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Education to Prevent AIDS: Prospects and Obstacles

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A number of obstacles thwart effective education to prevent AIDS in the United States. These include the biological basis and social complexity of the behaviors that must be changed, disagreement about the propriety of educational messages to prevent AIDS, uncertainty about the degree of risk to the majority of Americans, and dual messages of reassurance and alarm from responsible officials. Long-term protection of an individual from infection requires extreme changes in risk-taking behavior. Partial shifts toward safer practices may be epidemiologically important in retarding the rate and extent of spread of infection. Though some striking changes in behavior have occurred, especially in homosexual populations in areas with high prevalence of AIDS, educational efforts to date have succeeded more in raising awareness and knowledge about AIDS than in producing sufficient changes in behavior. The United States has yet to mount a nationwide comprehensive, intensive, and targeted education program to prevent AIDS.

TODAY, MOST AMERICANS VIEW THE ACQUIRED IMMUNODEficiency syndrome (AIDS) as the most serious health threat confronting the United States (*1*). Approximately 50,000 Americans have been diagnosed with the disease since 1981 (*2*). More than half are dead, and no one with AIDS has yet been cured. While researchers seek more effective therapies and biological preventives, education and behavior change have been repeatedly and correctly cited as the only available means of curtailing the spread of the human immunodeficiency virus type 1 (HIV-1) responsible for AIDS.

Extensive epidemiologic investigation has affirmed the principal means by which HIV-1 is spread—blood, sex, and birth (*3*). In the United States, the major groups who have developed AIDS are men exposed by homosexual contact, intravenous drug users who use contaminated needles, hemophiliacs and blood recipients prior to institution of protective measures, and the offspring of infected mothers.

The virus can be transmitted sexually from men to women and

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from women to men, though those exposed exclusively by heterosexual contact represent a small fraction of the current U.S. case load (*3*). Transmission through occupational exposure in health workers and in laboratory technicians handling high concentrations of the virus has also been documented (*4*).

Understanding of the modes of spread of HIV-1, though incomplete, does provide assurance that individuals have the ability to eliminate or greatly reduce the risk that they will contract AIDS. The key recommendations are by now familiar to the informed public: sexually active men and women should maintain a mutually monogamous relationship, or practice exclusively safer sex (for example, avoiding semen contact of mucous membranes) or use a latex condom for every sexual intercourse, preferably in conjunction with a spermicide containing nonoxynol-9. Intravenous drug users can protect themselves by abstaining from drugs or by relying exclusively on sterile or properly cleaned needles and syringes with no sharing.

Thus, with AIDS, there are a number of ingredients that would appear to favor behavior change to protect health: a dreadful disease perceived as a major threat to the nation, appreciation of behavior change as the sole current means of stemming further spread of HIV-1, firm knowledge of modes of transmission, and clear-cut steps that individuals at risk can take to protect themselves. At the same time, formidable obstacles stand in the way of the kind of behavior change that will help prevent HIV-1 transmission. Here I review several of these obstacles and set expectations for AIDS education in the light of early experience in AIDS prevention. While health education has had some striking successes, the experience to date provides little assurance that current efforts will accomplish the sustained and extensive change needed to stem the AIDS epidemic with a high degree of certainty.

Obstacles to Effective AIDS Education

To be effective, AIDS education must lead to changes in behavior that eliminate or substantially reduce the risk of transmission of HIV-1. Communication of information is clearly an essential part of effective education, and is also alone clearly inadequate. The individual must also have the motivation and means to effect the desired changes. Sustained change also typically requires a reinforcing social environment that supports the new pattern of behavior. Five key obstacles to effective education are as follows.

1) Sexual practices and drug use are biologically based, socially complex behaviors. Both derive from biological impulses that are hard to resist. Sexual attractiveness is a standard widely touted in our youth-oriented culture. Sexual activity may be spontaneous and unplanned and take place when judgment is clouded by alcohol consumption. Condoms may be rejected as unfamiliar, embarrassing, inappropriate, or compromising of pleasure. Sharing of needles has traditionally been part of the subculture among drug addicts. Addicts driven by withdrawal are likely to use the first available injection equipment. Such factors would tend to undermine efforts to change the most important behaviors that allow transmission of HIV-1.

