
How the Response to the Epidemic of HIV Infection Has Strengthened the Public Health System

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Synopsis

Since acquired immunodeficiency virus (AIDS) was first identified in 1981, it has become one of the leading causes of death in men and women 25-44 years of age in the United States. The urgent public health response to the human immunodeficiency virus (HIV) and AIDS epidemic has required the development of new prevention programs; these

efforts have significantly strengthened the public health system itself.

A major part of CDC's mission is to prevent HIV infection and reduce the incidence of HIV-associated illness. In fighting HIV infection and AIDS, as in all successful public health programs, CDC has four important goals: (a) to assess risks, (b) to develop prevention technologies, (c) to build prevention capacities, and (d) to implement prevention programs. The urgency of the need to prevent HIV infection and AIDS has in many instances added impetus or substance to programs already under way, as well as prompting the development of new initiatives to meet the four goals. Examples of ways in which the public health system has benefited from HIV-related programs and activities are detailed in this article.

Although the HIV epidemic has created significant stresses in many areas of public health and medical services, the experience gained in dealing with this epidemic will strengthen the nation's response to other health crises that arise. Despite the huge challenges, lessons learned thus far provide direction and hope for the future.

SINCE THE FIRST CASES of acquired immunodeficiency syndrome (AIDS) were identified 10 years ago, the number of AIDS cases and deaths has continued to increase each year. The urgent public health response to the human immunodeficiency virus (HIV) epidemic has required the development of new prevention programs. However, these efforts have significantly strengthened the public health system itself. To understand and appreciate the impact of these prevention programs, one must first examine the impact of HIV infection and AIDS on the people of the United States.

Impact of AIDS in the United States

Since AIDS was first identified in 1981, it has become one of the leading causes of death in the United States. Through 1981, 164 deaths were attributed to AIDS; in 1990, the count was 26,300, representing a 160-fold increase in one decade. As early as 1987, AIDS was the 15th leading cause of death for Americans, but it does not affect all age

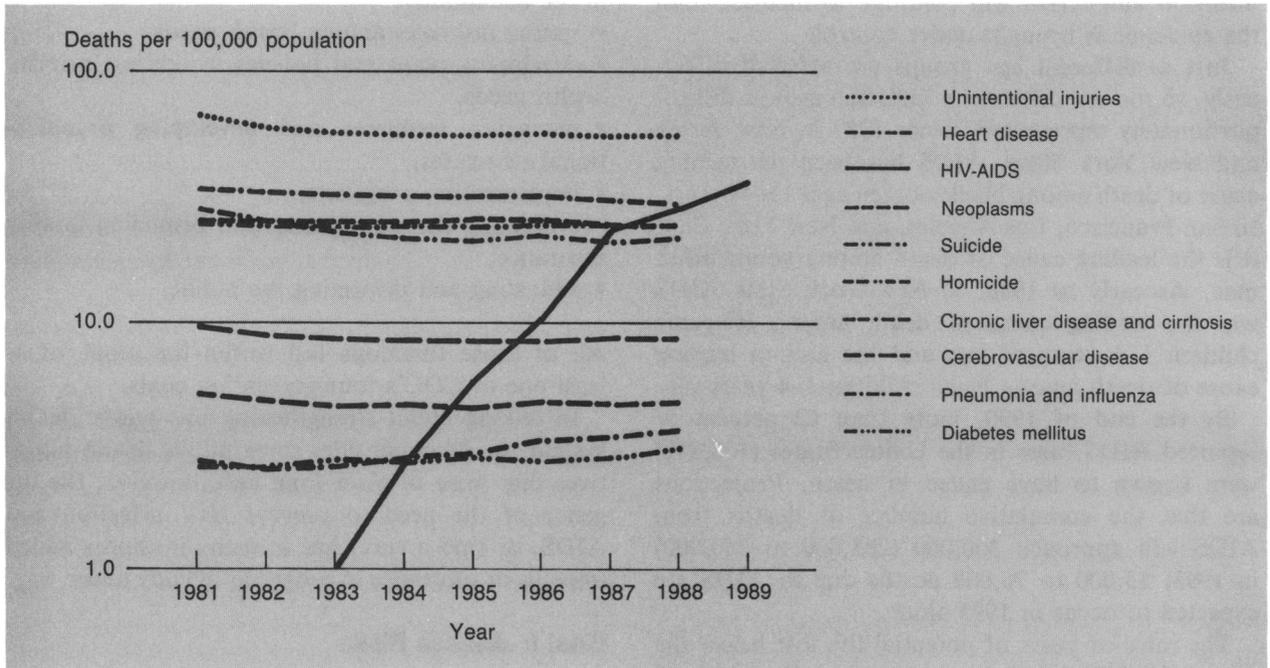
groups equally. The AIDS epidemic is most devastating for young Americans in what should be their most productive years.

