

ABSTRACT

Objectives. This study sought to determine whether introduction of a needle exchange program would be associated with increased crime rates.

Methods. Trends in arrests were compared in program and nonprogram areas before and after introduction of a needle exchange program in Baltimore. Trends were modeled and compared via Poisson regression.

Results. No significant differences in arrest trends emerged. Over the study period, increases in category-specific arrests in program and nonprogram areas, respectively, were as follows: drug possession, 17.7% and 13.4%; economically motivated offenses, 0.0% and 20.7%; resistance to police authority, 0.0% and 5.3%; and violent offenses, 7.2% and 8.0%.

Conclusions. The lack of association of overall and type-specific arrest data with program implementation argues against the role of needle exchange programs in increasing crime rates. (*Am J Public Health.* 2000;90:1933–1936)

Trends in Crime and the Introduction of a Needle Exchange Program

Melissa A. Marx, MPH, Byron Crape, MSPH, Ronald S. Brookmeyer, PhD, Benjamin Junge, MSc, Carl Latkin, PhD, David Vlahov, PhD, and Steffanie A. Strathdee, PhD

Needle exchange programs have been implemented to help reduce transmission of HIV and other blood-borne pathogens among injection drug users^{1–4} and to increase the frequency of drug abuse treatment referrals⁵ among addicted individuals. Studies have shown that needle exchange programs do not increase rates of drug use⁶ or increase numbers of discarded needles or syringes⁷; because drug use has been associated with crime,^{8,9} however, there are concerns that crime rates may increase in areas surrounding needle exchange programs after their introduction.^{10,11} We examined trends in arrests in Baltimore City before and after the opening of a needle exchange program.

Methods

Study Population

In 1997, Baltimore City had 657 250 residents; the average age of these residents was 35 years, and 60% were African American.¹² Approximately 50 000 Baltimore residents regularly used illicit drugs at that time, a substantial proportion of whom injected.¹³

In August 1994, the Baltimore City Health Department opened a needle exchange program housed at 2 locations. Program participants were exempt from syringe possession laws within city limits. During the first

14 months of operation, 3438 active injectors enrolled in the program, of whom 86% were African American; participants' average age was 42 years.

Data Collection

Arrest records for the period February 1994 through October 1995 were obtained from the Baltimore City Police Department. This enabled comparison of data 6 months before and 6 months after introduction of the needle exchange program. The immediate impact of the program was assessed, and seasonal variations in arrests were examined in a subsequent 8-month period. Dates and lo-

The authors are with the Johns Hopkins School of Hygiene and Public Health, Baltimore, Md. Melissa A. Marx, Byron Crape, Benjamin Junge, David Vlahov, and Steffanie A. Strathdee are with the Department of Epidemiology; Ronald S. Brookmeyer is with the Department of Biostatistics; and Carl Latkin is with the Department of Health Policy and Management. David Vlahov is also with the Center for Urban Epidemiological Studies, New York Academy of Medicine, New York City.

Requests for reprints should be sent to Steffanie A. Strathdee, PhD, Johns Hopkins School of Public Health, Department of Epidemiology, 615 N Wolfe St, Room E-6010, Baltimore, MD 21205 (e-mail: sstrathd@jhsph.edu).

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cations of arrests and up to 5 criminal charges were abstracted.

On the basis of input from law enforcement, crime, and drug abuse experts, as well as hypothesized associations of charges with needle exchange programs, arrest charges were categorized as follows: (1) drug possession, (2) economically motivated offenses, (3) resistance to police authority, or (4) violent offenses. Drug possession offenses included possession of drug paraphernalia and distribution/possession of heroin or cocaine. Economically motivated offenses consisted of property theft (e.g., nonvehicular breaking and entering, burglaries, vehicle break-in/theft) and prostitution, considered means of financing drug use. Resistance to police authority was defined as assaulting a police officer, resisting arrest, or violating parole/probation; these offenses were seen as indicators of increased frustration possibly resulting from law enforcement practices. Violent offenses included homicide, assault, rape, and armed robbery, which were considered potentially linked to drug trafficking.

We defined the area of maximum program impact with data from an ongoing evaluation of the program. We determined that 76% of participants reported walking to the program site and that travel time for these individuals averaged 15 minutes or less (median: 10 minutes).¹⁴ At an estimated speed of 2.0 mi per hour (3.2 km per hour), 84% of participants were estimated to live within a 0.5-mi radius of the program site. Therefore, areas within a 0.5-mi radius of the 2 program sites were combined and designated as "program areas," while areas within the city limits but outside of these radii were deemed "nonprogram areas."

