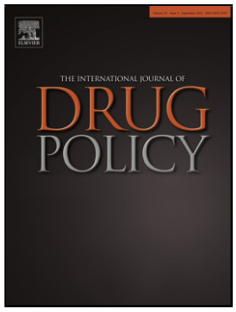

Title: The effect of on-site and outreach-based needle and syringe programs in people who inject drugs in Kermanshah, Iran

Author: Mehdi Noroozi Hamid Soori Alireza Noroozi Seyed Saeed Hashemi Nazari Yadoallah Mehrabi Ahmad Hajebi Hamid Sharifi Peter Higgs Ali Mirzazadeh

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Highlights

- Outreach needle and syringe program (NSP) model is as effective as facility-based NSP in reducing the harm associated with drug injection.
- The outreach model is even more effective in reducing the lending of syringes.
- Both NSP models increase the rate of HIV testing.
- We found that less than one-quarter of people who inject drugs have access to NSP services through outreach services, which need to be scaled up.

The effect of on-site and outreach-based needle and syringe programs in people who inject drugs in Kermanshah, Iran

Mehdi Noroozi[1], Hamid Soori[1], Alireza Noroozi[2,3], Seyed Saeed Hashemi Nazari[1], Yadoallah Mehrabi[1], Ahmad Hajebi[4], Hamid Sharifi[5], Peter Higgs[6], Ali Mirzazadeh[5,7]*

[1]Department of Epidemiology, School of Public Health, Shahid Beheshti University of Medical Science, Tehran, Iran

[2]Iranian National Center for Addiction Studies (INCAS), Iranian Institute for Reduction of High-Risk Behaviors, Tehran University of Medical Sciences (TUMS) , Tehran, Iran

[3]School of Advanced Technologies in Medicine (SATM), Tehran University of Medical Sciences (TUMS) , Tehran, Iran

[4]Mental Health Research Center, Tehran Institute of Psychiatry, Faculty of School of Behavioral Sciences and Mental Health, Iran University of Medical Sciences (IUMS), Tehran, Iran

[5]Regional Knowledge Hub, and WHO Collaborating Centre for HIV Surveillance, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

[6]Curtin University Research Fellowship. The National Drug Research Institute at Curtin University. Australian Government under the Substance Misuse Prevention and Service Improvement Grants Fund.

[7]Global Health Sciences, University of California, San Francisco, CA, USA

***Corresponding author:** Ali Mirzazadeh

Address: 550 - 16th Street, 3rd Floor, San Francisco CA 94158

Phone 415-476-5821

Email ali.mirzazadeh@ucsf.edu

Abstract

Background: Needle and syringe programs (NSP) are widely used to reduce harms associated with drug injection. This study assessed the effect of facility-based (on-site services at drop-in centre) and outreach NSP model on injection risk behaviours.

Methods: We used self-reported data from 455 people who inject drugs (PWID) during 2104 in Kermanshah, Iran to measure demographic characteristics and risk behaviors. We also used both self-reported and program data to identify their main source of injection equipments. Accordingly, we grouped participants into three sub-groups: facility-based NSP users, outreach NSP users and non-users (comparison group). Using coarsened exact matching, we made the three groups statistically equivalent based on age, place of residence, education and income; and compared them regarding the proportion of borrowing or lending syringes/cookers, reusing syringes and recent HIV testing.

Results: Overall, 76% of participants reported any NSP service use during the two months prior to the interview. Only 23% (95%CI: 17-27) reported the outreach NSP as their main source of syringes. Using facility-based NSP significantly decreased recent syringe borrowing (OR: 0.27, 95%CI 0.10-0.70), recent syringe reuse (OR 0.38, 95%CI 0.23-0.68) and increased recent HIV testing (OR 2.60, 95%CI 1.48-4.56). Similar effects were observed among outreach NSP users; in addition, the outreach NSP model significantly reduced the chance of lending syringes (OR: 0.31, 95%CI 0.15-0.60), while facility-based did not (OR: 1.25, 95%CI 0.74-2.17).

