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Contributors

D. Rose originated the study, led its implementation, helped interpret the analysis, and wrote the article. J.N. Bodor supervised field implementation and conducted the analysis. J.C. Rice led the analysis. C.M. Swalm completed the geomapping procedures. P.L. Hutchinson assisted with the study and analysis. All authors reviewed and approved the final version of the article.

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Note. The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention, US Department of Agriculture, or National Cancer Institute.

Human Participant Protection

Institutional review board approval was not required because human participants were not involved in this study.

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Syringe Disposal Among Injection Drug Users in San Francisco

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To assess the prevalence of improperly discarded syringes and to examine syringe disposal practices of injection drug users (IDUs) in San Francisco, we visually inspected 1000 random city blocks and conducted a survey of 602 IDUs. We found 20 syringes on the streets we inspected. IDUs reported disposing of 13% of syringes improperly. In multivariate analysis, obtaining syringes from syringe exchange programs was found to be protective against improper disposal, and injecting in public places was predictive of improper disposal. Few syringes posed a public health threat. (*Am J Public Health.* 2011; 101:484–486. doi:10.2105/AJPH.2009.179531)

Needlestick injuries resulting from injection drug users (IDUs) improperly disposing of syringes present a potential risk of transmission of viral infections such as hepatitis and HIV to community members, sanitation workers, law enforcement officers, and hospital workers.[1–8] There have been no reports of HIV, HBV, or HCV seroconversion among children who incurred accidental needlesticks.[6,7,9–11] Among IDUs, syringe exchange program (SEP) utilization is associated with proper disposal of used syringes.[12–16] In 2007, the *San Francisco Chronicle* published a series of articles containing anecdotal reports of widespread improper disposal of syringes on city streets and in Golden Gate Park. The reports implied that SEPs were responsible for improper disposal of syringes.[17–19] Concerned about public safety, the San Francisco Department of Public Health worked with other researchers to (1) determine the prevalence of improperly discarded syringes in San Francisco, and (2) examine syringe disposal practices of IDUs.

METHODS

We used geographic information system (GIS) software[20] to map city blocks in the 11 San Francisco neighborhoods most heavily trafficked by IDUs, as determined on the basis of drug treatment and arrest data. Of the 2114 total city blocks in these 11 neighborhoods, 1000 were randomly selected for visual inspection to look for improperly discarded syringes. We extrapolated from the number of syringes found in the 1000 randomly selected blocks to estimate the total number of syringes in these 11 neighborhoods. Half of Golden Gate Park was also randomized and inspected, along with all 20 operational public self-cleaning toilets in San Francisco. A research assistant walked through each selected geographic area once from February 2008 through June 2008, visually inspecting all publicly accessible areas, including sidewalks, gutters, and grassy areas, for evidence of discarded syringes.

To examine syringe disposal practices, we conducted a quantitative survey on syringe disposal practices with 602 IDUs from January 2008 through November 2008. We used targeted sampling methods to recruit the

TABLE 1—Syringe Disposal Methods and Syringe Sources Among Injection Drug Users (n = 602): San Francisco, CA, 2008

Disposal Methods and Syringe Sources	%
Syringe disposal methods, prior 6 mo	
Syringe exchange program	62
Trash	53
Flushing down the toilet	15
Giving them away	12
Hospital/clinic	11
Public place	11
Police confiscation	8
Public disposal box	8
Sewer/manhole	4
Selling	4
Private disposal box	3
Pharmacy	1
Any improper syringe disposal methods in prior 30 d[a]	67
Syringe sources, prior 6 mo	
Syringe exchange program	83
Someone else who goes to syringe exchange program	52
Pharmacy purchase	33
Purchase from an unauthorized source[b]	34

[a]In a public place, in the trash, down the toilet, or in a sewer or manhole. The percentage of syringes disposed of improperly was 13% (8425 of 66 409).
[b]From a stranger on the street or a drug dealer.