For men 25-44 years of age (fig. 1), who represent 33 percent of the male population of the United States, AIDS was the third leading cause of death in 1988. In 1989, it had moved up to second, causing 14 percent of all deaths among men in this age group—surpassing heart disease, cancer, suicide, and homicide; that is, all causes except unintentional injuries.

For women 15-44 years of age (fig. 2), HIV infection and AIDS was the eighth leading cause of death in 1988. In 1989, 4 percent of all deaths of women in this age group were caused by AIDS, and estimates based on current trends are that in 1991 HIV infection and AIDS will be among the five leading causes of death for these women.

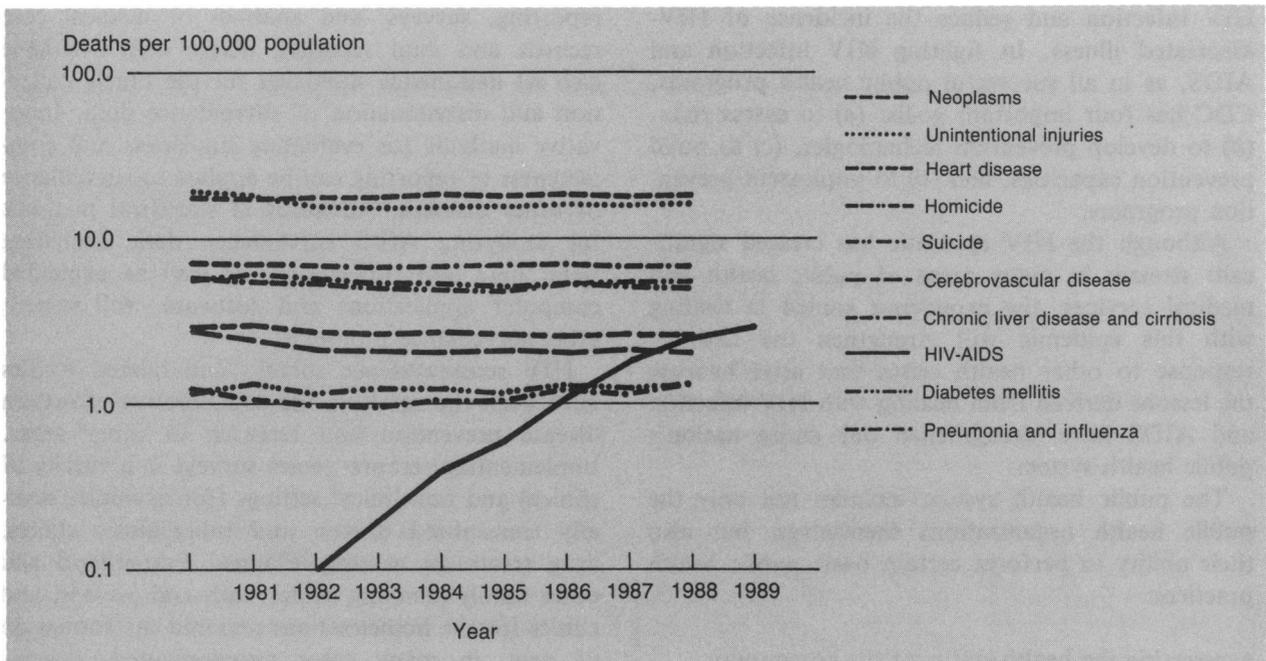
The number of AIDS cases due to heterosexual transmission rose by approximately one-third from 1989 to 1990. Because of the rising incidence of heterosexual HIV transmission in this country, the

Figure 1. Death rates for HIV-AIDS and other leading causes, men 25–44 years of age, 1981–89



SOURCE: National vital statistics, NCHS, CDC.

