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Consequences of a restrictive syringe exchange policy on utilization patterns of a syringe exchange program in Baltimore, Maryland: Implications for HIV risk

Susan G. Sherman, PhD, MPH^{1,*}, Shivani A. Patel, PhD, MPH¹, Daesha V. Ramachandran, MPH², Noya Galai, PhD^{1,3}, Patrick Chaulk, MD, MPH⁴, Chris Serio-Chapman, BA⁴, and Renee M. Gindi, PhD, MPH¹

¹Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, 615 N. Wolfe Street, E6543 Baltimore, MD 21205

²Department of Population, Family and Reproductive Health, Johns Hopkins Bloomberg School of Public Health 615 N. Wolfe Street, E4527 Baltimore, MD 21205

³Department of Statistics, University of Haifa. Mt Carmel, Israel

⁴Baltimore City Health Department, 250 City Hall, Baltimore, MD 21202

Abstract

Background—Syringe distribution policies continue to be debated in many jurisdictions throughout the U.S. The Baltimore Needle and Syringe Exchange Program (NSP) operated under a 1-for-1 syringe exchange policy from its inception in 1994 through 1999, when it implemented a restrictive policy (2000–2004) that dictated less than 1-for-1 exchange for non-program syringes.

Methods—Data were derived from the Baltimore NSP, which prospectively collected data on all client visits. We examined the impact of this restrictive policy on program-level output measures (i.e., distributed:returned syringe ratio, client volume) before, during, and after the restrictive exchange policy. Through multiple logistic regression, we examined correlates of less than 1-for-1 exchange ratios at the client-level before and during the restrictive exchange policy periods.

Results—During the restrictive policy period, the average annual program-level ratio of total syringes distributed:returned dropped from 0.99 to 0.88, with a low point of 0.85 in 2000. There were substantial decreases in the average number of syringes distributed, syringes returned, the total number of clients, and new clients enrolling during the restrictive compared to the preceding period. During the restrictive period, 33,508 more syringes were returned to the needle exchange than were distributed. In the presence of other variables, correlates of less than 1-for-1 exchange ratio were being white, female, and less than 30 years old.

Discussion—With fewer clean syringes in circulation, restrictive policies could increase the risk of exposure to HIV among IDUs and the broader community. The study provides evidence to the potentially harmful effects of such policies.

*Corresponding author: Susan G. Sherman, PhD, MPH, Associate Professor, Epidemiology and Health, Behavior and Society, Johns Hopkins Bloomberg School of Public Health, 615 N. Wolfe Street, E6543, Baltimore, MD 21205, +1(410) 614-3518, ; Email: ssherman@jhsph.edu

Keywords

Needle-exchange programs; public policy; Baltimore; drug users; HIV

Introduction

Multi-person use of syringes continues to be a driving risk factor for acquiring HIV and viral hepatitis infections throughout the world [1–12]. It is estimated that injection with an infected syringe is responsible for one-third of HIV cases outside of sub-Saharan Africa [13]. Needle and syringe exchange programs (NSPs) are cost-effective, low-threshold interventions in which sterile needles, syringes, and other injection paraphernalia are distributed to people who inject drugs (PWIDs) and a substantial body of research has documented the effectiveness of these programs over the past 25 years [1–5].

With few exceptions [14, 15], NSPs have been associated with decreases in prevalence and incidence rates of blood-borne diseases such as HIV [16–19], hepatitis B virus, and hepatitis C virus (HCV) [4, 20], declines in risky syringe sharing behaviors [21–24], and reduction in the frequency of injection [25, 26]. Additionally, NSPs provide numerous medical services including HIV and STI testing, TB screening, flu shots, Hepatitis B vaccination, drug treatment referrals, and on-site medical care, to an otherwise difficult to access population [27].

The US Public Health Service recommends to have a clean syringe for every injection [28], effectively increasing the “coverage” of sterile needles and syringes for every injection [7, 29]. The degree to which NSPs impact HIV rates among PWIDs is predicated on program policies, which affect the number of distributed syringes. Liberal dispensation policies (e.g., unrestricted or loosely restricted distribution) compared to strict 1-for-1 exchange (e.g., a single sterile syringe is distributed for each used syringe) have been found to be associated with higher coverage rates of sterile syringes per injection, lower HIV incidence, and safer injection practices [6, 8, 30].

