



Diffusion of the D.A.R.E. and Syringe Exchange Programs

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We examined the diffusion of the D.A.R.E. program to reduce use of illicit drugs among school-aged children and youths and the diffusion of syringe exchange programs to reduce HIV transmission among injection drug users. The D.A.R.E. program was diffused widely in the United States despite a lack of evidence for its effectiveness; there has been limited diffusion of syringe exchange in the United States, despite extensive scientific evidence for its effectiveness.

Multiple possible associations between diffusion and evidence of effectiveness exist, from widespread diffusion without evidence of effectiveness to limited diffusion with strong evidence of effectiveness. The decision theory concepts of framing and loss aversion may be useful for further research on the diffusion of public health innovations. (*Am J Public Health*. 2006;96:1354–1358. doi:10.2105/AJPH.2004.060152)

IN A GLOBALIZED HEALTH

environment, where there is a rapid spread of both new infectious diseases and poor health practices (e.g., smoking and overeating), the importance of the diffusion of effective public health innovations cannot be underestimated. HIV/AIDS and the injection of illicit psychoactive drugs are 2 of the most important current global health problems.^{1,2} We examined the diffusion of 2

innovations for addressing these problems: the Drug Abuse Resistance Education (D.A.R.E.) program, which is intended to reduce or eliminate psychoactive drug use among school-aged children and youths, and syringe exchange programs, which are intended to reduce the transmission of HIV among injection drug users (IDUs).

While diffusion of public health innovations is a complex process, the relative advantage of an innovation—the effectiveness of the innovation compared with the alternatives—is critical to its diffusion.³ The more effective an innovation, the more it should diffuse. For this analysis, we considered program effectiveness, as assessed through scientific research, to be the prime determinant of relative advantage. The diffusion process can be quite complex, with multiple possible diffusion pathways and with different associations between evidence for effectiveness and extent of diffusion (or lack of diffusion).

Historical Context

Both the D.A.R.E. and syringe exchange programs were developed during the mid-1980s, and the historical context in which they were developed is crucial to understanding their diffusion. The United States experienced an epidemic of crack cocaine use during the 1980s.⁴ Crack cocaine use was associated with

increases in street violence in many large US cities, primarily among those who were selling the drug. The crack cocaine epidemic led to the intensification of the war on drugs/zero tolerance approach to illicit drug use. Within this policy perspective, illicit drug use was seen as a moral failing that was best controlled by law enforcement, including long prison sentences for dealers and users.^{5–7}

The second relevant epidemic that occurred during the 1980s was that of HIV infection among IDUs in the United States and many other Western countries. As a result, the harm reduction approach to illicit drug use was developed.^{8–13} Within this policy perspective, drug users were considered to be full members of the community, and there was no expectation that drug use would be eliminated in the immediate future. Public health authorities had the responsibility for limiting the individual and the social harms associated with drug use, including the transmission of HIV among IDUs and their sexual partners.

The D.A.R.E. Program

Overview. The D.A.R.E. program is complex and includes a variety of activities. For example, substance abuse prevention curricula are delivered through this program to school-aged children and youths (kindergarten through high school). D.A.R.E. also integrates

law enforcement and education agencies, introduces children and youths to police officers through nonthreatening and fun activities, and, today, provides security through officers who also serve as school resource officers. The curricula that are offered through D.A.R.E. include parent education and after-school and summer programming.³ The decision as to which curricula and other programming activities are delivered within any community is usually made by community leaders, including law enforcement officers, school administrators, parent groups, and local government officials.

Initial development and diffusion. D.A.R.E. was developed in 1983 by former Los Angeles Police Chief Daryl Gates and Ruth Rich, a health education specialist from the Los Angeles Unified School District, at a time when drug use rates were increasing. The initial curricula were developed on the basis of a review of existing prevention programs, particularly Project SMART (Self-Management and Resistance Training).¹⁴ The initial D.A.R.E. program was designed for elementary students; middle-school and high-school components were added in 1986 and 1988, respectively. Ten Los Angeles police officers were trained during the first year to teach the program in 50 elementary schools. Since then, D.A.R.E. has spread widely and



continues to expand domestically and internationally—it is used in 80% of US school districts¹⁵ and in 54 other countries.