Figure 2. Death rates for HIV-AIDS and other leading causes, women 15–44 years of age, 1980–89



SOURCE: National vital statistics, NCHS, CDC.

number of women and children dying of HIV infection and AIDS will continue to increase until the epidemic is brought under control.

Just as different age groups are affected differently, so too are different population groups disproportionately represented. Since 1987 in New Jersey and New York State, AIDS has been the leading cause of death among black women ages 15–44 years. In San Francisco, Los Angeles, and New York City, it is the leading cause of death among young adult men. As early as 1988, in New York State AIDS was the leading cause of death among Hispanic children 1–4 years of age and the second leading cause of death among black children 1–4 years old.

By the end of 1990, more than 62 percent of reported AIDS cases in the United States (100,813) were known to have ended in death. Projections are that the cumulative number of deaths from AIDS will approach 300,000 (285,000 to 340,000) in 1993; 53,000 to 76,000 deaths due to AIDS are expected to occur in 1993 alone.

The rates of years of potential life lost below the age of 65 (YPLL–65) for many other diseases have stabilized or are declining slightly, but YPLL for AIDS increased by 25 percent from 1988 to 1989.

Mission of CDC

A major part of CDC's mission is to prevent HIV infection and reduce the incidence of HIV-associated illness. In fighting HIV infection and AIDS, as in all successful public health programs, CDC has four important goals: (a) to assess risks, (b) to develop prevention technologies, (c) to build prevention capacities, and (d) to implement prevention programs.

Although the HIV epidemic has created significant stresses in many areas of public health and medical services, the experience gained in dealing with this epidemic will strengthen the nation's response to other health crises that arise because the lessons derived from dealing with HIV infection and AIDS have strengthened our entire nation's public health system.

The public health system includes not only the public health organizations themselves, but also their ability to perform certain basic public health practices:

- assessing the health status of the community,
- investigating the occurrence and causes of health hazards and health effects (including epidemics) in the community,
- analyzing identified health needs,

- building constituencies and identifying resources in the community,
- setting priorities among health needs,
- developing plans and policies to address priority health needs,
- managing resources and developing organizational structures,
- implementing programs,
- evaluating those programs and providing quality assurance,
- educating and informing the public.

All of those functions fall within the scope of at least one of CDC's four prevention goals.

In talking about strengthening this public health system, we must consider some public health initiatives that were in place long ago; however, the urgency of the need to prevent HIV infection and AIDS, or find a cure, has in many instances added impetus or substance to programs already under way.

Goal I: Assess Risks

Surveillance. AIDS case surveillance activities have strengthened the capacity of State health departments to carry out surveillance and evaluate the findings for many diseases. AIDS surveillance has demonstrated the effectiveness of using multiple resources for disease monitoring (for example, case reporting, surveys, and analyses of medical care records and vital records). These activities have also set nationwide standards for the timely collection and dissemination of surveillance data. Innovative methods for evaluating timeliness and completeness of reporting can be applied to surveillance of other diseases. Advances in statistical methods for analyzing AIDS surveillance data, including trend data and projections, as well as expanded computer applications and software, will benefit other surveillance programs.

HIV seroprevalence surveys and related studies have been the catalysts for collaborative efforts in disease prevention and research in other areas. Implementing seroprevalence surveys in a variety of clinical and nonclinical settings (for example, sexually transmitted disease and tuberculosis clinics, drug treatment centers, Planned Parenthood and other family planning clinics, jails and prisons, and clinics for the homeless) has required the formation of new, in many cases unprecedented, liaisons between health departments and outside agencies and groups.