2) There is fundamental disagreement about the propriety of educational messages to prevent AIDS. AIDS touches upon deep-seated fears and inhibitions in American society. For some, the only socially acceptable change is to have people altogether abandon certain behaviors. In this moralist view, it is wrong to have sexual relations outside of marriage and it is wrong to use drugs, hence it is wrong to advocate or even discuss anything (such as use of condoms or sterile needles) that would appear to condone these activities. Others take what might be called a rationalist view: behaviors that will occur and are dangerous should be modified so as to make them safer. Such philosophical differences underlie the reticence of many national leaders about AIDS education, controversies over the propriety of specific educational materials, and debates among Catholic prelates over teaching about condoms. Of course, there are numerous shadings of view in a pluralistic society such as ours. Some condone heterosexual relations among unmarried young adults yet judge homosexual relations as morally unacceptable. Some rationalists oppose teaching addicts to clean their injection equipment on the grounds that illicit drug use has many dangers apart from AIDS and therefore should only be discouraged. Insofar as a major public commitment is required for a potentially successful education effort, these differences in view must be confronted, itself a politically unattractive prospect.

3) The degree of risk to the majority of Americans is currently a matter of debate. In terms of the natural history of an epidemic, AIDS in the United States is still at an early stage. Available data on the changing prevalence of clinical disease are consistent with a wide range of models of the antecedent spread of HIV-1 infection (*5*). Reliable and pertinent data on the incidence of HIV-1 infection are relatively sparse, though data from testing of military recruits and blood donors would suggest the rates of infection may be leveling off in some groups (*2*). While the disease has reached saturation levels in some sexually active homosexual populations, it is not certain whether conditions in the United States will sustain an epidemic in the heterosexual population. The circumstances in some

Table 1. Cumulative probability of HIV-1 infection from 1000 sexual exposures. For interpretation see text. Assumptions and calculation: (i) Risk (r) of infection from a single unprotected exposure = 0.01. (ii) Reduction in risk per exposure through use of condoms (c) = 0.90. (iii) Prevalence (p) of HIV-1 among potential partners is constant and selection of partners is random with respect to their probability of being infected. (iv) The number of exposures per partner using a condom (C) is the total number of exposures (1000) divided by the number of partners (m), the result multiplied by the frequency of condom use (0, 0.5, or 1.0). (v) The number of exposurers per partner without using a condom (NC) is the total number of exposures (1000) divided by the number of partners (m), the result multiplied by the frequency of condom nonuse (1.0, 0.5, or 0). Cumulative probability of infection = $1 - [p(1 - r)^{NC}(1 - \{1 - c\}r)^{C} + (1 - p)]^{m}$.

Prevalence of HIV-1 among potential partners	Frequency of condom use		
	Never	Half-time	Always
	One partner		
0.001	0.001	0.001	0.0006
0.01	0.01	0.01	0.006
0.05	0.05	0.05	0.03
0.25	0.25	0.25	0.16
0.50	0.50	0.50	0.32
	Five partners		
0.001	0.004	0.003	0.0009
0.01	0.04	0.03	0.009
0.05	0.20	0.16	0.04
0.25	0.70	0.60	0.21
0.50	0.94	0.87	0.38
	Ten partners		
0.001	0.006	0.004	0.001
0.01	0.06	0.04	0.01
0.05	0.28	0.19	0.05
0.25	0.82	0.67	0.21
0.50	0.98	0.91	0.39
	Fifty partners		
0.001	0.009	0.005	0.001
0.01	0.09	0.05	0.01
0.05	0.37	0.23	0.05
0.25	0.90	0.73	0.22
0.50	0.99	0.93	0.39

urban areas and geographic regions may be more conducive to a sustained epidemic than in other areas. While the prospect of widespread disease is sufficiently daunting and the possibility sufficiently high to make it prudent to act as though the epidemic can be sustained, it is not possible at this time to state with confidence the likelihood of that occurrence.