Data Analysis

To examine the impact of the introduction of the needle exchange program on arrest trends in Baltimore City, we assessed the number of category-specific arrests before and after program introduction. Mean numbers of monthly category-specific and overall arrests for program and nonprogram areas were calculated (1) over the 6-month period before program introduction and (2) over the 14-month period after program introduction. Percentage changes in mean numbers of arrests were then calculated.

To formally assess trends in monthly arrests by proximity to the program site, we used Poisson regression models that considered overall and category-specific arrests. A regression line was fitted to $\log E(Y_t)$, the log of the expected number of monthly arrests at month t , which allowed for different slopes and intercepts in program and nonprogram areas before initiation of the needle exchange program. At initiation, intercepts and slopes were

allowed to change in both areas. The hypotheses tested were that changes in intercepts and slopes would not significantly differ in program and nonprogram areas before and after initiation of the needle exchange program and that changes in arrest trends in program areas would be similar to changes in nonprogram areas. We tested hypotheses using a likelihood ratio test with 2 degrees of freedom, accounting for overdispersion.¹⁵

Results

Overall, there were 53 848 drug-related arrests in Baltimore City during the study period. Before introduction of the needle exchange program, there were 2500 drug-related arrests per month. After introduction of the program, there was a slight increase in the number of drug-related arrests to 2775 per month.

Wide fluctuations seen in monthly averages of drug possession arrests citywide were evidenced by high extradispersion values (cocaine: 5.3; heroin: 9.8) in the Poisson model. Overall, the mean number of monthly arrests for drug possession rose slightly in program areas, from 150 (range: 100–190) to 175 (range: 110–270). Average numbers increased gradually in nonprogram areas, from 1020 (range: 825–1240) to 1160 (range: 925–1370) per month.

Frequency of arrests for economically motivated offenses remained constant in needle exchange program areas, averaging 30 per month before and after introduction of the program (ranges: 25–40 and 15–40, respectively). Arrests for economically motivated offenses increased in nonprogram areas from 240 (range: 180–260) to 300 (range: 230–70) per month over the same period.

Similarly, numbers of individuals resisting arrest remained consistently low in program areas, averaging 30 per month before and after program introduction (ranges: 25–40 and 25–45, respectively). However, in nonprogram areas, the average number of individuals resisting arrest increased slightly from 300 per month (range: 270–350) to 325 per month (range: 285–370) during the same period.

Average numbers of arrests for violent offenses dropped in program areas from 90 (range: 70–100) to 80 (range: 70–100) per month after introduction of the program. Increases in arrests for violence were seen over the same period in nonprogram areas; the number of such arrests increased from 820 (range: 670–920) to 890 (range: 710–1100) per month.

Table 1 summarizes percentage changes in overall arrests and category-specific arrests in program and nonprogram areas in the period after introduction of the needle exchange program relative to the preprogram period. The unadjusted

percentage change in overall arrests was higher in program (11.4%) than in nonprogram (7.6%) areas. However, there were no significant differences in arrest trends by category after program introduction relative to before program introduction in program vs nonprogram areas ($P > .05$).

Discussion

We found that increases in drug-related arrests were not more pronounced in needle exchange program areas than in other areas of Baltimore after establishment of the program. Although there were some differences in category-specific arrest trends in areas of close proximity to the program relative to outlying areas, these differences were not statistically significant.

If the needle exchange program had directly influenced rates of drug use, a disproportionate increase in drug possession arrests would have been expected in program areas relative to nonprogram areas. Although increases in heroin and cocaine arrests after the program had been established were slightly more pronounced in program than in nonprogram areas, trends were not significantly different. Variability in heroin and cocaine arrests reflected in the high model extradispersion values might be explained in part by "police sweeps," which are common and variable in Baltimore, especially in drug trafficking areas. Anecdotal reports indicate that police sweeps were occurring early after program introduction, and we hypothesize that these sweeps may have contributed to the increased number of drug possession arrests observed in program areas at that time.

If the program had indirectly resulted in increased drug use rates, we would expect to see drug users committing, and being arrested for, a relatively higher number of economically motivated crimes in program areas than in nonprogram areas. Our data did not support this hypothesis. In fact, a decrease was observed in numbers of arrests for break-ins and burglaries in program areas after the opening of the needle exchange program, whereas a slight increase was observed in nonprogram areas.

If the needle exchange program had increased drug users' perceptions of lawlessness in areas of close proximity to the program, an increase in instances of resisting arrest might have occurred. However, numbers of arrests for assault on a police officer decreased in program areas while increasing slightly in nonprogram areas. The opposite was true for numbers of arrests for parole or probation violation, which increased slightly in program areas and decreased in nonprogram areas. None of these differences were statistically significant.