Syringe coverage is best met in the context of needs-based syringe distribution compared to 1:1 syringe exchange, given the almost certain higher number of syringes distributed [7, 31]. Needs-based distribution effectively decouples syringe distribution from syringe collection so that individuals can access as many syringes as needed, independent of the number of used syringes returned - thereby increasing coverage. In 2000, the NSP in Vancouver, BC shifted from a one-for-one syringe exchange to a needs-based distribution model in which individuals could access as many syringes as needed without requiring return of used syringes. The policy shift was associated with significantly decreased syringe borrowing, lending, and HIV incidence among PWIDs [6]. Further evidence is provided from a study among clients at 23 of the 24 NSPs in California examining the relationship between syringe dispensation policies and HIV risk [8]. Clients attending an NSP in California with a needs-based distribution policy were significantly less likely to report reusing or sharing syringes in the past 30 days compared to clients of one-for-one NSPs in California [8]. There were no significant differences by dispensing policies in distributive or receptive syringe sharing.

From its inception in 1994 through the end of 1999, the Baltimore City NSP operated with a 1-for-1 exchange policy. Beginning in January 2000, the syringe exchange policy became more restrictive: 1-for-1 exchange for program-distributed syringes, indicated by purple and gray capped syringes, and 2-for-1 for all non-program syringes. In 2005 the NSP returned to the unconditional 1-for-1 policy. The current study describes the impact the restrictive policy change on syringe exchange program performance, by examining five program-level distribution and client measures before, during, and after the restrictive exchange policy. Additionally, we analyzed client-level characteristics associated with less than 1-for-1 exchange in order to investigate whether any group was more likely to be impacted by the policy change. A discussion of the effects of NSP policies is timely given the continued debate of the US 15-year-old policy banning the federal government from funding NSPs, as well as the expansion of a range of health services, including syringe exchange, that could be a part of new health delivery systems which will develop out of the Affordable Care Act.

Methods

Baltimore Needle and Syringe Exchange Program Operation and Exchange policy

The Baltimore City NSP began to exchange used needles and syringes for sterile ones at two sites in November 1994 and over time, expanded to 18 sites throughout the city by 2007. The Baltimore NSP provided needle exchange and ancillary services, such as HIV testing and opioid drug treatment referrals, on a mobile van at select sites during six days a week at various times throughout the day and evening. Clients received two syringes at their initial visit in addition to syringes exchanged as well as a brief training on safer injection orientation.

From 1994 to 1999, the Baltimore NSP employed an unconditional 1-for-1 syringe exchange policy (“1-for-1 exchange”) in accordance with Maryland state law. The exchange policy became more restrictive in practice, beginning in 2000, when only program syringes, tracked with a purple or gray cap, were exchanged for one sterile syringe, while two non-program syringes were exchanged for one sterile syringe (“restrictive exchange”). The reason provided for this policy change by the former NSP Director was a budget reduction. The restriction was solely a matter of practice, as the law remained unchanged. The 1-for-1 exchange policy was resumed in January of 2005. In the current study, we focus on NSP administrative data collected during the 1996 to 2006, to examine the effects of the restrictive policies on five program-level output measures by comparing the time periods preceding (1996–1999), during (2000–2004), and following (2005–2006) the restrictive exchange policy. Further, we examined client characteristics associated with receipt of less than 1-for-1 in the period before and during the policy shift.

Data sources and study population

At enrollment, clients were assigned a unique identifier (based on a combination of birthdate, mother’s maiden name, and initials) that was used to record background and utilization information at subsequent visits. The staff’s familiarity with the clients helped to prevent individuals from using multiple unique identifiers. During the enrollment visit they provided demographic and current drug use practices. At each subsequent visit to any

Baltimore NSP site, the date, the site attended, and the number of program and non-program syringes returned and distributed were recorded in a centralized electronic database. The study was approved by IRB of the Johns Hopkins Bloomberg School of Public Health.

Program output measures

Five program-level distribution and client measures were used to characterize the Baltimore NSP performance over time: 1) total syringes distributed by the program; 2) total syringes returned to the program; 3) ratio of distributed:returned syringes; 4) total client volume; and 5) new client enrollment. We calculated the annual total number of syringes distributed and returned by summing the corresponding numbers recorded on each visit over all visits per calendar year during the 10-year period. The distributed:returned syringe ratio for each calendar year was calculated by dividing the annual total distributed syringes by the annual total returned syringes. The annual total client volume was defined as the total number of unique identification numbers recorded in a given year across all NSP sites. The annual total number of new clients was similarly derived from the number of new clients exchanging syringes with the NSP for the first time in each calendar year, across all sites.