4) The feeling conveyed to the public from responsible officials about AIDS in fact is ambivalent, both reassuring and alarming. Public health authorities insist that HIV-1 is not transmitted through the air, by mosquito bites, or through everyday interaction. At the same time, the public is told that AIDS is everyone's problem, that women as well as men are at risk, and that taking protective action is wise. The public is told that HIV-1 has been isolated from saliva and tears, and that kissing on the cheek or even the lips will not transmit AIDS. To the physician or epidemiologist schooled in the transmission of viral disease, the dual message is eminently sensible. The layperson runs an understandable risk of confusion.

5) Long-term protection of an individual from infection requires extreme changes in risk-taking behavior. To illustrate, let us consider a simple model for sexual transmission of HIV-1 and examine the effects of reduction in the number of partners and increased use of condoms. One can think of the model as applying, for example, to the homosexual population in a city, though the same reasoning would pertain to heterosexual transmission. Let us estimate the cumulative risk of becoming infected with HIV-1 over a period of time involving 1000 sexual encounters. The risk of infection from a single unprotected exposure to an infected person is assumed to be 0.01 and condoms are assumed to be 90% effective in stopping transmission (*6*). The actual risk of infection per exposure would be expected to depend on the type of sexual activity and may depend on the presence of genital lesions, specific viral strain and stage of infection, and host genetic factors (*3*). The cumulative risk depends also on the probability of selecting a partner who is infected, the number of different partners, and the frequency of condom use. Table 1 shows the results for various combinations of a number of partners, prevalence of infection in the population of prospective sexual partners, and frequency of condom use.

Several observations stand out from these results. First, the cumulative probabilities of infection are high because an individual can escape infection only by successfully avoiding transmission at every sexual encounter; even one failure is a failure for life. Perhaps more surprising is the fact that the increment in risk when one goes from one to five or ten partners is much greater than the increment in going from five or ten to fifty partners. Put another way, a sexually active individual who may have 50 partners in the next 10 or 20 years, has less to gain by reducing the number to five or ten than by going from five or ten all the way to monogamy. Condom use is beneficial in reducing the cumulative risk, though if the prevalence of infection in the population of prospective partners is sufficiently high, even consistent condom use may not afford an adequate measure of protection over the long term. The benefit gained from use of condoms is more substantial in moving from half-time to every-time use than in moving from no use to half-time use.

The main conclusions persist when various assumptions in the model are modified. For example, if the population of potential partners contains a minority who if infected are ten times as likely as others to transmit the virus, then as the number of partners increases, the cumulative probability of infection rises less steeply than in the case of uniform infectivity, yet the jump in risk from one partner to five or ten is still much greater than the jump from five or ten partners to fifty. If condoms are assumed to be more than 90% effective, this would accentuate the advantage in moving from half-time to every-time use compared to the smaller gain going from never used to half-time use. If the risk of transmission per exposure is very small (for example, 0.001) then the cumulative probability of infection is lowered much more by the consistent use of condoms than by reducing the number of partners. The implication overall is that if the goal of education and behavior change is individual long-term protection from risk of infection, the changes toward safer sex must be rather extreme.

Degrees of change in behavior that fail adequately to protect the individual over a long period may nevertheless be beneficial in retarding the spread of HIV-1 infection in a population. Behavior change such as part-time use of condoms would tend to increase the number of contacts (that is, lengthen the time) required on average to transmit the virus. If the net rate of additions (transmission plus imports) to the infected pool falls below the rate of loss from the infected pool, then an epidemic will not be sustained. Short of stifling the epidemic altogether, prolonging the course of its development can provide time for other strategies of control and treatment to come into being. The precise impact on the course of the epidemic from a partial shift toward safer behavior in different populations at risk remains highly speculative at this time.