Conclusion: We found that outreach NSP model is as effective as facility-based NSP in reducing injection risk behaviours and in increasing the rate of HIV testing. The outreach model is even more effective in reducing the lending of syringes to other PWID in compare to facility-based NSP model. Scaling up outreach NSP is an effective intervention to further reduces the transmission of HIV via needle sharing.

Keywords: People who inject drugs, matching, needle and syringe programs, injection risk behaviours

Introduction:

Recently UNAIDS/WHO reported that about 270,000 people are living with HIV in the Middle East and North Africa (1). In Iran, HIV prevalence is low in the general population (less than 1%), while concentrated among people who inject drugs (PWID) (2, 3). There are approximately 170,000-230,000 PWID in Iran, of whom, 15% infected with HIV (4, 5). Over two-third of all new identified HIV cases have been attributed to unsafe injection (2, 6-8). To reduce the risk and harms associated with injection, Needle and Syringe Programs (NSP) have been developed and implemented in Iran since 2002. NSP is delivered through specific facilities, called Drop-in Centres (DIC) to those who have access to the services and by outreach teams to those PWID who are off services (6, 9, 10).

NSP outreach is a community-based intervention strategy, which reaches PWID at the venues where they live, socialize, buy or inject drugs (11). The DICs and outreach NSP provide sterile needle and syringe services, deliver training on safe injecting practices and overdose prevention. They also provide condom and safe sex education (12, 13). Safe injection kits distributed through NSP consisted of 3-4 syringes, extra 3-4 needles, sterile water vials, and alcohol pads at every visit for anyone self-reported as injecting drug user. In outreach, the same strategy is being implemented (7). The two models of NSP services are the main sources of access to syringe and needle in Iran (3). People who inject drugs can use both on-site and outreach NSP services, whatever they have access too (14).

The effectiveness of the two models of NSP has not been evaluated in Iran. The cost for establishing and maintaining a new NSP site is much higher than adding-on or expanding an outreach-based NSP to an existing Drop-in Centre or a health facility. Some NSP sites have their focus on on-site services and less interested to provide outreach NSP. Part of this is the lack of knowledge or believes on the effectiveness of outreach activities; the big question is that are they truly reduce the harm and injection risk behaviours when delivered at the community. The objective of this study is to evaluate the effectiveness of the two NSP models, on-site services at DICs and outreach-based NSP, on injecting risk behaviors of PWID in Kermanshah, an urban setting in southwestern part of Iran. Kermanshah is the first place where HIV epidemic was emerged in Iran and triggered the national response to HIV.

Methods

We used data from a cross-sectional study of PWID in Kermanshah. Study participants were recruited from the community and NSP sites between September and December 2014. PWID from NSP sites were recruited by convenient sampling among the eligible PWID attended the facility, whereas other PWID were recruited by outreach and peer-referral. The outreach team regularly attended venues where PWID congregated frequently, approached the PWID to check the eligibility and, if agreed, recruited them to the study after consenting. They were also asked to refer their peers to the study by distributing referral coupons.

The study inclusion criteria were:

- Males aged over 18 years
- Self-reported drug injection within the last month prior to the interview
- Willingness to provide written consent to participate in the study.

We collected data through face-to-face interviews. The questionnaire consisted of five sections including demographic information, the type of drug injected the most, duration of drug use and injection, frequency of injection, risk behaviours such as sharing (borrowing or lending) syringes/needles and cookers, reuse of syringes and the number of injecting partners they have shared syringes/needles with during the month prior to the interview. We also asked whether the participant has tested for HIV in the last 12 months. We validated the content of our questionnaire with inputs from eight experts in behavioural science, epidemiology and harm reduction areas.