In addition, the syringe exchange ratio at the client-level was considered to be a measure of whether the program met the demands of clients. These syringe exchange ratios were calculated per visit by dividing the number of syringes distributed by the number of syringes returned. Visits were then classified as either 1-for-1 exchange of distributed:returned syringes, or less than 1-for-1. A less than 1-for-1 exchange ratio (“low ratio”) indicated that returned used syringes exceeded the number of clean syringes provided by the NSP.

Client demographic characteristics

Demographic variables of interest collected at enrollment included age, sex, race, employment, marital status, and housing status. Drug use characteristics included previous experience with drug treatment (any versus none) and injection history (years of injection). The number of years of injection was calculated by subtracting age at first injection from current age. Individuals who reported living in a shelter/welfare boarding house, on the street, or in a transitional housing program were considered homeless.

Analysis

At the program-level, we plotted the annual Baltimore NSP program-level distribution and client measures. In addition, we computed average annual output measures for the periods before (1996–1999), during (2000–2004), and after (2005–2006) the restrictive exchange policy period. At the client-level, we were interested in assessing demographic characteristics associated with the time periods before (1996–1999) and during (2000–2004) the restrictive policy period. After describing client characteristics from the two time periods, we conducted log-binomial regression analysis to model the relative risk of receiving a less than 1-for-1 exchange ratio per individual visit as a function of client demographic characteristics separately for before (1996–1999) and during (2000–2004) the policy. The post-policy period was not included because the length of this period was markedly shorter than the previous two periods because of a change in NSP databases, and the latter comparison provided evidence that might have been affected by the policy shift.

Generalized estimating equations (GEE)[32] were used to account for multiple visits made by a single client and provided valid estimates for the regression coefficient and their standard errors. The enrollment visit was excluded because clients received at least two new syringes regardless of the number returned, leaving 58,504 visits in the 1-for-1 exchange period and 77,815 visits in the restrictive exchange period for analysis. SAS 9.2 (SAS Institute, Cary, NC) was used for data management and analyses.

Results

Program-Level Outputs

Table 1 displays program-level output measures during the three policy periods. The average annual number of distributed syringes dropped from 491,198 in 1996–1999 to 242,602 in 2000–2004, a 50% reduction in the number of distributed syringes before and during the policy shift. The average annual number of distributed syringes increased the year after the policy was repealed. The average annual number of returned syringes declined from 494,333 to 276,110 during the restrictive period. During the restrictive period, 33,508 more syringes were returned to the needle exchange than were distributed. Similar to the number of distributed syringes, the average annual number of returned syringes increased after the policy was repealed, but not to pre-restrictive policy levels. In 1996–1999, the average annual distributed:returned ratio was 0.99. In 2000, the ratio of distributed:returned syringes dropped to 0.85, indicating that the program did not distribute as many syringes as were returned. On average, the ratio of distributed to returned syringes during the five-year restrictive exchange period was 0.88. The total distributed:returned syringe ratio went back up to 0.99 after the restrictive policy was abandoned in 2005. The average annual number of clients attending the Baltimore NSP also declined from 3,205 in the 1-for-1 exchange period to 2,801 in the restrictive exchange period. The average number of annual clients and newly enrolled clients did not appreciably increase in the year after the policy was repealed.

Individual characteristics associated with <1:1 exchange ratio

For the individual-level analysis, the demographic composition of enrolling clients for the pre-policy and policy periods is displayed in Table 2. A total of 5,529 clients were enrolled between 1996–1999 during the 1-for-1 exchange period (pre-policy), and 3,634 clients were enrolled during the subsequent 2000–2004 restrictive period. The majority of the sample was male, aged over 30 years, African American, not married, injecting drugs less than 20 years, had been in drug treatment at some point, and were not employed. All background characteristics, except for homelessness, statistically differed between the policy periods. The most substantial difference was the lower proportion of enrolled clients who were African-American or older than 30 years during the restrictive compared to the earlier period.

Table 3 displays the unadjusted and adjusted relative risk models that examine the association between individual-level characteristics and “low” (less than 1:1) exchange ratio. In the presence of other variables, clients of white or other ethnic backgrounds (vs. African American) were more likely to receive low exchange ratio in both the 1-for-1 exchange period (Adjusted risk ratio[ARR]=1.19; 95% Confidence Interval [CI]: 1.05,1.36) and

restrictive exchange period (ARR=1.28; 95% CI: 1.16,1.41). In the restrictive exchange period, male clients (ARR=0.90; 95% CI: 0.82, 0.99) and those aged under 30 years (ARR=0.88, 95% CI: 0.78, 0.99) were less likely to receive low 1:1 exchange ratio.