Evidence of the Effectiveness of AIDS Education

The homosexual communities in cities such as San Francisco and New York, hardest hit by AIDS, were earliest to organize patient support services and an extensive array of educational interventions aimed at preventing spread of infection. These have included community outreach to promote wide participation, distribution of educational literature, broadcast media campaigns, individual counseling and testing, telephone hotlines, and peer discussion and support groups to reinforce change. A number of studies in San Francisco document dramatic changes in behavior (*7–10*). For example, 90% of a cohort of 125 homosexual men followed at the San Francisco City Clinic between 1978 and 1985 had reduced the reported number of nonsteady partners from a median of 16 to a median of 1 (*7*, *8*). (It is interesting that men who seroconverted during the 7-year period showed a pattern of reduction in high-risk sexual practices similar to that for men who remained seronegative.) The AIDS Behavioral Research Project in San Francisco found substantial changes in reported behavior in a cohort of 454 homosexual men (*9*). Between November 1982 and May 1984, the average number of male partners in the preceding month declined from 6.3 to 3.9, and the frequency of anal intercourse without using a condom dropped by more than 50%.

In view of my earlier comments about the limited long-term protection afforded by partial movement toward safer sexual practices, it may be particularly useful to distinguish results in terms of the proportion of individuals who make extreme changes in behavior and the average change made by a group of individuals at risk. Study results reported on a cohort of 745 homosexual men in New York City permits such a distinction (*11*). In assessing behavior change between 1981 and 1985, Martin found that 40% had made some change toward safer sexual practices. While there was a decline of 72% in the mean reported number of partners, the proportion of the cohort who had become monogamous had increased only from 8 to 14%. Also, of those who reported being monogamous in 1981, only 9% had remained so by 1985. Monogamy, of course, refers to a state that is sustained over time, and the proportion of individuals reporting monogamy for a limited time should be regarded as the upper estimate of the number who remain monogamous.

Studies of homosexual men in other cities have also revealed evidence of change toward safer sexual practices, though less striking

than in San Francisco. For example, the Multicenter AIDS Cohort Study is following nearly 5000 homosexual or bisexual men (*12*). Between 1984 and 1986, the proportion reporting either celibacy or monogramy increased from 14 to 39%, and the proportion not practicing receptive anal intercourse increased from 26 to 49%. While the use of condoms doubled, fewer than one-third reported using them in 1986. In a Pittsburgh study of a cohort of homosexual and bisexual men in 1986, more than 60% reported they never or hardly ever used a condom, even though 90% had agreed that condoms can reduce the spread of AIDS (*13*). More than 70% of the men reported having two or more sexual partners in the preceding 6 months.

Overall, it seems clear that substantial changes in behavior can be effected in populations of homosexual and bisexual men, particularly in geographic areas with relatively large numbers of AIDS cases and a well-organized gay community. Less clear is whether behavior change can be accomplished sufficiently soon, by sufficient numbers of individuals, and in sufficient degree and duration to be personally significant (in terms of an individual's long-term risk of infection) and epidemiologically significant (in terms of stifling spread of the virus). The reduction in HIV-1 transmission found in recent years in the homosexual population of San Francisco (*10*) brings scant comfort when half or more are already infected.

A number of U.S. cities have introduced educational and behavior change programs intended to reduce dependence on intravenous drugs and to reduce the risk of HIV-1 transmission among intravenous drug abusers. These programs have included expanded methadone and residential treatment programs, vouchers for entry into detoxification programs, and various outreach efforts to addicts (*14–16*). The National Institute on Drug Abuse recently inaugurated a $10-million program in six cities to test various strategies for reducing risk behaviors among intravenous drug abusers, their sexual partners, and prostitutes.

U.S. officials have been reluctant to undertake needle exchange programs, though these have been conducted in the Netherlands apparently without increasing the number of addicts or reducing entry into treatment programs (*17*). There is evidence for widespread awareness of AIDS among addicts in New York and for an increase in demand for needles believed to be sterile (*18*).

