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Outreach-Based HIV Prevention for Injecting Drug Users: A Review of Published Outcome Data

S Y N O P S I S

Objectives. Over the past decade, a body of observational research has accrued about the effects of outreach-based human immunodeficiency virus (HIV) interventions for drug users. The authors reviewed the findings related to postintervention behavior changes and integrated findings across studies to provide the best estimate of program impact.

Methods. The authors conducted a computerized literature search to locate published accounts of HIV intervention effects on drug users. Thirty-six publications covered outreach-based HIV risk reduction interventions for out-of-treatment injecting drug users (IDUs) and reported intervention effects on HIV-related behaviors or HIV seroincidence. Two-thirds of the publications reported that participation in street-based outreach interventions was followed with office-based HIV testing and counseling. The authors described the theoretical underpinnings of outreach intervention components, the content of the interventions, and the outcome measures that investigators used most frequently. The authors also described and critiqued the evaluation study designs that were in place. Because most of the evaluations were based on pretest and posttest measures of behavior rather than on controlled studies, results were examined with respect to accepted criteria for attributing intervention causality, that is, the plausibility of cause and effect, correct temporal sequence, consistency of findings across reports, strength of associations

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observed, specificity of associations, and dose-response relationships between interventions and observed outcomes.

Results. The majority of the published evaluations showed that IDUs in a variety of places and time periods changed their baseline drug-related and sex-related risk behaviors following their participation in an outreach-based HIV risk reduction intervention. More specifically, the publications indicated that IDUs regularly reported significant follow-up reductions in drug injection, multiperson reuse of syringes and needles, multiperson reuse of other injection equipment (cookers, cotton, rinse water), and crack use. The studies also showed significant intervention effects in promoting entry into drug treatment and increasing needle disinfection. Although drug users also significantly reduced sex-related risks and increased condom use, the majority still practiced unsafe sex. One quasi-experimental study found that reductions in injection risks led to significantly reduced HIV seroincidence among outreach participants. Few investigators looked at dosage effects, but two reports suggested that the longer the exposure to outreach-based interventions, the greater the reductions in drug injection frequency.

Conclusions. Accumulated evidence from observational and quasi-experimental studies strongly indicate that outreach-based interventions have been effective in reaching out-of-treatment IDUs, providing the means for behavior change and inducing behavior change in the desired direction. The findings provide sound evidence that participation in outreach-based prevention programs can lead to lower HIV incidence rates among program participants.

The human immunodeficiency virus (HIV) epidemic is well into its second decade in the United States. The epidemic has spread rapidly among injecting drug users (IDUs), who transmit the virus primarily through serial reuse or sharing of contaminated syringes, needles, and other drug injection equipment¹ and secondarily through unprotected sexual intercourse. With no vaccine yet available to avert new infections, the key to prevention remains the same as in the earliest years: getting people to eliminate or reduce their risky behaviors. The difficult task of reaching IDUs with this message was underscored by the Institute of Medicine in its landmark 1986 report *Confronting AIDS*,² which sounded a call for innovative strategies to educate IDUs and encourage them to adopt safer behaviors.

One early strategy was community outreach, which relied on peers and indigenous workers to identify out-of-treatment IDUs and initiate appropriate education and support. Although other types of HIV interventions for drug users have since been developed, outreach remains important today, with good reason. Outreach has been identified as one of three common prevention strategies contributing to low seroprevalence levels in cities where HIV has entered the local heterosexual IDU community.³ Moreover, as this chapter shows, a growing body of observational research suggests that outreach-based interventions have been effective in getting drug injectors to change risky behaviors and thereby slow the rate of new infections. These findings, along with results from experimental and quasi-experimental research, gain in importance as they meet accepted criteria for inferring intervention causality.⁴