Our primary exposure was whether study participants have used on-site or outreach NSP services as their main source of syringes in the last two months prior to the interview. We measured it based on the self-reported data, and then validated by checking the sites' charts and outreach log books at the study site. More specifically, as a rough cutoff, if a participant reported NSP site as the source of 70% or more of their syringes, they have been considered as on-site NSP users; and if they have been receiving most (70% or more) of syringes from outreach services, we assigned them to outreach-based NSP users' group. Those who have reported neither on-site nor outreach NSP as their main (70% or more) source of syringes were considered as NSP non-users group. In case of discrepancy, we allocated the participants based on the charts and data in the logbook.

No identifying information was collected. During the consent procedure, participants were provided sufficient information about the study objectives, risk and benefits of participating in the study, and the right that they can withdraw from the study at any time without any penalty. The study protocol and all the procedures were reviewed and approved by the Research Ethics Committee of the Kerman University of Medical Sciences (Ethics Code: k/93/204).

In this paper, we applied a novel technique, Coarsened Exact Matching (CEM), to match the groups, outreach and facility-based NSP users and non-NSP users based on certain covariates and made statistically equivalent comparison groups to estimate the effect of the two NSP models on injection risk behaviours. The CEM created a comparable sub-sample of the three subgroups based on age, place of residence, income and education level. CEM is a statistical matching technique, used to improve causal inferences of observational studied (17). CEM attempts to control for the potential confounding influence of 'pre-exposure' covariates on the outcome of interest, by matching 'exposed' cases with 'non-exposed' cases that are approximately similar to them with regard to covariates (18). In our study, the CEM approach allowed us to designate a counterfactual for each participant in the exposed group, i.e. outreach-based NSP, and mimic a randomized clinical design. The CEM approach is recommended especially when an experimental design is not feasible (19). The effect of public health programs, like NSP, which are part of ongoing services, are hard and unethical to be assessed by randomization controlled trials (which provide the highest quality of evidences). We chose CEM over other matching techniques, such as propensity score matching, to achieve balanced groups, reduce the need for multiple iterations and re-matching, and maximize the number of possible matches in our sample. Also, it was not known to us what are the predictors for using outreach or on-site NSP, which is crucial to apply a propensity matching analysis (20, 21).

Using CEM, we allocated every study participant into one of the specified set of strata in which all were exactly matched on a set of coarsened or matched variables. Matched members were then assigned a weight specific to their stratum and representative of the proportion of all members present in that stratum (20). Then, we calculated a statistical measure called L1 distance. L1 varies between 0 and 1 and values close to zero indicate that the matching is perfect and ensure the comparability of the two groups (15). We calculated the L1 before and after applying CEM, and we observed that L1 decreased from 0.43 to 0.00003 after coarsened exact matching. It was reassuring that the imbalance between the two comparison groups is very small and can be ignored. Given the matched subgroups, we reported the descriptive statistics for the pool sample and matched sub-sample. We applied logistic regression models to estimate the effect of outreach and facility-based NSP on injection risk behaviours. The effects were reported as odds ratio (OR) and 95% confidence interval (CI). All data analysis were performed using STATA v.11.

Results

Characteristics of study participants

A total of 455 men who injected drugs participated in this study. The characteristics of participants in pooled (unmatched) and matched sub-sample are presented in table 1. Matched sample (n = 278) had a mean age ± standard deviation (SD) of 34.5 ± 8.6 (range 19-58) years. The majority of respondents were under 30 years old (54.6%). Also, 61.8% of participant had less than a high school education, 77.3% were single, 52.5% lived with their families, and 87.3% had monthly income less than $150. About 88.5% reported their first drug use, and 76.4% had their first injection under the age of 25 years old.

Behaviors of study participants and estimates of NSP outcomes

Overall, 76% of study participants reported any NSP service use during the two months prior to the interview. And only 23% (95%CI: 17-27) have used outreach NSP as their main source of their syringes.