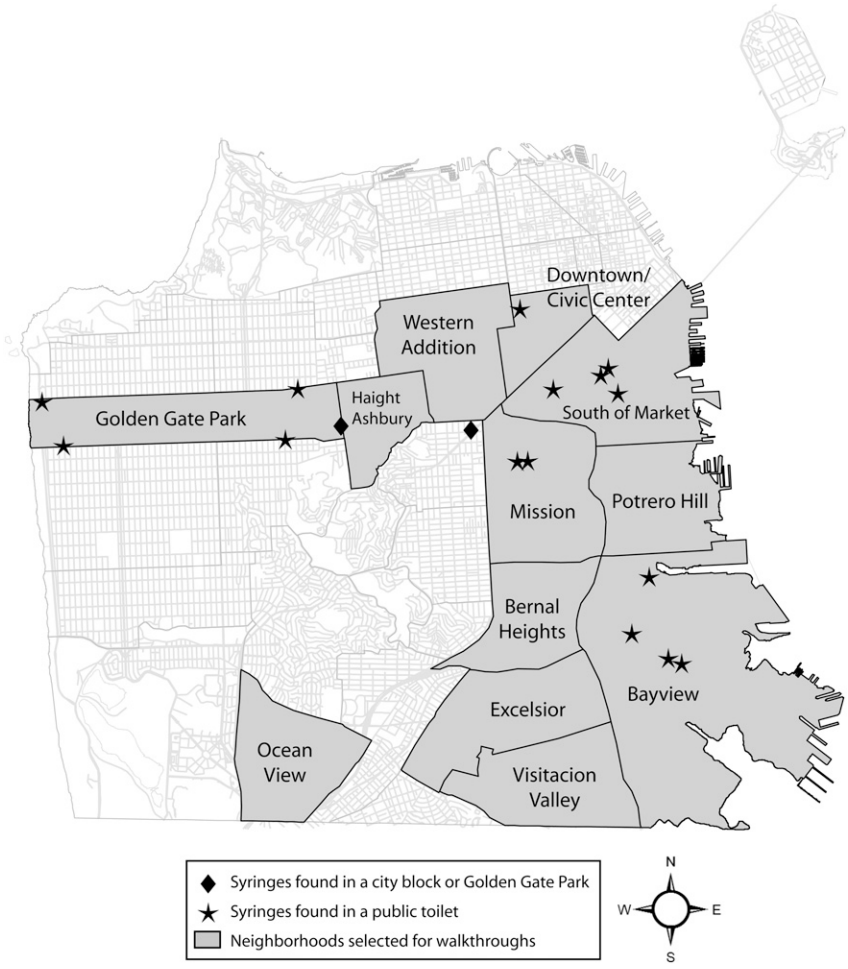

FIGURE 1—Locations of syringes found in selected neighborhoods (n = 20): San Franscisco, CA, March 2008–June 2008.

IDUs.[21,22] The main outcome variable was improper disposal of a syringe, defined as disposal in or on a street, sidewalk, park, parking lot, trash receptacle, toilet, sewer, or manhole. We used the Mantel–Haenszel χ^2 statistic to determine statistical significance ($\alpha < .05$) in bivariate analysis and logistic regression for multivariate analysis, using SAS (SAS Institute, Cary, NC) software version 9.13.

RESULTS

Twenty syringes were found during the visual inspection: 11 in the randomly selected blocks, 6 in Golden Gate Park, and 3 in the self-cleaning public toilets (Figure 1). By extrapolation, we estimated that there were a total of 108 improperly disposed syringes in the selected high-drug-use areas (93 on street blocks, 12 in Golden Gate Park, and 3 in public toilets). In none of the found syringes was there visible blood or an exposed needle; 5 of the syringes were capped, and the other 15 had the needle broken off. The majority of found syringes, although visible, were not easily accessible (e.g., behind a fence, in the gutter).

In the survey, 67% of IDUs reported improper disposal at some point over the prior 30 days (Table 1), with 13% (8425 of 66 409) of syringes being disposed of improperly. Eighty percent of syringes were disposed of at SEPs.

In multivariate analysis, improper syringe dispsal was independently associated with having injected in a public place (adjusted odds ratio [AOR] = 2.4; 95% confidence interval [CI] = 1.6, 3.6), having injected crack in the prior 30 days (AOR = 1.9; 95% CI = 1.0, 3.5), and having obtained syringes from an unauthorized source (AOR = 3.0; 95% CI = 1.9, 4.7). Having obtained syringes from an SEP was independently protective against improper syringe disposal (AOR = 0.20; 95% CI = 0.10, 0.40).

DISCUSSION

As far as we know, this is the first study to use GIS methods to map, systematically inspect,

and document the occurrence of improperly discarded syringes in public places. The number of syringes found was very small relative to the estimated 16 789 IDUs in San Francisco.[23] The potential danger posed by found syringes was low, with none being able to produce a needlestick without substantial handling. A substantial proportion of IDUs reported disposing of syringes improperly at some point in the prior 30 days. However, the proportion of syringes disposed of improperly was small.

A limitation of this study is the lack of visual inspection of all city blocks in San Francisco. Thus, it is possible that we missed areas where improper disposals were more frequent. However, we did inspect nearly half the blocks (1000/2114) in the 11 neighborhoods where drug-related arrests and drug treatment admissions were highest. Another limitation is that survey data were self-reported and thus subject to recall and social desirability biases. Finally, a significant proportion of study participants reported flushing syringes down the toilet and throwing them in the trash. We were unable to assess the risk these disposal methods posed to plumbers and sanitation workers.

This study addresses a complex social problem at the intersection of public health and public opinion. Findings demonstrate that SEPs benefit the community by collecting the vast majority of potentially infectious syringes from IDUs. Structural solutions to the remaining improper disposals of syringes include lengthening SEPs' hours of operation, installing public disposal boxes,[24] promoting pharmacy-based disposal,[25] and providing spaces for IDUs to inject safely.[26] ■

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Contributors

L. D. Wenger and A. H. Kral designed the study, developed the analysis plan, interpreted the data, and participated in writing and revising the article. A. N. Martinez conducted all geographic information system mapping activities and participated in revising the article. L. Carpenter conducted quantitative analysis. D. Geckeler and G. Colfax made recommendations regarding the design of the study and participated in revising the article.

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Human Participant Protection

This study was approved by the institutional review board of RTI International.

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