BACKGROUND

The majority of published studies about the effects of outreach derive from research sponsored by the National Institute on Drug Abuse (NIDA). In the mid-1980s, NIDA launched a national multisite program of outreach-based intervention services and research. The 29-site National AIDS Demonstration Research (NADR) program was operational from 1987 to 1991 and was succeeded by the 23-site Cooperative Agreement for AIDS Community-Based Outreach/Intervention Research Program (1990 to present). In making outreach the basis of the multisite intervention studies, NADR and the Cooperative Agreement Program built on a proven approach for reaching hidden populations of IDUs⁵ and on theoretically effective elements of behavior change

models, especially communications theory about credible messengers and health behavior theory about self-perceptions of vulnerability. For example, using outreach workers indigenous to the community draws on the premise that, to be credible, a communicator must be someone others can use as a frame of reference or someone who provides a normative reference to the situation at hand.⁶ Raising awareness about HIV and providing material means for protection—bleach and condoms—are elements distilled from the Health Belief Model, which posits that people will change health behaviors if they think they are at serious risk but capable of protecting themselves.⁷

The intention of the two programs was to discourage unsafe drug use and unsafe sex, using a variety of messages and strategies. Since what was delivered is key to the observed outcomes, a description of program activities follows.

Outreach-based activities in NADR. NADR grantees deployed indigenous outreach workers to initiate risk reduction activities on the streets and in other settings where injectors tended to congregate. Basic risk reduction activities usually involved face-to-face communication; the provision of literature on HIV disease, prevention, and services; and the distribution of male condoms for safer sex and bleach kits for decontaminating injection equipment. Ordinarily, outreach workers made contacts with individuals and small groups; workers in a few NADR sites targeted outreach at existing networks of drug users, often engaging network leaders in teaching or modeling HIV risk reduction, to diffuse the information more rapidly (a principle of communications theory put forward by Rogers).⁸ Outreach workers also referred drug users to other available services in the community, including drug treatment.

NADR outreach was generally followed with more structured activities, such as confidential risk assessments and HIV testing. Although individual sites were allowed to tailor intervention activities to community needs and preferred models of behavior change, retrospective process data show that the majority of NADR grantees offered HIV testing and counseling to outreach participants (79%). A typical off-street counseling session lasted an hour or less (89%), was individualized in format (72%) and didactic in nature (73%), often included an educational video or slide presentation (67%), and usually included a demonstration of bleach and condom use (61%).⁹ Most NADR sites compared the effects of outreach plus basic structured activities with the effects of outreach plus “enhanced” interventions, using random

assignment of IDUs to one group or the other. Examples of enhanced activities include multiple counseling sessions of one to four hours, couples counseling or group counseling sessions, engagement in role-playing exercises, and community organizing.

Outreach-based activities in the Cooperative Agreement Program. Investigators in the Cooperative Agreement Program also conducted field experiments in which participants were randomly assigned to outreach plus basic services or outreach plus enhanced services; in contrast to NADR, however, the basic activities were adopted systematically across all sites. Grantees collaborated to develop a multicomponent standard intervention that included HIV counseling and testing as a follow-on activity to street outreach. Outreach content and duration were standardized to a maximum of five contacts, each lasting approximately 15 minutes, to provide HIV education and service referrals, distribute bleach and condoms, describe the study, and recruit subjects. (After five recruitment overtures, outreach workers continued to provide these services to any IDU they encountered, but they no longer urged them to participate in the study.) Process data collected in 1996 showed that Cooperative Agreement grantees provided drug users with nearly 39,000 bottles of bleach, 32,000 bottles of clean rinse water, and over 200,000 male condoms over four years’ time—statistics that highlight the feasibility of outreach as a means of reaching a hidden population.

The basic follow-on to outreach was a two-session, off-street HIV testing and counseling component that included demonstrations and rehearsals of needle cleaning and condom use. (The added element of skills training stems from self-efficacy theory, which posits that behaviors are learned through observation and copying, along with expectations that one will be competent in practicing the new behaviors.¹⁰) Session one focused on HIV antibody testing and pretest counseling and typically lasted just under 30 minutes. Session two involved posttest counseling for individuals who were tested for HIV (85%) or booster education for the individuals who did not get tested. Session two usually lasted 25 minutes for seronegative or untested clients and 33 minutes for clients with positive test results.