Research on effectiveness. The widespread diffusion of D.A.R.E. has occurred despite criticisms about the effectiveness of the curricula. In 1994, Ennett et al. published a meta-analysis of several evaluations of D.A.R.E. that showed no long-term positive effects.¹⁶ This analysis prompted the beginning of criticism that continues today.¹⁷ To our knowledge, there has been no review of research studies on D.A.R.E. that has concluded the curricula are effective in reducing illicit drug use among school-aged children and youths.

The negative evaluations led to a number of other federal activities that had a negative impact on the D.A.R.E. program, including the National Registry of Effective Programs of the Center for Substance Abuse Prevention¹⁸ and the Exemplary and Promising Safe, Disciplined and Drug-Free Schools Programs of the US Department of Education.¹⁹ These programs were established to guide the use of federal funds for prevention within communities and to provide lists of promising, exemplary, and model programs. The D.A.R.E. curricula were not included on these lists. As a result, many communities questioned the continuation of D.A.R.E. curricula in their schools, and federal funding for training police officers to teach D.A.R.E. has been cut.

In 1999, the Robert Wood Johnson Foundation and D.A.R.E.

leadership collaborated on a national research study—the Adolescent Substance Abuse Prevention Study—that is currently being conducted by the Institute for Health and Social Policy at the University of Akron. New curricula designed for seventh- and ninth-grade students were developed within the existing D.A.R.E. infrastructure. If this program is found to be effective after following students for a 5-year period, the D.A.R.E. program will train police officers to deliver the new program.

Syringe Exchange Programs

Overview. The defining characteristic of syringe exchange programs is the exchange of new, sterile needles and syringes for used needles and syringes to reduce HIV transmission among IDUs. In actual practice, many syringe exchange programs provide a wide variety of other services, either on-site or through referral, including HIV counseling and testing, condom distribution, referral to drug abuse treatment, and referral to other health and social services.²⁰

Initial development and diffusion. By 1985, it was clear that multiperson use of needles and syringes was contributing to the spread of AIDS and that there were already large numbers of IDUs who were infected with HIV. As a result, a variety of programs for reducing HIV transmission among IDUs were developed, including community outreach, bleach disinfection, users' groups, and—perhaps most importantly—syringe exchange.

In 1984, after a large pharmacy in central Amsterdam stopped selling injection equipment to IDUs, the local health department and an Amsterdam drug users group (Junkiebond) set up a syringe exchange program. After finding HIV infection among IDUs in Amsterdam, the exchange was expanded to other Dutch cities.²¹ In 1987, the United Kingdom's government conducted a pilot study of syringe exchange. After a 1-year evaluation, a national system of syringe exchange programs was implemented.²² Australia also was quick to establish a national system in 1986.^{23,24}

Diffusion of syringe exchange programs continued in many industrialized countries; by the mid-1990s, almost all of these countries had national syringe exchange systems.²⁵ The United States and Sweden are the 2 major exceptions; however, even though there has been far more diffusion of syringe exchange programs in other industrialized countries, there still has been considerable diffusion of syringe exchange programs within the United States. The first formal program was established in Tacoma, Wash, in 1988²⁶; since then, the number of programs has increased from 113 in 1997 to 184 in 2005. In 2000, there were syringe exchange programs in approximately half of the 96 largest metropolitan statistical areas in the United States.

Research on effectiveness. Evaluation research has played a critical role in the diffusion of syringe exchange programs. Most of the early programs were

moved from pilot programs to public health innovations (including national systems) on the basis of evaluations. The early evaluation studies of Amsterdam,²¹ the United Kingdom,²⁷ Tacoma, Wash,²⁶ Portland, Ore,²⁸ and New Haven, Conn,²⁹ were all positive. These evaluations were action research in the context of ongoing epidemics rather than randomized clinical trials. A variety of research designs were used, including before and after comparisons, case-control studies, and mathematical modeling. Outcome measures typically included observation/counting of syringes exchanged and self-reported risk behavior, although some studies did use HIV prevalence^{30–32} and hepatitis B and C incidence as surrogates for HIV infection.³³ More recently, HIV incidence has been used.^{30,34}