Data from the surveys are being used by health departments and the collaborating agencies to de-

sign and implement needed clinic-based services. For example, in South Carolina, HIV seroprevalence data were used to develop a statewide (and a model regional) HIV services plan; results of the survey of childbearing women are being used to target interventions in counties with the highest rates of HIV infection in women; allocation of resources to district health departments is based on the prevalence of HIV infection as well as AIDS; and data obtained from surveys in alcohol and drug treatment facilities have been used to plan staff training programs and client education programs in similar facilities around the State.

HIV seroprevalence surveys have afforded training opportunities for health department staff in data collection and analysis that are applicable to other public health data systems. Supplemental training in designing research studies, conducting interviews, and developing study protocols has enabled experienced personnel in health departments to function effectively in multiple positions, strengthening and broadening the research capacities of health departments in general.

The survey of childbearing women, which depends on existing programs for screening newborns for metabolic diseases, has focused attention on newborn screening and fostered new collaborations between health department epidemiologists and those responsible for screening.

Epidemiologic studies. Studies that examine the modes and characteristics of transmission of HIV and the natural history of HIV infection have had broad implications in many areas. For example, studies involving the modes, rates, and risk factors for transmission of HIV from women to their fetuses or infants highlight the requirements for more accessible health care for inner-city, largely minority populations.

The need to understand better the patterns of high-risk behavior associated with HIV infection and AIDS and the public's knowledge about these behaviors has had an impact on the collection and use of such data. For example, questions on knowledge of HIV were included for the first time in the 1987 National Health Interview Survey, carried out annually by the National Center for Health Statistics, CDC, for the purpose of developing and evaluating a major national educational campaign.

Goal II: Develop Prevention Technologies

Diagnostic technology. The development and appli-

cation of polymerase chain reaction technology for the sensitive and specific diagnosis of HIV infection have given impetus to more widespread use of this research technique with a variety of infectious agents, including other viruses (human papillomavirus, HTLV-I/II, and so forth), bacteria, and parasitic agents, that are difficult to detect or characterize by standard means.

Safe blood. The application of blood-donor deferral and heat treatment of blood factor concentrates to prevent HIV transmission has led to a safer blood supply, with major declines also seen in transmission of other bloodborne agents, especially hepatitis B and C viruses.

Engineering controls. Increased focus on the use of engineering controls to reduce the need for voluntary action by workers (for example, by developing needleless systems and antineedlestick devices) and on the use of personal protective equipment (gloves, masks, eye and face shields) has reduced the risk of occupational transmission of HIV and other bloodborne pathogens. With gloves, for example, the goals have been to validate a method for evaluating holes and the effect of various agents on the integrity of gloves, to make recommendations on shelf-life and use, and also to look into the possibility of developing stronger, better gloves.

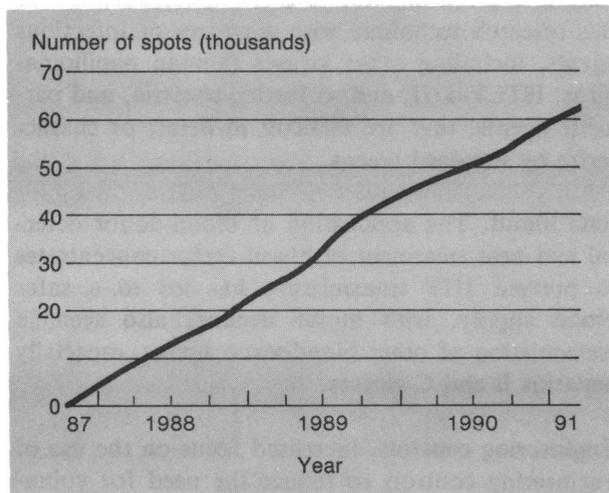
Studies to characterize the aerosols produced in surgical settings will lead to a better understanding of what potential risk, if any, may exist for aerosol transmission of bloodborne pathogens.