Both sessions used standardized cue cards to cover hierarchical sets of risk reduction messages. The drug-related hierarchy advised IDUs to stop using drugs; enter drug treatment if possible; stop injecting drugs; stop reusing syringes, needles, and other injection paraphernalia; and disinfect any injection equipment that was reused.

Messages in the sex-related hierarchy counseled IDUs to practice sexual abstinence, have nonpenetrative sex, use condoms and other barrier methods, and reduce the number of sex partners. A newly identified risk factor for HIV—the use of crack cocaine—also was covered in the cue cards. This message advised crack users to quit using the drug and practice safer sex.

The following section presents a review of the published findings about the effects of the above-described outreach-based risk reduction education, supplies, HIV test counseling, and skills training.

REVIEW PROCEDURES

More than 80 reports of interventions for IDUs were identified through computer searches of the literature. Thirty-six met the following inclusion criteria: (1) they focused on out-of-treatment drug users (thus, studies of clinical populations were excluded); (2) they evaluated, at a minimum, street-based outreach risk reduction interventions; (3) they reported on HIV-related behavioral or serological outcomes; and (4) they reported statistical significance, direction of change, or range of change in the outcome variables. Nineteen of the 36 publications were evaluations of NADR interventions, and 12 were from the ongoing Cooperative Agreement Program. Of the remaining evaluations, four were sponsored by NIDA outside of the multisite trials, and the fifth was funded by the Centers for Disease Control and Prevention (CDC), as one of CDC's multisite AIDS Community Demonstration Projects. All of the five involved street outreach to out-of-treatment IDUs, and their activities and outcome measures are very similar to those of the NADR and Cooperative Agreement Programs.¹¹⁻¹⁵

Study designs. To answer the central question of most program evaluations—"Does it work?"—the strongest design for attributing causality is the randomized controlled trial, in which individuals are randomly assigned to an experimental intervention or no intervention. However, NADR and Cooperative Agreement grantees concurred that it would be inappropriate and unethical to withhold basic outreach services and counseling and testing from drug users, a decision similar to the recommendation reached by the National Academy of Sciences in the late 1980s.¹⁶ As a result, most published evaluations of outreach were based on one-group pretest and posttest designs, in which behaviors reported at baseline were compared with behaviors reported six months after intake into the intervention study. The absence of control groups

made it difficult for individual investigators to attribute observed changes to the outreach-based intervention, although the pretest and posttest designs fixed the temporal sequence of events, an important element in inferring causality.

A handful of studies applied an experimental or quasi-experimental design to tease out the behavioral effects of outreach interventions *vs.* the sensitizing effects of personal interviews about HIV risks or the impact of secular events or trends. For example, Simpson and colleagues¹⁷ randomly interviewed half their IDU sample at intake and compared them with the noninterviewed half one month later; the comparison revealed that the groups' outcomes were not differentially influenced by the intake interview. Next, Colon and his team of investigators¹⁸ applied post-hoc controls for the effects of historical trends by dividing their sample into successive cohorts over time.

It should also be noted that several investigators published results comparing the effects of basic *vs.* enhanced outreach-based interventions. These studies are able to answer the question, "What works better?"; however, they cannot answer the primary question, "Does it work?"¹⁹⁻²⁷

Outcome measures. Investigators in NADR and the Cooperative Agreement Programs used standardized interview schedules to collect preintervention and post-intervention data on behaviors in the past 30 days, with posttest data collected approximately six months after intake into the study. NIDA-sponsored investigators outside of the multi-site programs followed similar data collection schedules, whereas the CDC-sponsored team used three-month intervals to collect data on behaviors occurring in the past 60 days. The common use of instruments across studies facilitated comparability of outcome data, although individual grantees often diverged in choosing single or composite variables to report as their results.