Discussion

The current study examined the syringe exchange and client patterns before, during, and immediately after a restrictive policy in syringe distribution at the Baltimore NSP was enacted. We found that the number of syringes distributed and the number of syringes collected annually were roughly halved during the restrictive policy period compared to the preceding period. Moreover, the number of clients enrolled and the number of visits per client were lower during the restrictive policy period than the preceding period. These results could indicate an increase in the circulation time of unsafe syringes among the population of injection drug users during the restrictive policy period [29], directly calling into question the public health utility of such a policy. Further, it is likely that restrictive NSP policies result in people obtaining syringes from sources other than the NSP, which has been found to be associated with distributive syringe sharing, the passing of used needles/syringes to other PWIDs [33]. The study can provide insights into current day policies regarding syringe exchange policies, even in light of the age of the data.

At a client level, the restrictive policy may have had a disproportionate impact on women, and those aged over 30 years, both of whom were more likely to receive a low exchange ratio during the restrictive policy period. During both the preceding and restrictive periods, whites and other race clients were more likely to receive a low ratio compared to African Americans. There could be a number of explanations why certain types of individuals were less likely to receive 1:1 syringes at the individual, network, or structural levels. At the individual level, perhaps youth, whites, and women were less likely to bring in NSP syringes because they were more likely to obtain syringes from sources other than NSPs. At the network level, women are less likely to inject themselves than men [34], implying that they are likely to have fewer syringes in general, including those from the NSP, compared to men. At the structural level, women and youth could carry syringes less frequently than men and older IDUs, due to past experiences of police harassment or greater fear of police given that people can be arrested for carrying drug paraphernalia.

The discordance between staff and client profiles could explain the more stringent application of the restrictive policy to clients who differed demographically from the staff. During the time of the study, there was one African American female and the rest of the staff were African American males, all of whom were over 30 years old. There is an extensive body of health services research that has found that patient-provider race discordance affects healthcare processes (e.g., quality of care) and outcomes (e.g., involvement in and satisfaction with care) [35–37]. Provider and patient or in this case, client relationships, are influenced by a number of factors beyond demographic concordance, but these discordant factors could have played a role in the differential implementation of the restrictive policy for some and not other clients. In an earlier analysis of these data, we found that women and youth (<30 years old) had lower rates of NSP retention compared to male and older clients, which is supported in other settings [38, 39]. Further, studies have found that NSPs are

under-utilized by young IDUs, regardless of NSP distribution policies [40]. No matter the reasons why these populations did not access the NSP or received less syringes, the result was less access to sterile syringes, thereby elevating individuals' HIV and HCV risk. It is important to note the successes of the Baltimore NSP since the policy shifted in 2000. In large part due to the great advocacy of the Baltimore NSP and health department, the Maryland state government changed the law to allow for a needs-based distribution which went into effect in October 2014.

The results must be viewed in light of several limitations. We are not able to document the effects of the restrictive policy on incident HIV or HCV given the lack of biological data collected at the NSP. The lack of such data limits the conclusions that we can draw on the restrictive policy's impact, although given extensive previous literature, inferences can be made. Trends in HIV incidence from a cohort study of IDUs, the "ALIVE" study, indicate that declines occurred in the late 90s into the 2000s, likely due to factors such as prevention education and the uptake of antiretroviral therapy among ALIVE participants [41].

We are unable to rule out alternative explanations for the reduction in program output measures during the restrictive exchange. The NSP did not change any locations where it distributed syringes. We are unaware of any changes in policing practices [42, 43] or advertising campaigns that could have affected the change in program measures during the study time periods. Further, we are not aware of any other distribution schemes (e.g., pharmacy sales). During the time periods included in the current study, the Baltimore City NSP was the only legal and known NSP in the state of Maryland. Latkin and Foreman found that among Baltimore IDUs (N=741), the primary sources of syringes in addition to the NSP included needle sellers, pharmacies, and people with diabetes [44]. Further, there is no documented drop in heroin supply during the restrictive policy period that could have led to less demand for syringes. Lastly, due to changes in the database used by the Baltimore NSP, we were unable to analyze a longer period of data directly after the policy change. Although the post-policy period was informative, it was only 25% of the length of time of the preceding time periods, thereby shortening the time period that we can examine if the trends continued to improve, as indicated in the one post-policy calendar year for which we have data. The current study was, however, strengthened through the use of administrative data instead of self-report, as there is evidence that PWIDs underestimate NSP utilization through self-report [45].