Heightened concern about possible HIV transmission through contaminated medical waste has resulted in improved procedures for disposing of such waste.

Communications. The severity of the AIDS epidemic necessitated the development of a health communications system that is unprecedented in public health history. Effective public health programs require the support of an informed public. When health problems call for behavioral solutions, potentially vulnerable persons must have access to information on which to base their individual and collective decisions. One principal method of communicating with persons at risk of transmitting or acquiring HIV infection is through peer-level community groups at local levels, but mass communication channels must also be used in the effort to reach everyone at risk.

CDC's mass communication efforts are directed through three major channels: radio and televi-

Figure 3. Cumulative estimated number of donated spots for "America Responds to AIDS" public service announcements, all sources



SOURCE: Broadcast Advertisers Report.

sion, the National AIDS Clearinghouse, and the National AIDS Hotline. First, AIDS prevention information is disseminated through television and radio. While deregulation was reducing the broadcast industry's contributions to public service time, the "America Responds to AIDS" (ARTA) public service advertising (PSA) campaign in its first 3 years of activity was able to generate more donated air time than any previous publicly funded PSA campaign in history (fig. 3). The program's staff, through numerous meetings and interactions with public service directors at the network and local levels, learned valuable lessons that have application to similar public health efforts: air time enhanced through predevelopment approvals from the networks; broad consensus-building in developing materials to make sure that the materials meet actual needs; high-quality production values; and local tagging and marketing, demonstrating to local media outlets that the national problem is one that is also relevant in their communities.

CDC's National AIDS Clearinghouse is demonstrating the type of cost efficiencies and public health benefits that can accrue from using advanced technologies for collecting and storing data and disseminating information that optimize the full range of services. Other Public Health Service agencies now tout this clearinghouse as a model for others, and other CDC programs are beginning to tap staff expertise in setting up information dissemination systems.

CDC's National AIDS Hotline, the third component of this information system, has answered more than 5 million calls during the past 3 years—approximately four times as many calls as any

public health helpline in history. The volume of calls has required CDC to learn about many different types of telephone-related technologies to improve our capacity to keep line blockage to a minimum and to enhance our ability to obtain up-to-the-minute intelligence about the concerns and questions of the American public.

CDC's hotline also became the first federally supported health line to provide national information service to hearing-impaired callers. This effort provides information to the more than 21 million Americans with severe or total hearing loss, for many of whom standard English and the spoken word are not effective for communicating health messages.

Communications research. The AIDS crisis has also enabled CDC to break new ground in the field of health communications research. Using the National Academy of Sciences' blueprint for evaluating public service advertising campaigns (1), CDC has developed a foundation for its efforts. CDC has brought in health communications experts from around the United States and other countries in its efforts to test new evaluation instruments and technologies to improve our ability to know what will be most effective in influencing populations of interest, and under what conditions.

It will thus be possible to refine interventions, monitor services and activities, evaluate the outcomes (behavior changes such as in condom use, sexual behavior, drug usage, sharing of drug injection equipment, and so forth), and measure the impact on the incidence and prevalence of HIV infection and AIDS. Lessons learned about evaluation technology and design of instruments, as well as lessons learned about communication channels for special audiences based on the "stages of behavior change" model (precontemplative, contemplative, ready, action, maintenance) will provide information that will be immediately applicable to other health programs.

Laboratory support. Laboratory support services, too, have been enhanced as a result of HIV infection and the AIDS epidemic.

CDC's National Laboratory Training Network (NLTN) was implemented in cooperation with the Association of State and Territorial Public Health Laboratory Directors (ASTPHLD) in seven cities to provide information and train laboratorians doing HIV-related laboratory testing, but it has become a recognized training model that can be applied to many other public health training needs.