Table 2 shows NSP outcomes in matched and unmatched study sub-samples. Only matched results are discussed here. Regarding needle sharing behaviors, about 30% of respondents reported “ever borrowing a syringe” and 12% reported “recent borrowing a syringe”. Similarly, 13% of participants reported “recent lending a used syringe” to other PWID. Ever and recently borrowing or lending a cooker was more commonly reported by participants (68% and 53%, respectively). The majority of participants (86%) reported “reuse of their own syringes” in the month prior to the interview. The mean number of injecting partners whom the study participants had shared syringe/needle or cooker with was 2.31±1.45. The majority of PWID (85.3%) reported “an HIV test in the past 12 months”.

In Table 3, we present the effect of the two NSP models, facility-based and outreach, on different injection risk behaviours in the pooled and matched sub-samples. In the matched sub-sample, PWID who used facility-based NSP services were less likely to report borrowing syringes in past month (OR: 0.27, 95%CI: 0.10-0.70, P-Value: 0.04), in compare to non-NSP users. Likewise, those who used the NSP outreach services had reported less recent syringe borrowing (OR: 0.40, 95%CI: 0.28–0.81, P-Value: 0.01).

Regarding recent syringe lending, the outreach NSP was significantly effective (OR: 0.31, 95%CI 0.15-0.60, P-Value: 0.02), while facility-based NSP was not (OR: 1.25, CI95% 0.74–2.17). Own syringe reuse was reported less frequently in both the facility-based group (OR: 0.38, CI95% 0.23-0.68,P-Value: 0.03) and outreach (OR: 0.54, 0.30-0.92,P-Value: 0.02). Recent cooker sharing was reported less among facility-based NSP service users (OR: 0.86, 95%CI 0.4-1.82, P-Value: 0.30) and outreach NSP users (OR: 0.63, 95%CI 0.47-3.38, P-Value: 0.23), however both were not statistically significant. Both facility-based and outreach NSP programs increased the chance of recent HIV testing by 2.60 and 2.45 times, respectively.

Discussion

We found that outreach NSP is as effective as facility-based outreach in decreasing the use of borrowing syringes, reuse of own used syringes and being tested for HIV. Outreach NSP shown promising effect on reducing the lending syringe behaviours than the facility-based NSP.

Effectiveness of needle/syringe programs in reducing needle and syringe sharing among PWID has been shown in previous studies (13, 22-24). There are several methods for distribution, sale or exchange of injecting equipment such as conventional NSPs (Facility-based NSP), pharmacy-based distribution and outreach programmes. NSP services through outreach can be provided at locations and times that are convenient for PWID and so increase their access to NSP services (25). It also improves the coverage of NSP service as some PWID do not use NSP services at the facilities due to structural and cultural barriers (26).

There are limited data on the effectiveness of different delivery method of NSP and their effect on preventing HIV risk behaviours (27). We found that majority of the PWID have access and use either of the NSP delivery models. However, only one-quarter of them reported outreach NSP as their main source of injection equipments. Obviously there is a room to improve and scale up the NSP services through outreach. The results of matched analysis in our study showed that injection high-risk behaviours are relativity common in PWID, no matter if they have access to facility-based or outreach NSP services. Our results are consistent with the results reported in other studies (5, 28, 29). In 2010, Sajadi et al. reported that 12.6% of PWID in Iran shared syringes and needle (28). We found that the most common injection equipment that shared was cooker. High rate of cooker sharing also reported by other studies. In study of PWID in Wales (UK) in 2010, paraphernalia (cooker) sharing was reported by 67% of participants (30). Zamani et al in 2010 reported that %32 of injecting drug users in Isfahan share cooker (31).

We found both facility-based and outreach NSP models are effective in reducing the injection risk behaviours. Putting NSP in scale, increasing the number of distributed syringes/needles, scaling up second-hand distribution, expanding the coverage of services and establishing NSP services at high-risk neighbourhoods and venues where PWID gathered has been shown to reduce the risk behaviours (32). Such comprehensive intervention packages have been shown to be effective in developed settings such as San Francisco and Montreal where the risk of HIV transmission among PWID decreased over time by scaling up NSP services (13, 33). In 2007, Islam et.al. demonstrated that fixed-site NSP and outreach programs are effective strategies to reach, refer and provide services that can lead to reduced HIV-related risk (25). Rhodes (2004) who studied injecting equipment sharing among PWID in Russia, showed that PWID who reported NSP or outreach as their main source of new needles and syringes were less likely to share compared to those obtaining them from a pharmacy or shop (12).