Although the accuracy of behavioral self-reports has often been questioned, investigators in the NADR and Cooperative Agreement Programs used urinalysis and visual examinations for recent needle marks to corroborate the veracity of self-reported drug use. While no such corroboration was available with respect to sex-related behaviors, the reliability of the data collection instruments used in the Cooperative Agreement Program was studied and found to be of high quality.²⁸ Moreover, a strategy of separating the data collection staff from the intervention staff was implemented to reduce the kind of self-report bias that might be induced by social pressure or a desire to please the interventionist with "correct"

answers. In addition, Des Jarlais³ has suggested that such self-reports are valid because IDUs in several studies have associated changes in their behaviors with their ability to avoid AIDS.

Finally, two-thirds of the outreach evaluations examined interventions that included counseling and HIV testing as follow-on activities, thus yielding data on seroprevalence and seroincidence of HIV. Nonetheless, because the detection of seroconversion often requires long intervals of time for sufficient data to accrue, the salient observed outcomes in almost all HIV intervention evaluations were behavioral. To date, only one longitudinal study of outreach used seroincidence as an outcome measure.²⁹

RESULTS

Table 1 lists alphabetically, by year of publication, the 36 published evaluations and their research sites. Twenty-four are reports from single sites; 12 pooled data from multiple sites. The table notes whether the sites participated in one of the multisite studies and whether the investigators reported having offered HIV testing and counseling. It also shows the follow-up response rates, which ranged from 41% to 95%, for an average of 66% across studies. (The large amount of attrition experienced in some studies can be a worrisome source of bias.) Table 1 also includes 11 columns of frequently reported risk or protective behaviors. The word "Yes" in a column indicates that the study found significant differences between pretest and posttest reports; "NS" means that the study examined the behavior but that behavior changes were not significant.

Consistency of findings. Table 2 condenses the outcome results and provides a count of the reports finding significant changes in eight behaviors. Although results vary by category, the majority of evaluations shows that IDUs in a variety of places and time periods changed their drug-related and sex-related risk behaviors following participation in outreach. This consistency of results lends support to the inference that outreach interventions promoted behavior changes. More specifically, the research indicates that IDUs regularly reported follow-up reductions in five major risk behaviors: stopping injection use; reducing frequency of injection; reducing reuse of syringes; reducing reuse of other equipment (cookers, cotton, rinse water); and reducing crack use. The studies also show significant effects in three protective behaviors: (1) more frequent needle disinfection, (2) entry into drug treatment, and (3) increases in condom use.

Magnitude of program effects. Consistency of research findings across studies strengthens the evidence of underlying claims about program effects. As shown in Table 2, most evaluations have reported significant differences at follow-up. Nonetheless, as would be expected, there is some variation across studies in the magnitude of reported effects. Given this variation and the limited number of papers reporting on each individual outcome, it was determined that the best estimate of program effect across studies would be the median of the observed effects. Medians are shown in Table 3 along with ranges of effects, which give an estimate of the amount of variability associated around each median.

Summary statistics such as these can be adequate estimates of effects only if outcomes were operationalized in the same way across studies, but often they were not. For example, seven publications examined crack use, and all found significant reductions from pretest to posttest. Investigators reported the risk reduction in different ways, however—two calculated the proportion of drug users who terminated crack use at follow-up,^{24,26} three measured changes in the frequency or number of crack use events in the past 30 days,^{38,44,47} and the other two reports provided statistical tests of the association between participation in enhanced interventions and less crack use.^{20,22}

For the purpose of this chapter, the condition set for estimating median and range was a minimum of four studies that used a common metric to measure and report a given behavior change. Using this standard led to the calculation of medians and ranges for four drug risk behavior domains—termination of drug injection, reduced frequency of injection, reduced or discontinued reuse of syringes and needles, and reduced or discontinued reuse of other injection equipment.

As displayed in the first row of Table 3, a subset of five publications (combined $n = 6254$) used the same metric to report that significant numbers of IDU outreach participants discontinued injection, the most certain way of reducing drug-related HIV transmission. Across the five studies, between 24% and 31% of outreach participants reported they had stopped injecting in the past 30 days.^{19,23,24,42,43} The median reduction across these studies was 26%. Using the median as the best estimated index of change among outreach participants translates into approximately 1600 fewer IDUs who injected drugs following participation in outreach-based HIV prevention interventions.