NLTN serves to promote interaction between State and local departments of health and the private sector in the assessment, delivery, and evaluation of laboratory training services. It encourages information and resource sharing and increases the visibility of the public health laboratory sector among private-sector laboratorians by providing a network for quickly disseminating laboratory training in new technology; for example, Western blot, HIV-1 and HIV-2 antibody testing, use of dried blood spot specimens, and polymerase chain reaction. It provides a mechanism for delivering training close to those who need it; for more accurately identifying training needs by direct input from the field, including public-sector collaborators who participate in training delivery; and for delivering long-distance training, for example, through teleconferencing. NLTN strengthens collaborative training relationships and opportunities between CDC, ASTPHLD, and other professional and scientific organizations.

CDC's Laboratory Performance Information Exchange System is an electronic bulletin board developed for laboratorians performing HIV-related testing so they can collaborate among themselves to identify problems in testing and work together for rapid resolution of problems. It provides a system for quickly relaying information about performance evaluation results, improvements in testing, new technology, and sources of laboratory training and education that could be applied in other laboratory testing situations. It also provides a mechanism for communicating within and between constituencies of laboratory organizations. The number of users of this system increased from 389 in July 1990 to 1,621 in December 1990, and it is still growing.

CDC's Model Performance Evaluation Program (MPEP) enables States to compare their laboratories' performance and contributes to meeting the Institute of Medicine's recommendation that a uniform national data set be established. MPEP serves as a model for evaluating laboratory performance and for identifying and resolving problems that may be occurring throughout the testing process. Currently building on the model for performance evaluation of new technology and tests (for example, flow cytometry and CD4+ cell testing), this model could also be applied in other areas. MPEP conducts research to identify the determinants of laboratory testing quality that may be used in focusing training needs and standards of practice guidelines. For example, problems were identified with particular manufactured kits, with

applying appropriate criteria for interpreting Western blot patterns, and with reporting HIV test results in a format that clearly conveyed the HIV antibody status to the requesting physician.

Goal III: Build Prevention Capacities

Linkages. Strong linkages have been forged between CDC and national organizations (including those addressing HIV issues among minority populations) and community-based organizations through HIV prevention funding and technical assistance. The development of prevention capabilities in these organizations is nurtured through the transfer of new scientific findings and technical information from demonstration projects to programs; for example, community outreach programs for AIDS education have wider application.

Outreach. Hard-to-reach populations, such as drug users, youth in high-risk situations, the homeless, and persons who exchange sex for money or drugs, are often at risk for other medical and social problems that could be effectively addressed through outreach programs. Such programs seek out persons at risk in their local communities through members of their peer groups or respected community leaders.

Street outreach serves several important functions. It is a way of providing health messages to persons who are not being served or who are not getting health information from public or private physicians and other health professionals; outreach becomes the primary vehicle through which information is disseminated to hard-to-reach, at-risk populations. Outreach is also a major vehicle for connecting persons with needed services throughout the public health and social services arena; HIV street outreach programs make referrals to HIV counseling and testing centers, drug treatment programs, and medical, educational, legal, and other social services. As a result of the first two functions, street outreach has unique potential to transform dysfunctional persons by fostering individual empowerment through information and access, which can lead to more informed and responsible decision-making by individuals concerning their health and social and economic welfare.

Communication partners. Efforts to communicate important public health messages to the many populations that may be at risk—in a country that has prided itself on the diversity of its population—have enabled us to forge partnerships with organi-

zations and individuals that are uniquely capable of delivering public health prevention messages to particular segments of the population, many of whom have often fallen outside the health care mainstream. Partnerships with racial and ethnic minority organizations, for example, have brought CDC staff into frequent contact with a wide range of health professionals who had been previously "unknown" to CDC and to its State and local public health partners.

Networking through national organizations may set a model for future prevention programs in other areas; for example, in partnership with CDC, eight national organizations, such as the National Parent-Teacher Association, were instrumental in implementing a CDC-based national Youth Risk Behavior Surveillance System (including both the State and Local Youth Risk Behavior Survey and the National School-Based Youth Risk Behavior Survey), which has provided important baseline information on sexual and drug use behaviors of high school students throughout the country. And through national and regional minority organizations, CDC has provided financial or technical support, or both, to produce and distribute important educational materials directed to Spanish-speaking women; good examples are KCET TV's documentary on women and AIDS and the self-help "Latina AIDS Action Plan and Resource Guide" developed by the National Hispanic Education and Communications Project of the Hispanic Designers, Inc.

