Research to Prevention

Needle and Syringe Programs
Rigorous Evidence – Usable Results

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Second in a series, this summary fact sheet presents existing evidence from rigorously evaluated interventions to prevent HIV transmission in developing countries. Results are presented here from the meta-analysis of needle and syringe program studies published in leading scientific journals. In contrast to the many anecdotal reports of best practices, this series provides readers with the strongest evidence available in a user-friendly format. The evidence provides program planners, policy makers, and other stakeholders with information about "what works."

Needle and Syringe Programs (NSPs) are interventions that provide drug preparation and injection equipment to injection drug users to decrease equipment sharing, and consequently, HIV transmission risk. Drug equipment may include needles, syringes, and other ancillary materials, such as drug cookers, cotton balls, bleach, and sterile water. While NSPs have sometimes been described as "needle exchange programs," these interventions are not always strictly limited to "one-to-one" exchanges of needles and syringes, and instead may sell, exchange, or give materials freely (i.e., without requiring participants to exchange used drug equipment).

Because of their access to IDUs, a typically hidden and stigmatized population, NSPs are uniquely situated to provide resources that may further reduce HIV transmission risk. Resources may include condoms, educational materials about HIV sexual and non-sexual risk reduction, medical care, and information regarding community resources to assist with detoxification and drug rehabilitation.

Meta-analyses of NSPs conducted to date have generally focused on NSPs in the United States, Europe, and other developed country settings. These meta-analyses have provided support for reductions in HIV risk behaviors among NSP participants.[1,2,3] In these meta-analyses, NSP participation was associated with significant declines in needle sharing[2] and reductions in injecting frequency, sharing drug paraphernalia, risky drug preparation behaviors, and syringe use.[3] NSPs also appear to be cost-effective. In Australia, NSPs have been shown to reduce HIV and hepatitis C virus infections and are actually cost-saving, wherein for every dollar currently spent on NSP, more than four dollars are saved in short-term health care costs.[4] Our literature review identified only one meta-analysis examining outcomes of NSP programs in developing countries.[5]

Effectiveness of Needle and Syringe Programs

Results from the meta-analysis showed that NSP interventions in developing countries had the following effects on participants compared to those who were not exposed to the intervention:

Needle Sharing (6 studies, 8 subgroup results)[6-9]

- Participants were three times as likely to demonstrate reductions in needle sharing.
- Additionally, a large study[10] not included in the meta-analysis but included in the systematic review showed decreases in needle sharing among 1671 participants in 10 Eastern European cities, with a 20% average decrease in use of shared needles.

Effectiveness of Needle and Syringe Programs

Outcome	Number of studies	Odds ratio	Confidence interval (95% confidence level)
Reduction in Needle Sharing	6	3.22	2.17-4.77

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Injection Frequency

- Three studies examined injection frequency and showed mixed results. One showed no differences in injection frequency from participation in NSPs,[7] while a second study showed a decrease in injection frequency after participation.[8] The largest study[10] showed mixed results on injection frequency, with participants in 4 of 10 sites reporting less frequent injection drug use after participation in an NSP.

How Is the Effectiveness of a Needle and Syringe Program Determined?

The findings presented in this fact sheet come from a recent meta-analysis of 6 studies (2 studies reported results from multiple sites). For the purposes of the analysis, the researchers defined NSPs as "programs that provide needles and/or syringes to injection drug users whether the drug equipment is sold, exchanged or given freely." (Note: This definition is more inclusive than that used in the meta-analyses identified above,[1,2] which specifically examine the exchange of used for unused needles). There was only one outcome with sufficient data to be meta-analyzed: needle sharing. A second outcome, injection frequency, was presented descriptively due to the small number of studies. Studies were conducted in Russia (n = 2), China (n = 1), India (n = 1), Vietnam (n=1), and Iran (n = 1).

Selection Criteria and Rigor Criteria of Studies Included in the Sweat et al.[5] Meta-analysis

A study had to meet three criteria to be included in the analysis:

1. present behavioral, psychological, or biological outcomes related to HIV prevention in developing countries
2. use either a pre-/post- or multi-arm design
3. appear in a peer-reviewed journal between January 1990 and November 2006

Studies that did not meet these criteria were excluded.