We found that not only NSP programs improved injection risk behaviours, but also, use of NSP either on-site or outreach-based was associated with higher uptake of HIV testing. Ever HIV

testing was reported as low as 60% in 2004 among 105 injecting drug users recruited in Tehran (7) and as 49.8% in recent national PWID surveillance survey in 2010 (unpublished data). Such outreach programs should be considered as an opportunity to provide condoms, information, refers to services, providing community-based HIV testing and counselling, and overall improving health of PWID (34). In a study in southern China, the authors found that referral for HIV testing is an effective strategy and can increase the uptake of HIV testing among PWID (31).

We found that outreach NSP was more effective in reducing the lending of syringes. In 2002, Obadia showed that Outreach users were significantly less likely to share syringes, cookers and solutions during the previous six months compared to non-users(35). Also Miller et al reported that needle lending was lower among outreach users than participants who reported using the fixed-site NSP and pharmacy-base NSP (36). The lower rates of syringe lending in outreach users compared to fixed-site users can be explained by higher injection frequency in outreach users that also reported in other studies (37). We found that the injection rate (per week) of those using outreach NSP was higher than users of NSP services at facilities. One hypothesis could be that as the numbers of distributed syringes per visit are the same in both NSP models, outreach NSP users are less willing to lend their injection equipments. Another explanation is that during the NSP outreach, all PWID who were presented at the venue had received syringes and other injection equipments, all together and at about the same time. So, everybody at the site have received sufficient number of syringes and therefore, there was no peer-presser to lend injection equipments. In contrast, in the facility-based model, the approach was more like an individual-based approach and one person served at a time; the client who had received the injection equipments at the facility, might be asked later at the venues (peer-presser) to share their injection equipments.

A limited number of PWID (less than one-quarter) have access to NSP services through outreach services. Given that the effect of outreach NSP is equivalent to on-site NSP services, scaling up the outreach services to improve the coverage of NSP services is one of the effective strategies to reach the population of injecting drug users in Kermanshah and reduce the injection transmission of HIV in this setting.

There are some limitations to our study findings. We used a mixed method of recruitment strategies to locate and recruit eligible participants to our study; our sample diversity might be comprehensive enough for Kermanshah, however, it is not a truly random sample of our target PWID population. Like any other observational studies, we can only report the association of program exposure with high-risk behaviours. Furthermore, our data were based on participants self-report and therefore may be subject to recall bias and social desirability bias (38). We made the two groups comparable based on matching of age, income, education and city residence, however we could not account for other factors such as distance to NSP facilities, availability of methadone maintenance therapy and other individual factors.

Conclusion

Our analysis demonstrates that current NSP model in Iran is effective. We found that outreach NSP is as effective as facility-based NSP in reducing the harm associated with drug injection and is even more effective in reducing the lending of syringes to other PWID. Sharing cookers is common and current NSP models in Iran have limited effects on it. Both models of NSP should be scaled up in terms of quality and coverage of target PWID to see their promising impacts on HIV epidemic in Iran.

Conflict of interests

AN and AH participated in the planning and implementation of harm reduction programs in Ministry of Health. All other authors had no conflicts of interest to be declared.

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Authors' contributions: Study concept and design: HS and AM. Analysis and interpretation of data: MN and SH. Drafting the manuscript: MN and AM. Critical revision of the manuscript: AN, PH, HS, SH, AH, AM.

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Conflict of interests

AN and AH participated in the planning and implementation of harm reduction programs in Ministry of Health. All other authors have no conflicts of interest to be declared.