The second row of Table 3 shows the results of seven evaluations of IDUs who continued to inject drugs

Table 1. Thirty-six published studies of outreach-based interventions and selected posttest behaviors (studies arranged alphabetically by year)

Authors arranged by date of publication	Reference number	Site(s) and period of study	Part of a multisite study	Counseling and testing offered	Response rate at follow-up (%)	Drug injection ended	Frequency of injection reduced
1987							
Watters	(11)	San Francisco, fall 1986	No		N/A		
1990							
Neaigus et al.	(12)	New York, 1/87-8/88	No		44	Yes	Yes
1991							
Booth et al.	(30)	Baltimore, no dates	NADR		N/A		
Stephens et al.	(31)	Cleveland, 2/88-8/89	NADR		61	Yes	
Sufian et al.	(13)	Brooklyn, 1987-88	No	In 2nd half	49		Yes
1992							
Booth & Wiebel	(32)	3 sites, no dates	NADR		47		NS
Colon et al.	(33)	San Juan, 5/89-1/90	NADR	Yes	79	NS	
Friedman et al.	(14)	Brooklyn, 1987-88	No		51		Yes
1993							
Birkel et al.	(34)	3 sites, 1988-91	NADR		75		
Booth et al.	(35)	Denver, 1989-90	NADR		41		Yes
Bux et al.	(36)	2 NJ sites, 4/89-1/92	NADR		N/A		
Colon et al.	(19)	San Juan, 5/89-11/90	NADR	Yes	87	Yes	
Deren et al.	(37)	Harlem, 1989-91	NADR		58	Yes	Yes
C. McCoy et al.	(38)	Miami, no dates	NADR	Yes	N/A		Yes
Stephens et al.	(09)	28 sites, 1987-90	NADR	In 22 of 28	N/A		Yes
1994							
Simpson et al.	(17)	5 sites, 7/91-12/91	NADR	Yes	85		Yes
Wechsberg et al.	(39)	Unnamed, 4/90-12/91	NADR		52	Yes	Yes
1995							
Camacho et al.	(40)	2 TX sites, no dates	NADR	Yes	83		Yes
Colon et al.	(20)	San Juan, 11/89-11/90	NADR	Yes	88		
Deren et al.	(41)	Harlem, 1989-91	NADR		55		Yes
Deren et al.	(42)	63 sites (women), 1987-90	NADR	In most	N/A	Yes	Yes
Siegal et al.	(43)	2 OH sites, 3/89-9/90	NADR	Yes	62	Yes	
1996							
Andersen et al.	(20)	Detroit, no dates	Coop	Yes	72		Yes
Beardsley et al.	(21)	East Harlem, no dates	Coop	Yes	70		
Booth et al.	(22)	15 sites, 1/92-12/93	Coop	Yes	67		Yes
He et al.	(23)	Portland, 9/92-6/94	Coop	Yes	68	Yes	Yes
C. McCoy et al.	(44)	Miami (men), no dates	Coop	Yes	95		
Rhodes & Malotte	(24)	Long Beach, no dates	Coop	Yes	78	Yes	
Rietmeijer et al.	(15)	Denver, 2/91-12/93	CDC		45		
Robles et al.	(45)	16 sites, no dates	Coop	Yes	N/A		
Trotter et al.	(25)	2 AZ sites, no dates	Coop	Yes	61-97		
Weeks et al.	(46)	Hartford, 10/92-5/95	Coop	Yes	44	Yes	Yes
Wiebel et al.	(29)	Chicago, 1988-92	NADR	Yes	68		
1998							
Kotranski et al.	(26)	Philadelphia, 1/93-5/95	Coop	Yes	70		
H. McCoy et al.	(27)	Miami (women), no dates	Coop	Yes	80		
Stevens et al.	(47)	21 sites, 1/92-12/95	Coop	Yes	N/A		Yes

Table 1 (continued)