The studies in the meta-analysis either report effect sizes for each outcome or provide sufficient information in tables or text to calculate an effect size. For the categorical outcomes typically presented in the studies, these data include sample size information for each outcome, and either percentages or frequencies for each response category.

A poster detailing modes of HIV transmission hangs on a wall in India. Credit: © 2009 Frederick Noronha, Courtesy of Photoshare

What's New?

Since the Sweat et al.[5] meta-analysis was completed, there have been several additional studies reporting the efficacy of NSPs in developing countries.

- A community randomized controlled trial in China found that needle sharing was reduced by 35.5% in groups receiving a needle social marketing intervention as compared to the control.[11] Although this intervention utilized several harm reduction strategies, drug users could exchange needles through visiting the local hospital, the Center for Disease Control (CDC) or through peer educators.[11]
- In Iran, a recent study comparing two neighborhoods in Tehran with and without an NSP found that individuals with access to the NSP were significantly less likely to share needles over a one month period than those who lacked NSP access.[12]

- A cross-sectional study in Kazan, Russia found that NSP clients were more likely to have used a new syringe for their last injection than IDUs who had not yet been exposed to the needle exchange program.[13]

These studies support the finding from the meta-analysis[5] that NSPs can help reduce needle sharing among IDU populations in developing countries.

What More Do We Need to Know about Needle and Syringe Programs?

Needle and Syringe Programs can be effective in reducing needle sharing among IDUs.

However, we do not have enough evidence to determine whether NSPs have an impact on other important outcomes that may affect HIV incidence, including injection drug use frequency or sexual risk behaviors. Additionally, more information is needed to assess what, if any, program features have an impact on HIV risk, especially given the unique opportunity NSPs have to provide multiple services to IDUs. Further, differences in program implementation (e.g., exchanged versus freely distributed needles) may differentially affect receptive (injection with materials previously used by another) and distributive (sharing self-used injection materials with another) drug equipment sharing behaviors. These program differences should be evaluated further.

Several of the studies included in the needle syringe program meta-analysis were conducted in challenging real-world settings using sampling methods that may have decreased the likelihood of seeing changes in individual behavior over time (e.g., serial cross-sectional studies). Given challenging research conditions in real world settings, the evaluation of NSPs often takes the form of repeated cross-sectional studies that use sampling methods that may decrease the likelihood of detecting and interpreting intervention effects. For this reason, it is important to distinguish between lack of intervention effect and lack of evidence of effect. That is, lack of evidence of an effect does not imply that an intervention failed; it means that we do not have enough evidence to judge its effectiveness. For this reason, additional research using rigorous study designs (e.g., community randomized trials) with sufficient follow-up is crucial to increasing confidence in the above results and to gathering enough evidence to answer complex questions (e.g., the effect of a behavioral intervention on HIV and STI incidence).

A needle exchange van in Berkeley, California.
Credit: © 2008 Emily Hoyer

Finally, findings from this review must be seen in light of its limitations. Results may be subject to publication bias, where studies showing positive results are more likely to be published than studies showing negative results. In addition, there is the possibility that some articles that should have been included in the review were not identified by the search methods used.

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Terminology and Acronyms

Confidence interval
The range of values within which the "true value" can be expected to fall.

Confidence level
The likelihood that the "true value" will fall within the confidence interval.

Effect size
A measurement of the magnitude of change (e.g., the average point increase in a qualifying examination score from taking a test preparation course)

IDU
Injection drug user

Meta-analysis
Analytic method that gathers information from multiple studies and combines them statistically to determine whether an intervention is effective.

NSPs
Needle and syringe programs

Odds ratio
The ratio of the probability of an event occurring in one group to the probability of the same even occurring in a referent group; for example, an odds ratio of 2.0 for a condom promotion means that those in the treatment group were twice as likely as those in the control group to use condoms in last casual sexual encounter.

STI
Sexually transmitted infection

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