As the research on syringe exchange programs accumulated, a number of reviews were conducted. These included the *Twin Epidemics* report from the US National Commission on AIDS,³⁵ a report prepared for the Centers for Disease Control,³⁶ a report from the National Science Foundation,³⁷ an NIH Consensus Development Conference report,³⁸ and a Cochrane Collaboration report.³⁹ Not every evaluation of a syringe exchange program has shown positive effects. Studies of programs in Montreal⁴⁰ and Vancouver, Canada,⁴¹ found unacceptably high rates of HIV incidence among both syringe exchange participants and non-participants. The researchers who conducted these studies interpreted the exchanges as not



being adequate for controlling the high-risk behavior of the cocaine IDUs in those cities.⁴² Thus, the local authorities expanded the programs and added additional services for IDUs.

Although not all individual syringe exchange programs have been effective in controlling HIV transmission among IDUs, to our knowledge, all scientific reviews conducted to date have concluded that syringe exchange programs can be an effective method for reducing HIV transmission among IDUs when implemented as part of a comprehensive program and that syringe exchange programs do not lead to increased drug use. This research base has been frequently cited in support of expanding syringe exchange programs since 1992.^{43,44}

The federal government's policy about syringe exchange programs deserves special attention. Beginning in 1988, the funding authorization for the US Department of Health and Human Services (DHHS) forbade the use of any federal funds for supporting syringe exchange programs until these programs were shown to be safe (i.e., did not lead to increased drug use) and effective (reduced HIV transmission). A 1995 National Academy of Science report³⁷ included research summaries that concluded syringe exchange programs met these requirements. That same year, the DHHS made the same conclusion.⁴⁵ However, through 2004, the US government did not allocate any federal funds for syringe exchange programs. Because the federal government is

the primary source of funding for HIV prevention in the United States, the lack of any federal funding for syringe exchange programs has clearly limited the diffusion of these programs.

DISCUSSION

In classic diffusion of innovations theory,³ there should be a relatively straightforward association between the relative advantage/effectiveness of an innovation and the diffusion of that innovation. On the basis of the 2 case studies we have presented, we propose that there are at least 3 different models for the association between the effectiveness of a public health innovation and its diffusion.

1. *Diffusion on the basis of firm evidence of effectiveness.* This corresponds with the classic theoretical association between evidence of effectiveness and diffusion as described by Rogers.³
2. *Widespread diffusion without evidence of effectiveness.* This type of diffusion is likely to occur during a perceived crisis situation, when public health officials do not have time to fully determine the effectiveness of an innovation or alternative innovations before acting, but there is some theoretical base or previous experience that suggests the innovation may be effective. When done well, this type of diffusion is followed by more extensive evaluation research. If firm evidence of effectiveness is found, additional

diffusion should occur; at the least, the existing programs should be maintained. If problems are identified, the innovation is either modified or replaced with an alternative. The widespread diffusion of the D.A.R.E program and the initial diffusion of syringe exchange programs in the United Kingdom and Australia are examples of this type of diffusion. The modifications to syringe exchange programs in Vancouver and Montreal, and the current effort to revise the D.A.R.E program, are examples of the effects of later evaluation research on initial widespread diffusion.

3. *Lack of diffusion despite evidence of effectiveness.* Clearly, evidence of effectiveness is not a sufficient condition for widespread diffusion of a public health innovation, and the failure of the federal government to support syringe exchange programs is an example. The current delays and problems with implementing syringe exchange programs in developing and transitional countries provide many more examples of lack of diffusion despite the evidence of effectiveness.⁴⁶

We do not interpret these case studies as disproving Rogers' theory of the diffusion of innovations, because Rogers' concept of relative advantage includes subjective assessments of advantage and objective, scientific evidence. Thus, the case studies are consistent with the theory, but the perceived relative advantage that

was considered by many of the decision makers was not based on the scientific evidence. This, however, merely rewords the problem for public health officials: when will the relative advantage of an innovation be determined on the basis of scientific evidence rather than by other factors?