Needle reuse ended or reduced	Other reuse ended or reduced	Injecting in group ended or reduced	Bleach use, disinfection increased	Composite needle risks reduced	Crack use ended or reduced	Drug treatment entered	Condom use increased or risk reduced	Composite sex risks reduced
			Yes					
NS	NS	Yes	NS				Yes	
Yes	Yes	Yes	Yes					
Yes	Yes	Yes	Yes			Yes	Yes	
Yes	NS	NS	NS					
Yes	Yes	Yes	Yes					Yes
Yes			NS					
NS	NS	Yes		Yes				
Yes	Yes	NS	Yes			Yes	Yes	
				Yes	Yes			
Yes		Yes	NS	Yes				Yes
Yes	Yes		NS					
Yes	Yes	Yes	Yes					Yes
NS	Yes	NS	Yes	Yes		Yes	NS	
Yes	Yes	Yes	NS	Yes		Yes	Yes	Yes
Yes			Yes					Yes
					Yes		Yes	
					Yes		Yes	
Yes					Yes	Yes	Mixed	
					Yes		Yes	
			Yes		Yes	Yes	Yes	
NS	NS	NS					Yes	
Yes	Yes						Yes	Yes
				Yes				
								Yes
Yes					Yes		Yes	
Yes			Yes		Yes		Yes	

Table 2. Drug use, needle practices, and sex risk behaviors

Outcome measures	Number of findings	Number significant
Stopped injection use	11	10
Reduced injection frequency	18	17
Stopped/reduced multiperson reuse of needles/syringes	20	16
Stopped/reduced reuse of cookers, cotton, rinse water	12	8
Stopped or reduced crack use	7	7
Increased needle disinfection	16	10
Entered drug treatment	7	6
Increased condom use or had less unprotected sex	17	16

following exposure to an intervention (combined *n* = 2447). Those IDUs who persisted in injecting reduced their injection frequency from a baseline median of 73 injections per month per person to a follow-up median of 45, a reduction of 28 injections per month per person.^{13,17,23,40,41,46,47} Applying the estimated index of change to the reports' original participants results in about 70,000 fewer injections in the past 30 days.

Multiperson reuse of needles and syringes remains the major mechanism by which IDUs transmit HIV. Many IDUs learned through the mass media and word of mouth to avoid this practice early in the epidemic.⁴⁹ Thus, in many sites, relatively low levels of risk were reported at baseline, but moved still lower following outreach interventions. As displayed in the third row of Table 3, four evaluations used a common metric to report and analyze data on needle reuse (combined *n* = 2830).^{19,33,41,46}

At intake into the study, the median proportion of IDUs who reported reuse was 37%. At follow-up, substantial proportions of intervention participants—between 14% and 43%—reported they had not shared needles or syringes in the past 30 days. The median reduction was 19%, which translates into 147 fewer individuals in the four studies who reused syringes following exposure to the outreach-based HIV intervention.

The last row of Table 3 displays data from four outreach evaluations that measured reuse of drug preparation and injection paraphernalia such as rinse water, cookers, and cotton. Prior to the intervention, such behavior was much more widespread than syringe reuse—indeed, nearly twice as prevalent, with two-thirds of the IDUs reporting at intake that they reused others' injection paraphernalia in the past 30 days. HIV prevention messages in outreach emphasized this practice somewhat belatedly, but after exposure to the intervention, a substantial proportion of IDUs made the desired change. Across the four studies (combined *n* = 2554), between 16% and 34% fewer IDUs reported reusing drug preparation paraphernalia in the past 30 days.^{19,33,41,46} The median reduction was 27%, which translates into 460 fewer IDUs who shared injection equipment in the past month.