The outreach efforts in American cities, some utilizing ex-addicts, aim to increase understanding of risks and of ways to clean needles and syringes. In one such program among Baltimore addicts, knowledge about AIDS and risks of transmission increased significantly, though there were no significant changes in needle-sharing behavior (*15*). Despite a belief by 93% of addicts in a Sacramento study that they would eventually acquire HIV-1 infection from sharing injection equipment, more than three-fourths continued to share needles and syringes (*19*). Preliminary evidence from a study of San Francisco addicts suggests that providing bleach or other cleaning agents as well as instruction in their use may be more successful in promoting cleaning of injection equipment (*16*).

Overall, where measured effects have been reported, behavior change to reduce risk of HIV-1 transmission has been less widely adopted among intravenous drug abusers than among some homosexual populations. This is consistent with an analysis of changes in the incidence patterns of hepatitis B in four disparate U.S. counties showing a decline in cases associated with homosexual behavior (from 20% of cases in 1985 to 9% of cases in 1986) at the same time as the number of cases related to intravenous drug abuse rose in absolute numbers and as a proportion of the total (from 16 to 27% of cases) (*20*).

The general public has been barraged with information about AIDS from the print and broadcast media. Orchestrated campaigns sponsored by the Centers for Disease Control and others conducted in various communities represent only a small fraction of the total coverage given to the many facets of AIDS. By early 1987, more than half of the nation's 73 largest school districts had in place some form of AIDS education program (*21*). Recently, the Centers for Disease Control provided more than $7 million to state and local agencies to improve AIDS education in the schools. According to preliminary results from the National Center for Health Statistics National Health Interview Survey of August 1987, 92% of the public know that a person can get AIDS by having sex with someone who is infected, and more than 80% believe condoms are a somewhat or very effective way to avoid getting the disease (*22*). Misunderstandings about transmission persist: shared eating utensils are considered a likely mode of transmission by 47%, mosquito bites by 38%, public toilets by 31%, donating blood by 25%, and working near someone with AIDS by 21%.

To date, relatively few assessments have examined the impact of specific communication campaigns on the reported behavior (as distinct from knowledge and attitudes) of the heterosexual population. An advertising campaign in New York City in 1987 was directed especially at AIDS prevention in unmarried, sexually active men and women between the ages of 18 and 34. One purpose of the campaign was to convince sexually active young people that condoms will add a measure of protection against HIV-1. A telephone survey designed to sample the distribution by age, race, and ethnic groups in the target population was carried out before and after the campaign (*23*). Awareness of sexual transmission of HIV-1 was increased and more than 80% agreed that sexually active people should carry condoms and women should tell their sexual partner to use a condom. Yet, the reported numbers and frequency of sexual contacts in the preceding month had not changed and more than 60% failed to use a condom more than just some of the time.

The burden of AIDS is being borne disproportionately among the black and Hispanic communities, where the prevalence of disease is more than double that for whites. National attention to the problem was catalyzed by a conference at the Centers for Disease Control in August 1987, and a number of programs targeted specifically to the minority community are beginning. The effects on behavior of preventive interventions in minority populations will be especially important. AIDS education in minority communities must deal with all the major risk activities because all contribute to the burden of illness. The special needs of the minority population, itself a composite of many communities, will require culturally specific interventions. If AIDS can become a self-sustaining epidemic in some heterosexual U.S. populations, it is reasonable to expect that this will become evident first in the urban minority areas where the disease is currently most prevalent.

Prospects for the Future

For the most part, those who will develop AIDS in the next 5 years have already been infected with HIV-1. Even a spectacularly successful AIDS education program could not alter the course of the epidemic in the near term. The best that prevention of virus transmission can achieve is a reduction in cases of clinical disease in the intermediate and long terms.

Communicating accurate information to everyone at risk of infection is difficult enough and yet is only a first step in the educational task ahead. Most people who can already answer questions correctly about sexual transmission of HIV-1 and the risks of sharing needles are not modifying their sexual activity and drug behavior accordingly.