Guidelines. Concern about occupational transmission of HIV and hepatitis B virus (HBV) has led to the development of very specific guidelines for health care workers, including public safety workers, and a Joint Advisory Notice (HIV and HBV) calling for more widespread use of HBV vaccine to protect health care workers.

Reports of HIV transmission to five patients in a single dental practice have heightened concern about and prompted CDC to review the risks of HIV and HBV transmission to patients during certain invasive medical and dental procedures. CDC recently published guidelines to further reduce the risk of transmission of HIV and other bloodborne pathogens in specific health care settings.

Mass media. CDC is currently providing State and local public health personnel with specific training and consultation assistance in developing the skills associated with health communications using the mass media. Once these skills are firmly implanted

throughout the United States, CDC's ability to mobilize the public health community as well as the public through rapid transfer of public health information will be superior to what was in place prior to the HIV infection and AIDS epidemic. The CDC Office of Public Affairs has capitalized on the many national meetings on AIDS sponsored by CDC, including national meetings on health communications in Dallas and New Orleans in 1989 and in 1990, to forge a new alliance of public information officers from all the State health departments. This new communications network has already been used to transmit vital public health information on many non-HIV-related issues.

CDC has collaborated with entertainment media representatives by initiating a dialogue with Hollywood's screen writers and producers and with television program standards personnel of the major networks. These contacts and the provision of compelling epidemiologic data about the course of the HIV epidemic have brought about changes in programming policies with regard to sexual health that will also benefit family planning and STD programs. Before 1988 all three major networks had policies against using the word "condom" in public service advertising messages, but in October 1988 the networks publicly announced removal of this prohibition in the interest of health. Condom "spots" now are carried by all three. And, since the beginning of the fall 1990 TV season, numerous popular situation comedies and dramatic series have incorporated dialogue in sexually suggestive scenes that reflects a new sense of sexual responsibility—an emerging new norm—that has been AIDS-generated, but which if successful in changing public practices will also contribute to the reduction of STDs and unplanned pregnancies.

Goal IV: Implement Prevention Programs

Many of the programs already described contribute to a strengthened ability to implement prevention programs. Additional examples include the following.

Blood safety. HIV infection and AIDS prevention programs have helped improve the safety of the nation's blood supply through collaboration with blood centers, the American Red Cross, and the Food and Drug Administration in using HIV surveillance data to evaluate routine blood collection procedures.

Youth. The outlook for the health of the nation's

youth has been improved by CDC's working to help schools provide comprehensive school health education programs since 1974. In 1986, CDC's staff members in the Office of School Health Education began planning a nationwide school-based program to prevent HIV infection in youth. The program was implemented in September 1987 by providing support to 15 national organizations and 50 State and 12 local departments of education that serve jurisdictions with the highest cumulative number of reported AIDS cases. By the fall of 1988, CDC was providing fiscal and technical assistance to 19 national organizations, all 50 States, 5 Territories, and 16 local departments of education. The mission of the program has been broadened to include out-of-school youth also.

These programs help establish a foundation for understanding the link between personal behaviors and health, especially sexual behavior and health. They help youth avoid or reduce behavioral risks associated with leading causes of mortality, morbidity, and disability—behaviors associated with unintentional and intentional injuries; tobacco, drug, and alcohol use; sexual behaviors associated with HIV infection, other sexually transmitted diseases, and unintended pregnancy; health-related physical activity; and nutrition and eating behaviors.

Conclusion

The epidemic of HIV infection and AIDS has placed enormous strains on the public health system of our nation, requiring heroic efforts to meet the challenge. Although weaknesses remain, the response to this epidemic has in many ways brought new strength to the public health structure. Despite the huge challenges, lessons learned thus far provide direction and hope for the future.

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