If introduction of the needle exchange program had resulted in a perception of anar-

TABLE 1—Changes in Numbers of Arrests Before and After Introduction of the Needle Exchange Program (NEP): NEP and Non-NEP Areas, Baltimore, Md, 1994–1995

	NEP			Non-NEP			NEP vs Non-NEP ^a , P
	Mean No. of Arrests, Time 1	Mean No. of Arrests, Time 2	Change, %	Mean No. of Arrests, Time 1	Mean No. of Arrests, Time 2	Change, %	
Overall	278.3	299.4	11.4	2221.8	2475.4	7.6	.40
Drug possession	147.2	173.3	17.7	1018.8	1155.6	13.4	.32
Cocaine	101.5	117.8	16.0	743.3	818.0	10.0	.34
Heroin	59.8	80.2	34.1	342.3	433.5	26.6	.30
Paraphernalia	17.5	17.4	-0.4	150.2	135.2	-10.0	.39
Economically motivated	32.5	32.4	0.0	240.8	290.6	20.7	.29
Break-ins and burglaries	27.0	24.1	-10.6	209.7	225.4	7.5	.25
Theft from vehicles	1.8	3.0	63.6	10.8	21.6	99.8	.26
Prostitution	3.8	5.5	43.5	20.7	46.1	122.9	.43
Resistance	32.8	33.2	0.0	305.2	321.4	5.3	.38
Assaulting officer	11.3	9.6	-15.5	81.8	86.1	5.3	.30
Resisting arrest	16.3	17.6	7.0	128.7	147.5	14.6	.37
Probation/parole violation	10.7	11.6	8.5	138.8	134.8	-2.9	.36
Violence	89.0	82.6	7.2	817.2	882.3	8.0	.34
Rape	3.8	4.6	21.1	38.8	45.6	17.5	.40
Murder	5.0	6.0	20.0	48.2	66.3	37.6	.38
Assault	79.0	70.6	-10.7	724.3	767.4	5.9	.35
Robbery	16.7	19.1	15.8	150.5	174.3	14.4	.41

Note. Time 1 = 6-month period before NEP implementation; Time 2 = 14-month period after NEP implementation. Arrest categories and types are not mutually exclusive and thus will not sum to overall drug-related arrests.

^aBased on likelihood ratio test derived from Poisson regression model.

chy, increased violence might be expected. However, violent assault arrests decreased in program areas while increasing slightly in non-program areas. Violence trends in program vs nonprogram areas were, again, not statistically different.

In conducting this analysis, we assumed that coding of arrests was uniform across different areas of the city at different times. However, even if this assumption were invalid, there is no reason to believe that differences in coding would vary by region. In addition, we estimated crime trends using arrest data. While this approach may be subject to bias¹⁶ and may limit the conclusions that can be drawn, police department arrest data are considered superior to self-reported crime and self-reported arrest data in that both of the latter measures may be subject to response bias.^{17,18}

Arrest data may also be superior to crime data because drug-related crime is often "victimless" and therefore underreported. The validity of using arrests as a surrogate for crime could be ascertained by calculating the degree of correlation between arrests (as reported by police) and drug-related crime. However, this method would also be subject to bias because it relies on counts of drug-related crime.

Trends in crime, as measured by arrests, are also likely to be affected by secular factors (e.g., demographics, community policing practices). These factors were not taken into account here, which is also a limitation. In addition, some officers may have altered their

policing practices in program areas; however, no record of official changes in policing practices specific to program areas was found.

Our data are consistent with those gathered in a study conducted in Boston, Mass, in which no differences in arrests were observed in needle exchange program areas and non-program areas.¹⁹ Our data also corroborate reports from a study of New Haven, Conn, crime trends²⁰ and results from a multisite study of Manhattan, New Haven, San Francisco, Boston, and Portland, Oregon, crime trends.²¹ The lack of increases in arrests after the establishment of the needle exchange program in Baltimore is consistent as well with survey data showing that frequency of injection did not increase among program participants during the same time period.^{14,22}

In conclusion, based on results of analyses of Baltimore City arrests, needle exchange programs do not appear to be associated with increases in crime rates. This suggests that such concerns should not be a basis for formulating policy regarding these programs. □

Contributors

M. A. Marx and B. Crape participated equally in the writing of the article. M. A. Marx assisted with study design, directed study progress and planning, served as a liaison with the city health department, and wrote the manuscript and revisions. B. Crape assisted in study planning and design, served as a liaison with the city police department, compiled and analyzed the data, and contributed to the writing of the manuscript.

R. S. Brookmeyer directed and supervised data analysis and contributed to the writing of the methods section of the manuscript. B. Junge conceived and planned the study and performed the preliminary data analyses. C. Latkin directed study progress and reviewed the final manuscript. D. Vlahov oversaw study progress and contributed to major sections of the manuscript. S. A. Strathdee assisted in interpretation of the statistical analysis and contributed to the writing, editing, and revision of the final manuscript.

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