Several conclusions can be drawn from the current study. Restrictive syringe exchange policies, which still exist in the form of one-for-one exchange policies in cities such as Washington, DC [46], are somewhat contradictory to the public health goals and potential benefits of NSPs. In addition to providing sterile syringes, NSPs offer clients a range of health and social services, who might otherwise have limited options. Given the infrequency of NSPs with such restrictive policies, few studies have been able to document the deleterious effects of such policies.[6–8] The closure of an NSP in Windham, Connecticut resulted in significant increase syringe reuse and syringe sharing [47].

Over the past 25 years, NSPs throughout the U.S. have proven one of the most cost-effective public health interventions – sterile syringes, to hundreds of thousands of PWIDs. Further,

they have provided and connected PWIDs to numerous needed medical, social, and mental services [48–50]. With the increased discussion at the federal level of re-lifting the federal ban on funding NSP programs, it is vital that new programs are not hampered by restrictive policies.

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Table 1

BNSEP program-level outputs by policy period

Calendar period	Exchange policy	Annual syringes distributed	Annual syringes returned	Average annual distributed: returned	Average clients per year	Average new clients per year	Average client visits per year
1996 to 1999	1-for-1 exchange for all syringes	491,198	494,333	0.99	3,205	1,382	24,658
2000 to 2004	Restrictive exchange: 1-for-1 for program syringes only	242,602	276,110	0.88	2,801	727	20,276
2005 to 2006	1-for-1 exchange for all syringes	311,319	313,976	0.99	2,492	531	20,740

Table 2

NSEP Client characteristics at enrollment during the 1-for-1 exchange and restrictive exchange periods

	Full Sample (N=9,163)	1-for-1 Exchange Period, 1996–1999 (n=5,529)	Restrictive Exchange Period, 2000–2004 (n=3,634 [*])	P-value
Male	6,254 (68.3)	3,820 (69.1)	2,434 (67.0)	0.03
Age < 30	1,375 (15.0)	652 (11.8)	723 (19.9)	<.01
High school degree/GED	5,649 (62.0)	3,349 (60.9)	2,300 (63.6)	<.01
Black race	6,434 (70.2)	4,396 (79.5)	2,038 (56.1)	<.01
Homeless	336 (3.7)	195 (3.5)	141 (3.9)	0.38
Single marital status ^{**}	864 (9.5)	492 (9.0)	372 (10.3)	0.03
>20 years of injection drug use	3,410 (37.5)	2,189 (39.9)	1,221 (33.8)	<.01
Drug treatment (ever)	5,082 (60.3)	2,826 (57.1)	2,256 (64.8)	<.01
Employed	1,423 (16.0)	732 (13.4)	691 (20.0)	<.01

^{*} 2,451 clients with visits during the restrictive exchange period were enrolled in the 1-for-1 exchange period and their characteristics are shown in that column.

^{**} Includes divorced, widowed, and separated.

Missing as follows: High school/GED, n=177; homeless, n=181; marital status, n=186; drug treatment, n=884; years injecting, n=196; employed, n=383.

Table 3

Characteristics associated with low (<1:1) syringe exchange-ratio

	1-for-1 Exchange Period, 1996–1999 (n=5,476 individuals; 58,504 visits)		Restrictive exchange period, 2000–2004 (n=6,085 individuals; 77,815 visits)	
	RR (95% CI)	ARR* (95% CI)	RR (95% CI)	ARR* (95% CI)
White/Other Race (ref=Black)	1.63 (1.38, 1.92)	1.19 (1.05,1.36)	1.28 (1.17, 1.40)	1.28 (1.16,1.41)
Male	0.96 (0.84, 1.11)	1.02 (0.90,1.15)	0.88 (0.80, 0.97)	0.90 (0.82,0.99)
Age <30 years	1.78 (1.42, 2.23)	1.04 (0.87,1.24)	1.05 (0.94, 1.18)	0.88 (0.78,0.99)
No GED/HS	1.03 (0.90, 1.17)	1.01 (0.90,1.13)	1.03 (0.93, 1.13)	1.02 (0.93,1.12)
Married	0.91 (0.71, 1.16)	0.89 (0.71,1.10)	1.10 (0.94, 1.28)	1.09 (0.94,1.26)
Injecting <20 years	1.32 (1.16, 1.50)	1.06 (0.94,1.19)	1.09 (0.99, 1.19)	1.02 (0.93,1.12)
Homeless	1.12 (0.82, 1.52)	1.04 (0.79,1.37)	0.94 (0.75, 1.18)	0.95 (0.76,1.17)

* Adjusted for all other variables in the table and whether client made multiple exchange visits