. In both cases, the values of other variables were essentially unchanged, and neither civic establishments nor religious establishments were significant predictors.

DISCUSSION

Changes in hard drug arrest rates did not predict changes in IDU population rates. These results are inconsistent with criminal deterrence theory and raise questions about whether arresting people for hard drug use contributes to public health.

Our study had certain limitations. We analyzed only a small number of explanatory variables to avoid statistical problems related to multicollinearity and modeling changes over time with observational data. Other variables not included in the study (e.g., the level of implementation of needle exchange and other harm reduction programs, other economic variables, and MSA-specific historical drug use or drug price trends) may have been related to IDU rates. Our findings are also limited to the extent that data were measured with error. Religious congregation rates were derived from only a sample of religious congregations, and this may have affected the associations we discovered. Annual data on congregations were not available.

TABLE 2—Linear Mixed-Effects Model Results for Predictors of Injection Drug User Rate per 10 000 Population in 93 Large US Metropolitan Statistical Areas, 1992–2002

Parameters	Model 1,[a] r (SE)	Model 2,[b] r (SE)	Model 3,[c] r (SE)
	Initial status, 1992		
Intercept	124.19*** (6.71)	124.84*** (6.01)	124.73*** (5.67)
Hard drug arrest rate initial values (1991)		2.52*** (0.53)	1.59** (0.57)
Unemployment rate initial values (1991)			8.46** (3.18)
Congregation rate initial values (1990)			−3.89 (2.26)
	Change, 1992–2002		
Time	−1.12* (0.46)	−1.33** (0.53)	−1.39** (0.47)
Hard drug arrest rate initial values (1991)		−0.08* (0.04)	−0.05 (0.05)
Hard drug arrest rate change (current y minus previous y)		−0.18 (0.40)	−0.15 (0.39)
Unemployment rate initial values (1991)			0.10 (0.26)
Unemployment rate change (current y minus previous y)			1.37** (0.48)
Congregation rate initial values (1990)			0.36 (0.19)

[a]Unconditional linear growth model with the number of years since 1992 as a predictor.
[b]Hard drug arrests added to variables in model 1.
[c]Unemployment variables and the congregation rate as controls added to model 2.
*P < .05; **P < .01; ***P < .001.

Ambiguity regarding the proportion of hard drug arrestees who were IDUs also limited the findings. Arrest data did not specify whether the offender injected drugs, although arrests of non-IDUs for drug-related offenses might well deter people from drug injection. Although hard drug arrest rates were not associated with changes in the IDU rate, imprisonment might be. Arrest data may fail to capture incapacitation effects if arrests do not lead to incarceration or if sentences are brief.[42] Furthermore, even data on time served may not reflect the perception of punitiveness among the population hypothesized to be deterred by incarceration.[43] A study of incarceration and injection among 1603 IDUs, however, found that incarceration was negatively associated with injection cessation.[7]

Because high arrest rates move many active IDUs from the community into the penal system, the lack of a negative relationship between arrest rates and IDU prevalence raises the question of why removal of IDUs does not reduce their number. One possible reason is that incarcerated IDUs are replaced by new IDUs. This might result if hard drug arrests or the fear of such arrests promote transitions to injecting among noninjectors.[23,25–27] Another possibility is that, in MSAs where hard drug arrests have been decreasing over time, the removal of new arrestees is balanced by the return of previously arrested IDUs from jail or prison. More research is needed on this question.

Deterrence-based approaches to reducing drug use thus appear not to reduce IDU prevalence. They may harm public health: IDUs in MSAs with higher hard drug arrest rates have been found to have higher HIV prevalence.[21] Furthermore, arrests for drug use disrupt the lives of drug users, their families, and their neighbors. High imprisonment rates for African American men have been suggested as a contributing factor to racial disparities in sexually transmitted infections in the United States.[44,45] Alternative approaches such as harm reduction, which prevents HIV transmission and increases referrals to treatment, may be a better foundation for policy.[46] ■

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Contributors

All authors helped to conceptualize the study and the analyses and contributed to writing the article. S. R. Friedman oversaw all aspects of the study's design and execution, had access to the data, supervised the project direct, and led the writing of the article. E. R. Pouget was project director, conducted much of the statistical analysis, and had access to all data. S. Chatterjee conducted statistical analyses and had access to all data. C. M. Cleland provided statistical guidance throughout the analyses and the writing of the article. B. Tempalski, a coinvestigator on the overall project that supported this article, helped plan analyses and clarified issues about various data sets. J. E. Brady, the first author on the article that published the annual estimates of numbers of IDUs in each MSA, also conducted the initial statistical analyses that led to this article. H. L. F. Cooper contributed to creating the introduction section and provided key ideas for statistical analyses.

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Human Participant Protection

This project was ruled to be exempt by the institutional review board of the National Development and Research Institutes, Inc., because it did not involve direct contact with human participants.

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