We suggest the use of 2 concepts from psychological decision theory, framing, and loss aversion⁴⁷ when analyzing decisions about public health innovations. *Framing* is the context within which a particular problem is posed, and it can determine whether something is considered a problem, the range of acceptable solutions if it is a problem, and the most preferred solution. The concept of framing was developed within psychological decision theory⁴⁷ and has since been successfully applied to political science.⁴⁸

In the United States, there are 2 competing frames for the consideration of illicit psychoactive drug use: the war on drugs/zero tolerance frame⁵ and the harm reduction frame.^{8,49} Within the first frame, law enforcement agencies have the primary responsibility for addressing illicit drug use. Having police officers provide drug education is consistent with this frame, and the D.A.R.E program was diffused widely without evidence of its effectiveness.

Similarly, within the harm reduction frame, public health agencies are responsible for addressing the problems associated with illicit drug use. Within a frame of reducing transmission of



a fatal blood-borne disease, it is appropriate to provide standard infection control procedures for all hypodermic injections, including the use of sterile needles and syringes and the safe disposal of used injection equipment. This applies to injections in medical facilities, home injections (e.g., diabetics), injections by traditional healers (e.g., herbalists, shamans), and injections by psychoactive drug users. Within an infectious disease prevention/harm reduction policy frame, providing sterile injection equipment and properly disposing of used injection equipment are necessary public health measures.

Rogers defined the compatibility of an innovation as its consistency with existing values, past experiences, and needs of the potential adapters.³ The policy frames for illicit drug use are clearly related to values, past experiences, and needs. These frames, however, go beyond values, experiences, and needs to a more fundamental level of how problems are defined, the range of acceptable solutions, and the identification of preferred solutions.⁵⁰

Loss aversion is the selection of courses of action that avoid possible losses in a choice situation, even at a cost of missing opportunities for potentially large gains. It is a particularly common and powerful strategy, because most persons are usually much more concerned about large losses than they are about large gains. For example, consider 2 bets: (1) you have a 50% chance of winning \$150 and a 50% chance of losing \$100, and

(2) you have a 50% chance of winning \$150,000 and a 50% chance of losing \$100,000. The second bet has the higher expected value, but loss aversion results in many people taking the first bet. If school and health officials are concerned about an impending epidemic of drug use among school-aged children and youths, the school officials may readily adopt a drug use prevention program that looks good even if there is no clear evidence that the program is effective. They are unlikely to wait the years needed to determine if the program is actually effective.

Loss aversion may also explain both the strong advocacy for syringe exchange programs and the strong opposition to syringe exchange programs. AIDS activists who advocate for syringe exchange programs are attempting to prevent the loss of large numbers of lives to new HIV infections. They also may believe that they are defending effective HIV programming in general, because censoring 1 type of a potentially effective HIV prevention program may threaten other potentially effective but unpopular programs.

Opponents of syringe exchange programs, who operate within a zero tolerance frame, also may be using a loss aversion strategy, because they believe implementation of syringe exchange programs will send the wrong message about drug use and may undermine all other zero tolerance antidrug programs. Thus, the maximum potential loss is the viability of the entire zero tolerance framework

rather than whether or not the syringe exchange programs will lead to increased drug use.

People often become very emotionally committed to their loss aversion choices when the potential loss is very large. Thus, they would have a difficult time admitting the strategy was in error. It took many years before the research results led D.A.R.E. officials to agree to change the curricula. Compromises between advocates for and opponents of syringe exchange programs have been very difficult to achieve in the United States, because these opposing groups use loss aversion strategies within different frames.

CONCLUSION

We compared the associations between scientific evidence of effectiveness and the diffusion of the D.A.R.E. program and syringe exchange programs in the United States. In addition to the classic association between evidence of effectiveness and greater diffusion, there also is the possibility for widespread diffusion when evidence of effectiveness is absent and the possibility for very limited diffusion despite considerable evidence of effectiveness. We believe the concepts of framing and loss aversion decisionmaking are useful when understanding the multiple associations between evidence of effectiveness and diffusion of public health interventions. We also believe these ideas may be of considerable use when studying the diffusion (or lack of diffusion) of innovations in other important

areas of public health, including sex education, reproductive health, reducing firearms violence, and regulation of legal psychoactive drugs. ■

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Contributors

D.C. Des Jarlais originated the study, supervised all aspects of its implementation, and drafted the initial article. Z. Sloboda was responsible for the D.A.R.E. data. S.R. Friedman, B. Tempalski, C. McKnight, and N. Braine reviewed all versions of the article and contributed to its revisions.

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