Variations in measurement across evaluations precluded an assessment of the magnitude of changes made in sex risk behaviors. Despite consistency in reported effects (condom use and unprotected sex significantly changed in the desired direction in 16 of 17 studies), sex-related risk for HIV transmission among drug users appears to remain high. To illustrate, Stephens and colleagues⁹ analyzed data from over 13,000 IDUs and found that 10% reported always using condoms at baseline. That proportion increased to 19% at follow-up. Regardless of

Table 3. Effectiveness of outreach-based strategies in reducing drug use and needle practices

Behavioral outcome	Number of findings	Median at baseline	Range of change at follow-up	Median change at follow-up
Stopped injecting drugs at time of follow-up	5	100% injected	24% to 31% of IDUs stopped injecting	26% of IDUs stopped injecting
Reduced drug injection frequency	7	73 injections per month	11 to 62 fewer injections per month	28 fewer injections per month
Stopped/reduced reuse of needles/syringes	4	37% reused syringes	14% to 43% fewer IDUs reused syringes	19% fewer IDUs reused syringes
Stopped/reduced reuse of cookers, cotton, rinse water	4	67% reused equipment	16% to 34% fewer IDUs reused equipment	27% fewer IDUs reused equipment

statistical significance, over 80% of IDUs continued not using condoms, or used them inconsistently, following participation in outreach.

Finally, the pivotal question in evaluating HIV interventions is whether the reductions in behavioral risks led to fewer infections. Only one study to date has addressed this question, but its quasi-experimental design adds credence to its findings. Wiebel and colleagues²⁹ conducted a prospective study of an intensive outreach intervention in Chicago, collecting baseline and six follow-up waves of data between 1988 and 1992 from IDUs who were at "injection risk" through their reuse of dirty needles, syringes, or other paraphernalia. At the final wave, the authors also collected data from a nonequivalent control group of IDUs who were not exposed to outreach. In the longitudinal part of the study, the authors reported that the proportion of users at injection risk declined from 54% at wave one to 14% at final follow-up. They also found that seroincidence among the outreach participants declined from 8.4 to 2.4 per 100 person-years. Importantly, the only behavioral risk factor associated with the reduction in HIV seroincidence was a reduction in injection risk. In the comparison part of the study, the investigators reported significantly lower levels of risky injection practices among the IDUs exposed to the outreach intervention than among the nonoutreach IDUs (14% vs. 50%). The authors attributed the reduced rate of HIV infections among the outreach group to their reductions in injection risks.

Intervention dosage. To judge whether a causal relationship exists between outreach and behavior changes, it would be helpful to know whether the level of behavior change covaries with the level or "dosage" of intervention received. To date, few investigators, however, have looked at the dosage effects of outreach, either in terms of its intensity or duration. Indeed, the two evaluations that did examine the amount of outreach to which IDUs were exposed used different operational definitions of duration. In one study, Booth and Wiebel³² compared injection frequency across three NADR outreach sites, taking into account how long outreach had been offered in each community. The authors found significant decreases in injections at only one of the sites, and they concluded that the reductions were a result of outreach workers having been in that community longer than in the other two sites. In the other study, Stephens and colleagues⁹ measured the amount of time IDUs spent in outreach-based interventions. Reviewing pooled data from eight NADR outreach sites, they reported that the number of

minutes spent in the intervention was a significant predictor of reduced injection frequency.

DISCUSSION

The "gold standard" in evaluation study designs is the randomized controlled trial in which individuals are randomly assigned to different conditions. Without experimental controls or quasi-experimental comparison groups, competing hypotheses for why IDUs change their behaviors cannot be eliminated. As discussed earlier, two controlled studies did rule out hypotheses, respectively, of concurrent events outside the intervention and of sensitizing effects of intake interviews. Still, the evidence of outreach effects is largely confined to observational studies that deployed pretest and posttest evaluation designs. When taken individually, such studies warrant some circumspection in attributing causation. Taken as a group, however, the evidence of intervention effects becomes stronger, especially when they meet the specific criteria indicative of causality, enumerated by Hill.⁴ These include:

- Plausibility (causation is feasible in the context of current knowledge).
- Temporally correct association (an appropriate time sequence between the intervention and the observed outcome).
- Consistency of finding similar associations by different persons, in different places, under different circumstances, and at different times.
- Strength of association between the intervention and the observed outcome.
- Specificity of association (association is limited to specific participants or specific outcomes).
- Dose-response relationship (larger effect is demonstrated from more intense treatment).