Table 1: Characteristics of participants in the pooled (total) and matched subsample of people who inject drugs, Kermanshah, 2014

Variable	Pooled Sample (N=455) N (%)	Matched Sample (N=278) N (%)
Age, year		
Under 30	182(40.3)	152(54.6)
30-39	145(31.7)	82(29.5)
40-49	103(22.6)	38(13.6)
Upper 50	25(5.4)	6(2.3)
Education		
Primary or below	117(23.7)	39(14.0)
High school	179(39.3)	133(47.8)
Diploma or higher	159(34.9)	106(38.1)
Current marital status		
Single	268(60.2)	217(77.3)
Married	54(10.5)	18(8.5)
Divorce	79(17.3)	30(9.7)
In separation	44(9.7)	6(2.4)
Widower	10(2.3)	7(2.1)
Live with		
Family	228(50.3)	148(52.5)
Friends	37(7.4)	23(8.2)
Alone	189(42.3)	107(39.3)
Monthly income		
Less than $150	391(86.4)	249(87.3)
$150 or more	63(13.6)	29(10.7)
Age at first drug injection, year		
Under 25	270(60.3)	210(76.4)
25-30	104(21.4)	41(14.3)
30 or older	81(18.3)	27(9.3)

Age at first drug use, year		
Under 25	399(87.5)	254(88.5)
25-30	44(9.2)	21(8.7)
30 or older	12(3.3)	3(2.8)

Table 2: Behavioral outcomes in the pooled (total) and matched subsample of people who inject drugs, Kermanshah, 2014

Behavioral Outcome	Pooled (N=455), N(%)	Matched (N=278), N(%)
Ever borrowing a syringe	152(34.2)	84(30.2)
Borrowing a syringe in the past month	60(14.2)	31(12.3)
Ever lending a used syringe	145(32.4)	71(26.3)
Lending a used syringe in the past month	58(13,7)	36(13.4)
Ever borrowing or lending a cooker	329(72.4)	186(68.2)
Borrowing or lending a cooker in the past month	253(56.5)	137(53.2)
Reuse own syringes in the past month	397(88.2)	239(86.1)
Received an HIV test in the past 12 months	390(85.2)	237(85.3)
Number of injecting partners whom shared syringes/needles or cookers with in the past month		
Mean (SD)	2.88(1.7)	2.31(1.4)
Median (P25, P75)	2 (0, 4)	2 (0, 4)

P: Percentile

Table 3: The odds ratios for the association of the two needle and syringe distribution models with some injection risk behaviours in the pooled (total) and matched subsample of people who inject drugs, Kermanshah, 2014

Behavioral outcomes	Pooled sample OR (CI%95)	Match sample OR (CI%95)
Borrowing a syringe in the past month		
NSP nonusers*	1	1
Facility-based NSP users	0.36 (0.10-0.70)**	0.27 (0.10–0.70)**
Outreach NSP users	0.42 (0.21–0.62)**	0.40 (0.28–0.81)**
Lending a syringe in the past month		
NSP nonusers	1	1
Facility-based NSP users	1.26 (0.74–2.15)	1.25 (0.74–2.17)
Outreach NSP users	0.34 (0.18–0.64)**	0.31 (0.15–0.60)**
Sharing a cooker in the past month		
NSP nonusers	1	1
Facility-based NSP users	0.86 (0.42–1.75)	0.86 (0.4–1.82)
Outreach NSP users	0.94(0.43–2.04)	0.63(0.47–3.38)
Syringe reuse in the past month		
NSP nonusers	1	1
Facility-based NSP users	0.31(0.19–0.51)**	0.38 (0.23–0.68)**
Outreach NSP users	0.44 (0.27–0.72)**	0.54 (0.30–0.92)**
HIV test in the past 12 months		
NSP nonusers	1	1
Facility-based NSP users	3.32(1.90–5.76)**	2.60 (1.48–4.56)**
Outreach NSP users	2.83 (1.72–4.65)**	2.45 (1.36–4.39)**

*Reference group, **Significant at $p < 0.05$. The matched subsample was made by considering age, place of residence, education and income.