Changes in behavior that will reduce risk of acquiring HIV-1 depend upon individual motivation and a reinforcing social environ-

ment. In the August 1987 National Health Interview Survey, nine out of ten Americans reportedly viewed their own risk of getting AIDS as low or nonexistent (*22*, *24*). Lacking perceived vulnerability, a person is unlikely to change customary habits and behaviors, especially ones that are biologically driven. Aware as we are of biological drives, we are usually unconscious of the powerful social and psychological factors that shape our everyday behavior—how we dress, when and what we eat, what we say to one another, and so forth. If there is to be a widespread and persistent shift in behavior related to sex and drugs, it must be grounded in a shift in social norms. Is it imaginable that one day an unmarried couple will find unthinkable the prospect of sexual relations without a condom? That every homosexual couple will practice exclusively safer sex? That every intravenous drug user who cannot quit will incorporate needle cleaning procedures into the ritual of drug use?

The honest answer to such questions must be: not soon and only with a sustained struggle, if at all. To the strict moralist, these are not even the right questions because they concede unacceptable activities—sexual relations outside of marriage, homosexuality, and illicit drug use.

The history of sexually transmitted disease in the United States is replete with clashes between moral and pragmatic approaches (*25*). During World War II, the Army aggressively warned troops about the dangers of venereal disease and actively promoted condoms with the slogan, "If you can't say no, take a pro [a prophylactic or condom]." Outraged critics did force withdrawal of several graphic educational films which were said to promote promiscuity. Still, the military sold or distributed freely as many as 50 million condoms each month during the war, and between 1940 and 1943 (prior to the introduction of penicillin), the venereal disease rate in the Army fell from 42.5 to 25 per thousand (*26*).

When social change occurs, the evolution of life-style and habit can unfold over a period of decades, or longer. Since the first Surgeon General's Report on the Health Consequences of Smoking in 1964, for example, more than 37 million Americans have given up smoking, and the proportion of adults who smoke has declined from 42% in 1965 to less than 30% today (*27*). Progress has been uneven in that the rate of smoking among women aged 20 to 24 years actually increased in the early 1980's, smoking is disproportionately prevalent in lower socioeconomic groups, and adults who continue to smoke appear to be smoking more than the average smoker in the past (*27*). Yet, social attitudes are clearly turning against smoking. One can envision the day in a smoke-free society when medical historians will look back quizzically on the 20th century as the age of tobacco.

The capacity to mobilize a social and personal will to prevent AIDS may depend critically on evidence about the rapidity and extent of spread of HIV-1. Active and sensitive surveillance systems for tracking the incidence of HIV-1 infection therefore are an essential underpinning of AIDS prevention. The proportion of Americans who report they know someone with AIDS grew from 4 to 6% between October 1986 and October 1987 (*28*). Perhaps, as more people are touched personally by AIDS, our collective resolve to stem the epidemic will be fortified. These considerations point to a sad, and somewhat paradoxical, impression: our country may have to experience more spread of infection in order to prevent spread.

A realistic appreciation of the many obstacles besetting AIDS prevention must not deter those who value human life from pressing ahead with every ounce of skill, vigor, imagination, and determination to inform, empower the individual, and create a social environment supportive of behavior changes. Although partial shifts toward safer behaviors will not assure adequate long-term protection to every individual at risk, such changes may nevertheless spell the difference between a serious and a catastrophic epidemic. In the United States and many other countries, the AIDS epidemic is an unprecedented threat in modern times, and it demands an unprecendented response. Despite many hundreds of dedicated individuals working on AIDS prevention in communities throughout the United States, despite the federal and state investments beginning to be made in AIDS education, our nation has yet to mount a coordinated, intensive, and comprehensive AIDS prevention program. In this sense, education to prevent AIDS has not been given the full-scale test it deserves. The best we can do in AIDS education offers no guarantee of success. To do less invites failure.

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