Although many of the evaluations covered in this review contained methodological flaws, including undesirable attrition rates, together they met many of Hill's criteria. First, the various outreach interventions were built on theoretical models of behavior and behavior change, thus making it plausible that the interventions were responsible for the observed behavioral effects. It also is plausible that reductions in injection risk behaviors

led to reductions in new HIV infections, given that HIV is a blood-borne disease, that drug injection exposes needles and other injection equipment and paraphernalia to blood, and that blood from contaminated equipment is conveyed to other users of that equipment. When IDUs stop or decrease reuse of dirty equipment, as Wiebel and colleagues found, it is logical that HIV transmission would decrease as well.

All of the studies reviewed in this chapter examined behaviors at baseline and at a follow-up interval or intervals. In this way, they established an appropriate time sequence between intervention and outcomes, which strengthens claims that outreach interventions led IDUs to change their behaviors. In addition, the observed effects were similar across evaluations more often than not. Although some studies did not find significant changes in behaviors, there was a considerable degree of consistency in findings reported across sites, across investigative teams, and throughout the 10-year period in which outreach was evaluated. Positive intervention effects were reported by IDUs exposed to outreach between 1986 and 1995 in over two dozen cities, with varying levels of HIV prevalence and varying baseline rates of risk behavior. (Sites included Baltimore, Chicago, Cleveland, Columbus, Dallas, Dayton, Denver, Detroit, El Paso, Flagstaff, Hartford, Houston, Jersey City, Laredo, Long Beach, Miami, New Orleans, New York City, Newark, Philadelphia, Portland, San Antonio, San Diego, San Francisco, and San Juan.)

The strength of the association between outreach and behavior change also was shown by rather substantial reductions in needle-related risk behavior reported at follow-up. Aggregated studies showed that approximately one-quarter of IDUs stopped injecting drugs. IDUs reduced their monthly frequency of injection by nearly 40%. They reduced syringe reuse, which was already low at baseline, by another 20%, and they reduced reuse of other injection equipment by 27%.

These drug-related risk reductions also point to the specificity of the types of behaviors that were shaped by outreach. As noted earlier, the association between outreach interventions and sex-related behavior change was not as strong as that between outreach and drug practice changes. That the interventions were not as effective in this area may mean that the sex-related message was weak, the messenger was not credible, or the outreach

intervention and one-to-one counseling was not appropriate for changing sex practices. (On the positive side, the weaker changes in sex risk help to discount the idea that IDUs provided "socially desirable" biased responses at the time of their follow-up interviews.) Future studies are needed to shed light on which interventions are more or less effective with distinct behaviors and different populations (as they differ by drug use preferences or gender and race, for example).

Future studies also need to address the last causal inference criterion, dose response, and identify components of outreach "dosage" that affect outcomes. Investigators also may need to consider whether a plateau or ceiling effect of dosage is possible; that an hour spent in counseling and testing leads to a certain amount of change, but that amount will not change significantly if a second hour is added. Indeed, the idea that substantial effects may result from rather brief interventions should be welcome news for practitioners, who must marshal what are often scarce resources for HIV prevention.

In summary, the research results reported in the 36 publications largely satisfy Hill's criteria. Thus, it can be argued that outreach-based HIV prevention has been and continues to be effective with IDUs. Although more studies are necessary to illuminate the components of outreach that work and the types of people they work for, the research to date suggests that:

- Outreach is an effective strategy for reaching out-of-treatment IDUs and providing the means for behavior change.
- A significant proportion of IDUs who are exposed to outreach—but not all—change their behaviors in the desired direction.
- Changed behaviors are associated with lower rates of new HIV infection among IDUs.

The published findings thus challenge the belief that prevailed in the early years of the epidemic—that IDUs would be resistant to risk reduction education and that they could not or would not modify their behaviors in response to the threat of HIV—and herald the success of outreach in reducing HIV infection rates among out-of-treatment drug users.

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